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# Impact of Sugar Industry Effluent on Productivity of Tomato (*Lycopersicon esculentum* Mill. Var. Navodaya)

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## ABSTRACT

Five concentrations of sugar industry effluent was given in irrigation medium i.e. 20 per cent as T<sub>1</sub>, 40 per cent T<sub>2</sub>, 60 per cent as T<sub>3</sub>, 80 per cent as T<sub>4</sub> and 100 per cent as T<sub>5</sub>. The yield characters' studied the diameter of flower, length of anther, pollen fertility, number of flowers per inflorescence, number of inflorescence per plant, number of fruits per plant, diameter of fruit, number of seeds per fruits, average of fruit and productivity per plant. Diameter of flower was found to increase with the treatment of sugar industry effluent and maximum increase was recorded as 7.49 per cent in T<sub>3</sub> treatment. Maximum increase in the length of anther was noted as 23.53 per cent in T<sub>3</sub> treatment. Pollen fertility was almost unaffected with the treatment of sugar industry effluent a little increase of 3.47 per cent was recorded in T<sub>2</sub> treatment. Number of flower per inflorescence was also found to increase and maximum increase was recorded in T<sub>3</sub> treatment and it was 15.69 per cent as compared to control. Number of inflorescence per plant was also affected with the treatment of sugar industry effluent and T<sub>3</sub> treatment where plant received 60 per cent concentration of sugar industry effluent showed maximum increase of 22.07 per cent as compared to control. Number of fruits per inflorescence was found to increase with the increase of concentration of sugar industry effluent and maximum increase was recorded in T<sub>3</sub> treatment and it was 28.89 per cent as compared to control. Diameter of fruit was found to increase and maximum increase was noted as 22.13 per cent over control in T<sub>3</sub> treatment. Number of seeds per fruit and average weight of the fruit were also found to increase with the increase of sugar industry effluent up to 60 per cent and maximum increase was recorded as 29.66 per cent and 53.71 per cent respectively, over control. Fruit productivity per plant was found to be affected by the treatment of sugar industry effluent and maximum increase of 98.16 per cent was recorded in T<sub>3</sub> treatment. It was observed that T<sub>3</sub> treatment where plants were irrigated with 60 per cent concentration of sugar industry effluent was to found to enhance

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the maximum in almost all the yield parameters taken in to consideration. It is concluded that the concentration up to 60 per cent favours the yield characteristics of *Lycopersicon esculentum* Mill. Var. Navodaya. The concentration above 60 per cent showed toxic effect on almost all the yield parameter including fruit productivity of tomato crop.

**Keywords** : Sugar industry effluent, *Lycopersicon esculentum* Mill. Var. Navodaya, Treatment ( T<sub>0</sub>, T<sub>1</sub>, T<sub>2</sub>, T<sub>3</sub>, T<sub>4</sub>, & T<sub>5</sub>), Yield characters.

## I. INTRODUCTION

Progress of any country is measured by its industrial development, which resulted in to industrial revolution all over the world. India with fast industrial growth is also facing pollution problem of a significant magnitude. The liquid base (effluents) produces by industries are resulting into degradation of environment. Several rivers of the world are receiving heavy amount of industrial effluents, with highly toxic chemicals (Mathur, 1975). It makes water bodies foul smelling unpleasant, turbid and unfit for life of living organism including plants. Agricultural production is mostly affected by the reckless discharge of these effluents. Farmer use these effluents for irrigation due to scarcity of irrigational water. Sugar industry effluent is the second largest industry of our country next to the textile (Rachel & Sequira, 2010). Reckless release of Sugar industry effluent on land or into natural water bodies, exposing serious pollution problem in India (Srivastava & Sahai, 1987). The pollution due to industries is increasing day by day. A huge amount of water is used in sugar industry and subsequently a large amount of effluent of medium pollution range is discharged. Sugar industry effluent is light brown to black in colour it is charecterised by high pH value, suspended solids, COD, BOD, Chloride, Sulphates, low dissolve oxygen and heavy metals, like Manganese, Copper, Zinc, Lead, and Mercury which affected primary producers specially green plants (Ajmal and khan, 1983). Farmers in the vicinity of

these industries irrigate their crops of cereals, pulses, oils, vegetables etc. by the polluted water. Beside the hazardous elements, effluents also contain some useful elements like Nitrogen, Phosphorous, and Potassium. Some effluents at a particular dilution are found to be beneficial for irrigation (Taghavi and Vora, 1994). In our country sugar industry effluent is used for irrigation by farmers (Singh, et al, 1985). Therefore, it is necessary to know that impact of sugar industry effluent on agricultural crops.

The Tomato (*Lycopersicon esculentum* Mill. Var. Navodaya) is one of the most popular as well as important commodities in the world; about 20 million metric tons of Tomatoes are produced each year on world basis United State, Italy, and Spain are the leading producer of the crops. Tomato is often referred as “The poor man’s orange” because of its high vitamin, malic acid, and citric acid content (Salunkhe et al, 1974). Seeing the nutritional value of Tomato and its global demands, the present experiment was conducted to study the effect of sugar industry effluent on productivity of *Lycopersicon esculentum* Mill. Var. Navodaya.

## II. MATERIALS AND METHODS

The seeds of *Lycopersicon esculentum* Mill. Var. Navodaya was obtained from government agricultural office, Azamgarh and sugar industry effluent was obtained from Sahkari Chini Mil Sathiyaon, Azamgarh.

The experiment was carried out at research field, Shibli National P.G. College, Azamgarh in factorial randomized block designs. The crop irrigated with different concentration of sugar industry effluent (20, 40, 60, 80 and 100 per cent named as T<sub>1</sub>, T<sub>2</sub>, T<sub>3</sub>, T<sub>4</sub> and T<sub>5</sub> treatments) respectively. A control experiment was grown side by side where the crop was irrigated with tap water only and named as T<sub>0</sub> treatment. Several reproductive parameters including productivity per plant were studied and compared with control. The yield characters studied were the diameter of flower, length of anther, pollen fertility, number of flower per inflorescence, number of inflorescence per plant, number of fruits per plants, diameter of fruits, number of seeds per fruits, weight of fruits, productivity per plants.

### III. RESULTS AND DISCUSSIONS

An experiment was conducted on the effect of different concentration of sugar industry effluent on reproductive parameters of *Lycopersicon esculentum* Mill. Var Navodaya. The parameters were diameter of flower, length of anther, pollen fertility, number of flowers per inflorescence, number of inflorescence per plant, number of fruits per plant, diameter of fruit, number of seeds per fruit, weight of fruit, fruit productivity per plant. A comparative statistical analysis of the mean value has been made, and the resultant data represented in Table.

The significant increase was noted in the diameter of flower in T<sub>3</sub> treatment and it was 7.49 percent as compared to control. Treatment T<sub>4</sub> & T<sub>5</sub> were showed the toxic effect to the diameter of flower and decreases the diameter by 0.229 & 8.38 percent respectively. Length of anther was affected with the effect of different concentration of sugar industry effluent and the increase was recorded in treatment

T<sub>1</sub>, T<sub>2</sub>&T<sub>3</sub> by 9.94, 12.40 and 23.53 percent respectively, over control. The maximum increase was recorded in T<sub>3</sub> treatment. The treatment T<sub>4</sub> &T<sub>5</sub> showed toxic effect on the length of anther, a decrease was noted by 7.75, and 14.83 per cent as compared with to control crop. The pollen fertility was found to be unaffected with the treatment of sugar industry effluent although a little increase of 3.47 per cent was recorded in T<sub>2</sub> treatment. The number of flowers per inflorescence was found to be affected with the treatment of different concentration of sugar industry effluents. An increase in treatments T<sub>1</sub>, T<sub>2</sub>, and T<sub>3</sub> was recorded as 2.49, 6.59, & 15.69 per cent respectively as compared to control (Table). The treatment T<sub>4</sub> & T<sub>5</sub> were showed the toxicity to the number of flower per inflorescence, found to be decrease the number by 17.29 &19.79 per cent respectively, the maximum decrease was recorded in T<sub>5</sub> treatment as compared to control. The other reproductive parameter i.e., number of inflorescence per plant was also found to be affected with irrigation of sugar industry effluent. It increases up to 60 per cent concentration and above 60 per cent concentration was found to be toxic for number of inflorescence per plant. Maximum increase was recorded at 22.09 per cent as compared to control in T<sub>3</sub> treatment. Statistical analysis showed a significant increase of 5.52, 19.63 & 22.09 per cent in T<sub>1</sub>, T<sub>2</sub> and T<sub>3</sub> treatments over control respectively. Treatment T<sub>4</sub> &T<sub>5</sub> was found to reduce the number of inflorescence per plant by 7.97 and 71.78 per cent respectively and a significant decrease was recorded in T<sub>5</sub> treatment by 71.78 per cent (Table). The number of fruits per plant was also affected with the effect of different concentration of sugar industry effluent. All the treatment that is treatment T<sub>1</sub>, T<sub>2</sub> and T<sub>3</sub> showed that the number of fruit increase with the increase of different concentration of sugar industry effluent up to the 60 per cent concentration. It has been recorded that the treatment T<sub>1</sub> increases by 16.44 per cent, T<sub>2</sub>

by 28.67 per cent and T<sub>3</sub> by 28.89 per cent respectively, as compared to control. On the other hand, the treatment T<sub>4</sub> & T<sub>5</sub> showed the toxic effect on the number of fruits per plant of *Lycopersicon esculentum* Mill. Var. Navodaya, and it was 8.22 and 85.64 per cent respectively and statistical analysis revealed the significant decrease in treatment T<sub>5</sub>. The diameter of fruit was found to increase with the increasing concentration of sugar industry effluent up to T<sub>3</sub>, the increase was recorded as in Treatment T<sub>1</sub> by 9.10, T<sub>2</sub> by 22.12 and in T<sub>3</sub> 22.132 per cent as compared to control. In treatment T<sub>4</sub> and T<sub>5</sub>, a decrease was recorded in diameter of fruit by 0.4228 percent and 17.61 per cent respectively. The numbers of seed per fruit was also affected with the irrigation of different concentration of sugar industry effluent. The treatments T<sub>1</sub>, T<sub>2</sub>, & T<sub>3</sub> showed an increase of 12.29 per cent, 17.42 per cent and 29.66 per cent respectively. The maximum increase was recorded in T<sub>3</sub> treatment that is significant. The treatment T<sub>4</sub> and T<sub>5</sub> showed a decrease of 5.185 & 9.34 per cent respectively as compared to control. The other parameter like weight of the fruit also affected, with the effect of increasing concentration of sugar industry effluent. An increase of 13.55, 23.61 and 53.71 per cent in T<sub>1</sub>, T<sub>2</sub>, & T<sub>3</sub> treatment respectively as compared to control crop. The maximum increase was recorded in T<sub>3</sub> treatment, which was significant. The treatment T<sub>4</sub> and T<sub>5</sub> decreases the weight of fruit by 21.24 & 25.55 per cent respectively. The fruit productivity per plant was found to increase with increase of concentration of sugar industry effluent in irrigation medium up to 60 per cent i.e. T<sub>3</sub> treatment. The concentration above 60 per cent decreases the fruit productivity. Significant increase of 59.12 per cent and 98.16 per cent was recorded in T<sub>2</sub> and T<sub>3</sub> treatment. A significant decrease of 89.40 per cent was recorded in T<sub>5</sub> treatment.

Increase in almost all the yield parameters with the application of sugar industry effluent indicated that its proper dilution (60 percent) can be used as liquid fertilizer for such type of crop especially *Lycopersicon esculentum* Mill. Var. Navodaya. Moreover, can minimize the pollution load in our environment. Similar type of observation have been reported by some other workers like Rahate et al, 1990, Devrajan and Oblisamy (1994), Rampal and Dorjey (2001), Kumar (2004) etc. Stomberg et al, (1984) reported that the total yield of sweet corn was highest with the treatment of tannery waste. Rahate et al, (1990) reported increase in the yield per plant and pod number of groundnut with the effect of biogas slurry effluent. Devrajan & Oblisamey, (1994) reported highest yield of banana with the irrigation of sugar industry effluent. Rajannan et al, (1998) reported in the yield of sugarcane with the effect of distillery-based compost at certain concentration. Rampal and Dorjey, (2001) reported that the number of pods per plant in lens esculentum Moench. Var. Malica increases with the treatment of foam industry effluent. Karmakar et al, (2001) reported highest yield of rice with the effect of paper factory sludge. Kumar, (2004) reported enhancement in grain productivity (Q/ha) and oil yield in two high yielding varieties of *Brassica campestris*. Sugar industry effluent contain about 80 mg per liter magnesium which has a direct role in protein synthesis as it is involve in the binding of ribosomal sub-particles. Although the excessive amount of magnesium is injurious to the plants causing rolling and curling of leaves and necrosis at the tip of the leaf. Magnesium plays an important role in the formation of chlorophyll. It is also involve in enzymatic reaction. Copper is require by the plant in very small amount 2 - 7.5 ppm and is toxic to the plant beyond certain concentration. It helps in biosynthesis of chlorophyll. Copper is also a component of enzyme L-gulono-oxidase involved in the synthesis of ascorbic acid that is why the presence

of copper in trace amount in sugar industry effluent *esculentum* Mill. Var. Navodaya. may favour the productivity of *lycopersicon*

Table 1 - Statistical comparison of the mean values of yield characters in between control and treated populations of *Lycopersicon esculentum* Mill. Var. Navodaya

S.NO.	Characters'	T <sub>0</sub>	T <sub>1</sub>	T <sub>2</sub>	T <sub>3</sub>	T <sub>4</sub>	T <sub>5</sub>	CD
1	Diameter of flower (cm)	2.4448 ±0.08068 (1.5-3.5)	2.46 ±0.08611 (1-3.9)	2.5024 ±0.12317 (1.5-3.6)	2.628 ±.12866 (1.5-4)	2.4392 ±0.12176 (1.2-3.5)	2.24 ±0.16992 (1.2-3.5)	0.080
2	Length of anther (mm)	6.7088 ±0.1902 (4-9)	7.376 ±0.038 (5-9)	7.5408 ±0.1004 (4.5-9.5)	8.2872 ±0.175 (5.5-10)	6.1888 ±0.1502 (4-8.5)	5.7136 ±0.1154 (4-7)	1.85
3	Pollen fertility (%)	74.65 ±0.79114 (60-8605)	71.9193 ±0.5216 (60-81.63)	77.24 ±1.08967 (60-92.77)	74.9426 ±1.29301 (59.29-95.31)	69.3625 ±0.56267 (58-78.57)	59.9225 ±0.8868 (48-70)	2.005
4	Number of Flowers/ inflorescence	4.488 ±0.2424 (2-8)	4.6 ±0.2945 (1-8)	4.784 ±0.3844 (2-10)	5.192 ±0.2809 (2-9)	3.712 ±0.2394 (1-7)	3.6 ±0.158841 (1-7)	3.312
5	Numberofinflorescence/plant	6.52 ±1.135 (2-12)	6.88 ±0.887 (3-14)	7.8 ±0.978 (2-14)	7.96 ±0.584 (4-12)	6 ±0.341 (2-9)	1.84 ±0.289 (0-5)	1.104
6	Number of fruits /plant	18 ±1.016 (13-25)	20.96 ±1.386 (15-29)	23.16 ±0.463 (20-29)	23.2 ±0.462 (19-26)	16.52 ±0.317 (13-20)	2.584 ±0.048 (1-5)	1.032
7	Diameter of fruit (cm)	13.624 ±0.21043 (9.5-18.5)	14.864 ±0.26279 (8.3-19.5)	16.6384 ±0.25879 (10.2-19.6)	16.6392 ±0.2834 (12.3-20)	13.5664 ±0.30124 (5-16.8)	11.2248 ±0.23488 (8.3-14.2)	0.3082
8	Number of seeds / fruit	41.192 ±0.5854 (19-67)	46.256 ±1.7794 (9-74)	48.368 ±1.9851 (18-80)	53.408 ±2.0884 (20-80)	39.056 ±1.1398 (17-67)	37.344 ±2.5389 (10-80)	2.8742
9	Weight of fruit (gm)	54.512 ±0.7804 (30-75)	61.896 ±1.4071 (23-91)	67.384 ±2.6505 (36-98)	83.792 ±2.4928 (43-120)	42.936 ±0.9977 (20-78)	40.584 ±0.6304 (25-65)	0.234
10	Productivity / Plant (Kg)	0.981	1.297	1.561	1.944	0.709	0.104	

T0= Control population irrigated with tap water

T1= Population irrigated with 20 per cent concentration of sugar industry effluent.

T2= Population irrigated with 40 per cent concentration of sugar industry effluent.

T3= Population irrigated with 60 per cent concentration of sugar industry effluent.

T4= Population irrigated with 80 per cent concentration of sugar industry effluent.

T5= Population irrigated with 100 per cent concentration of sugar industry effluent.

#### IV. CONCLUSION

On the basis of experimental result. It is concluded that the sugar industry effluent which is a medium range pollutant and pollute our water bodies in nearby area of sugar industry and is toxic for the

growth and development of crop plants if irrigated by that water. This effluent can be used as liquid fertilizer for the growth and development of crops like *lycopersicon esculentum* Mill. Var. Navodaya in proper dilution. It has recorded that 60 per cent concentration of sugar industry effluent enhance the maximum growth & productivity of *Lycopersicon esculentum* Mill. Var. Navodaya and it was 98.16 percent as compared to control.

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## Diversity of Endophytic Bacteria in *Aerides crispa*, an Epiphytic Orchid

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### ABSTRACT

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*Aerides crispa* is an epiphytic flowering orchid belongs to the family Orchidaceae. We have identified five different endophytic bacteria from this orchid. Genotypic characterization of the bacterial culture was done using 16S rDNA sequencing after PCR amplification. These sequences were compared with the known similar bacterial sequences from the NCBI GenBank database. Homological relationship of the bacteria was also compared by Phylogenetic tree generation. Bacteria obtained were *Bacillus pumilus* MT463728, *Bacillus megaterium* MT540506, *Lysinibacillus fusiformis* MT540507, *Bacillus cereus* MT540510, *Aneurinibacillus migulanus*. From the study, we have molecularly characterized and documented five different endophytic bacteria from the epiphytic orchid, *A. crispa*. This shows the diversity of endophytes in orchids which speaks a lot about the urgent necessity of bioconservation without words.

**Keywords :** *Aerides crispa*, endophytic bacteria, 16S rDNA, similarity matrix, phylogenetic tree, bioconservation

### I. INTRODUCTION

Kodagu district in Karnataka is located in the central part of the Western Ghats, situated in south India comprises of 50% forest and agro-forestry area. Trees of Western Ghats harbor a variety of epiphytic orchid [10]. The forests of Western Ghats are known to be a varietal storehouse of economically important plants. The tropical climate, heavy rainfall from southwest monsoon and favorable soil factors made the area

ideal for the rich biodiversity. The central Western Ghats area of Karnataka covers places viz., Kodagu, Hassan, Chikmagalur, Shivamogga, and Uttara kannada [1]. Orchids are one among the most threatened of all flowering plants. The Orchidaceae is one of the largest plant families with more than 25,000 species globally. These plants are known for its beauty and medicinal property. *Aerides crispa*, epiphytic flowering plants that habitat on tree trunks

in broad leaved evergreen forests and semi-evergreen forest which belongs to Orchidaceae family.

Endophyte, by definition, is one which resides in the tissues beneath the epidermal cell layers and causes no apparent harm to the host [16]. They form inconspicuous infections within tissues of healthy plants for all or nearly all their life cycle [12]. Endophytic bacteria can be defined as those that can be isolated from healthy, superficially disinfected plant tissues and do not cause any damage to the host plant [2][3]. Orchid species are critically dependent on mycorrhizal fungi for completion of their life cycle, particularly during the early stages of their development when nutritional resources are scarce. Mycorrhizal specificity was low, but significant variation in mycorrhizal community composition was observed between species inhabiting different ecological habitats. Molecular identification of endophytic bacteria from the epiphytic plant *Vanda testacea* were discussed in our previous study [4]. The aim of the present study is to identify endophytic bacteria from the epiphytic orchid plant, *Aerides crista* to its genotypic level.

## II. MATERIALS AND METHODS

The plant specimens were collected from the Somwarpet region (located at 10.42°N 74.73°E latitude) agro-forestry area of Kodagu district, Karnataka which is the central part of Western Ghats, hottest hot spot of biological diversity in the world. The parts of the plant such can be randomly cut off with a disinfected sickle and placed separately in sterile polythene bags to avoid moisture loss. The materials were transported to the laboratory within 24 hours and stored at 4°C until the isolation procedures were completed.

The plant brought into the laboratory were processed within 6 hours. The collected plant parts were thoroughly washed in running tap water to remove dirt and debris. Fresh healthy leaves and root were

selected for endophyte isolation. Epiphytes were removed from the surface by disinfecting the specimen by 70% ethanol for 1 minute, 4% sodium hypochlorite solution for 3 minutes; 70% ethanol for 30s and two rinses in sterilized distilled water. After removing the excess water, the leaf and root were excised in to the size of 0.5X0.5cm with the help of a sterile blade. A total of 50 segments were screened from each and these segments were placed in petri-plates nutrient agar with chloramphenicol (150 mg/L). These plates were incubated at 28°C for 24-48 hours and after getting visible bacterial colony. Each different colonies were cultured separately by streak plate method for obtaining pure culture. These pure cultures were maintained for further experiments [9] [14].

Genomic DNA of bacterial culture were isolated by phenol-chloroform method according to Mora [13]. 16S rDNA obtained were quantified and amplified using the primers: Forward BSF: 5'GAGTTTGATCCTGGCTCAGG 3'; Reverse BSR: 5' TCATCT GTCAC ACCTTCGGC 3'. The process of PCR was done using the set up; 10X PCR buffer: 2.5 µl, MgCl<sub>2</sub>: 2 µl, dNTP's mix (1mM each): 5 µl, Primer (10µM): F-0.5µl, R: 0.5µl, *Taq* polymerase (3U/µl): 0.3 µl DNA template (50ng/µl): 4 µl. The PCR programme employed was as follows: primary denaturation for 5 minutes at 94°C; 35 cycles of denaturation at 94°C for 30s; annealing for 30 s, and extension at 72°C for 1 min; and a final extension for 10 minutes at 72°C. The sequence similarity matrix was generated by comparing the sequences of known bacterial culture from NCBI data base and submitted for the accession number. Phylogenetic tree is constructed by comparing with strains from GenBank with highest similarities. Tree is constructed using kimura 2 model with bootstrap method. The neighbor joining tree and subtree were generated using MEGA5.2 software.

### III. RESULTS

From the epiphytic orchid plant *Aerides crispera*, different plants were used for the isolation of endophytic bacteria. A number of endophytes were obtained. We have selected a few for molecular identification. Those selected ones were AR1, AR2, AR3, AR4 and AL2 (names for temporary convenience). The sequences obtained were submitted to Genbank for Accession numbers; submission code and the accession number of each bacteria were given in the Table 1.

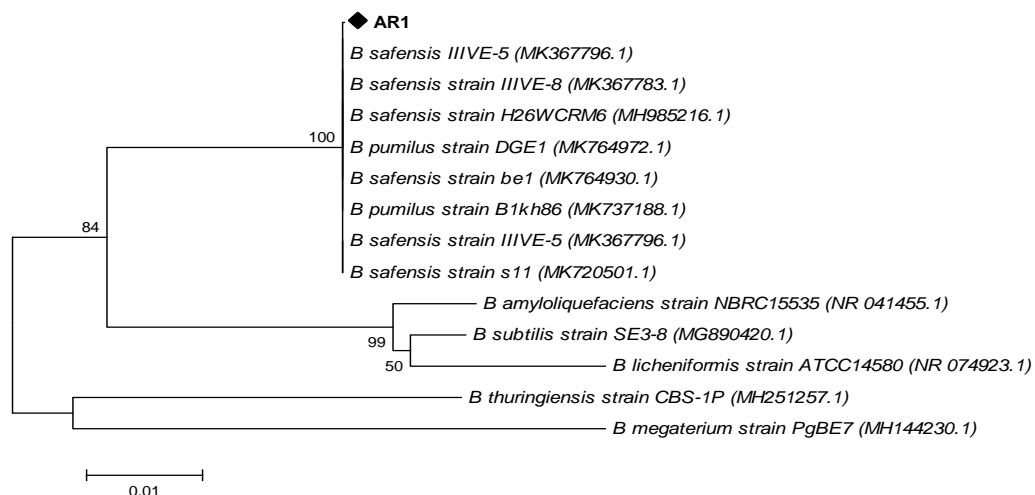
Sl. No	Bacteria	Submission code	Accession number	Temporary Names
1	Bacillus pumilus	SUB7444699	MT463728	AR1
2	Bacillus megaterium	SUB7526079	MT540506	AR2
3	Lysinibacillus fusiformis	SUB7526079	MT540507	AR3
4	Bacillus cereus	SUB7526079	MT463728	AL2

Similarity matrix of each bacteria were given in the tables named Table 2, Table 3, Table 4, Table 5 and Table 6 respectively. AR1: The culture 16S rDNA sequence has 100% similarity with *Bacillus* sp. with maximum homology with *Bacillus pumilus*. AR2:

The culture 16S rDNA sequence has 95.0% similarity with *Bacillus* sp. with maximum homology with *Bacillus megaterium*. AR3: The culture 16S rDNA sequence has 99.67% similarity with *Lysinibacillus* sp. with maximum homology with *Lysinibacillus fusiformis*. AR4: The culture 16S rDNA sequence has 98.89% similarity with *Aneurinibacillus* sp. with maximum homology with *A. migulanus*. AL2: The culture 16S rDNA sequence has 100% similarity with *Bacillus* sp. with maximum homology with *Bacillus cereus*.

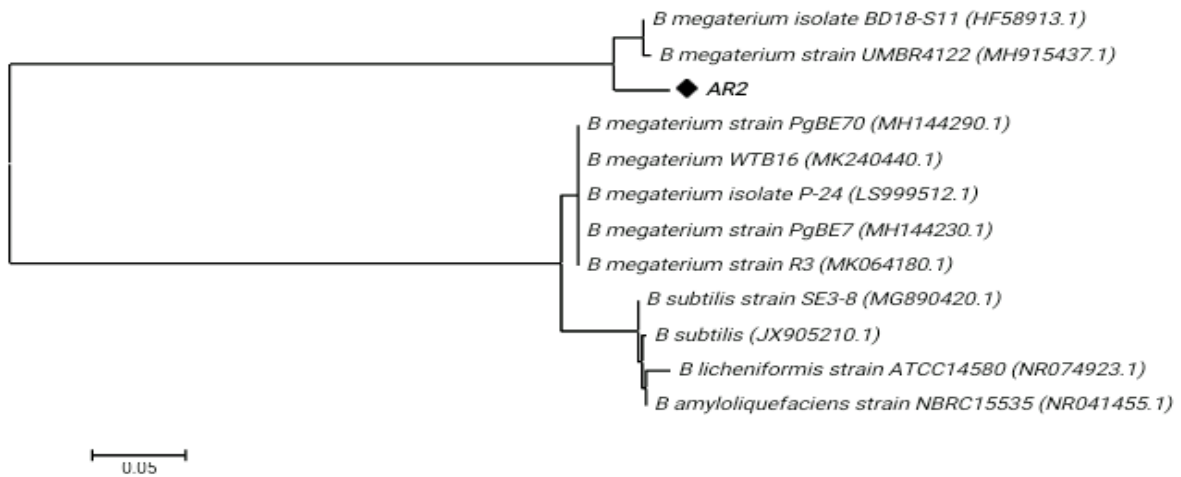
Phylogenetic tree is constructed by comparing with strains from GenBank with highest similarities. Tree is constructed using kimura 2 model with bootstrap method. The neighbor-joining tree and subtree were generated using MEGA5.2 software. Numbers show the level of bootstrap support from 1,000 repetitions. The tree is drawn to scale, with branch lengths in the same units as those of the evolutionary distances used to infer the phylogenetic tree. All positions containing alignment gaps and missing data were eliminated only in pairwise sequence comparisons. From the experiments, identified bacteria were *Bacillus pumilus*, *Bacillus megaterium*, *Lysinibacillus fusiformis*, *Bacillus cereus*, *Aneurinibacillus migulanus*. Constructed phylogenetic tree were mentioned in figures (Figure 1 for AR1, Figure 2 for AR2, Figure 3 for AR3, Figure 4 for AR4, Figure 5 for AL2).

Given below is the **figure 1** indicating phylogenetic tree of bacterial culture AR1

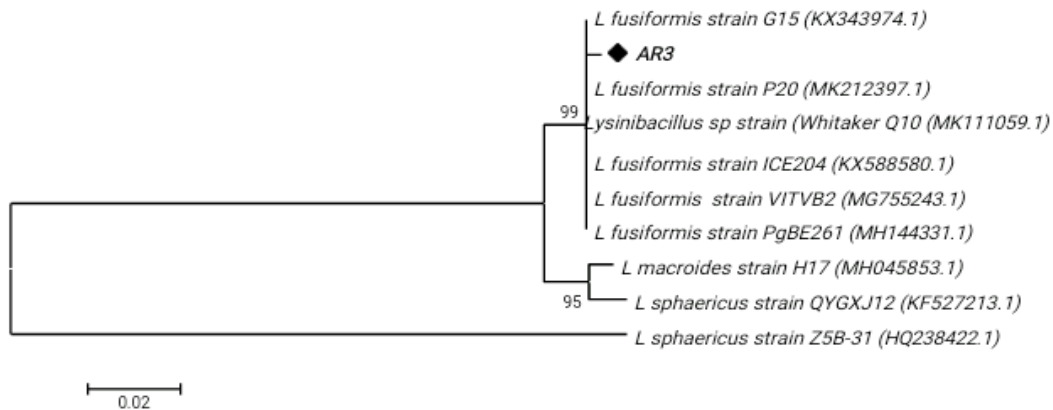




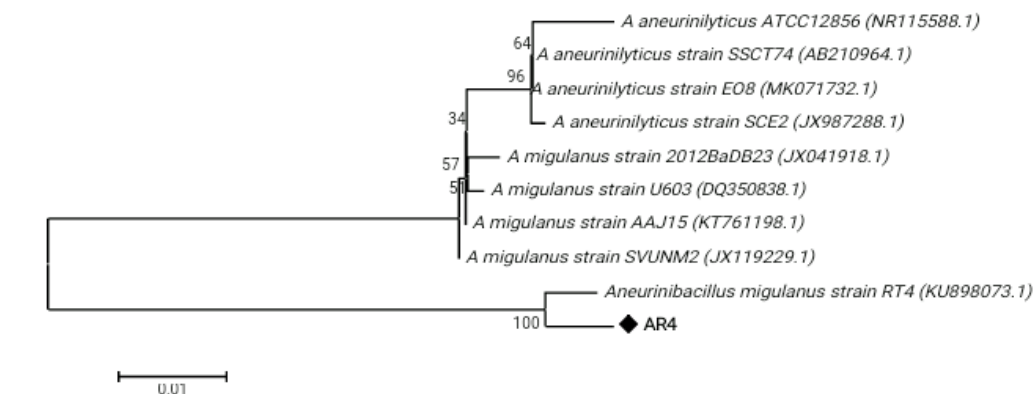
Given below is the **figure 2** indicating phylogenetic tree of bacterial culture AR2



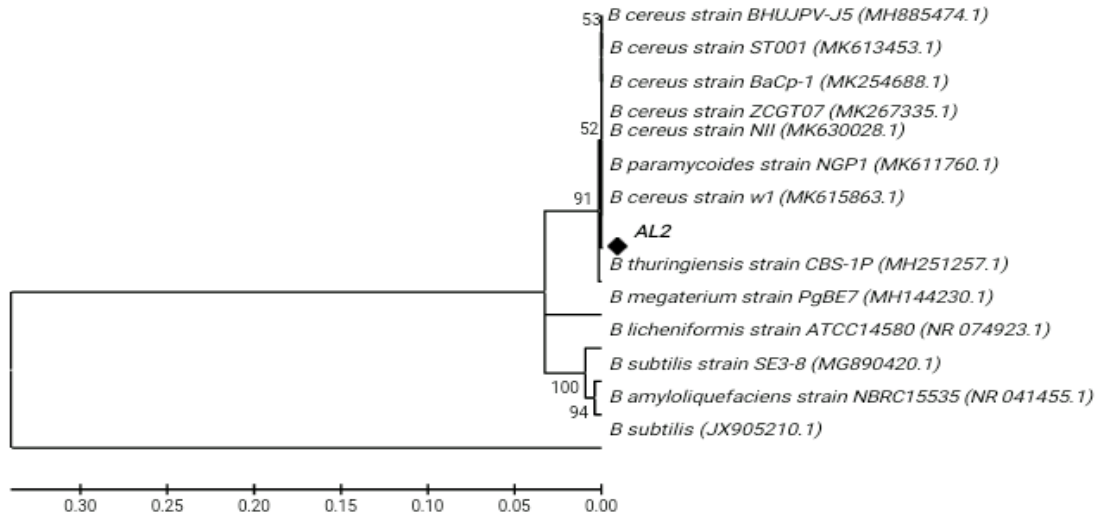
Given below is the **figure 2** indicating phylogenetic tree of bacterial culture AR3



Given below is the **figure 2** indicating phylogenetic tree of bacterial culture AR4



Given below is the **figure 2** indicating phylogenetic tree of bacterial culture AL2



**Table 1:** Sequence similarity matrix of AR1 16S rRNA partial sequence with the other closely related species

Sequence	1	2	3	4	5	6	7	8	9	10	11	12	13	14
AR1	-													
B_safensis_IIIIVE-5 (MK367796.1)	100	-												
B_safensis_strain_IIIIVE-8 (MK367783.1)	100	100	-											
B_safensis_strain_H26WCRM 6 (MH985216.1)	99. 5	99. 5	99. 5	-										
B_pumilus_strain_DGE1 (MK764972.1)	100	100	100	99. 5	-									
B_safensis_strain_be1 (MK764930.1)	100	100	100	99. 5	100	-								
B_pumilus_strain_B1kh86 (MK737188.1)	100	100	100	99. 5	100	100	-							
B_safensis_strain_IIIIVE-5 (MK367796.1)	100	100	100	99. 5	100	100	100	-						
B_safensis_strain_s11 (MK720501.1)	100	100	100	99. 5	100	100	100	100	-					
B_thuringiensis_strain_CBS- 1P (MH251257.1)	92. 5	92. 5	92. 5	92. 1	92. 5	92. 5	92. 5	92. 5	92. 5	-				
B_megaterium_strain_PgBE7 (MH144230.1)	92. 5	92. 5	92. 5	92. 1	92. 5	92. 5	92. 5	92. 5	92. 5	91. 5	-			
B_subtilis_strain_SE3-8 (MG890420.1)	94	94	94	93. 6	94	94	94	94	94	92. 5	90. 2	-		
B_licheniformis_strain_ ATCC14580	92. 6	92. 6	92. 6	92. 2	92. 6	92. 6	92. 6	92. 6	92. 6	91. 9	89. 8	97. 6	-	

_(NR_074923.1)															
B_amyloliquefaciens_strain_NBRC15535_(NR_041455.1)	94	94	94	93.6	94	94	94	94	94	94	92.5	89.4	98.7	97.2	-

**Table 2:** Sequence similarity matrix of AR2 16S rRNA partial sequence with the other closely related species

Sequence	1	2	3	4	5	6	7	8	9	10	11	12
B_subtilis (JX905210.1)	-											
B_licheniformis_strain_ATCC14580 (NR074923.1)	98.30	-										
B_amyloliquefaciens_strain_NBRC15535 (NR041455.1)	99.40	98.60	-									
B_subtilis_strain_SE3-8 (MG890 420.1)	99.60	98.30	99.40	-								
B_megaterium_strain_R3 (MK0641 80.1)	94.00	93.40	93.80	94.40	-							
B_megaterium_strain_PgBE7 (MH144230.1)	93.60	93.40	93.60	94.00	99.60	-						
B_megaterium_isolate_P-24 (LS999512.1)	90.50	89.90	90.30	90.80	96.00	96.00	-					
B_megaterium_strain_PgBE70 MH	94.00	93.40	93.80	94.40	100.00	99.60	96.00	-				
B_megaterium_WTB16 (MK240440.1)	92.70	92.10	92.50	93.10	98.60	98.30	97.30	98.60	-			
B_megaterium_strain_UMBR4122 (MH915437.1)	48.80	47.90	48.60	48.80	49.50	49.30	48.20	49.50	48.60	-		
B_megaterium_isolate_BD18-S11_(HF584913.1)	49.00	48.10	48.80	49.00	49.70	49.50	48.40	49.70	48.80	99.20	-	
<b>AR2</b>	47.60	46.90	47.80	47.60	48.70	48.70	48.00	48.70	48.20	92.10	92.70	-

**Table 3:** Sequence similarity matrix of AR3 16S rRNA partial sequence with the other closely related species

Sequence	1	2	3	4	5	6	7	8	9	10
Lysinibacillus_sp_strain_Whitaker (MK111059.1)	Q10 -									
L_fusiformis_strain_ICE204 (KX 588580.1)	100.00	-								
L_fusiformis_strain_P20 (MK212397.1)	100.00	100.00	-							
L_fusiformis_strain_VITVB2 (MG755243.1)	100.00	100.00	100.00	-						
L_fusiformis_strain_G15 (KX343 974.1)	100.00	100.00	100.00	100.00	-					
L_macroides_strain_H17 MH0458	97.60	97.60	97.60	97.60	97.60	-				
L_sphaericus_strain_QYGXJ12 (KF527213.1)	97.10	97.10	97.10	97.10	97.10	98.50	-			
L_fusiformis_strain PgBE261 (MH144331.1)	100.00	100.00	100.00	100.00	100.00	97.60	97.10	-		
<b>AR3</b>	99.60	99.60	99.60	99.60	99.60	97.30	96.80	99.60	-	
L_sphaericus_strain_Z5B-31 (HQ238422.1)	75.20	75.20	75.20	75.20	75.20	74.70	74.90	75.20	74.90	-

**Table 4:** Sequence similarity matrix of AR4 16S rRNA partial sequence with the other closely related species

Sequence	1	2	3	4	5	6	7	8	9	10
A_aneurinilyticus_strain_EO8_(MK071732.1)	-									
A_aneurinilyticus_strain_SCE2_(JX987288.1)	99.80	-								
A_aneurinilyticus_ATCC12856_(NR115588.1)	99.10	98.90	-							
A_migulanus_strain_2012BaDB23_(JX041918.1)	98.90	98.80	98.00	-						
A_aneurinilyticus_strain_SSCT74 (AB210964.1)	99.80	99.70	98.90	98.80	-					
A_migulanus_strain_AAJ15_(KT761198.1)	99.20	99.10	98.30	99.40	99.10	-				
A_migulanus_strain_U603_(DQ350 838.1)	99.10	98.90	98.20	99.20	98.90	99.50	-			
A_migulanus_strain_SVUNM2_(JX119229.1)	98.60	98.50	97.70	98.80	98.50	99.10	98.90	-		
Aneurinibacillus_migulanus_strain RT4 (KU898073.1)	83.70	83.70	83.00	83.80	83.50	84.10	84.10	83.70	-	
<b>AR4</b>	83.50	83.50	82.80	83.70	83.40	84.00	84.10	83.50	98.80	-

**Table 5:** Sequence similarity matrix of AL2 16S rRNA partial sequence with the other closely related species

Sequence	1	2	3	4	5	6	7	8	9	10	11	12	13	14
B_cereus_strain_ZCGT07 (MK267335.1)	-													
B_cereus_strain_NII (MK630028.1)	100.00	-												
B_cereus_strain_BHJVPV-J5 (MH885474.1)	94.30	94.30	-											
B_cereus_strain_BaCp-1 (MK254688.1)	100.00	100.00	94.30	-										
B_paramycoides_strain_NGP1 (MK611760.1)	100.00	100.00	94.30	100.00	-									
B_cereus_strain_w1 (MK615863.1)	100.00	100.00	94.30	100.00	100.00	-								
B_cereus_strain_ST001 (MK613453.1)	99.80	99.80	94.30	99.80	99.80	99.80	-							
<b>AL2</b>	100.00	100.00	94.30	100.00	100.00	100.00	99.80	-						
B_thuringiensis_strain_CBS-1P_(MH251257.1)	99.70	99.70	94.10	99.70	99.70	99.70	99.60	99.70	-					
B_megaterium_strain_PgBE7_(MH144230.1)	93.20	93.20	88.00	93.20	93.20	93.20	93.00	93.20	93.30	-				
B_subtilis_strain_SE3-8_(MG890420.1)	93.40	93.40	88.10	93.40	93.40	93.40	93.30	93.40	93.40	92.40	-			
B_subtilis_(JX905210.1)	46.00	46.00	45.30	46.00	46.00	46.00	46.00	46.00	45.90	44.50	44.90	-		
B_licheniformis_strain_ATCC14580_(NR_074923.1)	93.40	93.40	88.10	93.40	93.40	93.40	93.30	93.40	93.40	92.50	98.10	45.30	-	
B_amyloliquefaciens_strain_NBRC15535_(NR_041455.1)	93.40	93.40	88.10	93.40	93.40	93.40	93.30	93.40	93.90	91.20	99.20	45.00	97.90	-

#### IV. DISCUSSION

Associative bacteria of terrestrial (*Paphiopedilum appletonianum*) and epiphytic (*Pholidota articulata*) tropical orchids were investigated. Microbial community of epiphytic plant differed from that of the terrestrial one. Observed production of plant growth hormone by the microorganisms and its varying effects were also investigated [18].

Abundant bacteria and diazotrophs were identified in common in different tissues of *D. catenatum* from five planting bases, which might play a great role in the supply of nutrients such as nitrogen. The exact abundance of phylum and genus on the different tissues from different planting bases need deeper sequencing with more samples [11]. Some mycorrhizal fungi themselves have endosymbiotic bacteria *Glomeribacter gigasporarum* [7]. Like mycorrhiza, other endophytic fungi completely depend on the plant and its inside conditions for growth.

Some endophytic fungi have been shown to protect plants from herbivores or to be responsible for the synthesis of novel and useful secondary products [17]. Twelve endophytic bacteria were isolated from the meristem of in vitro *Cymbidium eburneum* orchid, and screened according to indole yield quantified by colorimetric assay, in vitro phosphate solubilization, and potential for plant growth promotion under greenhouse conditions. Suggested that these bacterial effects could be potentially useful to promote plant growth during seedling acclimatization in orchid species other than the species of origin [6]. Fenella and Joshi [8] revealed a definite pattern in the diversity of culturable epiphytic bacteria, host-dependent colonization, microhabitat localization and biofilm formation which play a significant role in plant-microbe interaction. A novel endophytic

filamentous bacterium strain was isolated from wild orchid *Grosourdyia appendiculata* of Thailand [15].

Associative bacteria of terrestrial (*Paphiopedilum appletonianum*) and epiphytic (*Pholidota articulata*) tropical orchids were investigated. Microbial community of epiphytic plant differed from that of the terrestrial one. Rhizobium and other beneficial microbial diversity of three legumes plants that would help as biofertilizers for the crop from Fabaceae family [5]. Orchid species are critically dependent on mycorrhizal fungi for completion of their life cycle, particularly during the early stages of their development when nutritional resources are scarce. Mycorrhizal specificity was low, but significant variation in mycorrhizal community composition was observed between species inhabiting different ecological habitats. Molecular identification of endophytic fungi from the epiphytic fungi *Vanda testacea* were discussed in our previous study [4].

Here, we have identified and documented five endophytic bacteria from the epiphytic orchid plant, *Aerides crispa*. These bacteria were *Bacillus pumilus*, *Bacillus megaterium*, *Lysinibacillus fusiformis*, *Bacillus cereus*, *Aneurinibacillus migulanus*. All are bacillus but different from each other. This shows molecular methods are accurate in identification to avoid misidentification. Presence of variety of endophytic bacteria in one plant shows the importance of conservation of biomes and its habitat. *Aerides crispa* have a habitat favourable for endophytes. Five bacteria were genotypically identified from a single plant. Genotypic characterization is better in comparison with other methods of identifying endophytic microbes from plants. Microbial diversity has also be conserved for future generation along with vulnerable plants such as epiphytic orchids.

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# Use of Data Science during Worldwide Pandemic : An Efficient and Reliable System to Support Decision Making in Different Sectors

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## ABSTRACT

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Any calamities or emergency situations have created drastic and everlasting impacts on mankind since history. Such situations need to be managed in an efficient and effective manner. There are countries of the world where the use of evolving technology is not a part of the management system. In this paper using a combination of technologies and tools we will provide a better alternative solution to the intuitive decisions thus making systems more reliable. Data Mining, Data Analytics, Data Visualization and Decision making have key applications demonstrated in this paper. Upon the choice of User Selections, this system will look into the number of deaths and recoveries that have occurred everyday from the start of spread of the COVID-19. Based on this information, the goal will be to analyze and formulate a death and recovery analysis, which will in turn help us in understanding the effect of corona virus on different work sectors, which in our case will be the Business sector of the country. The system will also focus on forecasting the GDP based on the past datasets of the country. Different visualization methods will be shown according to the Automated Machine learning system that will generate statistical depiction from the inflow of dynamic data. These info graphic visuals will provide a better understanding to the user as to how the situation will affect her own sector/domain as well as current stance of the GDP and enhance the overall User Experience (UX) of the user.

**Keywords** : Data Mining, Data Analytics, Data Visualization and Decision Making, Automated Machine Learning, Prediction, UI, UX.

## I. INTRODUCTION

The world has been greatly affected by any disasters, pandemics, epidemics, wars, calamities etc. These

situations have created major disturbances in the life of people and have created life changing impacts.

The aim is to develop a web application data intelligently and thus minimize the negative effects of the situation by educating the user of the application



with info-graphic details according to the sector the user is a part of. The system provides an insight into the real-time details of the pandemic, in our case COVID -19 and thus shows the tendency of the positive outcomes on making the smartest calculated decision relatively.

Data from the most relevant times of covid-19 spread is analyzed and predictions are used for pattern detection which makes the system learn from the past and ensure the machine learning for the crisis under consideration leads to trusted outputs maximizing the benefits of disaster management. The system works with dynamic data fed to the application at runtime supported by Automated Machine Learning.

The sections III, IV, V, and VI i.e., Proposed Work, Implementation, Methodology and Experimental Analysis of this paper provide useful details and focuses on all necessary and relevant information on the system development and execution process.

## II. LITERATURE SURVEY

Authors Gunther Schuh et al. (2019) [37] describes existing approaches focusing on structuring the Data Mining domain so as to provide decision making to choose suitable Data Mining methods for the user.

Authors Jaya Bajpai et al. (2016) [5] explains the problems in Data Cleaning process and presents data cleaning approaches involving different phases such as Data Analysis, Definition of Transformation Work Flow and Mapping Rules, Verification, Transformation, Back Flow Process of Cleaned Data. The tools used for the process of transformation and Data Cleaning have been mentioned.

Authors M. J., Price et al. (2014) [13] describes the use of time series models such as ARIMA and Random Forest for prediction. A comparative study is presented which resulted in the fact that Prospective

Random Forest model outperformed the ARIMA model over a specified time period.

Authors Zhang, L et al. (2020) [15] proposes a method for time series forecasting known as LSTM networks. Long-short-term-memory (LSTM) also known as RNN with blocks, are found to be efficient algorithms to build a time series sequential model. LSTM helps in processing information with the help of activation function and the output comes to be between 0 or 1.

Authors H. R. Bhapkar et al. (2020) [6] proposed a new method for understanding the pattern of recovery and death rates by including the recovery time period.

Authors Mahipal Jadeja et al. (2015) [29] present the use of Tree Maps in Data Visualization and transition from traditional representation methods to Tree-Maps. Tree-Maps are widely used to express a variety of nested as well as hierarchical data and data structures. These maps prove to be very useful in finding trends in large data sets.

Along with the Tree Maps, other Data Visualization Techniques such as Scatterplot, Sparkline, Pie Chart, Gauge, Heat Map, Histogram, Box Plot etc. are also used to visualize the data by matching the data to right information.

## III. PROPOSED WORK

The effect of pandemic has been negative on the economy across the world. During the Spanish influenza in 1918, the consequences on the business sector in the US and Europe were devastating. The overall economic loss incurred to the US business market was huge and many businesses had to shut down. The similar effects can be seen in 2020's covid-19 pandemic. The total loss in the global economy is predicted up to \$1Tn. The graph below shows the losses suffered by the share market in various

countries between January 10 2020 and March 16 2020. Fig.1.

### Stock Markets Feel The Heat

US, European, Hong Kong and Indian stock markets suffered sharp losses between January 10 and March 16

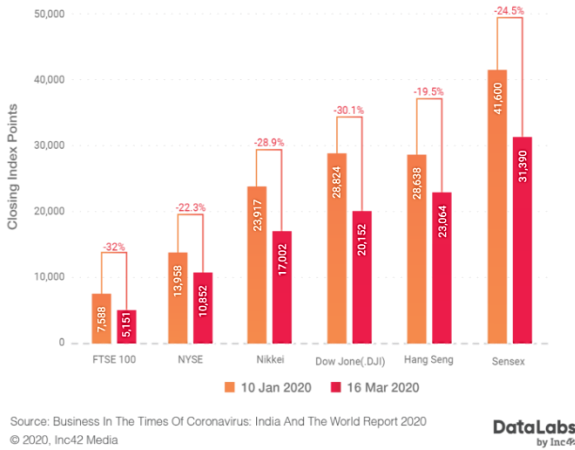


Fig.1.Share Market losses of various countries

This shows how much impact this pandemic has on the economy of countries. The most affected sector is the business sector. According to an article by BBC, there are certain countries that are trying their best to survive this economic crisis (Denmark, Singapore, The US, Rwanda and New Zealand).

The system proposed in this paper, will help various sectors to reduce loss and be resilient to any such situation. The data generated during this pandemic are brought together to get insights and propose better ways for businesses to minimize the effects of macro environmental factors. During the lockdown imposed to control pandemic, many small businesses had to close down, many are still trying to manage and maintain their position in the market. If these businesses are given proper assistance about what, when and where to invest their time and money, it would result in improvised situations.

## IV. IMPLEMENTATION

The flow chart depicts the basic workflow of the system architecture. The first step is to attain the

relevant datasets for the research and analysis. The datasets aimed are of dynamic dataset of COVID-19, that will help us analyze the recovery and death stats as per the situation; the economic growth and downfall in business sectors (if observed) dataset in that period, etc. The data is achieved from various sources like social media, health departments, economical departments, hence the data is never clean or ready for instantaneous use, it needs to be cleaned using data cleaning techniques. The data cleaning techniques are specified.

Analyzing the past up till present data to get better insights for future development that will eventually help to get a brief overview of trends and patterns where macro environmental factors are affected, composing further decision making easier. The application would start with depiction of recovery and death rates during the pandemic till date by using a calculative formula as proposed by Dr. Bhapkar [6]. The aim is to use this method rather than going with traditional method of statistic calculations to procure a finer and more accurate rate. Meanwhile, per day recovery and death cases would also be represented in info-graphical format. Using automated machine learning algorithms to training and testing of datasets for statistical depiction of dynamic inflow of data regarding Gross Domestic Product (GDP) will also be done. Further, the prediction and analysis procedures to forecast the same will be followed. In addition to this system, another info-graphic representation of businesses in every state of the country, how the economy has been respectively. This will give the user an insight as to how the conditions are for business in their region. Once the models are defined and their feasibility gets established, we will be able to develop an apt user interface with the defined methods connected at their backend.

The goal is to let the user review the outcomes for next few days, how the rate of virus spread will be, whilst analyzing the situation for them as to how they

can keep their business steady. For ease of operation and understanding, the analysis will be described in visual forms. This will help the clientele to make a thought-through decision for their purposes.

The smooth inflow of data is ensured using Redux-saga as middleware which will help note the state change in the application. Testing is done using Junit test cases. The ultimate application will assist the client in the emergency situation or calamity that has extreme effects on the world using the past, present data and visualization in least complicated ways, for the measures and better decisions that can be taken to avoid future damage to their business. The macro environment effects on any trade can result in declination of its economic growth, providing assistance in these situations in a user-friendly way is the consequent outcome of this application.

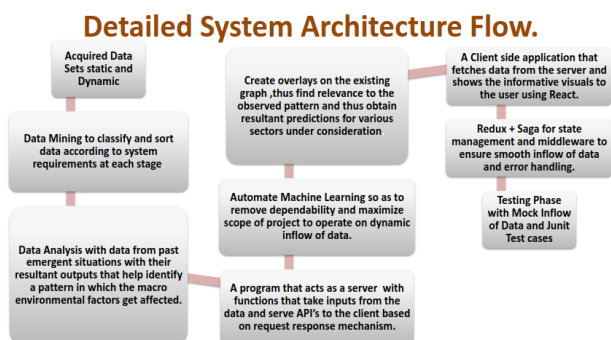


Fig. 2. Implementation Flow Chart

## V. METHODOLOGY

### Data Cleaning & Mining

Data cleaning is a technique or a process used for eliminating any errors and inconsistencies in the data to upgrade the data quality [1]. Considering the current situation, the data sets regarding any pandemic are huge and changes in the trends take place gradually. This bulk source of data contains patterns of uncertainties that may hinder the further process of prediction [5]. In order to avoid such situations, we need various methods of cleaning. Depending upon the need of the data sets, there are

few tools (ETL tools) for data cleaning among which the one that fits well must be used: COPYMANAGER (Information Builders), DATASTAGE (Informix / Ardent), EXTRICATE (ETI), POWERMART, DECISIONBASE (CA/Platinum).

These are more advanced methods of data processing; and instead, we can make use of some simpler means of cleaning of data, like clearing null values of certain columns by either discarding the data, which may lead to major loss. Hence another option of normalizing the data by means of statistics is also available. We can substitute the null values with the mean, median or mode of the column. This will not only give us a precise value of calculation, but will also not lead to data loss overall.

### Data Analytics(Favourable algorithm prediction)

The application requires two major analytical approach to represent the per day recovery to death ratio as well as prediction of GDP of the country. Hence for these actions, certain research on types of algorithm and methods was required. In the current case-scenario, a very less amount of data is available. Due to this severely fast developing epidemic conditions, our model needs to be working among high uncertainties. Thus, in order to select the most appropriate and accurate algorithm, we will be making use of an extensive selection method, named as Group of Optimized and Multisource Selection, abbreviated as GROOMS [11]. This method is specifically designed in order to achieve highest rates of prediction with limited resource. This design is being used for group forecasting, by making use of algorithms, some of which are capable of taking multiple sources of input. After comparison among various optimized methods, the one that produces highest prediction accuracy will be implemented for defining the forecast on rate of growth/decline in spread of the virus.

a) Group of Optimized and Multi-source Selection  
In this method, major three step process is implemented. Step one starts with the data set, no matter how small or large in scale, is being fed to the

collection of models defined by us. In the next step, each candidate model will present its best performance, either by optimizing the parameters, or by including other data sources. The characteristics of algorithms being used in this method are roughly categorized as: non-parametric (e.g., linear/logistic regression, simple statistics) that may not require fixture of parameters: parametric model (e.g. activation functions for neural networks, splitting criteria for decision tree and random forest classifiers); and dual models whose performances are sensitive to both types of input sources as well as selection of parameters. Step wise allocations for GROOMS are shown in Fig. 3.

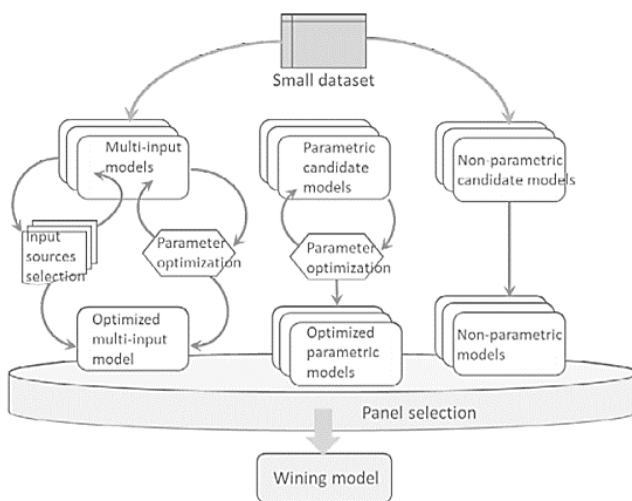


Fig. 3. GROOMS top to bottom approach.

All though GROOMS methodology analyses algorithms of various segregation, we chose this method to analyse various linear models of regression itself.

The linear regression models that were experimented were as follows: ElasticNet CV, Linear Regression, SGD Regressor, Bayesian Ridge, Lasso Lars, ARD Regression, Passive Aggressive Regressor and TheilSen Regressor.

### Data Visualization(Infographic Visuals of analysis and prediction)

Visualizing information in the form of graphs, charts, diagrams that help getting a better overview of the large data is called Data Visualization. We need data visualization because the visual summary of any information makes it easier to understand the trends

and patterns of data.[31] Analysis of data is done to get insights from data, visualization adds to the betterment of data analysis. Data visualization of unstructured data does not give good insights hence it is necessary to have clean data, which helps in visualization.[33]

Types of data visualization techniques used in this system are as follows:

- a) Line Chart
- b) Tree Map
- c) Polar Chart

#### a) Line Chart:

Line chart is widely used for visualizing patterns, trends and fluctuations in data that changes continuously. We can easily compare two or more datasets that are different yet have similar trends [27]. Through this representation, we can easily display the per day recoveries and deaths happening. From python programming perspective, there are many ways of plotting the graphs, some statically, and some animated in nature. One such library of graph, known as plotly is being used in the system. The graph\_objects module is being used for representing the recovery death analysis, as well as showing the prediction of GDP.

#### b) Tree Map:

Tree is used to display hierarchical data while Tree map is used to display hierarchy and compare values between categories and subcategories.[29] The concept of tree maps is simple: allocate one box for the parent node and children of the node are drawn as boxes within it.[34] Displaying the effect of lockdown in the metro cities of a country using tree maps. This type of representation would be effective for showing business economy state-wise in the applications case.

#### c) Polar Chart:

Polar charts are similar to pie charts but the angles measure the same and there is a change in radius depending on the value.[35] Polar charts here will show whether the certain sector should open for

business and will it earn profits amid lockdown or is it better to keep low and not add-up extra costs. This is based on data received in the past and government guidelines at that time.[30] The revenues earned by sectors in the past within a time span of 15 days are considered to depict the decision. The tree map below shows the after ease of lockdown some sectors were able to earn revenue. Fig. 4.

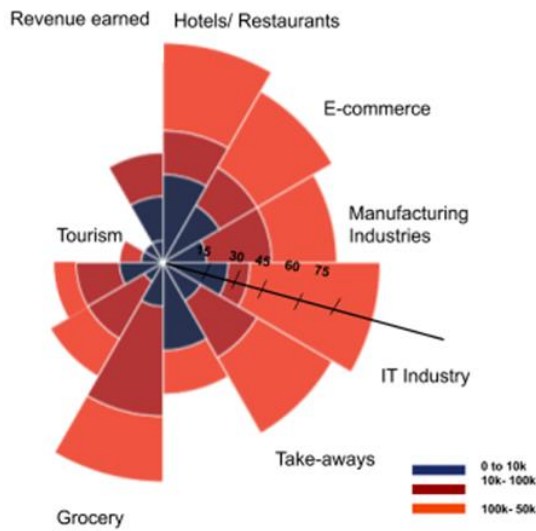


Fig. 4. Polar Chart showing the revenue earned by various sectors during Lockdown.

## VI. EXPERIMENTAL ANALYSIS

The first step in the application is to have a calculative source, so as to display the recovery and death rate analysis during this pandemic. For that to happen, the main initial process is to find a relative dataset, and looking into the cleaning process of it. The dataset being used for recoveries vs deaths analysis is from World Bank Group [10]. The dataset for GDP analysis is from Macrotrends website that indulge in providing historical and present data for various aspects [9]. In both the cases, the cleaning and processing of data is being done by simpler methods of statistics. The null values in a column are substituted with mean values of the entire column, giving an even palette to work on. The next step is calculating the rate of recoveries and deaths occurred during the pandemic. After cleaning and normalization of data, we get the following representation of data as shown in table 1.1, with certain columns defined, that are useful for the inspection. For this process, we make use of a formula as defined by Dr. Bhapkar in his searches. According to the formula, since mortality rate changes over time during COVID-19 pandemic, we call it Progressive

S.No.	Date_YMD	Daily Confirmed	Total Confirmed	Daily Recovered	Total Recovered	Daily Deceased	Total Deceased	
0	30 Jan	2021-01-30	1	1	0	0	0	
1	31 Jan	2021-01-31	0	1	0	0	0	
2	01 Jan	2021-02-01	0	1	0	0	0	
3	02 Jan	2021-02-02	1	2	0	0	0	
4	03 Jan	2021-02-03	1	3	0	0	0	
.	.	.	.	.	.	.	.	
.	.	.	.	.	.	.	.	
.	.	.	.	.	.	.	.	
353	17 Jan	2021-01-17	13962	10572599	14513	10210569	145	151865
354	18 Jan	2021-01-18	9987	10582586	17127	10227696	137	152002
355	19 Jan	2021-01-19	13787	10596373	17229	10244925	161	152163
356	20 Jan	2021-01-20	15279	10611652	20071	10264996	152	152315
357	21 Jan	2021-01-21	14490	10626142	17726	10282722	161	152476

S. No.	Date_Y MD	Daily Confirmed	Total Confirmed	Daily Recovered	Total Recovered	Daily Deceased	Total Deceased	Recovery_r	Recovery_rate	Fatality_r	Fatality_rate
353	2021-01-17	13962	10572599	14513	10210569	145	151865	96.87	96.58	1.44	1.44
354	2021-01-18	9987	10582586	17127	10227696	137	152002	97.03	96.65	1.44	1.44
355	2021-01-19	13787	10596373	17229	10244925	161	152163	97.20	96.68	1.44	1.44
356	2021-01-20	15279	10611652	20071	10264996	152	152315	97.39	96.73	1.45	1.44
357	2021-01-21	14490	10626142	17726	10282722	161	152476	97.55	96.77	1.45	1.43

Table 1.1. Recovery and Death Records

S.No.	Algorithm	MSE	R2
0	Linear Regression	2261.878252	0.995431
1	ElasticNet CV	2310.806511	0.995332
2	SGD Regressor	3268.581138	0.993398
3	Bayesian Ridge	2320.479117	0.995313
4	Lasso Lars	2077.670415	0.995803
5	ARD Regression	1834.062541	0.996295
6	Passive Aggressive Regressor	6126.077982	0.987626
7	TheilSen Regressor	1822.249353	0.996319

Table 1.3. MSE and R<sup>2</sup> score comparison for best fit algorithm selection

Mortality Rate (PMR). In general, for any case/pandemic, C disease and  $N_{P_{avg}}$  refers to a total number of infections before average recovery time period  $P_{avg}$  [6].

Similarly, Recovery Rate (RR) used to follow classical mathematical equation,  $RR = \frac{R}{N} \times 100$ , where R refers to N total number of recovered cases. As before, when recovery time period is taken into account, Progressive Recovery Rate (PRR) is,

$$PRR = \frac{R_c}{N_{P_{avg}}} \times 100 ;$$

where  $R_c$  refers to total number of recovered cases till date [6].

According to the analysis, the general recovery time is 14 days. But in our case, we make the  $P_{avg}$  modification to 15 days for calculative simplicity. Based on the formula described above, an algorithm for the rate calculation is formulated.

In the initial stages, we make use of simple method of rate analysis just by division of deaths caused and total number of infections recorded. Alongside, we also implement Dr. Bhapkar's method of analysis. The results for both are projected below in table 1.2. The recovery and death rate by simple formula are represented by keywords 'recovery\_rate' and 'deceased\_rate'; whereas rate calculated by the progressive method are shown as 'recovery\_r' and 'deceased\_r'.

On establishing a visualization in the python programming itself, we implement a representation of recoveries and death per day, in comparison to the total confirmed cases of any given day.

The main purpose of the deceased and recovered rates are to understand the impact of COVID-19 on business sector, by looking into the mortality against the disease. The aim is that while the user can view the per day numbers of confirmed cases, along with recoveries and deaths, they would also be able to see the rate with which the recoveries are occurring in the UI. It will be precise as we are taking in consideration the 15 days recovery period.

The second functionality of the application is analysing the GDP and forecasting it. For this process, as mentioned in V section of the paper, we make use of a methodology that will help us decide the best fit model for the prediction, i.e., GROOMS (Group of Optimized and Multi-source Selection). In this, we make use of linear regression algorithms for smooth inflow of data during the visual representation of the forecasting. Not to mention, instead of using complex algorithms of ML and Deep Learning like SVM, K-Means or ANN that may lead to overfitting of data which is already not large in size, it's easier to use simpler methods for analysis.

For GROOMS method of selection, we chose algorithms such as ElasticNet CV, Linear Regression, SGD Regressor, Bayesian Ridge, Lasso Lars, ARD Regression, Passive Aggressive Regressor and TheilSen Regressor. We implement training and testing on the same data for all the algorithms. As mentioned earlier, the data being used is from Macrotrends [9]. After testing for all the methods, we look into the Mean Squared Error values and  $R^2$  scores of each of them, which lets us finally choose the desired method of implementation. The lowest the MSE value and the highest

the  $R^2$  values is, the better the algorithm. A tabulation of the algorithms implemented along with their MSE and  $R^2$  scores are represented in table 1.3.

From the above observation, we can see that TheilSen Regressor produces minimum MSE and maximum  $R^2$  score. Thus, the best fit model for the prediction is considered to be TheilSen Regressor.

## VII. CONCLUSION

The paper thus, provides an informative insight into the real world application of data science and analytics. The demonstrations of problem solving using a combination of different methods and tools and how they will be beneficial for the business sector. Analyzing the effect of covid-19 by looking into the aspects of recovery and death rates, GDP of the country gets affected, not to mention forecasting the succession of GDP.

These insights will not only provide information to its business users, but will also be easy to understand due to its highly info-graphic visual representation.

## VIII. SCOPE OF IMPROVEMENT

To make the system completely self-reliant and accurate, there may be additions to the set of tools and technologies used. The advanced versions, updated algorithms that are successful on boundary conditions and exceptions may be used for newer versions of the system with time. A major breakthrough could be applying the system for various other job sectors such as education, banking and finance as well as other tertiary sectors. These solutions can be implemented for any kind of calamities, as well as pandemic situations. Business Intelligence powered with AI will serve as a decision support system, that will help user make certain decisions for their business according to the type and give them fruitful results.

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# Assessing Intrinsic Mechanism of Service Quality and its Effect on Patient Retention in Ghanaian Private Hospitals. Using Trust and Patient Satisfaction as Mediators

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## ABSTRACT

The achievement of patient retention by a private healthcare facility can be established by the provision of quality service delivery. The main objective of this paper is to assess the intrinsic mechanism of service quality factors and its effect on patient retention in Ghanaian private hospitals. And also assess the mediating role of trust and patient satisfaction between intrinsic mechanism of service quality factors and patient retention. The sample size of the study was 880 patients. Data collection was done among inpatient and outpatients of four selected private hospitals in the Ashanti region of Ghana. The questionnaires used for the study were made up of forty items that include twenty-seven items on intrinsic mechanism of service quality; two items on trust, three items of service quality and four items of patient satisfaction were used as mediators of service quality factors and patient retention, lastly, four items on Patient retention. The validity and reliability of the data was confirmed. WarpPLS software was used to analyze the data. It was revealed that there is a strong relationship between the factors of service quality (Empathy, Safety, Improvement of care and Efficient) and service quality, the study also revealed that there is a positive relation between the factors of service quality and patient retention. The mediating role of trust and patient satisfaction showed significant relation between factors of service quality and patient retention. This paper suggested that if private hospitals administrators will pay much responsiveness to the above factors of service quality, they will retain most of their patients who come to their institution for treatment. This study further emphasizes that trust and patient satisfaction should be the standard of every private hospital to retain their patients.

**Keywords :** *Empathy, Safety, Improvement of care, Efficient, Trust, Patient satisfaction and retention*

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## I. INTRODUCTION

The objective of this study is to highlight the significant influence of intrinsic service quality factors on patient retention among the private healthcare facilities in Ghana. This study seeks to answer questions in respect of the first research hypothesis. Regarding the influence of empathy on service quality of healthcare facilities, the extant literature suggest that institutions that hospitals are the most basic institutions of care. It is the home of for people who are reluctant to be there but have frailty of body and mind that is a natural condition of humanity gives them no choice. In their most difficult moments healthcare service providers must develop attitudes that reflects element of utmost care and emotions. For many patients, the hospital may be their last encounter with humanity and hospitals officials may become true confidants and trusted companions on their respective journey. Hospitals better understand and serve patients with utmost attention. When these conditions persist, the quality of service of the organizations is improved and vice versa. On the other hand, prior research studies underscore the fact that safety of patients is an essential factor in determining service quality. With documented evidence of patient abuse, wrong diagnoses and prognosis, poor physical conditions of healthcare facilities and avoidable exposure to highly risk patients, patient safety ensures elicits trust that can sustain patient retention.

According to (Lin & Wu, 2011) patients like most other service consumers expect hospitals to bring improvement to the way their services are provided. Patients expect hospitals to be able to resolve complaints and adopt new techniques, technologies and employ highly resourceful personnel to provide them with improved services. In instances where patients consider the services provided by other

establishments are superior to those offered in a preferred hospital, there is the likelihood of changing hospital in so far as the switching cost is not excessively significant. Efficiency of the service underscores the ability of the organization to provide cost effective service and avoid wasting resources. Patients expect organization to be able to reduce queues and offer them more personalized interactive services that enable them to get value for money as persist in other service platforms. When hospital service is deemed efficiently delivered, it helps facilities to attract more patients to secure their operations. With an enhanced quality of service, trust and patient satisfaction becomes strong factors in stimulating patient retention, as hospitals are able to win the trust of their clients. With this knowledge, this chapter seeks to explore seven main hypotheses as follows

### Hypotheses of the Study

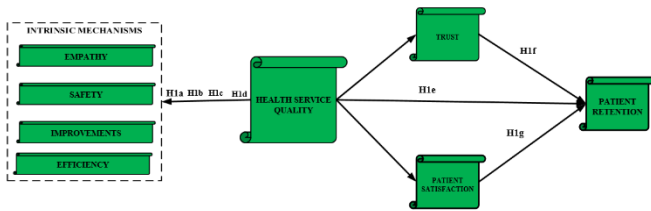
1. Ha. The delivery of empathetic services is positively associated with high service quality levels among private hospitals in Ghana
2. Hb. Hospitals that prioritize the safety of patients are more likely to improve their service quality levels
3. Hc. Hospitals that pursue continuous service improvement for their patients are more likely to improve their service quality levels
4. Hd. Hospitals that prioritize efficient service delivery for patients are more likely to improve their service quality levels
5. He. Hospitals that offer high quality services to their patients are more likely to improve patient retention
6. Hf. The relationship between the delivery of high quality service by hospitals and patient retention is mediated by the patient's trust

7. Hh. The relationship between the delivery of high quality service by hospitals and patient retention is mediated by the patient's satisfaction

## II. METHODS AND MATERIAL

### Conceptual Framework of Intrinsic Mechanism

Figure 1



### Methodology

The methodology of this section entails the process of data collection and analytical procedures that were employed to draw conclusions from the research. Questionnaire data collection instrument was constructed based on previous attempts to conceptualize the intricate relationship between service quality and customer behavior in other industries in general and the healthcare sector in particular. The four main constructs that incidentally served as the independent variables for service quality were empathy, safety, improvements and efficiency. They were collated from the HEALTHQUAL model proposed by (Lee, 2017). The attributes of trust was measured based on the work of (Somu et al., 2017) whereas the attributes of patient satisfaction and patient retention were measured based on the prior works of (Ng & Luk, 2019) and (Moodie et al., 2016) respectively. Each construct was measured by a number of selected questions that were reconfigured to suit the objectives of the research. The items of the questionnaire were configured into a five point Likert scale in order to rank responses from the respondents. A scale value of 5 was designated as strongly agree

whereas a value of 1 was designated as strongly disagree. Consistent with the prior work of (Brown & Nicassio, 1987), the questions were asked in both the active and the passive form in order to measure expectations gaps i.e. respondents were asked to rank the importance of each of the questions and then further indicate the extent to which they were satisfied with its provision in the designated hospitals. For example, Empathy (EM) was measured with five questions in consistence with (Gesn & Ickes, 1999) while safety was also measured with six main questions. On the other hand efficiency was also measured using six questions whereas improvements were measured using eight questions. Service quality was measured using three questions. Trust was measured based on two questions whereas patient satisfaction was measured based on four main questions. Lastly patient retention was measured using four questions. The questionnaires were piloted on 20 respondents who were selected from the respondents in order to review and fine tune the instrument to improve its validity and reliability. Data collection was done among inpatient and outpatients of four private hospitals that were selected from the Ashanti region of Ghana. Patients were randomly asked to participate in the research and were not required to fill the questionnaires that were self-administered to them. The researcher employed research assistances to assist the patients in answering the questions. The average data collection lasted within 10 minutes as the responses to the questionnaire were coded as closed ended questionnaire to reduce errors. In all a total of 880 responses were collated. The data was analyzed using WarpPLS software. With this software, a robust statistical test procedure was adopted to ensure that the data met all the required data integrity benchmarks recommended in the extant literature.

III. RESULTS AND DISCUSSION

Results

Descriptive Statistics

Table 1 : Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation	Skewness	
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error
Empathy	880	3.00	5.00	4.035	.681	-.044	.082
Safety	880	2.00	4.00	4.820	.384	-1.673	.082
Improvements	880	3.00	5.00	4.428	.729	-.861	.082
Efficiency	880	3.00	5.00	4.072	.703	-.102	.082
Service Quality	880	3.00	5.00	4.105	.772	-.184	.082
Trust	880	3.29	5.00	4.119	.506	.108	.082
Patient Satisfaction	880	3.43	4.71	4.154	.363	-.441	.086
Patient Retention	880	3.50	5.00	4.558	.472	-.749	.086
Valid N (listwise)	880						

Table 1, presents the descriptive statistics of the analysis that has been conducted to determine the strength of the responses to each of the indicator variables to be analyzed in this section of the research. The first of the 8 constructs is empathy. The response ranges from a minimum of 3.0 to a maximum of 5.0 with a mean response value of 4.03. The standard deviation is 0.681 and the data is negatively skewed. When it comes to safety the table shows that the response ranges from a minimum of 1.0 to a maximum of 4.0 with a mean response value of 4.820. The standard deviation is .384 and the data is negatively skewed. The next variable is improvements constructs and the response ranges from a minimum of 3.00 to a maximum of 5.00 with a mean response value of 4.428. The standard deviation is .729 and the data is negatively skewed. The next construct is the service quality constructs. In this case the response ranges from a minimum of 3.00 to a maximum of 5.00 with a mean response value of 4.105. The standard deviation is .772 and the data is negatively skewed. When it comes to trust, the results show that the

response ranges from a minimum of 3.29 to a maximum of 5.00 with a mean response value of 4.119. The standard deviation is .506 and the data is positively skewed. Regarding the descriptive overview of patient satisfaction, the results show that the response ranges from a minimum of 3.43 to a maximum of 4.71 with a mean response value of 4.558. The standard deviation is .472 and the data is negatively skewed. Overall it can be said that the data responses are relatively high but that alone is not enough to draw all the conclusions needed in this research. Other preliminary statistics have been provided in the next section.

Table 2 : KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.	.782
Approx. Chi-Square	2381.326
Bartlett's Test of Sphericity df	358
Sig.	.000

The next procedure that was used to check the reliability of the collected data was to explore the adequacy of the samples that have been taken. According to (Seng, 1951) a sample need not be extremely large before conclusions can be drawn but it must be representative to guarantees reasonable deductions from the population trends. In statistics the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy is a preferred option and was applied to this research due to robustness of inference. The table shows a KMO value of .782 that outperforms the recommended KMO value of 0.05(Kaiser, 1982). According to Kaiser, a KMO value of 0.5 is the minimally acceptable value but a KMO value between 0.7 and 0.8 is highly accepted. Any value in excess of 0.8 is deemed an excellent KMO value hence the results as shown in table supports a very highly acceptable sampling adequacy test. However this information is not enough to conclude on the reliability of the information (Xanthopoulos et al., 2013). The second section of the table shows the Bartlett's Test of Sphericity. This provides information about the intra-variable strength or whether the correlation matrix is an identity matrix or not. This is the type of matrix where all the diagonal items have a value of 1 and the off diagonal items are close to 0. In this case the Bartlett's Test of Sphericity 0.000 which means the null hypothesis that the correlation matrix is not an identity matrix is rejected.

**Table 3 :** Extraction Method: Principal Component Analysis

Constructs	Initial	Extraction
EMP1	1	0.739
EMP2	1	0.851
EMP3	1	0.892
EMP4	1	0.909
EMP5	1	0.756
EMP6	1	0.622
EMP7	1	0.694

SAF1	1	0.779
SAF2	1	0.804
SAF3	1	0.764
SAF4	1	0.809
SAF5	1	0.793
SAF6	1	0.804
EFY1	1	0.777
EFY2	1	0.722
EFY3	1	0.688
EFY4	1	0.751
EFY5	1	0.724
EFY6	1	0.824
IMP1	1	0.843
IMP2	1	0.657
IMP3	1	0.813
IMP4	1	0.813
IMP5	1	0.848
IMP6	1	0.818
IMP7	1	0.754
IMP8	1	0.794
TRU1	1	0.786
TRU2	1	0.796
SEQ1	1	0.797
SEQ2	1	0.915
SEQ3	1	0.866
PAS1	1	0.822
PAS2	1	0.843
PAS3	1	0.657
PAS4	1	0.813
PAR1	1	0.813
PAR2	1	0.880
PAR3	1	0.818
PAR4	1	0.657

Table 3, presents the communalities variables used in the final path analysis to establish the relationship between the independent and the dependent variables. The first part of the table shows the maximum variance explained by the extraction in the variables. Each of them has a value of 1. On the other hand section two of the communalities table shows the actual variance extracted which is the proportion

of the variance that can be explained. As a rule of thumb a variance extracted value of 0.5 is acceptable (Smisha, 2018) or high enough to conduct further analysis. Those of the variables explored in this study

returned values in excess of 0.5. Most importantly, the least value is 0.622 whereas the largest value is 0.909.

**Table 4 : Confirmatory Factor Analysis**

VARIABLE	$\alpha$	CR	AVE	FACTOR LOADING
<b>Empathy</b>		<b>0.782</b>	<b>0.849</b>	<b>0.893</b>
EMP1				0.831
EMP2				0.894
EMP3				0.823
EMP4				0.892
EMP5				0.923
EMP6				0.954
EMP7				0.781
<b>Safety</b>		<b>0.953</b>	<b>0.982</b>	<b>0.758</b>
SAF1				0.763
SAF2				0.861
SAF3				0.959
SAF4				0.857
SAF5				0.882
SAF6				0.854
<b>Improvement</b>		<b>0.928</b>	<b>0.893</b>	<b>0.727</b>
IMP1				0.852
IMP2				0.832
IMP3				0.938
IMP4				0.792
IMP5				0.928
IMP6				0.848
IMP7				0.844
IMP8				0.871
<b>Trust</b>		<b>0.788</b>	<b>0.825</b>	<b>0.812</b>
TRU1				0.852
TRU2				0.891
<b>Service Quality</b>		<b>0.783</b>	<b>0.818</b>	<b>0.935</b>
SEQ1				0.741
SEQ2				0.863
SEQ3				0.854



<b>Patient Satisfaction</b>	<b>0.85</b>	<b>0.837</b>	<b>0.942</b>	
PAS1				0.833
PAS2				0.867
PAS3				0.893
PAS4				0.841
<b>Patient Retention</b>	<b>0.834</b>	<b>0.729</b>	<b>0.742</b>	0.823
PAR1				0.763
PAR2				0.827
PAR3				0.728
PAR4				0.882

**Table 5 :** Correlations Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Empathy	26.1935	6.364	.486	.718
Safety	29.4435	9.417	-.351	.817
Improvements	25.8185	5.534	.726	.658
Efficiency	26.1518	5.794	.638	.681
Service Quality	26.1101	6.794	.366	.744
Trust	26.1458	6.937	.596	.704
Patient Satisfaction	26.0685	7.037	.768	.694
Patient Retention	25.7143	7.350	.441	.728

In this research the individual questions were computed into composite values and the composite variables were the ones that were used for the analysis. Before using the individual composite factors, their internal consistency was determined. This involves establishing the accuracy with which individual items measure the designated construct as a group. In the extant literature, two main methods are used to explore the internal consistency. These are the composite reliability factor as well as the Cronbach alpha's correlation coefficient. Table 5, presents the results of the Cronbach's alpha. Researchers are inconsistent about the threshold for accepting the Cronbach's alpha correlation coefficient value. According to (Dakanalis et al., 2017) the number of items in the composition accounts strongly for a more reliable value and asserts that where a construct is made up of between 5 and 8 items, then a minimal threshold of 0.80 is required. The research constructs are placed within this threshold hence a benchmark of 0.8 was set. The table shows that each of the eight constructs recorded a Cronbach Alpha correlation coefficient value in excess of 0.8 hence a proof of internal consistency among the variables.

**Table 6 : Multicollinearity**

\*Correlation is significant at the 0.01 level (2-tailed).

\*. Correlation is significant at the 0.05 level (2-tailed).

			Empathy	Safety	Improvements	Efficiency	Service Quality	Trust	Patient Satisfaction	Patient Retention
Spearman's rho	Empathy	Correlation Coefficient	1.000	-.248**	.392**	.354**	.200**	.493**	.477**	.006
		Sig. (2-tailed)	.	.000	.000	.000	.000	.000	.000	.858
		N	880	880	880	880	880	880	880	880
Safety		Correlation Coefficient	-.248**	1.000	-.078*	-.352**	-.166**	-.354**	-.363**	-.020
		Sig. (2-tailed)	.000	.	.020	.000	.000	.000	.000	.557
		N	880	880	880	880	880	880	880	880
Improvements		Correlation Coefficient	.392**	-.078*	1.000	.580**	.355**	.424**	.660**	.436**
		Sig. (2-tailed)	.000	.020	.	.000	.000	.000	.000	.000
		N	880	880	880	880	880	880	880	880
Efficiency		Correlation Coefficient	.354**	-.352**	.480**	1.000	.172**	.477**	.425**	.232**
		Sig. (2-tailed)	.000	.000	.000	.	.000	.000	.000	.000
		N	880	880	880	880	880	880	880	880
Service Quality		Correlation Coefficient	.200**	-.166**	.355**	.172**	1.000	.363**	.482**	.458**
		Sig. (2-tailed)	.000	.000	.000	.000	.	.000	.000	.000
		N	880	880	880	880	880	880	880	880
Trust		Correlation Coefficient	.493**	-.354**	.424**	.677**	.363**	1.000	.493**	.229**
		Sig. (2-tailed)	.000	.000	.000	.000	.000	.	.000	.000
		N	880	880	880	880	880	880	880	880
Patient Satisfaction		Correlation Coefficient	.477**	-.363**	.660**	.425**	.482**	.493**	1.000	.348**
		Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.	.000
		N	880	880	880	880	880	880	880	880
Patient Retention		Correlation Coefficient	.006	-.020	.436**	.232**	.458**	.229**	.348**	1.000
		Sig. (2-tailed)	.858	.557	.000	.000	.000	.000	.000	.
		N	880	880	880	880	880	880	880	880

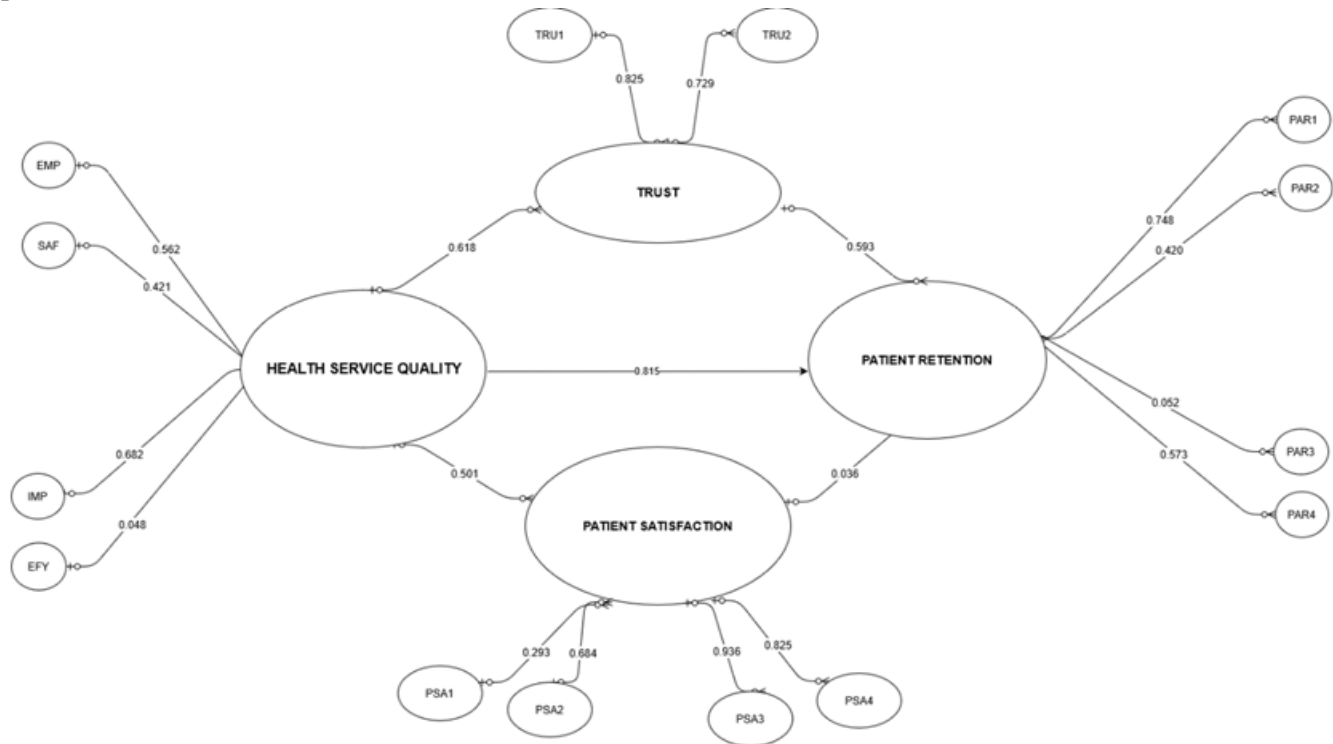
\*\* Correlation is significant at the 0.01 level (2-tailed).

\*. Correlation is significant at the 0.05 level (2-tailed).

The last analytical process before carrying out the inferential analysis was to determine the degree of multicollinearity among the variables. This is to determine whether the variables are truly independent of each other. The Variance Inflation Factor score as well as the Correlation Matrix is the most preferred test of multicollinearity. Before carrying out this test, there was the need to examine the normality of the data to determine the appropriate correlation regression to be adopted. The skewness values were used in the absence of the much preferred Kolmogorov-Smirnov and Shapiro Wilks Test. The results of the skewness test showed that the constructs were largely negatively skewed or did not meet the Gaussian distribution threshold. For this reason the non-parametric spearman rank correlation coefficient test was applied and the results are presented in table 5 above. The results show that in the case of service quality, its independent variables namely; empathy, safety, improvement, efficiency have no strong correlation between them but significantly relates to service quality at 95% confidence interval. All other correlation test fell short of the 0.5 correlations r-value as

recommended by (Bassingthwaighte & Bever, 1991). This implies that by and large the independent variables are truly independent and can be used for the inferential analysis.

Figure 2 shows the path diagram that shows the relationship between the independent and the dependent variables as well as the mediating factors. Detail explanation and implication for the research hypothesis are presented in Table 7 below



**Table 7 : Path Coefficient Analysis**

Parameter			Estimate	Lower	Upper	P	
SEQ	<---	EMP	0.562	0.385	0.956	0.004	
SEQ	<---	SAF	0.421	0.549	0.853	0.002	
SEQ	<---	IMP	0.682	0.149	0.856	0.005	
SEQ	<---	EFY	0.048	-0.050	0.073	0.010	
PAR	<---	SEQ	0.815	-0.086	0.047	0.017	
PAR	<---	TRU <---	SEQ	0.036	0.172	0.637	0.018
PAR	<---	PAS <---	SEQ	0.593	0.385	0.256	0.004

The information in table 7, is the summary of the path coefficient and statistical significance level of the relationships that have been analyzed about the hypotheses that were hypothesized at the beginning of the study. Hypothesis 1a that the delivery of empathetic services is positively associated with high service quality levels among private hospitals in Ghana is supported by the findings. The path

coefficient value of 0.562 supports this conclusions and this statistically significant at 95% confidence interval (p =0.000). On another hand, hypothesis 1b that suggested that hospitals that prioritize the safety of patients are more likely to improve their service quality levels is also validated by the path coefficient results. The recorded value is 0.421 and this is statistically significant at 95% confidence interval (p =

0.000). The path coefficient results of 0.682 and a p value of 0.000 suggest that the postulation that hospitals that pursue continuous service improvement for their patients are more likely to improve their service quality levels is acceptable at a confidence interval of 95%. Further the analysis of the research results also supports hypothesis 1d that indicates that hospitals that prioritize efficient service delivery for patients are more likely to improve their service quality levels. The path coefficient value of 0.048 and a p value of 0.010 supports the above claim. Similar statistically significant results is seen in the case of hypothesis 1e that said that hospitals that offer high quality services to their patients are more likely to improve patient retention. The path coefficient result of 0.815 supports the above assertion. A key element in this research is the mediating role of the trust and patient satisfaction in stimulating positive patient behavior such as loyalty. In this regard, the analysis shows a statistically significant path coefficient value of 0.036 that is statistically significant at 95% confidence interval ( $p = 0.018$ ). Similarly, the results also show that the relationship between the delivery of high quality service by hospitals and patient retention is mediated by the patient's satisfaction. The path coefficient value recorded was 0.593 and the statistical significant level was 0.004.

#### IV. DISCUSSION

The study show that in the case of service quality, its independent variables namely; empathy, safety, improvement, efficiency have no strong correlation between them but significantly relates to service quality at 95% confidence interval. All other correlation test fell short of the 0.25 correlation r value. This shows that the independent variables are truly independent and can be used for the inferential analysis that is in consistent with the previous findings (Hayes & Montoya, 2017).

The patients' perception of the services' empathetic services is positively associated with high service quality delivery among private hospitals in Ghana, so that, the more positive this empathetic perception was with the patients, they felt more satisfied with service quality delivery which is consistent with the previous study results (Nguyen et al., 2020). Empathy shown by the medical and non-medical staff on patients at the private hospitals is one of the most important dimensions for many patients in accessing and using healthcare service delivery. Empathy of medical and non-medical staff's services at the hospital is in line with a study conducted by (Qolipour, M., Torabipour, A., Faraji Khiavi, F., & Saki Malehi, 2018) who consider service empathy as one of the dimensions in service quality.

Proper safety at the hospital is likely to improve the delivery of service quality and for that matter the safety of the patient should be the priority of every private hospital. The findings of the studies carried out by (Meesala & Paul, 2018)(Lim et al., 2018)(Al-Damen, 2017) show that safety at the healthcare center is relevant in the since that patient will be satisfy at service quality delivery at the private hospitals when the see that they are secure at the hospital. This can be seen when their healthcare information is kept confidential and there is enough protection in and around the premises of the private hospital which was also in line with previous study by (Nikpouraghdam et al., 2020) (Nikpouraghdam et al., 2020)(Taqdees et al., 2017). In the past, healthcare practitioners had different approach to provision of healthcare, they were of the views that delivery of service quality was based on the quality of care that a patient may receive from a hospital, and not much attention was giving to the safety at the hospital (Taqdees et al., 2017). Accordingly this study it has been revealed that when patient received the right service quality delivery and maximum safety from the private hospital the patient who seek treatment from these private hospitals will be satisfy which is in consistence with previous study(Al-Borie & Sheikh

Damanhour, 2013). (Tateke et al., 2012) (Sankar et al., 2003) in their study revealed that when private hospitals are able to keep the healthcare record of patient confidential and are able to provide a good security at the premise of the hospital it will influence the satisfaction of the patients who come to these private hospitals for treatment. One of the major problems that is affecting private hospitals that may force patient not to come to the same hospital is the lockage of confidential healthcare report to an unauthorized personnel by staffs at the hospital and if there is an improper security at the hospital. This can lead to dissatisfaction and anger among patients (Hopkins et al., 2009).

Improvement of service quality at the private hospital is another effective way to achieve patient satisfaction. Previous studies' results show that the used of modern equipment and the upgrading the healthcare process and procedures at the private hospitals are the important and determining factors in the patient satisfaction (Naidu, 2009). Since the improvement of service quality by the administration of the private hospital is inevitable because of the competition among them, this finding can therefore be deemed as logical that patients assign more importance to the way the private hospital improve the services. These results this study is an indicate that private hospitals especially its personnel and physicians are to be encouraged and advised to pursue continuous service improvement for their patients in order to increase the satisfaction of their patients.

The result of the study revealed that any private hospital that put much attention on efficient service delivery for patients are more likely to improve their service quality levels that is consistent with the results obtained from the previous studies (Brugha & Zwi, 1998). Similar study undertaken by (Ramli, 2019)(Jandavath & Byram, 2016) determine how private hospitals can provide quality service by putting medical resources available at the hospital

into effective use has a significant and positive effect on the service quality delivery. The efficiency use of medical resources by medical and non-medical staff is factor that are expected by the private hospitals. If the patients who visit the hospital for treatment see the inefficient use of the resources then, it will make them believe that there is lack of service quality delivery at the hospital. However, if medical and non-medical staffs are able to put medical resources into effective use, it will lead to the achievement of efficiency at the private hospitals, this may also be in consistence with the study of (Ferreira & Marques, 2019) (Kruse et al., 2018) which revealed that quality service delivery at the hospital is as a result of the efficiency use of medical resources.

The result of the study also revealed that even though patient will received all the service quality delivery from a private hospital but may not return to the same private hospital if they don't trust the administration of the private hospital to keep the healthcare information or data confidential and the vice vasa. Good healthcare delivery of a private hospital without the confidence of the patient to entrust their healthcare data to the hospital will discourage the patient from returning to the same hospital. This is consist with the study conducted by (Kissi et al., 2019) which state that patient data linked to unauthorized or access by unauthorized person through linkage or hacking will tarnished the image of the private hospitals. This may in the long run deprive the patient from entrusting the medical information in the care of such healthcare facility or hospital.

The analysis of this paper further showed that a hospital may have all the qualify medical and non-medical, have all the modernized equipment, provide all the safety guideline at the hospital, established various strategies to improve healthcare at the hospital, and involve themselves in different collaboration and social responsibilities, if the patient

who come the private hospital for treatment are not satisfy with the service quality delivery at the hospital they may not return to that private hospital again. This is link with the study done by (Fatima et al., 2018) which revealed that patients might not return to the same hospital if they are not satisfy with the service delivery of the healthcare facility even though that hospital may have all the qualities of factors of providing healthcare service to their patients. This cements the fact that patients will only return to hospital that will be able to satisfy their medical needs. Which is consisting with pervious study done by (Harries et al., 2010). Which state that patient retention can only be achieve when all resource of the healthcare facility are been use for the quality treatment of the patient who come the hospitals.

## V. CONCLUSION

In this study the objective was to assess the influence of the intrinsic health quality dimension of service quality and its consequential effect on patient retention. The basis for this study is that patients do not simply make choices of the hospitals they attend. In the past hospitals were considered humanitarian services and barely attracted market place demands from patients as they were deemed to be receiving the favor of the healthcare facilities. This was not surprising because most of the clients of hospitals come in contact with these facilities at the lowest moment of their lives when they are helpless and follows the dictates of the healthcare professional even if they are in disagreement. Today's healthcare market place has changed dramatically. Patients expect healthcare facilities to compete for their attention and resources as they exercise choice over their decision to patronize a particular hospital or not. In this study four of the key elements that patients consider before they commit their healthcare care need to a hospitals have been discussed and empirically validated. Private hospitals must provide empathetic services to their customers by ensuring

that they are there for them at every point of the service delivery process. Moreover, the study noted that ensuring safer healthcare environment is a functional prerequisite to eliciting the retention of healthcare customers. Further in this research, the notion that consistent improvement and efficient utilization of the resources of the organization as panacea for maintaining a strong bond of relationship between hospitals and patients has been supported by the findings of this research.

## VI. ETHICS STATEMENT

Respondents were assured that the data was going to be used for research purposes only. This made the researchers labeling each respondent with an identified number instead of a name to ensured anonymity. Completed questionnaires were considered consent to participate in the survey. All information the collected from respondents were made strictly confidential.

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## Computational in Silico Modelling of Phytochemicals as a Potential Cure

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### ABSTRACT

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Urinary tract infection (UTI) is one of the most severe public health problem affecting both sexes but females are more susceptible due to the differences in urogenital and reproductive anatomy, physiology and lifestyle. Due to multi-drug resistant strains and high recurrence rate, UTI has become a major socioeconomic burden. It was found that microbial infections including *Enterococcus faecalis*, *Escherichia coli*, *Pseudomonas aeruginosa* and *Proteus mirabilis* species are the major causes of UTI with different signs and symptoms including painful urination or dysuria, haematuria, urinary urgency, burning micturition, frequent urination, nausea, and vomiting. Phytochemicals are effective to combat bacterial resistance with high efficacy, and easy availability with minimal or no side effects. For this reason, We present a docking-based screening using a quantum mechanical scoring of a library built from approved drugs and compounds that Curcumin, Anolignan B, Piperine, Carvacrol, Quercetin, Kaempferol, Citral, Allyl Isothiocyanate with Proteins with PDB id's 2N50, 4C4V, 6H1X, 4UU4 could display antibacterial activity against UTI. Clearly, these compounds should be further evaluated in experimental assays and clinical trials to confirm their actual activity against the disease. We hope that these findings may contribute to the rational drug design against UTI.

**Keywords :** *Enterococcus Faecalis*, *Escherichia Coli*, *Pseudomonas Aeruginosa*, *Proteus Mirabilis Species*, Urinary Tract Infections

### I. INTRODUCTION

Urinary tract infections (UTIs) are the most common bacterial infectious diseases encountered in clinical practice and account for significant morbidity and high medical costs. The prevalence of UTI seems to be a J-shaped distribution, with higher frequency among

very young children which gradually increases with age. It is estimated to affect 150 million people each year worldwide, with an annual incidence of 12.6% in women and 3% in men. Although most UTIs can be effectively treated by antibiotics, UTI recurrence is a common problem and sometimes maybe very troublesome. Urinary tract infections may be

asymptomatic, acute, chronic and complicated or uncomplicated, and the clinical manifestations of UTIs depend on the portion of the urinary tract involved.

## II. Procedure

### 1. Ligand Screening

For the initial Ligand screening purposes, a web-based tool named SwissADME (<https://www.swissadme.ch/>) was used to eliminate a few compounds according to Lipinski's rule of five parameters. For a compound to qualify as ligand it should Have < 500 Da molecular weight, a high lipophilicity i.e. value of Log P being less than 5, hydrogen bond acceptors being less than 10 and H-bond donors less than 5. Any compound with more than 2 violations was ruled out for further study (Lipinski2004).

### 2. Protein Preparation and Active site Determination.

Required protein in pdb format was downloaded from the website [rcsb.org](https://www.rcsb.org/), commonly known as the **Protein Data Bank**. 3D conformers of the ligand were downloaded from PubChem.

Using **PyMOL (Version 2.4.1)** software water molecules as well as native ligands from the protein were removed, defined as cleaning/purification of the protein for further application. **Using a web server called Deep Site** Active Pockets of the proteins were calculated. The results calculated by the web server were in the form of different ids, centers and scores.

Scoring In deep site was using neural networking based on following instructions using DCNN architecture.

<https://academic.oup.com/bioinformatics/article/33/19/3036/3859178> Center values for the grid were selected keeping score greater than 0.98.

**UCSF Chimera (Version 1.14)** was used to prepare the receptor using DockPrep function. **Dock Prep** prepared structures for Docking using these functions:

- deleting water molecules
- repairing truncated sidechains
- adding hydrogens
- assigning partial charges
- writing files in Mol2 format

**3. In silico Docking Using Auto dock Vina** **Auto dock Vina (Version 1.1.2) along with UCSF Chimera (Version 1.14)** was used for molecular **Docking Studies**. Center values and size of the grid of different scores were used from **DEEPSITE** calculations done above.

Following Parameters were set in auto dock vina.

#### Receptor options –

- **Add hydrogens in Chimera (true/false)** – whether to add hydrogens in Chimera before calling the script. The receptor prep script will check for hydrogens and add them if they are missing. AutoDock Vina needs the polar (potentially H-bonding) hydrogens to identify atom types for scoring purposes.
- **Merge charges and remove non-polar hydrogens (true/false)** – note AutoDock Vina does not use charges or nonpolar hydrogens, so this setting is not expected to affect results except for the presence or absence of nonpolar hydrogens in the processed receptor
- **Merge charges and remove lone pairs (true/false)** – note AutoDock Vina does not use charges or lone pairs, so this setting is not expected to affect results except for the presence or absence of lone pairs in the processed receptor (and there may not have been any lone pairs to start with)

- **Ignore waters (true/false)**
- **Ignore chains of non-standard residues (true/false)** – ignore chains composed entirely of residues other than the 20 standard amino acids.
- **Ignore all non-standard residues (true/false)** – ignore all residues other than the 20 standard amino acids.

#### For Ligands

- **Merge charges and remove non-polar hydrogens (true/false)** – note Auto Dock Vina does not use charges or nonpolar hydrogens, so this setting is not expected to affect results except for the presence or absence of nonpolar hydrogens in the ligand output files
- **Merge charges and remove lone pairs (true/false)** – note AutoDock Vina does not use charges or lone pairs, so this setting is not expected to affect results except for the presence or absence of lone pairs in the ligand output files (and there may not have been any lone pairs to start with)

#### Docking parameters

- **Number of binding modes (1-10, 10)** – maximum number of binding modes to generate
- **Exhaustiveness of search (1-8, 8)** – thoroughness of search, roughly proportional to time
- **Maximum energy difference (kcal/mol) (1-3,3)** – maximum score range; binding modes with scores not within this range of the best score will be discarded.

The docking results were calculated by Auto dock vina using its Scoring function and results were displayed in the form of Scores and RMSD values. Docking results with the highest value score accompanied by negative sign and least RMSD values were chosen for further studies.

#### 4. Residue Analysis

PyMOL was used for visualization of interactions of the docked structure at the ligand sites. **Discovery Studio 2020** was used to study the ligand interactions and total number of residues. It was also used to plot the 2D structure of the interactions and residues.

1. **Statistical Analysis:** Descriptive, estimation and Hypothesis testing with confidence interval of 95% was applied to data using formula 1 given below.

$$CI = \bar{x} \pm z \frac{s}{\sqrt{n}}$$

*CI* = confidence interval

$\bar{x}$  = sample mean

*z* = confidence level value

*s* = sample standard deviation

*n* = sample size

Formula 1 used for calculation of confidence interval

### III. RESULTS AND DISCUSSION

#### Molecular Docking:

The docking result was obtained from Auto dock vina in the form of Dock score for all the four proteins docked with above mentioned ligands.

#### Urinary Tract Infection caused by four main pathogenic bacteria-

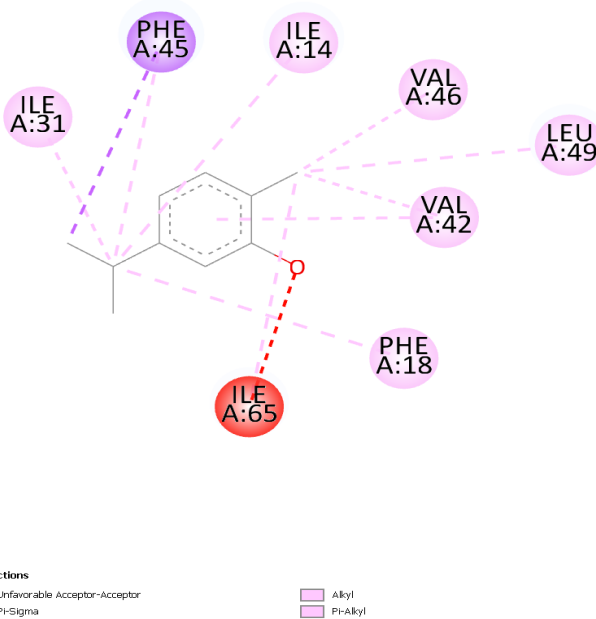
#### Enterococcus faecalis Target Protein Docking Results:

#### PDB-ID 2N50

For 2N50, out of the three active sites the 3<sup>rd</sup> active site was selected with a Deep site score of 0.900. The selection was made on the basis of the highest binding energy of the ligand-receptor. The docking results before statistics are shown in Table 1 and Table 2 shows the post statistical docking scores with Ligand Protein Interactions.

LIGANDS	DOCKSCORE
Citral	-6.2
Allyl isothiocyanate	-4.0
Curcumin	-6.0
Carvacrol	-7.8
Kaempferol	-6.7
Quercetin	-6.9
Piperine	-5.9
Anolignan B	-4.8

Table 1

Ligands	Dockscore	Interactions
Carvacrol	-7.8	 <p><b>Interactions</b></p> <ul style="list-style-type: none"> <li><span style="color: red;">■</span> Unfavorable Acceptor-Acceptor</li> <li><span style="color: purple;">■</span> Pi-Sigma</li> <li><span style="color: pink;">■</span> Alkyl</li> <li><span style="color: lightpurple;">■</span> Pi-Alkyl</li> </ul>

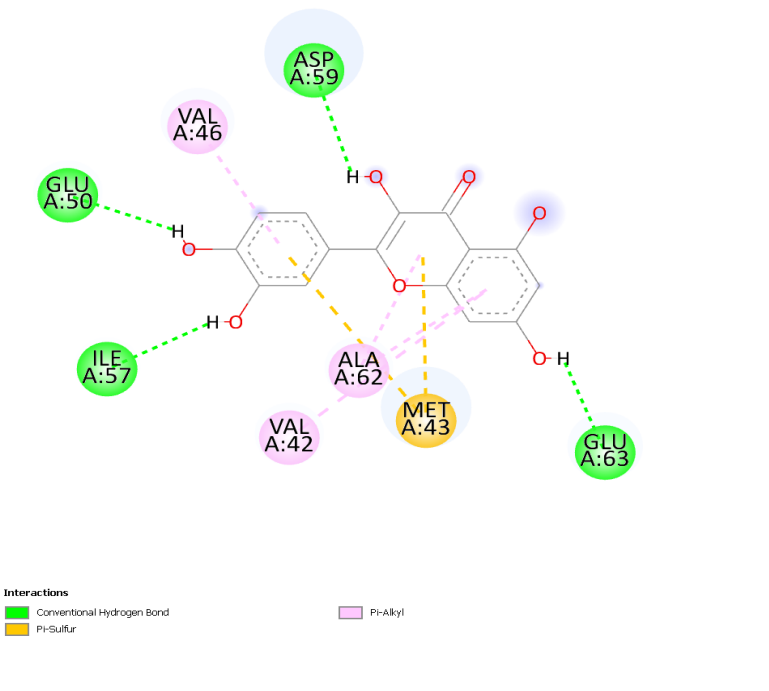
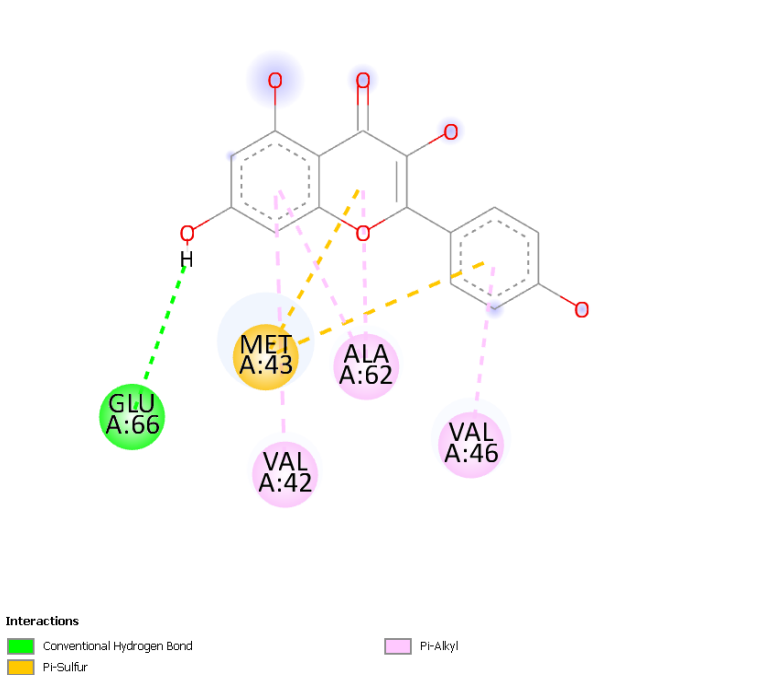
Quercetin	-6.9	
Kaempferol	-6.7	

Table 2

### Escherichia coli Target Protein Docking Results:

#### PDB-ID 4C4V

For 4C4V, out of the three active sites the 2<sup>nd</sup> active site was selected with a Deep site score of 0.999. The selection was made on the basis of the highest binding energy of the ligand-receptor. The docking results before statistics are shown in Table 1 and Table 2 shows the post statistical docking scores with Ligand Protein Interactions.

LIGANDS	DOCKSCORE
Citral	-5.3
Allyl isothiocyanate	-3.1
Curcumin	-7.8
Carvacrol	-5.9
Kaempferol	-7.7
Quercetin	-8.1
Piperine	-7.9
Anolignan B	-7.3

Table 3

Ligands	Dockscore	Interactions
Curcumin	-7.8	<p>Interactions</p> <ul style="list-style-type: none"> <li>Conventional Hydrogen Bond</li> <li>Carbon Hydrogen Bond</li> <li>π-Cation</li> <li>π-Anion</li> <li>π-π T-shaped</li> <li>Alkyl</li> <li>π-Alkyl</li> </ul>
Quercetin	-8.1	<p>Interactions</p> <ul style="list-style-type: none"> <li>Conventional Hydrogen Bond</li> <li>Carbon Hydrogen Bond</li> <li>π-Cation</li> <li>π-Anion</li> <li>π-π Stacked</li> <li>π-π T-shaped</li> <li>π-Alkyl</li> </ul>

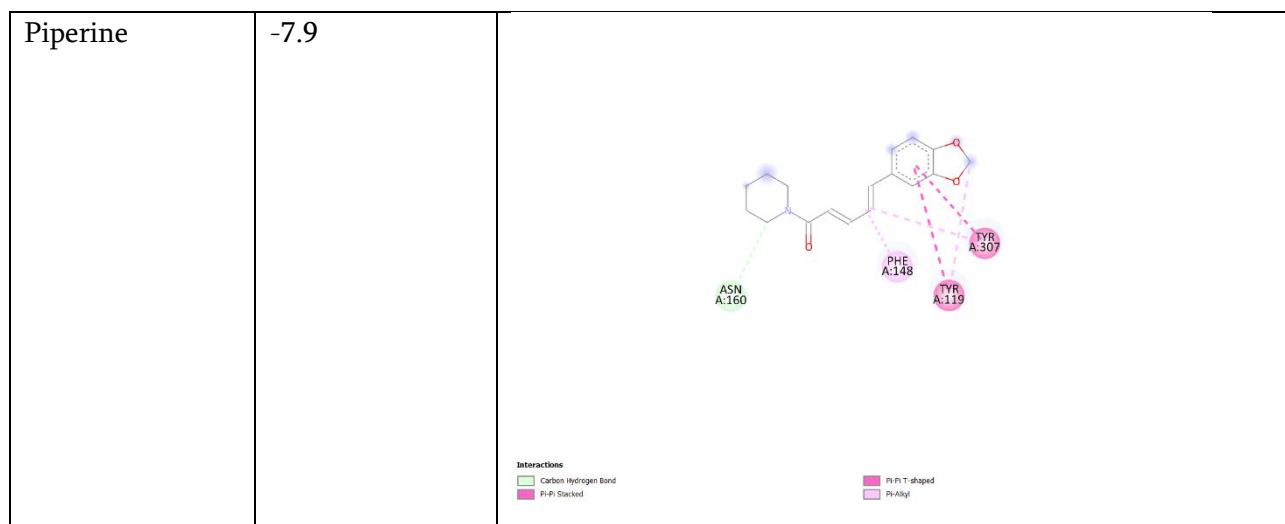


Table 4

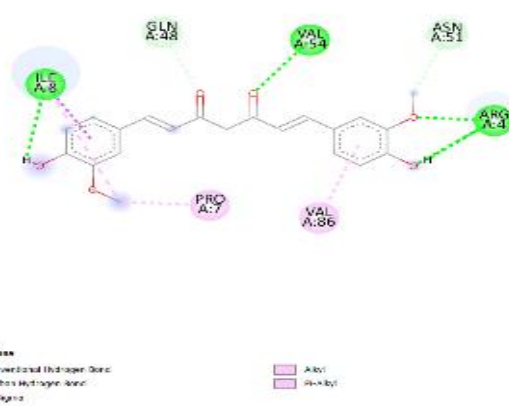
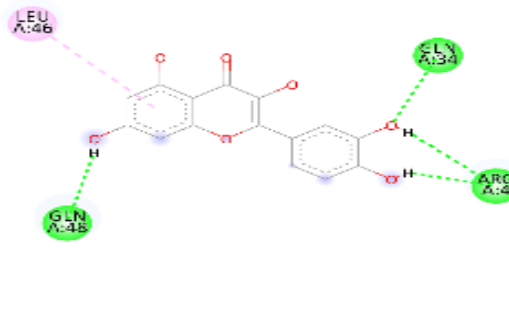
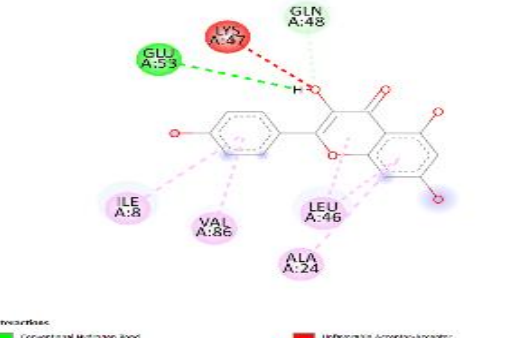
### Pseudomonas aeruginosa Target Protein Docking Results:

#### PDB-ID 4UU4

For 4UU4, out of the four active sites the 1<sup>st</sup> active site was selected with a Deep site score of 0.991. The selection was made on the basis of the highest binding energy of the ligand-receptor. The docking results before statistics are shown in Table 1 and Table 2 shows the post statistical docking scores with Ligand Protein Interactions.

LIGANDS	DOCKSCORE
Citral	-4.9
Allyl isothiocyanate	-2.9
Curcumin	-7.1
Carvacrol	-5.3
Kaempferol	-6.7
Quercetin	-6.9
Piperine	-6.0
Anolignan B	-6.7

Table 5

Ligands	Dockscore	Interactions
Curcumin	-7.1	 <p><b>Interactions</b></p> <ul style="list-style-type: none"> <li>Conventional Hydrogen Bond</li> <li>Carbon Hydrogen Bond</li> <li>Pi-Sigma</li> <li>Pi-Pi</li> <li>Pi-alkyl</li> </ul>
Quercetin	-6.9	 <p><b>Interactions</b></p> <ul style="list-style-type: none"> <li>Conventional hydrogen bond</li> <li>Pi-alkyl</li> </ul>
Kaempferol	-6.7	 <p><b>Interactions</b></p> <ul style="list-style-type: none"> <li>Conventional Hydrogen Bond</li> <li>Carbon Hydrogen Bond</li> <li>Hydrophobic Aromatic-Resonance</li> <li>Pi-Pi</li> </ul>



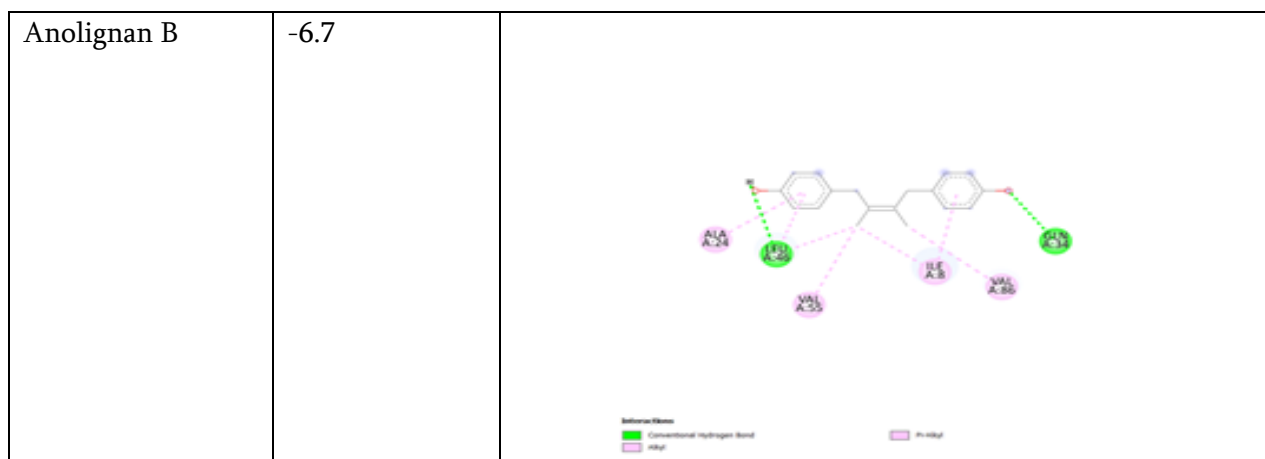


Table 6

### Proteus mirabilis Target Protein Docking Results:

#### PDB-ID 6H1X

For 6H1X, out of the four active sites the 2<sup>nd</sup> active site was selected with a Deep site score of 0.937. The selection was made on the basis of the highest binding energy of the ligand-receptor. The docking results before statistics are shown in Table 1 and Table 2 shows the post statistical docking scores with Ligand Protein Interactions.

LIGANDS	DOCKSCORE
Citral	-3.7
Allyl isothiocyanate	-2.5
Curcumin	-5.5
Carvacrol	-4.0
Kaempferol	-5.7
Quercetin	-5.6
Piperine	-5.3
Anolignan B	-5.2

Table 7

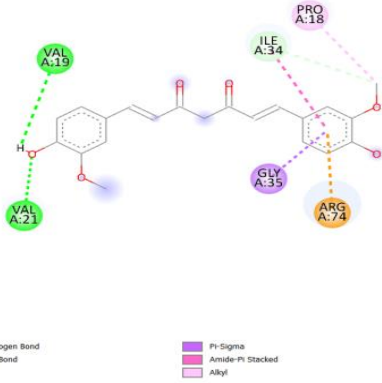

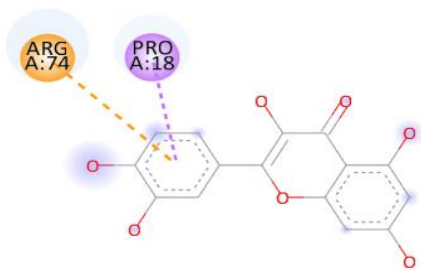
Ligands	Dockscore	Interactions
Curcumin	-5.5	 <p><b>Interactions</b></p> <ul style="list-style-type: none"> <li><span style="color: green;">■</span> Conventional Hydrogen Bond</li> <li><span style="color: orange;">■</span> Pi-Cation</li> <li><span style="color: purple;">■</span> Pi-Sigma</li> <li><span style="color: pink;">■</span> Amide-Pi Stacked</li> <li><span style="color: lightpink;">■</span> Alkyl</li> </ul>
Kaempferol	-5.7	 <p><b>Interactions</b></p> <ul style="list-style-type: none"> <li><span style="color: green;">■</span> Conventional Hydrogen Bond</li> <li><span style="color: orange;">■</span> Pi-Cation</li> <li><span style="color: pink;">■</span> Pi-Alkyl</li> </ul>
Quercetin	-5.6	 <p><b>Interactions</b></p> <ul style="list-style-type: none"> <li><span style="color: orange;">■</span> Pi-Cation</li> <li><span style="color: purple;">■</span> Pi-Sigma</li> </ul>

Table 8

Ligands	2N50	4C4V	4UU4	6H1X	Number of Proteins interacted
Citral	No	No	No	No	0
Allyl isothiocyanate	No	No	No	No	0
Curcumin	No	Yes	Yes	Yes	3
Carvacrol	Yes	No	No	No	1
Kaempferol	Yes	No	Yes	Yes	3
Quercetin	Yes	Yes	Yes	Yes	4
Piperine	No	Yes	No	No	1
Anolignan B	No	No	Yes	No	1

**Table 9.** Summarizes the results showing ligands and their interacted proteins that were considered in the study

#### IV. CONCLUSION

All eight ligands were studied using bioavailability radar. Our results proposed that Quercetin shows the best docking results with all the four target proteins. Curcumin and Kaempferol also depicts successful interaction with proteins with 2N50 and 4C4V as exceptions respectively. Carvacrol, Piperine and Anolignan B shows specific interaction with one protein each-2N50, 4C4V and 4UU4 respectively. Citral and Allyl Isothiocyanate didn't show standardized results with any of the proteins included in the study. To find the effectiveness and to propose the exact mechanism in-vitro studies can be encouraged on Quercetin, Curcumin and Kaempferol targeting respective pathogenic bacteria that are discussed above to understand the mechanism and a potential cure for Urinary Tract Infections.

#### V. ACKNOWLEDGMENT

We would like to thank our supervisor/Guide Bharat Kwatra, from Invenzion Labs Inc. whose expertise was

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# The Impact of Relationship Marketing on Customer Loyalty at Plaza Toyota Workshop Bandung

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## ABSTRACT

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This research was conducted to study the impact of relationship marketing on customer loyalty in a form of service consistency provided by the Plaza Toyota Workshop Bandung to its customers. This research used 4 (four) independent variables (customer's trust, service commitment, service communication and conflict handling) on to the dependent variable (customer loyalty). This research was conducted on customers of the Plaza Toyota Workshop Bandung who routinely use auto repair services at the workshop. This research used a quantitative approach to understand and define the variables standing that are studied in this research and the influence between one variable and another. The data collecting technique used in this research is by distributing questionnaires to 100 samples. The results showed that customer's trust gave zero impact in gaining customer loyalty. Meanwhile, service commitment, service communication, and conflict handling are in some ways correlated with customer's loyalty. According to the results of the analysis which based on the results of the average index calculation, customers have no doubt about the indicators that build their trust to the Plaza Toyota Workshop Bandung, in other word, customers automatically trust Plaza Toyota Workshop Bandung. While the other three variables have influence. And the indicators of these three variables can be used as a prove based on the results of the item ranking questions. Based on these results, Plaza Toyota Workshop Bandung must be more focused on developing these three variables in order to build customer loyalty.

**Keywords :** Relationship Marketing, Customer Loyalty, Plaza Toyota Workshop Bandung.

## I. INTRODUCTION

Transportation currently experiencing development at the same pace as the development of infrastructure in Indonesia. This development that goes hand in hand

and continuously causes Indonesian: Single Agent Brand (ATPM) to experience quite tough competition in the automotive market. This indicates that all ATPMs are competing to increase sales in order to stay in the competition.

Beside having to increase sales, They also have to face the increasing target of after sales, which includes repair and maintenance of the product. One of the largest automotive ATPMs in Indonesia is PT. Toyota Astra Motor (TAM). According to the data of car sales in January 2019 (Taufan, 2019), number of cars sold with the Toyota brand managed to be in the first place with 25,092 units sold (30.89%). PT. TAM (Toyota Astra Motor) as the market leader in 2019 should maintain the position it has achieved, namely by fulfilling customers' satisfaction to gain customers' loyalty. One way to gain customer loyalty is by reminding customers to carry out routine service at Toyota's authorized workshops. This strategy is carried out by a Maintenance Reminder Appointment (MRA) by contacting customers whose car have to be maintained via phone calls or other media of communication (Toyota Astra Motor, 2019).

One of the official workshops owned by Toyota in which applies this Maintenance Reminder Appointment (MRA) strategy is the Plaza Toyota Workshop Bandung. According to the West Java regional sales achievement report, the Plaza Toyota Dealer Bandung was ranked 8th out of 10 authorized dealers in the West Java region with a sales rate of 98% in August 2019 and according to whole West Java workshop sales achievement data, Plaza Toyota Workshop Bandung ranked in the top 10 (top ten) when compared to 31 workshops in the West Java region in the 2019 on Customer Paid Unit Service. It can be concluded that Plaza Toyota Workshop Bandung has done an important contribution in achieving the annual performance of PT. TAM (Toyota Astra Motor) in West Java.

Berry, L.L. (1982), said that Relationship Marketing is a strategy to attract, grow and maintain relationships with customers. Based on that understanding, it can be seen that the strategy executed by PT. TAM (Toyota Astra Motor) through a Maintenance Reminder Appointment (MRA) is a form of relationship

marketing of PT. TAM (Toyota Astra Motor) to its customers. According to Ndubisi (2007), the concept of Relationship Marketing has 4 (four) main keys, those keys are trust, commitment, conflict handling, and communication. Those four main keys are then associated with customer loyalty. Based on the five keys that exist in relationship marketing, company owners are encouraged to formulate values or sacrifices in building a relationship with loyal customers (Ndubisi, 2007).

PT TAM's Maintenance Reminder Appointment (MRA) strategy is not sufficient enough to prove that there is a strong correlation between relationship marketing and customer loyalty. Based on data on routine maintenance and general repair at the Plaza Toyota Workshop Bandung, (2019) it is known that in June 2019 the number of customers who had been contacted to carry out routine maintenance was 662 customers, but only 254 customers that actually came to perform routine maintenance at Plaza Toyota Workshop Bandung. This proves that there are problems so that customer loyalty is not created at Plaza Toyota Workshop Bandung. Based on the previous background fact, it encourages researchers to conduct a research on "The Impact of Relationship Marketing on Customer Loyalty at Plaza Toyota Workshop Bandung."

## 1.2 Problem Formulation

Based on the background description, the researcher formulates the problem "Does Relationship Marketing affect customer's loyalty" as for the elaboration of the main problems are as follows;

- 1.2.1 Does trust affect customer loyalty at Plaza Toyota Workshop Bandung?
- 1.2.2 Does commitment affect customer loyalty at Plaza Toyota Workshop Bandung?
- 1.2.3 Does communication affect customer loyalty at Plaza Toyota Workshop Bandung?

1.2.4 Does conflict handling affect customer loyalty at Plaza Toyota Workshop Bandung?

1.2.5 Do trust, commitment, communication and conflict handling have a simultaneous effect on customer loyalty at Plaza Toyota Workshop Bandung?

### 1.3 Research Objectives

Based on the formulation of the problems above, it encourages the researcher to find out more about the impact of relationship marketing on customer loyalty, therefore the research objectives are;

1.3.1 To determine the effect of trust on customer loyalty at Plaza Toyota Workshop Bandung

1.3.2 To determine the effect of commitment to customer loyalty at Plaza Toyota Workshop Bandung

1.3.3 To determine the effect of communication on customer loyalty at Plaza Toyota Workshop Bandung

1.3.4 To determine the effect of conflict handling on customer loyalty at Plaza Toyota Workshop Bandung

1.3.5 To determine the effect of trust, commitment, communication and conflict handling simultaneously on customer loyalty at Plaza Toyota Workshop Bandung

### 1.4 Research Benefits

#### 1.4.1 Theoretical Benefits

##### a. Benefits for Researchers

This study is useful for researchers to broaden knowledge, especially in the field of management, specifically in the scope of relationship marketing, regarding the influence of trust, commitment, communication and conflict handling on customer loyalty, deepening the theories that have been studied and apply those theories in real life.

##### b. Benefits for Other Researchers

This research can be used as a reference for other researchers and add insight into the study of the effect of relationship marketing on customer loyalty.

#### 1.4.2 Practical Benefits

##### a. Benefits for the Company

Based on research results conducted by researchers, it is hoped that it can be useful for Plaza Toyota Workshop Bandung in determining strategies, designing policies and creating programs that aim to increase customer loyalty at Plaza Toyota Workshop Bandung.

##### b. Benefits for Consumers

This research is beneficial for consumers in the future to get better service when they take their vehicles to routine maintenance at Plaza Toyota Workshop Bandung.

##### c. Benefits for Society

This research is beneficial for the community since it gives information about how routine vehicle maintenance services are at Plaza Toyota Workshop Bandung.

#### Relationship Marketing

According to Tandjung (2004: 89), Relationship Marketing is growth, development, and maintenance in the long term that creates cost-effective relationships with customers, suppliers, employees, and other partners that are mutually beneficial. According to Chan (2003: 6), the purpose of Relationship Marketing is to find life time value (LTV), increase the life time value (LTV) in each group and find new customers. According to Kotler and Armstrong (1996, p.579-582) relationship marketing has the benefit of saving costs that customers spend, learning what customers need and want individually, building strong



relationships between business entities and their customers.

According to Morgan and Hunt (1994); Churchill and Surprenant (1982) in Ndubisi (2007), relationship marketing is influenced by four (4) variables, those are as follow;

### **1. Trust**

Trust is the foundation of a partnership, that is, there are parties who have the desire to bind themselves to a relationship. According to Ndubisi (2007), building trust can be done by keeping promises to customers, providing security for every transaction, providing quality service and showing a caring attitude towards customers.

### **2. Commitment**

Commitment is a desire for a continuous relationship based on trust between one party and another. According to (Tjiptono, 2005: 415) commitment is the desire between the two parties to build and maintain a relationship that is considered important and reflected in cooperative behavior and active actions to establish and maintain relationships.

### **3. Communication**

Communication can be formed by providing accurate and reliable information. This information can be in the form of changes in the services offered. Communication is also needed when there are problems between the company and its customers (Ndubisi, 2007).

### **4. Conflict Handling**

Handling problems (Conflict Handling) is the ability to prevent, minimize and resolve conflicts that have occurred. If the conflict is ignored, it will become a serious problem for the company and have the potential to reduce performance if the conflict is not

resolved. According to (Bramson; 2005), when a customer face a problem even though he is only slightly disappointed, the company quickly shows its identity. Companies must be able to view service recovery as an opportunity that must be handled very well because customer complaints are one of the opportunities to create strength in the relationship that exists between the company and its customers.

### **Customer loyalty**

Amin Widjaja (2008: 6) states that customer loyalty is customer attachment to a brand, shop, manufacturer, service provider, or other entity based on a favorable attitude and good responses such as repeat purchases. The existence of loyal customers is able to form a situation where these customers will make repeat purchases, buy these products continuously and in larger quantities and recommend these products to relatives (Hayes, 2008: 22)

### **Relationship of Relationship Marketing to Customer Loyalty**

According to Schiffman (2000) the relationship of Relationship Marketing to customer loyalty is to develop customer commitment and loyalty to the services and products of the business entity. To achieve Relationship Marketing, business entities need to create strong relationships with customers, by emphasizing long-term ties, making customers comfortable.

Based on the relationship between the independent variable, namely Relationship Marketing and the dependent variable, namely customer loyalty, the hypothesis is proposed:

H1: Trust affects customer loyalty at Plaza Toyota Workshop Bandung

H2: Commitment affects customer loyalty at Plaza Toyota Workshop Bandung

H3: Communication affects customer loyalty at Plaza Toyota Workshop Bandung

H4: Conflict handling affects customer loyalty at Plaza Toyota Workshop Bandung

H5: Trust, commitment, communication and conflict handling have a simultaneous impact on customer loyalty at Plaza Toyota Workshop Bandung.

## II. RESEARCH METHODS

This research uses quantitative methods (quantitative). This study consists of variable X as an independent variable, namely the Relationship Marketing variable which consists of 4 dimensions, namely trust, commitment, communication and conflict handling on variable Y as the dependent variable, namely customer loyalty. The object of this research is Plaza Toyota Workshop Bandung.

This study used data collection methods in 3 (three) ways, first was interviewing the head of the workshop, service officers at t Plaza Toyota Workshop Bandung and some customers who aim to explore and seek deeper information about Plaza Toyota Workshop Bandung, second was distributing 100 copies of questionnaires using Likert scale to customers who carried out routine vehicle maintenance at Plaza Toyota.

Workshop Bandung and last one was collecting secondary data containing company documents both regarding customer databases, company history, and organizational structure of Plaza Toyota Workshop Bandung.

The population in this study are all customers who carry out routine maintenance of their Toyota brand vehicles at Plaza Toyota Workshop Bandung. In determining the research sample, the researcher used Slovin opinion which assumed that the population was normally distributed (Umar, 2011). The Slovin formula is shown below (Umar, 2011).

$$n = \frac{N}{1 + N e^2}$$

Note:

N : Population size

n : Sample size

e : Leniency percentage of inaccuracy due to sampling error that can still be tolerated or desired

Based on the formula above, the number of samples to be studied can be calculated as follows:

$$n = \frac{2237}{1 + 2237 10\%^2}$$

$$n = 100$$

Based on the calculations above, it can be seen that the number of samples about to be used in this study with an error rate of 10% is 100 people.

This study uses multiple linear regression analysis method which is used to determine how much influence relationship marketing has on customer loyalty at t Plaza Toyota Workshop Bandung. The multiple regression method is using the following formula:

$$Y = a + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + e$$

Y = Consumer loyalty

A = Constanta

$\beta_1$ - $\beta_5$  = Multiple regression coefficient

X1 = Trust

X2 = Communication

X3 = Commitment

X4 = Conflict handling

e = Standard error

The data in this study were processed statistically using the SPSS ver. 25 program. Valid data were then processed for reliability testing, classical assumption tests consisting of normality test, linearity test, multicollinearity test, heteroscedasticity test, multiple

linear regression test and hypothesis testing consist of partial significance test (T-test), joint variable test (F-test) and the coefficient of determination (R2).

### III. DISCUSSION

#### Respondent Characteristics

Based on the distributed questionnaire, the respondents were divided into 54 male respondents and 46 female respondents. The ages of the respondents in this study were grouped into 5 categories, category of respondents aged 17-25, 26-35, 36-45, 46-55, and 56-65. Based on the results of the study, most respondents were aged 26-35, about 37 respondents, aged 17-25 as many as 30 respondents, ages 36-45 as many as 29 respondents, aged 46-55 as many as 3 respondents, and aged 56-65 as many as 1 respondent.

Based on the research results under the criteria of the type of work, it is known that the most respondents are working as private employees as many as 66 respondents, entrepreneurship as many as 21 respondents, students as many as 6 respondents, civil servants as many as 3 respondents, freelance as many as 2 respondents and housewife as many as 2 respondents.

Based on the results of the research, the type of vehicle that carry out routine service the most, Avanza, are 23 vehicles and the type of routine service that is mostly carried out is regular routine service of 10,000 km, about 37 respondents.

#### Validity and Reliability Test

Before distributing the questionnaire, the researcher conducted a test distribution on the questionnaire given to 30 respondents. This questionnaire test was conducted to test the validity and reliability of the questions on the questionnaire. The validity test conducted by the researcher was carried out on 17 questions on the independent variable which were divided into 4 types of variables, and 2 questions on the

dependent variable which were divided into 1 type of variable. The results of the validity test are;

Questions (Item)	R <sub>count</sub>	R <sub>table 5%</sub> (30)	Criteria
KP1	0.444	0.361	Valid
KP2	0.396	0.361	Valid
KP3	0.677	0.361	Valid
KP4	0.581	0.361	Valid
KP5	0.722	0.361	Valid
KP6	0.727	0.361	Valid
Questions (Item)	R <sub>count</sub>	R <sub>table 5%</sub> (30)	Criteria
KL1	0.874	0.361	Valid
KL2	0.874	0.361	Valid
KL3	0.721	0.361	Valid
KL4	0.691	0.361	Valid

Questions (Item)	R <sub>count</sub>	R <sub>table 5%</sub> (30)	Criteria
KoL1	0.643	0.361	Valid
KoL2	0.830	0.361	Valid
KoL3	0.701	0.361	Valid
KoL4	0.820	0.361	Valid
Questions (Item)	R <sub>count</sub>	R <sub>table 5%</sub> (30)	Criteria
PKP1	0.851	0.361	Valid
PKP2	0.900	0.361	Valid
PKP3	0.756	0.361	Valid
Questions (Item)	R <sub>count</sub>	R <sub>table 5%</sub> (30)	Criteria
LP1	0.853	0.361	Valid
LP2	0.866	0.361	Valid

It was obtained R<sub>table</sub> 0.361 which the number was used for the amount of N = 30 with a significance level of 5%. Based on the comparison of the R<sub>table</sub> and also

the Rcount, it can be concluded that the results of the overall calculation of  $R_{count} > R_{count}$  indicate that the entire questionnaire in this study is considered valid and can be used as a research instrument.

Reliability test was done by looking for Cronbach's Alpha value. If the Cronbach's Alpha value is  $> 0.60$ , the reliability test results are considered reliable.

Variable	Cronbach's Alpha Value	Comparison Results	Value
Trust (X1)	0.643	$> 0.60$	Reliable
Commitment (X2)	0.802	$> 0.60$	Reliable
Communication (X3)	0.728	$> 0.60$	Reliable
Conflict Handling (X4)	0.787	$> 0.60$	Reliable
Customer Loyalty (X5)	0.647	$> 0.60$	Reliable

Based on the calculation of the reliability test results, it was known that all variables have a Cronbach's Alpha value  $> 0.60$  which means that the questionnaire is reliable.

**Classic Test Results**

After the results of the calculation were valid and reliable, the researchers collected data by distributing questionnaires to 100 respondents who researcher met directly at Plaza Toyota Workshop Bandung. After the data was collected, the researcher tabulated and calculated the data that have been obtained.

**Normality Test Results**

This test was done by looking at the profitability of Kolmogorof-Smirnov Z statistics. If the level of profitability was  $< 0.05$ , then the residual value of a regression was not normally distributed, and vice versa. Based on the results of the normality test, the following results were obtained:

		Unstandardized Residual
N		127
Normal Parameters <sup>a,b</sup>	Mean	.0000000
	Std. Deviation	1.06189416
	Most Extreme Differences	
	Absolute	.070
	Positive	.051
	Negative	-.070
Test Statistic		.070
Asymp. Sig. (2-tailed)		.200 <sup>c,d</sup>

It can be seen that the calculation results in the Asymp. Sig (2-tailed) table shows a result of 0.200. This figure shows  $> 0.05$  which proves the regression residual value has been normally distributed.

**Linearity Test Results**

The researcher used the linearity test in order to find out whether the two variables had a significant linear relationship or not. A good correlation should have a linear relationship between the independent variable (X) and the dependent variable (Y).

The basis for decision making in the linearity test can be done in two ways, Which are

- a. Comparing Significance Value (Sig.) With 0.05
  1. If the value of Deviation from Linearity Sig.  $> 0.05$ , then there was a significant linear relationship between the independent variable and the dependent variable.

2. If the value of Deviation from Linearity Sig.  $< 0.05$ , then there was no significant linear relationship between the independent variable and the dependent variable.

b. Comparing the Fcount value with the Ftable

1. If the value of Fcount  $<$  Ftable, then there was a significant linear relationship between the independent variable and the dependent variable.

2. If the value of Fcount  $>$  Ftable, then there was no significant linear relationship between the independent variable and the dependent variable.

The calculation results of the linearity test can be seen in the table below;

4. If the value of Fcount  $>$  Ftable, then there was no significant linear relationship between the independent variable and the dependent variable.

The calculation results of the linearity test can be seen in the table below;

The linearity test results of the variable customer trust on customer loyalty

Based on the calculation results, it could be seen that the Deviation from Linearity Sig.  $> 0.05$ , 0.117 to be exact, then there was a significant linear relationship between the customer trust variable and the customer loyalty variable.

- The linearity test results of the service commitment variable on customer loyalty

Based on the calculation results, it could be seen that the Deviation from Linearity Sig.  $> 0.05$ , 0.244 to be exact, then there was a significant linear relationship between the service commitment variable and the customer loyalty variable.

- The linearity test results of service communication variables on customer loyalty

ANOVA Table

			Su		Me		
			of		an		
			Sq		Sq		
			uar	d	uar	F	Sig.
			es	f	e		
Total	Bet	(Comb	30.	1	2.5	1.56	.111
Custo	wee	ined)	143	2	12	7	
mer	n	Lineari	2.4	1	2.4	1.52	.220
Loyal	Gro	ty	40		40	2	
ty *	ups	Deviat	27.	1	2.5	1.57	.117
Total		ion	703	1	18	1	
Custo		from					
mer		Lineari					
Trust		ty					
	Within		182	1	1.6		
	Groups		.73	1	03		
			9	4			
	Total		212	1			
			.88	2			
			2	6			

**ANOVA Table**

**ANOVA Table**

			Su m of Squ are s	df	Me an Sq uar e	F	Sig.
Total	Betw (Combi		32.	7	4.6	3.07	.005
Custo	een ned)		627		61	7	
mer	Grou Linearit		20.	1	20.	13.4	.000
Loyalt	ps y		430		430	88	
y *	Deviati		12.	6	2.0	1.34	<b>.244</b>
Total	on from		197		33	2	
Service	Linearit						
e	y						
Comm	Within Groups		180	1	1.5		
itment			.25	1	15		
			5	9			
	Total		212	1			
			.88	2			
			2	6			

Based on the calculation results, it could be seen that the Deviation from Linearity Sig. > 0.05, 0.258 to be exact, then there was a significant linear relationship between service communication variables and customer loyalty variables.

- The linearity test results of the conflict handling variable on customer loyalty

Based on the calculation results, it could be seen that the Deviation from Linearity Sig. > 0.05, 0.103 to be exact, then there was a significant linear relationship between the conflict handling variable and the customer loyalty variable.

The linearity test results of service communication variables on customer loyalty

			Su m of Sq uar es	df	Me an Sq uar e	F	Sig.
Total	Bet (Combi		61.	7	8.7	6.90	.000
Custo	wee ned)		512		87	8	
mer	n Linearit		51.	1	51.	40.4	.000
Loyalt	Gro y		511		511	96	
y *	Deviati		10.	6	1.6	1.31	<b>.258</b>
Total	on from		001		67	0	
Service	Linearit						
e	y						
Comm	Within Groups		151	1	1.2		
unicati			.37	1	72		
on			0	9			
	Total		212	1			
			.88	2			
			2	6			

Based on the calculation results, it could be seen that the Deviation from Linearity Sig. > 0.05, 0.258 to be exact, then there was a significant linear relationship between service communication variables and customer loyalty variables.

- The linearity test results of the conflict handling variable on customer loyalty

**ANOVA Table**

			Sum of Squares	df	Mean Square	F	Sig.
Total	Between (Combined)	Linearity	29.255	4	7.314	4.859	.001
Customer Loyalty*	Groups	Linearity	19.733	1	19.733	13.111	.000
Total	Deviation from Linearity		9.522	3	3.174	2.109	<b>.103</b>
Conflict Handling	Within Groups		183.627	12	15.302		
	Total		212.882	12			

Based on the calculation results, it could be seen that the Deviation from Linearity Sig. > 0.05, 0.103 to be exact, then there was a significant linear relationship between the conflict handling variable and the customer loyalty variable.

**Multicollinearity Test Results**

The researcher conducted a multicollinearity test to find out that there was no correlation between the independent variables. The basis for decision making in the multicollinearity test are;

- a. The basis for the decision based on the Tolerance value:
  1. If the tolerance value was > 0.10, it meant that there was no multicollinearity in the regression model
  2. If the tolerance value was <0.10, it meant that there was multicollinearity in the regression model
- b. The basis for the decision based on VIF value:
  1. If the VIF value was < 10.00, it meant that there was no multicollinearity in the regression model

2. If the VIF value was > 10.00, it meant that there was multicollinearity in the regression model

Independent Variable	Dependent Variable	Collinearity Tolerance Value	Tolerance Value Requirement	VIF	VIF Requirement	Value
Trust	Customer Loyalty	0.997	>0.10	1.003	<10.00	Un occur
Commitment		0.907	>0.10	1.102	<10.00	Un occur
Communication		0.953	>0.10	1.049	<10.00	Un occur
Conflict Handling		0.903	>0.10	1.107	<10.00	Un occur

Based on the calculation results of the multicollinearity test, it showed that there were no symptoms of multicollinearity in all variables of this study. The decision was made based on the terms of the tolerance value which the overall result of the calculation showed the number > 0.10 and also the VIF value which showed the result < 10.00.

**Heteroscedasticity Test Results**

The results of the heteroscedasticity test were carried out by comparing the results of significance (Sig.). If the results showed a number greater than 0.05, then there was no symptom of heteroscedasticity in the regression model in this study and vice versa.

Variabel	Hasil Hitung	Keterangan
Trust	0.184	There are no symptoms of heteroscedasticity
Commitment	0.129	There are no symptoms of heteroscedasticity
Communication	0.743	There are no symptoms of heteroscedasticity
Conflict Handling	0.623	There are no symptoms of heteroscedasticity

Based on the calculation results, it could be seen that the calculated significance (Sig.) of all variables shows a number greater than 0.05, it meant there was no symptom of heteroscedasticity in all the variables studied.

**Multiple Linear Regression Analysis Test**

Multiple linear tests were carried out to determine the relationship between the independent variable (X) and the dependent variable (Y) both simultaneously and individually/partially.

**Simultaneous F Test Results**

**ANOVA<sup>a</sup>**

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regres sion	70,802	4	17,700	15,1 99	,000 <sup>p</sup>
	Residu al	142,080	122	1,165		
	Total	212,882	126			

- a. Dependent Variable: Total Customer Loyalty
- b. Predictors: (Constant), Total Conflict Handling, Total Customer Trust, Total Service Communication, Total Service Commitment

Based on the results of the calculation in the table above, it shows the results of 15,199. Furthermore, the researcher looks for the results of the F table with the formula;

$$F_{count} = 15.199$$

$$F_{table} = (k ; n - k)$$

$$= (4 ; 100-4)$$

$$= (4 ; 96)$$

Note:

k = number of independent variables = 4

n = number of respondents = 100

Based on the formula above, it was known that the result of the Ftable is 2.47. If we looked at the comparison between Ftable and Fcount, it could be concluded that Fcount > Ftable so it could be concluded that there was a relationship between the variables of customer trust, service commitment, service communication and conflict handling simultaneously (together) and the customer loyalty variable.

**Result of Determination Coefficient Test (R<sub>square</sub>)**

**Model Summary**

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	,577 <sup>a</sup>	,333	,311	1,079

- a. Predictors: (Constant), Total of Conflict Handling, Total of Customer Trust, Total of Service Communication, Total of Service Commitment

Based on the calculation results, it could be seen that the amount of the relationship simultaneously between the variables of trust, commitment, communication and conflict handling on customer loyalty variable was 0.333 or 33.3%. This figure was based on the results of the Rsquare coefficient which is based on the formula:

$$R_{square} = R \times R$$

$$= 0.577 \times 0.577$$

$$= 0,333$$

$$= 33,3\%$$



This figure means that the variables of trust, commitment, communication and conflict handling simultaneously could influence the customer loyalty variable by 33.3%, while the remaining 76.7% was influenced by other variables not examined in this study.

**Coefficients<sup>a</sup>**

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error			
1 (Constant)	-4,931	1,894		-2,604	,010
Total of Customer Trust	,051	,041	,093	1,251	,213
Total of Service Commitment	,165	,065	,195	2,516	,013
Total of Communication Services	,384	,068	,426	5,623	,000
Total of Conflict Handling	,228	,103	,173	2,219	,028

a. Dependent Variable: Total Customer Loyalty

#### T Test Result (Partial)

Researchers calculate the value of T table with the following formula;

$$\begin{aligned}
 T \text{ tabel} &= (\alpha/2 : n - k - 1) \\
 &= (0,05/2) : (100 - 4 - 1) \\
 &= 0,025 ; 95 \\
 &= 1,98552
 \end{aligned}$$

Note:

k = number of independent variables = 4

n = number of respondents = 100

$\alpha = 5\%$  or 0,05

After making a decision, the researcher then looks at the relationship between variable X and variable Y;

1. The relationship between the variables of customer trust and customer loyalty. If we compared the  $T_{table}$  with  $T_{count}$  on the customer loyalty variable, it could be seen that the  $T_{count}$  value was 1.251 in other words, the  $T_{count}$  value (1.251) <  $T_{table}$  (1.98552), therefore it could be concluded that there was no significant relationship between the trust variable and the customer loyalty variable.
2. The relationship between the variable service commitment and customer loyalty. If we compared the  $T_{table}$  with  $T_{count}$  on the customer loyalty variable, it could be seen that the  $T_{count}$  value was 2.516 in other words, the  $T_{count}$  value (2.516) >  $T_{table}$  (1.98552), therefore it could be concluded that there was a significant relationship between the commitment variable and the customer loyalty variable.
3. The relationship between service communication variables and customer loyalty. If we compared the  $T_{table}$  with  $T_{count}$  on the customer loyalty variable, it could be seen that the  $T_{count}$  value was 5.623 in other words, the  $T_{count}$  value (5.623) >  $T_{table}$  (1.98552), therefore it could be concluded that there was a relationship between the communication variable and the customer loyalty variable.
4. The relationship between conflict handling variables and customer loyalty. If we compared the  $T_{table}$  with  $T_{count}$  on the customer loyalty variable, it could be seen that the  $T_{count}$  value is 2,219 in other words, the  $T_{count}$  value (2,219) >  $T_{table}$  (1,98552), therefore it could be concluded that there was a relationship between conflict handling variables and customer loyalty variables.

After the researcher knows the relationship between the four variables X and the Y variable partially, the researcher enters the relationship into the regression equation formula;

$$Y = \alpha + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \beta_4X_4 + e$$

$$Y = -4,931 + 0,051X_1 + 0,165X_2 + 0,384X_3 + 0,228 X_4 + e$$

Note

Y : Decision process

$\alpha$ : Konstanta

X1: Trust

X2: Commitment

X : Communication

X4: Conflict handling

$\beta_1, \beta_2, \beta_3, \beta_4$  : Regression coefficient (shows the rate of increase or decrease in the dependent variable based on the relationship between the values of the independent variable)

e: Standard error

1. If other variables were constant, the Y value will change by itself at a constant value of -4,931
2. If other variables were constant, the Y value will change by 0.51 for each X1 unit
3. If other variables were constant, the Y value will change by 0.165 for each X2 unit
4. If other variables were constant, the Y value will change by 0.384 for each X3 unit
5. If other variables were constant, the Y value will change by 0.228 for each X4 unit

It can be concluded based on the table along with the formula above that;

1. There is no relationship between customer trust variables and customer loyalty variables at Plaza Toyota Workshop Bandung
2. There is a significant and positive relationship between the service commitment variable and customer loyalty at Plaza Toyota Workshop Bandung

3. There is a significant and positive relationship between service communication variables and customer loyalty variables at Plaza Toyota Workshop Bandung

4. There is a significant and positive relationship between conflict handling and customer loyalty at Plaza Toyota Workshop Bandung

### Discussion According to the Average Index

Variabel	Pertanyaan	IR	Ranking	Pernyataan
Kepercayaan Pelanggan	1	4.00	13	Bengkel Plaza Toyota Bandung memberikan rasa aman kepada pelanggan dalam pelayanan jasa service
	2	3.76	16	Janji Bengkel Plaza Toyota Bandung yang diberikan kepada Saya dapat dipercaya (Harga yang dibayarkan sesuai dengan estimasi yang diinformasikan diawal)
	3	3.46	18	Bengkel Plaza Toyota Bandung memberikan layanan sesuai dengan harapan saya (contoh; Bengkel Plaza Toyota Bandung memberikan garansi terhadap service yang dilakukan pada kendaraan Saya)
	4	3.30	19	Petugas Bengkel Plaza Toyota Bandung menunjukkan rasa hormat kepada Saya
	5	3.70	17	Bengkel Plaza Toyota Bandung memenuhi kewajibannya dalam untuk melakukan service rutin kendaraan mengingatkan Saya
	6	4.10	12	Saya merasa nyaman terhadap pelayanan yang diberikan oleh Bengkel Plaza Toyota Bandung kepada Saya
Komitmen Pelayanan	7	4.20	8	Bengkel Plaza Toyota Bandung sudah mempersiapkan segala jenis kebutuhan yang Saya butuhkan
	8	4.00	13	Bengkel Plaza Toyota Bandung memberikan layanan service secara personal untuk memenuhi kebutuhan Saya (Saya dapat memilih teknisi maupun service advisor yang biasa menangani)
	9	4.00	13	Bengkel Plaza Toyota Bandung memiliki kebijakan yang fleksibel ketika Saya merubah jenis service yang Saya inginkan terhadap kendaraan Saya
	10	4.20	8	Bengkel Plaza Toyota Bandung memberikan fleksibilitas dalam melayani kebutuhan Saya
Komunikasi Pelayanan	11	4.14	11	Bengkel Plaza Toyota Bandung memberikan informasi yang tepat dan dapat dipercaya
	12	4.35	3	Bengkel Plaza Toyota Bandung memberikan informasi ketika terdapat jenis pelayanan baru
	13	4.24	6	Bengkel Plaza Toyota Bandung membuat dan memenuhi janji yang diberikan kepada Saya (Waktu pengerjaan service yang dijanjikan oleh Bengkel Plaza Toyota Bandung sesuai dengan yang telah
	14	4.23	7	Informasi yang diberikan oleh Bengkel Plaza Toyota Bandung kepada Saya selalu akurat
Penanganan Masalah	15	4.27	5	Bengkel Plaza Toyota Bandung selalu memberikan informasi terkait tindakan yang akan dilakukan
	16	4.51	1	Bengkel Plaza Toyota Bandung berusaha untuk memberikan solusi yang tepat terhadap permasalahan pada kendaraan Saya sebelum masalah tersebut berkembang menjadi masalah yang
	17	4.39	2	Bengkel Plaza Toyota Bandung mendiskusikan solusi yang diberikan kepada Saya ketika terdapat masalah pada kendaraan Saya
Loyalitas Pelanggan	18	4.20	8	Saya akan memilih Bengkel Plaza Toyota Bandung sebagai Bengkel pilihan pertama Saya
	19	4.30	4	Bengkel pertama yang Saya ingat ketika ingin melakukan service kendaraan adalah Bengkel Plaza Toyota Bandung

The top rank was occupied by the problem handling variable statement. This indicates that loyalty really depends on how Plaza Toyota Workshop Bandung was able to provide solutions, discuss how to handle problems, as well as information provided to customers on how to handle problems that occur. This can be proven from the ranking which shows the question items on the conflict handling variable are in the top 5 (five) rank.

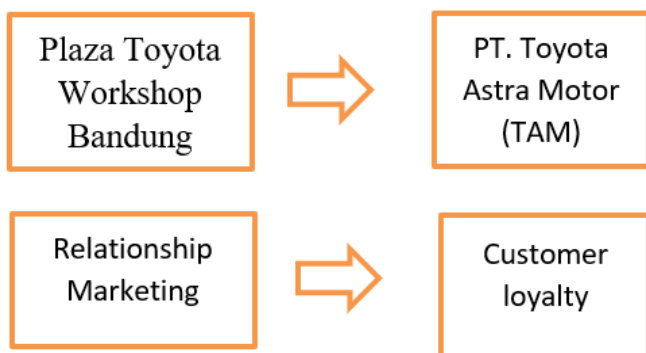
Various forms of communication related to the provision of information related to service dues, reschedule of service dues, the accuracy of information and the accuracy of estimates provided to customers are the next strongest factor affecting customer loyalty at the Plaza Toyota Workshop Bandung.

The service commitment provided to customers at Plaza Toyota Workshop Bandung, from the preparations made to the policies given to customers is a factor that strengthens customer loyalty who uses services at Plaza Toyota Workshop Bandung.

Customer trust did not have a big impact on customer loyalty. It could be seen that of the 6 (six) question items, almost all of them were in the lowest ranking. It could also be indicated that the customer no longer doubts the services provided by the Plaza Toyota Bandung Workshop. Services that fit your needs, sense of security, promises given, hospitality of the securities, to the comfort of customers have no influence on loyalty because Plaza Toyota Workshop Bandung has consistently done this so that it causes the variable customer trust to have no significant impact on customer loyalty.

#### IV. CONCLUSION

PT Toyota Astra Motor (TAM) is a Toyota Brand Sole Agent Holder which has long been the largest market share holder in Indonesia. Plaza Toyota Workshop Bandung has an important contribution in achieving the annual performance of PT Toyota Astra Motor (TAM) in the West Java region.



From this research, it was found that the relationship marketing dimension, namely customer trust, did not affect customer loyalty at Plaza Toyota Workshop Bandung, but service commitment, service communication and conflict handling affect customer loyalty at Plaza Toyota Workshop Bandung.

Relationships that were in line and also mutually reinforcing between one another could be used as a reference for Plaza Toyota Workshop Bandung to increase loyalty and had an impact on increasing entry service units (the number of vehicles that carry out routine maintenance) at Plaza Toyota Workshop Bandung.

#### V. SUGGESTION

Suggestions for Plaza Toyota Workshop Bandung

1. To be more active in implementing customer reminder activities to do routine maintenance of vehicles carried out by Maintenance Reminder Appointment (MRA), these activities could be done more to increase customer loyalty.
2. Plaza Toyota Workshop Bandung should understand what is needed by its customers and improve service quality. By improving the quality of service, the commitment between Plaza Toyota Workshop Bandung and its customers can be well established.
3. Plaza Toyota Workshop Bandung should further improve the way of information delivery to customers so information can be received by customers quickly, precisely and accurately. This information can be conveyed through various media, considering that at this time we are in a digital era and rapidly advancing technology, so information attainment should be done through online media such as websites, Instagram, whats app and others.
4. Plaza Toyota Workshop Bandung should be able to improve problem handling services by taking a broader approach to customers in preventing and dealing with all the problems that occur in customer's Toyota vehicles. The handling of these complaints can be improved by providing facilities and media that can directly accommodate any complaints from customers, providing special applications for receiving customer complaints so that customers can submit their complaints anytime and anywhere.

## Suggestions for Further Research

In this section the authors hope to hold further research with qualitative methods in order to support the results that have been researched in this study. The researcher recommends it because the researcher realizes there are deficiencies in this study, because the lack of information about the dimensions of relationship marketing to customer loyalty at Plaza Toyota Workshop Bandung.

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# Fuzzy Logic and Their application in Different Areas of Engineering Science and Research : A Survey

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## ABSTRACT

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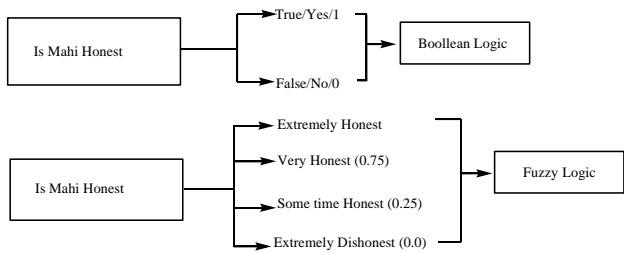
This Paper give introduction to Fuzzy Logic and Various application in different branch of Engineering and Research. Fuzzy Logic is Applied branch of Mathematics in which Lots of research is taking place. Fuzzy Logic works on "if.....then....." Fuzzy Logic gives the idea that members are not restricted to T or F definition. The concept of Fuzzy Logic is used in the various fields as Artificial Intelligence, Aerospace, Automotive Business, Defence, Electronics, Finance, Industrial Sector, Marine Sector, Manufacturing, Medical, Securities, Transportation Pattern Recognition and Classification, Psychology, etc. The whole field of Engineering as civil Engineering, Mechanical Engineering, Industrial Engineering real Reliability theory, Robotics, Computer Engineering is broad to be covered here in a comprehensive way.

**Keywords :** Application of Fuzzy system, Fuzzy Logic rule, Fuzzy theory Survey

## I. INTRODUCTION

Fuzzy Logic was First Proposed by **Lotfi Zadeh** of the University of California at Berkeley, United State in 1965. it has observed that Conventional Computer Logic could not manipulate due to that represented Subjective over vogue ideas, So he created Fuzzy Logic to allow Computer to determine the distinctions among do data with Shades of gray. Similar to the Process of human thinking. The word Fuzzy refers to things which are not clear are vogue. Any event Process or Function that is Changing Continuously can not always be defined as either True or False. Fuzzy

Logic resembles the human decision-making methodology. It deals with vogue and imprecise information. This is a gross over simplification of real word problems and based on degree of truth rather than usual True/False or 1/0 like Boolean logic the following diagram shows that in a Fuzzy systems, the values are indicated by a numbers in the range from 0 to 1. Here 1.0 represent absolute True and 0.0 represents Absolute Falseness. The number which indicates the value in Fuzzy system is called the truth value.



Climate=Rain  
 Hungry=Food  
 Life=Oxygen

Fuzzy sets can be considered as an Extension and gross over simplification of classical sets. It can be understood in the context of set membership. Basically it allows partial membership which means that it contain elements that have varying degrees of membership in the set. Classical sets contains element does that satisfies precise properties of membership while Fuzzy set contains elements that satisfy imprecise properties of membership. Membership function characterized Fuzziness whether the elements in Fuzzy sets are discrete or continuous. Membership function are represent represented by graphical forms.

**Fuzzy Logic rule Base**

The representation of human knowledge can be done with the help of following natural Language expression

**IF** antecedent **THEN** consequent

The above expression is referred to as the Fuzzy "if....then" rule base.

The canonical form of Fuzzy Logic rule base-

Rule 1- If condition P<sub>1</sub>, then restrictions Q<sub>1</sub>.

Rule 2- If condition P<sub>1</sub>, then restrictions Q<sub>2</sub>

.  
 .  
 .  
 .

Rule n-If condition P<sub>1</sub>, then restrictions Q<sub>n</sub>.

Fuzzy if Then "Rules can be interpreted in the following four terms,

- i. Assignment statement:- These kinds of statement use "=" sign for the purpose of assignment.

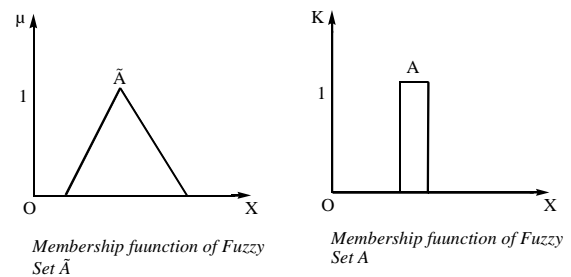
- ii. Condition Statements:- These Kind of statements use the "IF.....THEN" rule base form for the purpose of condition. They are the following form

"If temperature is Low THEN climate is cold"

- iii. Unconditional statements:- These type of statements are of following form

"Turn the Fan OFF"

- iv. Linguistic variable:- Fuzzy Logic is uses Linguistic variables which are very hot or cold, slightly cold, very warm, slightly warm, etc. Here is the words very, slightly, etc, are the Linguistic.



A Fuzzy Set  $\tilde{A}$  in the Universe of the information U can be defined as a set of ordered Pair and it can be represented as

$$\tilde{A} = \{(x, \mu_{\tilde{A}}(x)) \mid x \in U\} \quad \forall \quad \mu_{\tilde{A}}(x) = \text{degree of membership of } x \text{ in } \tilde{A}, \text{ assume values in the range from } 0 \text{ to } 1 \text{ i.e. } \mu_{\tilde{A}}(x) \in [0, 1]$$

Now consider two cases of universe of information as,

1. When universe of information U is discrete and finite then  $\tilde{A} = \sum_{i=1}^n \frac{\mu_{\tilde{A}}(x_i)}{x_i} \quad \forall \quad \sum$  represent the collection of each element.
2. When universe of information U is continuous and finite than  $\tilde{A} = \int \frac{\mu_{\tilde{A}}(x)}{x}$  for any Fuzzy Set  $\tilde{A}$ , the boundary of a membership function is the region of the

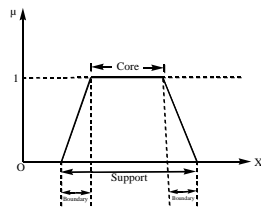
universe that is characterized by a non zero bit in complete membership in the set. Hence core consist of all those elements  $x$  of the inverse of information such that

$$1 > \mu_{\bar{A}}(x) > 0$$

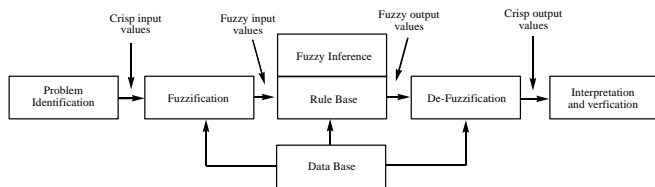
2>

Reducing a fuzzy set into a crisp set in known as

Defuzzification.



Algorithm of Fuzzy decision is



## II. APPLICATION

In this research paper we discuss the various fields where the concept of fuzzy logic are applied as follows,

**A. Psychology:-** In psychology, the Fuzzy Logic is used in following areas,

- Analysis of human behavior
- Criminal investigation and prevention

**B. Transportation:-** In transportation Fuzzy Logic is used in following areas,

- Automatic underground train operation
- Breaking and stopping
- Train schedule control
- Railways acceleration

**C. Medical:-** In medical field, Fuzzy Logic is used in following areas,

- Medical diagnostic support system
- Radiology diagnosis

- Multivariable control of anesthesia
- Modeling of neuro pathological finding in Alzheimer's patients
- Fuzzy inference diagnosis of diabetes and prostate cancer

**D. Securities:-** In securities, Fuzzy logic is used in following areas,

- Decision system for securities trading
- Securities appliances

**E. Marine:-** In the marine field, Fuzzy logic is used in the following areas,

- Autopilot of ships
- Optimal root selection
- Control of autonomous under water vehicles
- Ship steering

**F. Finance:-** In finance field, Fuzzy Logic is used in following areas,

- Bank note transfer control
- Find management
- Stock market prediction

**G. Electronics:-** In electronics Fuzzy Logic is used in following areas,

- Control of automatic exposure in video cameras
- Humidity in a clean room
- Air conditioning system
- Washing machine timing
- Microwave, ovens, vacuum cleaners, etc.

**H. Defense:-** In defense Fuzzy Logic is used in following areas,

- Underwater target recognition
- Automatic target recognition of thermal infrared images
- Naval decision support aids
- Control of a hypervelocity interceptor
- Fuzzy set modeling of NATO decision making

**I. Automotive:-** In automotive Fuzzy Logic is used in following areas,

- Intelligent Highways systems
- Traffic control

- Improving efficiency of automotive transmissions
- Shift scheduling method for automotive transmissions
- Trainable Fuzzy system for speed control

### III. RESEARCH DIRECTION

In this include the different domain engineering science and research where the Fuzzy Logic can be helpful for improving the existing models. During the survey of different article and research paper, it is recognised the Fuzzy logic is one of the most essential technique for processing data and obtain the fruitful pattern.

#### 3.1 Fuzzy mathematical approach for selecting candidate for election by a political party

A team of observed from a party will like to select a candidate who are willing to contest the election then following steps can be followed and weighted mean to be calculate.

- Fixing the parameters which can be used to select a candidate
- Assigning the gradation of these parameter
- Formation of observer's entry shift
- Devising method to calculate index of goodness of each candidate according to each observer
- Calculations which will lead to selection of proper candidate who will fight election on behalf of the party

#### 3.2 IOT enabled smart monitoring of Coronavirus empowered with Fuzzy inference system

IOTSMCFIS system is used to resolve the need for smart FIS coronavirus monitoring which consists of two cloud-connected phase, the first is a training phase and second is a validation phase.

The training phase comprises three level: sensory layers, pre-processing and application layer. Sensory comprise input parameter: flu, headache, sore throat and fever that accumulate and transfer the input values therefore called raw data. The processing layer in the next and very critical layer, the missing values are controlled by moving average and normalisation in order to reduce noisy results. The data is forward to the application layer after pre processing. The application layer is divided into two layer: prediction and perform layer. FIS is used in the prediction layer to predict the output. The input has been grouped and altered to a Fuzzy set with Fuzzy linguistic variables, semantic terms, Fuzzy membership function. During the following point, Fuzzy modification will be made by FIS. FIS is the way to suppose to give source input by using Fuzzy logic, after which Fuzzy set possibilities are transformed into a Fuzzy Set in defuzzifier. FIS is used to predict the coronavirus in prediction layer. If sensory input parameter are appropriate, it will move via a Fuzzfiction into the Fuzzy crisp inputs. The crisp set of input data is obtained and transformed into Fuzzy using Fuzzy linguistic variable. Fuzzy semantic terms and membership function.

#### 3.3 Applications of Fuzzy Logic in chemical process

Fuzzy Logic in chemical process are used in following steps,

- Piping risk assessment
- Furnace control
- Modelling of the fluidised catalytic cracking unit of a petrochemical refinery
- Separation processes
- PH controllers
- Combustion processes



### 3.4 Application of Fuzzy Logic in image processing

Fuzzy Logic used in image processing as in following steps,

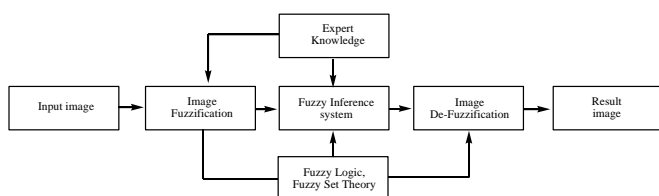
- Mapping of image into the Fuzzy domain
- Operation in the Fuzzy Domain
- Defuzzification function

The several Fuzzy images processing applications are described to

- Fuzzy binarization
- Fuzzy edge definition
- Fuzzy geometry measurement

Fuzzy image processing is the collection of all approaches that understand, present and process the image, their segments and features as Fuzzy set. Fuzzy image processing has three main stages:

- Image Fuzzyfication
- Modification of membership values
- Image defuzzification



### IV.CONCLUSION

Fuzzy logic provides way to calculate with imprecision and vagueness. Fuzzy Logic can be used to represents some kind of human expertise. The control stability, reliability, efficincy and durability of Fuzzy Logic makes it popular. The speed and complexity of application production would not be possible without system like Fuzzy Logic.

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## A Review on Stress Detection of users on Social Interactions

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### ABSTRACT

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Psychological wellbeing conditions impact a significant dimension of the total populace each year. Mental stress is turning into a risk to individuals' well-being nowadays. With the fast pace of life, an ever-increasing number of individuals are getting affected by increasing stress level. Distinguishing the user stress at initial stage is an important yet difficult task. With the notoriety of electronic social platform, people are accustomed to sharing their day to day events and exercises and connecting with companions by means of online networking media stages, making it conceivable to utilize online social network information for stress detection. In this paper, we will discuss a various study conducted by different researchers.

**Keywords** : Human Stress Detection, Social Media, Healthcare, Social Interaction, Data Mining

### I. INTRODUCTION

However, the pressure on children recently brought on by academia, their views of the future, and at home is rising, plus a growing sense of their own stress, is on them is more than they can handle medication and/liquor use can put the well-being of adolescents at risk, which then encourages prolonged stress and lead to restlessness or bitterness, as well as impaired cognitive functioning Having knowledge of the pressures is important, but it is much more important for kids and their parents to identify and control their stress beforehand, so that stress can be managed rather than overwhelming and lead to

medical problems arising. Many social media users are likely to experience strain as a result of stress. Two facts of social psychology have turned out to be interesting. An incredibly depraved mentality can be distributed socially if allowed to influence only one individual, leading to the transfer of terrible mental illness from one person to the next. It is also known as the second social influence, the individual effects, individuals are found in the Social Interaction. Since Sina Weibo has regularly increasing its users, new people will post and communicate their thoughts with their companions about the consistently expanding patterns and desires of each day, it is growing in terms of which a large numbers of

individuals will participate. In addition to these aims, this investigation looks at how we can plan for juvenile stress from micro-blog and knowledge deficiency and multi-process machine learning forecasts, it looks at how we can prepare the young persons for potential situations that incorporate complex and uncertain timetable expectations. All we do is done with young people in mind. If we address a possible source of stress in a thoughtful way, assertive manner, we help to enhance young people's mental health. The experimental outcomes of our study are showing us the possibility of giving equal consideration to correspondence and occasion impacts, or our study lends support to their relevance. Based on what we can tell, this is the main social media pundit's main assumption about the potential burden of the kids' supervisor hardestem weight can be something school newcomers would carry in their own baggage, in the form of individual and social tension.

Even though stress can be a good for certain people, there is also a particular form that can help people be better at accomplishing their goals. For the most part, new students experience in the class overrides all tension and unneeded anxiety. This is shown by an excess of newcomers who continue to have a ton of stress each year versus older students who just experience an increase in that. Over half of understudies face huge levels of stress amid the repetitive schedule of a commonplace semester In order to identify financially savvy and creative young people at-arts students at risk of mental illness, there's a need to alleviate their tension.

There is no research that demonstrates the impact of the advancement of social media use in novel ways such as Twitter and Facebook on overall well-being, but knowledge is already coming into being more common use in other ways, for instance, including to record one's progress on wellbeing. Instagram use has seen substantial growth for adults, and this age group

has grown 16% between 2012 and 2014. As of this moment, 32% of adults between the ages of 29 and up to and 30 are currently using Twitter, and will have to be increasing their use in the years ahead. It's surprisingly difficult to get people to talk about their emotions and experiences. Extending on experts' observations, personal happiness might fulfill the need of having a good impression. Also, fondness and esteem might be felt with special regard. As a result, this may make people more comfortable with how they are feeling and provide them with a fast relief. It is common for clients to offer their thoughts, musings, and general moods, as well as their evaluations of particular topics on social media. That means it can be useful for delivering continuous checking of stress and anxiousness to social undergrads. Examinations performed previously show that numerous variables, including Twitter knowledge, can be put to use to screen for the presence of immunodeficiency, distinguishing instances of human contamination episodes, and predicting whether or not, have been detected in an individual sadness. An excellent example of this is De Choudhury et al who identified people who talk about feeling sad in their tweets as a source of warning signs of depression in certain cases of depression. Specifically, posts gleaned over a single-year time periods were found to be inversely related to grown-up suffering on account of mentions of their brands of energizer, and separate posts on their religion drew attention to specific ailments that were captured in a trend towards "Visit the E and use these additional keywords to discover accounts that mention or have energizer in their bios."

Presently, no examinations have analyzed whether Twitter information can be utilized to screen stress level and emotional state among understudies. Concentrate this theme is vital on the grounds that the vast measure of social media information from understudies' incessant utilization of social media can

be utilized to help college authorities and scientists screen and lessen stress among undergrads.

## II. LITERATURE SURVEY

Yuan Zhang, et. al. [1] have presented consider a novel issue of feeling forecast in social networks. A technique alluded to as Moodcast for modeling and anticipating feeling elements in the social network. The proposed methodology can successfully model every client's feeling status and the expectation execution is superior to a few gauge techniques for feeling forecast. It is utilized to because of the set number of members. For model learning, it utilizes a Metropolis-Hastings calculation to acquire an inexact arrangement. Experimental outcomes on two diverse genuine social networks show that the proposed methodology can adequately model every client's feeling status and the forecast execution is superior to a few standard strategies for feeling expectation. The study focuses at the customized affirmation of user's each day stress based on following unique arrangements of data:

- a) people activity, as recognized through their phones (data identifying with transient properties of individuals);
- b) atmosphere conditions (data identifying with transient properties of the earth);
- c) personality attributes (data concerning enduring habits of individuals).

The issue was shown as a 2-way group activity one. The results convincingly suggest that all the three 484 sorts of data are imperative for accomplishing a sensible perceptive control. For whatever time allotment that one of those information sources is dropped, displays plunge under those of the baselines. Likewise, the distributional data for precision and show up the healthiness and theory vitality of our multifactorial approach.

Liqiang Nie, et. al. [2] have presented about Bridging the vocabulary hole between wellbeing searchers and

healthcare information with a worldwide learning approach. A medicinal wording task plan to connect the vocabulary hole between wellbeing searchers and healthcare information. The plan involves two parts, nearby mining, and worldwide learning. Broad assessments on a genuine world dataset exhibit that our plan can deliver promising execution when contrasted with the predominant coding techniques. Creator will examine how to adaptably sort out the unstructured therapeutic substance into client needs-mindful metaphysics by utilizing the suggested restorative wordings. This paper shows a therapeutic stating undertaking intends to associate the vocabulary gap between prosperity searchers and restorative administrations data. The arrangement incorporates two sections, neighborhood mining and overall learning. The past sets up a tri-organize framework to locally code each remedial record. In any case, the close-by mining strategy may encounter the evil impacts of information setback and low precision, which are caused by the nonappearance of key therapeutic thoughts and the closeness of the unnecessary helpful thoughts. This goads us to propose an overall adapting approach to manage modify for the lack of adjacent coding approach. The second portion agreeably learns and spreads phrasings among fundamental related therapeutic records. It engages the blend of heterogeneous information. Expansive evaluations on a genuine world dataset show that our arrangement is able to make promising execution when appeared differently in relation to the general coding systems. Even more critically, the whole strategy of our methodology is unsupervised and holds the potential to manage considerable scale information.

J. Frey [3] have presented about nonexclusive message-passing calculation, the total item calculation, that works in a factor graph Factor graphs give a characteristic graphical portrayal of the factorization of a worldwide capacity into a result of neighborhood capacities. It can create Factor Graphs

and the Sum-Product Algorithm. Further investigation of the modeling intensity of factor graphs and uses of the aggregate item calculation will turn out to be productive. Creator show an insipid message-passing figuring, the total thing count, that works in a factor chart. Following a lone, essential computational oversee, the entire thing estimation registers—either absolutely or around—various fringe limits got from the overall limit. A wide arrangement of figurings made in mechanized thinking, signal planning, and propelled exchanges can be resolved as specific instances of the entire thing count, including the forward/backward estimation, the Viterbi computation, the iterative "turbo" unraveling count, Pearl's conviction spread computation for Bayesian frameworks, the Kalman channel, and certain quick Fourier change (FFT) calculations.

Xiao jun Chang, et. al. [4] Yu have presented around distinguishing complex occasions in unconstrained Internet recordings. Creator proposes an effective, profoundly adaptable calculation that is a request of greatness quicker than existing options better execution can't generally be ensured by more ideas. Creator focus on distinguishing complex events in unconstrained Web accounts. While generally existing works rely upon the abundance of named getting ready data, Author considers a progressively troublesome zero-shot setting where no arrangement data is given. They first pre-set up various thought classifiers using data from different sources. the nuclear standard position adds up to the structure is grasped to search for agreement. To address the testing enhancement definition, they propose a powerful, significantly versatile estimation that is a demand of size speedier than existing decisions. Preliminaries on late TRECVID datasets affirm the prevalence of the proposed approach.

Jennifer Golbeck, et. al. [5] are presented a keen on the character of customers. Personality has been had all the earmarks of being appropriate to numerous

sorts of participation. We are keen on the character of customers. Personality has been seemed, by all accounts, to be material to numerous sorts of participation; it has been giving off an impression of being useful in foreseeing work fulfillment, relationship accomplishment, and even tendency. We are captivated in the character of customers. The character has been seemed, by all accounts, to be relevant to numerous sorts of correspondences; it has been had all the earmarks of being significant in predicting work satisfaction, master and sentimental relationship accomplishment, and even tendency for different interfaces. We can start to answer progressively advanced inquiries concerning how to display trusted, socially-applicable, and top-notch data to clients. This made it outlandish to use personality examination in various online social networking regions. In this paper, show a strategy by which a customer's character can be correctly foreseen through the transparently accessible information on their Twitter profile. We will portray the kind of data accumulated, our systems for examination, and the machine learning strategies that empower us to adequately predict character. We by then the discussion about the proposals this has for electronic social networking diagram, interface plan, likewise, progressively broad areas.

D. Kamvar [6] has presented an investigation about when any individual feels fine and looking through the emotional web. On the utilization of We Feel Fine to recommend a class of representations called Experiential Data Visualization, which center around vivid thing level interaction with data. The ramifications of such perceptions for publicly supporting subjective research in the social sciences. Rehashed data in important answers requires the client to peruse through countless so as to really get information. To date, most research in appraisal examination has been locked in on computations to remove, arrange, and consolidate end. While this has clearly been profitable, there remains a far reaching

open entryway for masters to manufacture vivid interfaces that consider thing level examination of incline data. This thing level examination of data can convey its own experiential favorable circumstances to the customer, and also engage publicly supported abstract data investigation.

Dan C Cirean, et. al. [7] presented a new profound CNN design, MaxMin-CNN, to all the more likely encode both positive and negative channel detections in the net. We propose to change the standard convolutional square of CNN remembering the true objective to trade more information layer after layer while keeping some invariance inside the system. Our fundamental idea is to mishandle both positive and negative high scores got in the convolution maps. This lead is procured by adjusting the standard establishment work adventure before pooling. The time required for this is more. It is a tedious process.

Chi Wang, et. al. [8] have presented a discover around an effect support issue, which hopes to find a little subset of centers (customers) in a relational association that could grow the spread of effect. A Pairwise Factor Graph (PFG) model to formalize the issue in the probabilistic model, and creator expands it by consolidating the time data, which results in the Dynamic Factor Graph (DFG) mode. The proposed approach can viably find the dynamic social impacts. Parallelization of our calculation should be possible in future work to scale it up further, propose a pairwise factor Graph (PFG) model to demonstrate the social effect in social frameworks. A gainful computation is expected to take in the model and make acceptance. We furthermore propose a dynamic factor Graph (DFG) model to meld the time data. Preliminary happens on three unmistakable classifications of data sets show that the proposed approach can capably incite the dynamic social effect. The results are associated with the effect help issue, which expects to find a little subset of center points (customers) in a casual association that could amplify the spread of

effect. Preliminaries show that the proposed methodology can energize the application.

Andrey Bogomolov, et. al. [9] have presented Studies about Daily stress acknowledgment from cell phone information, climate conditions, and individual qualities. That step by step stress can be reliably seen in the perspective of social estimations, got from the customer's phone activity what's more, from additional markers, for instance, the atmosphere conditions (data identifying with brief properties of the condition) and the character attributes. In workplaces, where stress has turned into a difficult issue influencing efficiency, prompting word related problems and producing wellbeing illnesses. Our framework could be broadened and utilized for initial discovery of stress-related clashes and stress infection, and for backing up adjusted loads.

H. Lin, et. al. [10] have presented the around a programmed stress identification method from cross-media microblog data. Three-level structure for stress detection from cross-media microblog information. By joining a Deep Neural Network to consolidate distinctive highlights from cross-media microblog information, the system is very achievable and effective for stress identification. This structure, represents a strategy which could help in consequently distinguish psychological stress from social networks. Creator intends to explore the social connections in psychological stress to additionally enhance the detection execution. They fabricate a three-level structure to figure out the issue. They at first get a game plan of low-level features from the tweets. By then creators describe and separate focus level depictions in light of mental and workmanship theories: etymological qualities from tweets' compositions, visual attributes from tweets' photos, and social properties from tweets' comments, retweets, and top decisions. Finally, a Deep Sparse Neural Network is planned to take in the weight classifications joining the hybrid-media attributes.

Examination occurs exhibit that the proposed strategy is convincing and successful in perceiving mental stress from microblog information.

Lexing Xie et. al. [11] have presented about Picture labels and world information: taking in label relations from visual semantic sources ponders the utilization of regular words to depict pictures. The proposed labeling calculation sums up to inconspicuous labels and is additionally enhanced joining tag-connection highlights acquired by means of ICR. Techniques to all the more likely fuse multi-keywords and out-of-vocabulary words; propelled NLP systems for taking in word relations from freestyle content; assessment of inactive idea connection recommendation, and anticipating the kind of relations. Creator proposes a novel framework estimation calculation, Backwards Concept Rank, to determine lacking mark connections. At that point plan a computation for picture remark that considers both picture and name features. We research in excess of 5 million photographs with in excess of 20,000 visual names. The experiences from this social affair prompt extraordinary results for picture naming, relationship estimation, and summing up to hid marks. This is an art adventure in separating picture names what's progressive, customary semantic data. Potential distinctive applications join making ordinary tongue depictions of pictures and likewise endorsing and enhancing learning databases.

Quan Guo, et. Al in [12] have presented about a Learning powerful uniform highlights for hybrid-media social data by utilizing hybrid auto encoders. To take care of evaluation models to address issue handle the hybrid-methodology connections in cross-media social features. The author proposes CAE to learn uniform modality invariant highlights, and they propose AT and PT stages to use monstrous cross-media information tests and train the CAE. Learning strong uniform highlights for cross-media social information by utilizing cross auto encoders take

additional time. A new unsupervised procedure has been presented for cross-strategy segment level component training model called cross auto encoder (CAE). CAE can get the cross-approach connections in segment tests. Also, we enhanced it to the AS using the well-known method called Convolution Neural Network or we can say CNN, specifically convolutional cross auto encoder (CCAIE). They use CAEs as directs in the CCAIE to manage cross-philosophy parts and the CNN framework to manage the time progression and decrease the impact of special cases in AS. Lastly author applies the presented implementation model to a course of action errands to survey the idea of the delivered depictions against a couple of authentic web-based networking datasets.

### III. CONCLUSION

Prolonged psychological stress is affecting individuals' overall well-being. It is important to differentiate between a substantive concern and a constructive cause. Thus, we showed a mechanism for differentiating the state of clients from their online posts as well as well as communications, which employed social media as a part of it. Conferring with other researchers and experts to better comprehend our clients' individual social behaviour and habits was the basis for this research, which helped us to see how psychological stress is related to their social experiences. This was discussed in this paper and numerous methods were investigated to discover how to find an answer. For the most part, the central question of the analysis (like the subject of this dissertation) was concerned with the contents of the interactions (e.g. textual content), not with the structure (e. structural details such as user relationships). like subject extraction and classification, topic extraction and classifying certain data would be a fine way to go about it the proper selection of methods for classification may be a

primary issue in ensuring the safe and effective operation of the system.

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# Comparative Analysis of Cancer Incidence and Trend by Dual Cancer Registry in Nepal (2013 -2017)

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## ABSTRACT

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Cancer is the malignant growth resulting from an uncontrolled division of cells and a major public health problem in the world. This study aims to compare a five years trend of cancer incidence by dual registry in Nepal. In this Retrospective analysis cancer patient of all age group was conducted to assess the frequency of different types of cancer presenting from first January to last December for each years of 2013, 2014, 2015, 2016 and 2017. In this study cancer incidence of each years and each registry (HBCR &PBCR) compared separately. The most common cancer in both sex and registries registry was bronchus & lung followed by cervical and breast. Among females, cervical cancer was most common followed by breast and lung cancer. Among males, bronchus and lung cancer was most prevalent followed by stomach. Cancer incidence is increasing day by day in Nepal thus comprehensive policies targeting prevention, early detection, and treatment programs should be carried out in national context.

**Keywords :** Dual Registry, Incidence, Trend, Nepal

## I. INTRODUCTION

Hospital based cancer registry (HBCR) program was started since 2003 in coordination with seven major hospitals in the nation with the support of WHO Nepal. Five other hospitals were also included for the study since 2013. However, population based cancer registry (PBCR) was not started until 2013. To address the need of population based cancer registry, Cancer

Prevention Control and Research Department of BPKMCH initiated the population based cancer registry in 2013. Dual registry are running parallels since 2013. The coverage of population based cancer registry was fifteen districts of three geographical region of Nepal with 25.88% out of total population of the country. Hospital based cancer registry covered twelve major hospitals of the nation known as hospital based national cancer registry in Nepal.

Cancer is an emerging public health problem in developing countries. The magnitude of the problem of cancer in terms of its large number, warrant s particular attention of policymakers to evolve national programs of the action to develop, implement, coordinate and also to evaluate the cancer control activities in individual countries (Gupta et al., 1993). Globally, about 1 in 6 deaths is due to cancer. Approximately 70% of deaths from cancer occur in low- and middle-income countries. (GLOBO CAN 2018). According to GLOBOCAN 2012, an estimated 14.1 million new cancer cases and 8.2 million cancer related deaths occurred. Compared with 12.7 million and 7.6 million, respectively in 2008 (Ferlay et al., 2012) The importance of cancer registry data for development of national cancer control programs has already been stressed in the context of South Asia (Bhurgri, 2004). In Nepal hospital based cancer registry program was started from 2003, with the support of WHO- Nepal in coordination with Seven hospitals of the nation. The programme expanded to cover 12 major hospitals in coordination with B.P. koirala Memorial Cancer Hospital Bharatpur, Chitwan. Population based cancer registry is a new to Nepalese cancer registry, We are not in a state of covering all the geographical region, province districts and population at the moment. so we decided to cover about 25.88% population and 15 districts representative of three geographical region of Nepal. To make data more homogeneous we selected district more or less in the central region of Nepal. This study includes data from fifteen districts of the country situated in Terai, hills and Himalaya. Therefore, outcome of this study can be used to infer an overall situation of cancer in Nepal.

## II. METHODS AND MATERIAL

In this retrospective analysis, the information of all age groups were collected from different data sources institution and authority.. Information include name, age, sex, topography, marital status, religion,

educational, occupation, and relevant details were collected and recorded from first January to December last , separately by each years of 2013, 14, 15,16 & 2017. Collected data were coded according to ICD O 3rd and ICD-10 published by IARC/WHO and proceeds for analysis using SPSS 19.0 version.

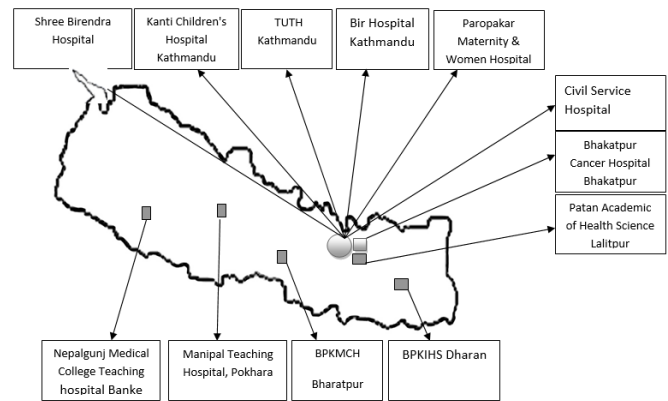


Figure 1: Hospital Based Cancer Registry (HBCR)



Figure 2: Population Based Cancer Registry (PBCR)

## III. RESULTS AND DISCUSSION

Table 1. Cancer cases by dual registry - 2013

Sex	PBCR		HBCR	
	#	%	#	%
Male	1113	45.1	4011	46.0
Female	1356	54.9	4718	54.0
Total	2469	100.0	8729	100

Table 2. Cancer cases by dual registry - 2014

Sex	PBCR		HBCR	
	#	%	#	%
Male	1088	41.5	4014	44.4
Female	1532	58.5	5022	55.6
Total	2620	100.0	9036	100.0

Table 3. Cancer cases by dual registry -2015

Sex	PBCR		HBCR	
	#	%	#	%
Male	1271	43.1	4483	46.1
Female	1679	56.9	5235	53.9
Total	2950	100	9718	100

Table 4. Cancer cases by dual registry – 2016

Sex	PBCR		HBCR	
	#	%	#	%
Male	1366	44.0	4697	46.4
Female	1738	56.0	5420	53.6
Total	3104	100	10117	100

Table 5. Cancer cases by dual registry – 2017

Sex	PBCR		HBCR	
	#	%	#	%
Male	1446	44.35	4939	46.97
Female	1814	55.65	5577	53.03
Total	3260	100	10516	100

Table 6. Comparison of most prevalent cancer cases from dual registry for both sex – 2013

ICD -10	Topography	Population based		Hospital based		Topography	ICD -10
		#	%	#	%		
C34	Bronchus & lung	390	15.7	1156	13.2	Bronchus & lung	C 34
C53	Cervix uteri	272	11.0	832	9.5	Cervix uteri	C 53
C50	Breast	188	7.6	752	8.6	Breast	C 50
C16	Stomach	138	5.5	527	6.0	Stomach	C 16
C56	Ovary	106	4.2	366	4.2	Larynx	C 32
C32	Larynx	94	3.8	350	4.0	Ovary	C 56
C67	Bladder	93	3.7	335	3.8	Bladder	C 67
C71	Brain	70	2.8	253	2.9	Gall bladder	C 23
C22	Liver	64	2.5	231	2.7	Liver	C 22
C23	Gall bladder	62	2.4	221	2.6	Rectum	C 20
**	Other cancer	992	40.7	3706	42.5	Other cancers	**
Total		2469	100.0	8729	100.0		Total

Table 7. Comparison of most prevalent cancer cases from dual registry for both sex – 2014

ICD -10	Topography	Population based		Hospital based		Topography	ICD-10
		#	%	#	%		
C34	Bronchus and lung	361	13.7	1241	13.7	Bronchus & lung	C 34
C53	Cervix uteri	277	10.5	852	9.4	Cervix uteri	C 53
C50	Breast	249	9.6	848	9.4	Breast	C 50
C16	Stomach	144	5.4	528	5.8	Stomach	C 16
C56	Ovary	123	4.6	359	4.0	Larynx	C 32
C23	Gall bladder	110	4.2	350	3.9	Ovary	C 56
C20	Rectum	86	3.3	320	3.5	Gall bladder	C 23
C32	Larynx	85	3.2	273	3.0	Rectum	C 20
C67	Bladder	76	2.9	238	2.6	Liver	C 22
C71	Brain	73	2.7	202	2.2	Brain	C 71
**	Other cancers	1036	39.9	3825	42.5	Other cancers	**
Total		2620	100.0	9036	100.0		Total

Table 8. Comparison of most prevalent cancer cases from dual registry – 2015

ICD -10	Topography	Population based		Hospital based		Topography	ICD-10
		#	%	#	%		
C34	Bronchus and lung	381	12.9	1334	13.7	Bronchus and lung	C34
C53	Cervix uteri	323	10.9	868	8.9	Cervix uteri	C53
C50	Breast	267	9.1	856	8.8	Breast	C50
C16	Stomach	169	5.7	519	5.3	Stomach	C16
C56	Ovary	125	4.2	365	3.8	Ovary	C56
C32	Larynx	99	3.4	360	3.7	Larynx	C32
C71	Brain	96	3.3	338	3.5	Gall bladder	C23
C23	Gall bladder	92	3.1	281	2.9	Leukemia /lymphoi	C91

						d	
C67	Bladder	81	2.7	27	2.8	Rectum	C20
C20	Rectum	75	2.5	24	2.5	Brain	C71
**	Other cancers	124	42.2	42	44.1	Other cancers	**
Total		295	100.0	97	100.0		Total

Table 9. Comparison of most prevalent cancer cases from dual registry – 2016

ICD -10	Topography	Population based		Hospital based		Topography	ICD -10
		#	%	#	%		
C34	Bronchus and lung	396	12.7	1342	13.2	Bronchus and lung	C34
C53	Cervix uteri	377	12.1	912	9.0	Cervix uteri	C53
C50	Breast	272	8.7	904	8.9	Breast	C50
C16	Stomach	162	5.2	499	4.9	Stomach	C16
C56	Ovary	127	4.0	392	3.8	Ovary	C56
C71	Brain	123	3.9	387	3.8	Gall bladder	C67
C23	Gall bladder	110	3.5	313	3.0	Leukemia/lymphoid	C91
C91	Leukemia/Lymphoid	103	3.3	289	2.8	Larynx	C32
C32	Larynx	87	2.8	279	2.7	Brain	C71
C67	Bladder	83	2.6	259	2.5	Rectum	C20
**	Other cancers	126	41.2	454	45.4	Other cancers	**
Total		310	100.0	1011	100.0		Total

Table 10. Comparison of most prevalent cancer cases from dual registry – 2016

ICD -10	Topography	Population based		Hospital based		Topography	ICD -10
		#	%	#	%		
C34	Bronchus and lung	430	13.1	1347	12.8	Bronchus and lung	C34
C53	Cervix uteri	379	11.6	928	8.82	Cervix uteri	C53
C50	Breast	275	8.43	916	8.71	Breast	C50
C16	Stomach	156	4.74	536	5.10	Stomach	C16
C56	Ovary	129	3.95	420	3.99	Gall bladder	C23
C23	Gall bladder	109	3.34	393	3.74	Ovary	C56
C22	Liver	96	2.94	312	2.97	Bladder	C67
C91	Leukemia/Lymphoid	89	2.73	302	2.87	Liver	C22
C32	Larynx	82	2.51	288	2.74	Leukemia/lymphoid	C91
C41	Bones joint & articular cartilage of other & unspecified sites	81	2.48	278	2.64	Larynx	C32
**	Other cancers	143	43.9	476	45.6	Other cancers	**
Total		326	100	1051	100	Total	Total

Table 11. Most prevalent cancers in PBCR for both sex – 2013

S.N.	ICD-10	Topography	#	%
1	C34	Bronchus and lung	390	15.7
2	C53	Cervix uteri	272	11.0
3	C50	Breast	188	7.6
4	C16	Stomach	138	5.5
5	C56	Ovary	106	4.2
6	C32	Larynx	94	3.8
7	C67	Bladder	93	3.7
8	C71	Brain	70	2.8
9	C22	Liver	64	2.5
10	C23	Gall bladder	62	2.4
11	**	Other cancers	992	40.7
Total			2469	100.0

Table 14. Most prevalent cancers in PBCR for both sex – 2014

S.N.	ICD-10	Topography	#	%
1	C34	Bronchus and lung	361	13.7
2	C53	Cervix uteri	277	10.5
3	C50	Breast	249	9.6
4	C16	Stomach	144	5.4
5	C56	Ovary	123	4.6
6	C23	Gall bladder	110	4.2
7	C20	Rectum	86	3.3
8	C32	Larynx	85	3.2
9	C67	Bladder	76	2.9
10	C71	Brain	73	2.7
11	**	Other cancers	1036	39.9
Total			2620	100.0

Table 12. Most prevalent cancers in PBCR for Male – 2013

S.N.	ICD-10	Topography	#	%
1	C34	Bronchus and lung	215	215
2	C16	Stomach	83	83
3	C32	Larynx	59	59
4	C67	bladder	58	58
5	C22	Liver	36	36
6	C15	Esophagus	34	34
7	C49	Connective subcutaneous & other soft tissues	34	34
8	C71	Brain	33	33
9	**	Unspecified	29	29
10	C23	Rectum	27	27
11	**	Other cancer	505	505
Total			1113	1113

Table 15. Most prevalent cancers in PBCR for male – 2014

S.N.	ICD-10	Topography	#	%
1	C34	Bronchus and lung	180	16.7
2	C16	Stomach	81	7.4
3	C32	Larynx	58	5.4
4	C67	Bladder	55	5.0
5	C71	Brain	39	3.5
6	C20	Rectum	39	3.5
7	C22	Liver	38	3.4
8	C61	Prostate gland	37	3.4
9	**	Unspecified Colon	35	3.2
10	C18	Colon	34	3.1
11	**	Other cancer	492	45.4
Total	Total		1088	100.0

Table 13. Most prevalent cancers in PBCR for female – 2013

S.N.	ICD-10	Topography	#	%
1	C53	Cervix uteri	272	20.1
2	C50	Breast	184	13.6
3	C34	Bronchus and lung	175	12.9
4	C56	Ovary	105	7.7
5	C71	Brain	37	2.7
6	C23	Gall bladder	37	2.7
7	C32	Larynx	35	2.5
8	C67	Bladder	35	2.5
9	C20	Rectum	28	2.0
10	C15	Esophagus	26	1.9
11	**	Other cancer	422	31.4
Total			1356	100.0

Table 16. Most prevalent cancers in PBCR for female - 2014

S.N.	ICD-10	Topography	#	%
1	C53	Cervix uteri	277	18.2
2	C50	Breast	238	15.6
3	C34	Bronchus and lung	181	11.8
4	C56	Ovary	123	8.0
5	C23	Gall bladder	80	5.2
6	C20	Stomach	63	4.1
7	C71	Rectum	47	3.0
8	C32	Thyroid	37	2.4
9	C22	Brain	34	2.2
10	C27	Larynx	27	1.7
11	--	Other cancers	425	27.8
Total			1532	100.0

Table 17. Most prevalent cancers in PBCR for both sex – 2015

SN	ICD-10	Topography	#	%
1	C34	Bronchus and lung	381	12.9
2	C53	Cervix uteri	323	10.9
3	C50	Breast	267	9.1
4	C16	Stomach	169	5.7
5	C56	Ovary	125	4.2
6	C32	Larynx	99	3.4
7	C71	Brain	96	3.3
8	C23	Gall bladder	92	3.1
9	C67	Bladder	81	2.7
10	C20	Rectum	75	2.5
11	**	Other cancers	1242	42.2
	Total		2950	100.0

Table 18. Most prevalent cancers in PBCR for male – 2015

SN	ICD-10	Topography	#	%
1	C34	Bronchus and lung	198	15.6
2	C16	Stomach	84	6.6
3	C32	Larynx	62	4.9
4	C67	Bladder	59	4.6
5	C71	Brain	51	4.0
6	C20	Rectum	42	3.3
7	C22	Liver and intrahepatic bile duct	42	3.3
8	C91	Leukemia/lymphoid	41	3.2
9	C02	Other and unspecified parts of tongue	39	3.1
10	C15	Esophagus	36	2.8
11	**	Other cancers	617	48.5
	Total		1271	100.0

Table 19. Most prevalent cancers in PBCR for female – 2015

SN	ICD-10	Topography	#	%
1	C53	Cervix uteri	323	19.2
2	C50	Breast	264	15.7
3	C34	Bronchus and lung	183	10.9
4	C56	Ovary	125	7.4
5	C16	Stomach	85	5.1
6	C23	Gall bladder	64	3.8

7	C71	Brain	45	2.7
8	C73	Thyroid gland	38	2.3
9	C32	Larynx	37	2.2
10	C20	Rectum	33	2.0
11	**	Other cancers	482	28.7
	Total		1679	100.0

Table 20. Most prevalent cancers in PBCR for both sex – 2016

SN	ICD-10	Topography	#	%
1	C34	Bronchus and lung	396	12.75
2	C53	Cervix uteri	377	12.14
3	C50	Breast	272	8.76
4	C16	Stomach	162	5.21
5	C56	Ovary	127	4.09
6	C71	Brain	123	3.96
7	C23	Gall bladder	110	3.54
8	C91	Leukemia/lymphoid	103	3.31
9	C32	Larynx	87	2.80
10	C67	Bladder	83	2.67
11	**	Other cancers	1264	40.72
	Total		3104	100.00

Table 21. Most prevalent cancers in PBCR for male – 2016

SN	ICD-10	Topography	#	%
1	C34	Bronchus and lung	225	16.47
2	C16	Stomach	85	6.22
3	C71	Brain	82	6.00
4	C32	Larynx	68	4.97
5	C91	Leukemia/lymphoid	65	4.75
6	C67	Bladder	60	4.39
7		Other and unspecified parts of tongue	47	3.44
8		Other and unspecified parts of mouth	45	3.29
9		Leukemia unspecified	45	3.29
10		NHL	41	3.00
11	**	Other cancers	603	44.14
	Total		1366	100.00

Table 22. Most prevalent cancers in PBCR for female – 2016

SN	ICD-10	Topography	#	%
1	C53	Cervix uteri	377	21.69
2	C50	Breast	266	15.3
3	C34	Bronchus and lung	171	9.83
4	C56	Ovary	127	7.30
5	C16	Stomach	77	4.43
6	C23	Gall bladder	73	4.20
7	C73	Thyroid gland	43	2.47
8	C71	Brain	41	2.35
9	C91	Leukemia/lymphoid	38	2.18
10	C22	Liver and intrahepatic bile duct	31	1.78
11	**	Other cancers	494	28.42
			1738	100.00

Table 23. Most prevalent cancers in PBCR for both sex – 2017

SN	ICD-10	Topography	#	%
1	C34	Bronchus and lung	430	13.19
2	C53	Cervix uteri	379	11.62
3	C50	Breast	275	8.43
4	C16	Stomach	156	4.74
5	C56	Ovary	129	3.95
6	C23	Gall bladder	109	3.34
7	C22Liver		96	2.94
8	C91	Leukemia/Lymphoid	89	2.73
9	C32	Larynx	82	2.51
10	C41	Bones joint & articular cartilage of other & unspacified sites	81	2.48
11	**	Other cancers	1434	43.98
Total			3260	100.00

Table 24. Most prevalent cancers in PBCR for male – 2016

SN	ICD-10	Topography	#	%
1	C34	Bronchus and lung	233	16.11
2	C16	Stomach	91	6.29
3	C22	Liver	66	4.56
4	C67	bladder	54	3.73
5	C02	Other and unspecified parts of tongue	52	3.59
6	C32	Larynx	52	3.59

7	C91	Leukemia/lymphoid	51	3.52
8	C18	Other and unspecified parts of mouth	45	3.11
9	C20	Rectum	45	3.11
10	C15	Esophagus	44	3.04
11	**	Other cancers	713	49.30
	Total		1446	100

Table 25. Most prevalent cancers in PBCR for female – 2017

SN	ICD-10	Topography	#	%
1	C53	Cervix uteri	379	20.89
2	C50	Breast	262	14.44
3	C34	Bronchus and lung	197	10.85
4	C56	Ovary	129	7.11
5	C23	Gall bladder	78	4.29
6	C16	Stomach	65	3.58
7	C73	Thyroid gland	42	2.31
8	C91	Leukemia/lymphoid	38	2.09
9	C41	Bones joints & articular cartilage of other & unspecified sites	38	2.09
10	C18	Colon	31	1.70
11	**	Other cancers	555	30.59
Total			1814	100

Table 26. Most prevalent cancers in HBCR for both sex – 2013

SN	ICD-10	Topography	#	%
1	C 34	Bronchus & lung	1156	13.2
2	C 53	Cervix uteri	832	9.5
3	C 50	Breast	752	8.6
4	C 16	Stomach	527	6.0
5	C 32	Larynx	366	4.2
6	C 56	Ovary	350	4.0
7	C 67	Bladder	335	3.8
8	C 23	Gall bladder	253	2.9
9	C 22	Liver	231	2.7
10	C 20	Rectum	221	2.6
11	--	Other cancers	3706	42.5
Total	Total		8729	100.0

Table 27. Most prevalent cancers in HBCR for male – 2013

SN	ICD-10	Topography	#	%
1	C 34	Bronchus & lung	664	16.6
2	C 16	Stomach	312	7.8
3	C 32	Larynx	250	6.3
4	C 67	Bladder	238	5.9
5	C 06	Other & unspecified parts of mouth	136	3.4
6	C 22	Liver	121	3.0
7	C 71	Brain	118	2.9
8	C 20	Rectum	111	2.8
9	C 85	NHL	109	2.7
10	C 02	Other & unspecified parts of tongue	107	2.7
11	--	Other cancers	1845	45.9
	Total		4011	100.0

Table 28. Most prevalent cancers in HBCR for female – 2013

SN	ICD-10	Topography	#	%
1	C 53	Cervix uteri	832	17.6
2	C 50	Breast	728	15.4
3	C 34	Bronchus & lung	492	10.4
4	C 56	Ovary	350	7.4
5	C 16	Stomach	215	4.6
6	C 23	Gall bladder	161	3.4
7	C 73	Thyroid	126	2.7
8	C 32	Larynx	116	2.5
9	C 20	Rectum	110	2.3
10	C 22	Liver	110	2.3
11	--	Other cancers	1478	31.4
	Total		4718	100.0

Table 29. Most prevalent cancers in HBCR for both sex – 2014

SN	ICD-10	Topography	#	%
1	C 34	Bronchus & lung	1241	13.7
2	C 53	Cervix uteri	852	9.4
3	C 50	Breast	848	9.4
4	C 16	Stomach	528	5.8
5	C 32	Larynx	359	4.0

6	C 56	Ovary	350	3.9
7	C 23	Gall bladder	320	3.5
8	C 20	Rectum	273	3.0
9	C 22	Liver	238	2.6
10	C 71	Brain	202	2.2
11	**	Other cancers	3825	42.5
	Total		9036	100.0

Table 30. Most prevalent cancers in HBCR for male - 2014

SN	ICD-10	Topography	#	%
1	C 34	Bronchus & lung	692	17.2
2	C 16	Stomach	305	7.6
3	C 32	Larynx	247	6.2
4	C 67	Bladder	150	3.7
5	C 20	Rectum	139	3.5
6	C 02	Other & unspecified parts of tongue	134	3.3
7	C 22	Liver	130	3.2
8	C 06	Other & unspecified parts of mouth	124	3.1
9	C 71	Brain	119	3.0
10	C 15	Esophagus	117	2.9
11	**	Other cancers	1857	46.3
	Total		4014	100.0

Table 31. Most prevalent cancers in HBCR for female – 2014

SN	ICD-10	Topography	#	%
1	C 53	Cervix uteri	852	17.0
2	C 50	Breast	826	16.4
3	C 34	Bronchus & lung	549	10.9
4	C 56	Ovary	350	7.0
5	C 16	Stomach	223	4.4
6	C 23	Gall bladder	220	4.4
7	C 73	Thyroid	145	2.9
8	C 20	Rectum	134	2.7
9	C 32	Larynx	112	2.2
10	C 22	Liver	108	2.2
11	**	Other cancers	1503	29.9
	Total		5022	100.0



Table 32. Most prevalent cancers in HBCR for both – 2015

SN	ICD-10	Topography	#	%
1	1	Bronchus and lung	1334	13.7
2	2	Cervix uteri	868	8.9
3	3	Breast	856	8.8
4	4	Stomach	519	5.3
5	5	Ovary	365	3.8
6	6	Larynx	360	3.7
7	7	Gall bladder	338	3.5
8	8	Leukemia/lymphoid	281	2.9
9	9	Rectum	270	2.8
10	10	Brain	245	2.5
11	**	Other cancers	4282	44.1
Total			9718	100.0

Table 33. Most prevalent cancers in HBCR for male – 2015

SN	ICD-10	Topography	#	%
1	C34	Bronchus and lung	760	17.0
2	C16	Stomach	292	6.5
3	C32	Larynx	254	5.7
4	C91	Leukemia/lymphoid	182	4.1
5	C67	Bladder	159	3.5
6	C20	Rectum	150	3.3
7	C71	Brain	137	3.1
8	C85	NHL	137	3.1
9	C18	Colon	124	2.8
10	C22	Liver and intrahepatic bile duct	123	2.7
11	**	Other cancers	2165	48.2
Total			4483	100.0

Table 34. Most prevalent cancers in HBCR for female – 2015

SN	ICD-10	Topography	#	%
1	C53	Cervix uteri	868	16.6
2	C50	Breast	838	16.0
3	C34	Bronchus and lung	574	11.0
4	C56	Ovary	365	7.0
5	C23	Gall bladder	235	4.5
6	C16	Stomach	227	4.3
7	C73	Thyroid gland	143	2.7
8	C20	Rectum	120	2.3
9	C71	Brain	108	2.1
10	C32	Larynx	106	2.0
11	**	Larynx	1651	31.5

Total	5235	100.0
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Table 35. Most prevalent cancers in HBCR for both – 2016

SN	ICD-10	Topography	#	%
1	C34	Bronchus and lung	1342	13.26
2	C53	Cervix uteri	912	9.01
3	C50	Breast	904	8.93
4	C16	Stomach	499	4.93
5	C56	Ovary	392	3.87
6	C23	Gall bladder	387	3.82
7	C91	Leukemia/lymphoid	313	3.09
8	C32	Larynx	289	2.85
9	C71	Brain	279	2.75
10	C20	Rectum	259	2.56
11	**	Otheersr cancer	4541	44.88
Total			10117	100.00

Table 36. Most prevalent cancers in HBCR for male – 2016

SN	ICD-10	Topography	#	%
1	C34	Bronchus and lung	798	16.98
2	C16	Stomach	284	6.04
3	C32	Larynx	223	4.74
4	C91	Leukemia/lymphoid	213	4.50
5	C67	Bladder	198	4.21
6	C71	Brain	174	3.70
7	C20	Rectum	150	3.19
8	C85	NHL	141	3.00
9	C02	Other and unspecified parts of tongue	139	2.95
10	C22	Liver and intrahepatic bile duct	136	2.89
11	**	Other cancers	2241	47.71
Total			4697	100.00

Table 37. Most prevalent cancers in HBCR for female – 2016

SN	ICD-10	Topography	#	%
1	C53	Cervix uteri	912	16.02
2	C50	Breast	874	16.12
3	C34	Bronchus and lung	544	10.03
4	C56	Ovary	392	7.23
5	C23	Gall bladder	269	4.96
6	C16	Stomach	215	3.96
7	C73	Thyroid gland	174	3.21

8	C22	Liver and intrahepatic bile duct	118	2.17
9	C20	Rectum	109	2.01
10	C71	Brain	105	1.93
11		Other cancers	1708	31.51
Total			5420	100.00

Table 38. Most prevalent cancers in HBCR for both – 2017

SN	ICD-10	Topography	#	%
1	C34	Bronchus and lung	1347	12.81
2	C53	Cervix uteri	928	8.82
3	C50	Breast	916	8.71
4	C16	Stomach	536	5.10
5	C23	Gall bladder	420	3.99
6	C56	Ovary	393	3.74
7	C67	Bladder	312	2.97
8	C22	Liver	302	2.87
9	C91	Leukemia/lymphoid	288	2.74
10	C32	Larynx	278	2.64
11	**	Other cancers	4796	45.60
		Total	10516	100.0

Table 39. Most prevalent cancers in HBCR for male – 2017

SN	ICD-10	Topography	#	%
1	C34	Bronchus and lung	787	15.93
2	C16	Stomach	324	6.56
3	C67	Bladder	241	4.88
4	C32	Larynx	204	4.13
5	C22	Liver	183	3.71
6	C91	Leukemia/lymphoid	169	3.42
7	C02	Other & unspecified parts of tongue	162	3.28
8	C20	Rectum	161	3.26
9	C18	colon	158	3.20
10	C06	Other & unspecified parts of mouth	153	3.10
11	**	Other cancers	2397	48.53
Total			4939	100

Table 40. Most prevalent cancers in HBCR for female – 2017

SN	ICD-10	Topography	#	%
1	C53	Cervix uteri	928	16.64
2	C50	Breast	891	15.98
3	C34	Bronchus and lung	560	10.04
4	C56	Ovary	393	7.05
5	C23	Gall bladder	281	5.04
6	C16	Stomach	212	3.80
7	C73	Thyroid gland	174	3.12
8	C22	Liver and intrahepatic bile duct	119	2.13
9	C91	Leukemia/lymphoid	119	2.13
10	C18	Colon	117	2.10
11	**	Other caNCERS	1783	31.97
Total			5577	100

Table 41. Yearwise Comparison of cancer incidence & trend 2013-2017

Yearwise Comparison of cancer incidence & trend by dual registry – Common cancer in Nepal												
Cancer sites	HBCR					PBCR					ICD-10	
	Year & %					Year & %						
	013	014	015	016	017	013	014	015	016	017		
Lung	13.7	13.7	13.7	12.8	12.8	15.7	13.7	12.9	12.7	13.1	C34	
Cervix	9.4	8.9	9.0	8.8	8.8	10.9	10.5	10.9	12.1	11.6	C53	
Breast	8.6	9.4	8.8	8.9	8.7	7.6	9.5	9.1	8.7	8.4	C50	
Stomach	6.0	5.8	5.3	4.9	5.1	5.5	5.8	5.7	5.2	4.7	C16	
Larynx	4.2	4.0	3.7	2.8	2.6	3.8	3.2	3.4	2.8	2.5	C32	
Ovary	4.0	3.9	3.8	3.8	3.7	4.2	4.6	4.2	4.0	3.9	C56	
Gall bladder	2.9	3.5	3.5	3.8	3.9	2.5	4.1	3.1	3.5	3.3	C23	
%												

#### IV. DISCUSSION

This study was undertaken at BP Koirala memorial cancer hospital, Bharatpur, Chitwan, Nepal, Which is only national cancer institute of the nation, using secondary data of hospital based and population based cancer registry 2013-2017.

In this study, bronchus & lung cancer generally predominating in males, presumably because of smoking habits, and latter in females (Curado et al., 2007., Moor at al., 2010., Forman et al., 2012). A

survey in rural communities of Nepal by Pandey et al. (1988) showed that in the 20+ years age group 85.4% of men and 62.4% of women were tobacco users. The prevalence of smoke less tobacco use, as well as smoking, is high, particularly among males and disadvantaged groups (Sinha et al., 2012). More recently, it was documented that older women are also very likely to smoke, especially those with a lower socioeconomic status (Pandey and Lin, 2013). An inverse association was observed between education and lung cancer risk also observed higher the lung cancer risk among unmarried personality and lower risk in the individuals who lived in the central region compared to the west (Hashibe et al., 2011). Awareness of lung cancer by tobacco use and other risk factors varied with socioeconomic status amongst residents of Pokhara, Despite their awareness of smoking as a risk factor for lung cancer, most of them still continue to smoke (Chawla et al., 2010). Furthermore, even medical student perceptions about the cause of lung cancer may be influenced by their smoking behavior and there was little knowledge of public health measures for smoking control (Khatiwada et al., 2012).

In this study cancer of cervix uteri was the second leading cancer site for both sex and top cancer topography for female. Among females cancer of cervix uteri is a common cancer site for developing countries but in developed countries breast cancer ranked as a leading cancer. (Curado et al., 2007; Moore et al., 2010; Forman et al., 2012). There is an urgent need for a reinvigorated and tailored approach to cervix cancer prevention among the educated youth in India, Nepal and Srilanka (joy et al., 2011). From this data we have found a significant increase in cancer of cervix uteri in the future, suggesting the need for more focus and resource allocation on cervical cancer screening and treatment (Sathin et al., 2013). Self- collected sampling methods should be the subject of additional research in Nepal for screening HR-HPV, associated with pre-cancer lesions and

cancer, in women rural communities with limited access to health services (Johnson et al., 2014). In the context of limited screening services in Nepal, the efforts should be to reduce the diagnostic delay especially patient and health care provider delay for early detection and reduction of mortality rate of cervical cancer (Gyenwali et al., 2014). Risk factors for cancer of cervix uteri like early age a marriage, and early age at first birth, multiparity, poor genital hygiene and infection with HPV virus infection are common in Nepal. Health education programs which are effective not only in increasing knowledge about cervical cancer and pap smear test but also effective in positively changing attitude towards the test should be organized to increase pap smear coverage (Ranabhat et al., 2014).

Breast cancer was the third most common cancer for both sex and second leading cancer site in female for 2015. Cancer of breast proved to have overtaken cervical cancer in terms of incidence, as in the majority of countries of Asia (Curado et al., 2007; Moore et al., 2010; Forman et al., 2012). The fact that young Nepalese women account for over one quarter of all female breast cancers, many being diagnosed at an advanced stage (Sharma et al., 2005; Thapa et al., 2013) is of particular importance. The level of awareness of breast cancer, including knowledge of warning signs and BSE (breast self examination), is sub-optimal among Nepalese women (Sathian et al., 2014). Low knowledge on breast cancer, risk factors and screening practice among female groups (shrestha, 2012). Community interventions have been a focus in Bangladesh (Ansink et al., 2008) and Kolkaata (Basu et al., 2006) and deserve emphasis in the Nepali context. In both breast and cervical cancer cases compliance with both screening guidelines and subsequent referral and treatment are necessary (Dinshaw et al., 2007a; 2007b). It Should be noted that BSE has been validated in the Nepalese setting (Tara et al., 2008).

In conclusion, cancer of bronchus & lung was ranked as a top leading cancer site for both sex followed by cervix uteri and breast for both registry system for 2013-2015.

## V. CONCLUSION

During the study period, net 48116 cases were recorded by 12 member hospitals of HBCR and 14403 were from different institutions of 15 districts and summarized in Table. Over the five years period from 1st January to December 31st in parallel registry of each calendar years, the most frequent form of cancer for both sexes was bronchus & lung followed by cervix uteri and breast. Among the female cases cervix uteri was the most frequent, followed by breast. Similarly, bronchus & lung cancer was the most common cancer among males, followed by stomach

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## A Comparative Analysis of Amoxicillin and Cefuroxime

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### ABSTRACT

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This article is an examination of the Comparative analysis of Amoxicillin and Cefuroxime. The scientific development and subsequent analysis of antibiotics like Amoxicillin and Cefuroxime used to combat bacterial infections such as urinary tract infections, pneumonia, etc. continues to influence the researchers all over the globe today. This article examines the research done and published by researchers and scientists. Consideration of current trends and data in scientific queries and demonstrates further aspects of the comparative analysis of Amoxicillin and Cefuroxime. Additionally, this article explores options for different approaches and applications of Cefuroxime and Amoxicillin such as acute bronchitis, renal functions and tooth enamel defects, acute malnutrition, etc, respectively. This article also highlights the administration, dosages and the various advantages and disadvantages of both the antibiotics Cefuroxime and Amoxicillin, thus giving an in depth, overall comparison of the same.

**Keywords :** Amoxicillin, Cefuroxime, Antibiotics, Bacterial infections, Renal function.

### I. INTRODUCTION

Antibiotics are antimicrobial substances that are effective against the activity of bacteria and play a crucial role in the treatment and prevention of bacterial infections, since they are the most common form of antibacterial agent. These compounds are extremely important as a wide range of bacteria can be killed or inhibited by these compounds and thus, also prevent the bacterial infections caused by them in various organisms. Scientists and researchers across the world are thoroughly studying the various

antibiotics available in depth in order to gauge the safety, efficiency, long term effects and positives and negatives to find out which are the most suitable antibiotics. Amoxicillin is a modern, semisynthetic penicillin that is structurally comparable to ampicillin but has been found to be better absorbed and yields higher serum and urine concentrations. It has been shown to be effective against several bacterial infections such as pneumonia (infections caused in the chest), dental abscesses, UTIs (urinary tract infections) and is also often used in children, to treat ear infections as well. A comparable antibiotic to

Amoxicillin is Cefuroxime. Cefuroxime (Cefuroxime axetil) is a prodrug of cephalosporin, a second generation oral cephalosporin antibiotic. It is an antibiotic that only treats bacterial infections and is widely known for the same as it has demonstrated antibacterial activity in vitro against a number of gram-positive and gram-negative bacteria. This drug is an effective and well tolerated treatment in adult and paediatric patients as well with various infections, including pharyngitis, sinusitis, acute exacerbations of chronic bronchitis, amongst others. There has previously been rigorous research individually on both these antibiotics. Both have shown great promises, however there have been studies portraying their drawbacks as well. This review literature aims at giving a concise and accurate comparison of these two antibacterial compounds, highlighting various factors of efficacy, efficiency, administration, dosage, immediate and long term effects, side effects and tolerability of the drugs. This is done by analysing various research methods and techniques that have been carried out for Amoxicillin and Cefuroxime, on a diverse and wide range of patients suffering from these bacterial infections. This research paper is written having gathered information from a wide range of databases, over a wide time period, including the most recent advances. This paper aims to thoroughly compare Amoxicillin and Cefuroxime to devise better therapies and make the treatment robust for future medicinal healthcare.

## II. METHODS

The study was conducted using four databases Google Scholars SAGE, DOAJ and PubMed. Selection of papers were done based on keywords and theme relevant to this review. Further the published papers from these databases were arranged in systematic order with respect to year of publication.

## III. RESULTS AND DISCUSSION

### 1. Amoxicillin<sup>1-12</sup>

Sr. No	Title	Year of publication
1	Amoxicillin, a New Penicillin Antibiotic	1973
2	Comparative Therapeutic and Pharmacological Evaluation of Amoxicillin and Ampicillin Plus Probenecid for the Treatment of Gonorrhoea	1974
3	Pharmacokinetics of Amoxicillin: Dose Dependence After Intravenous, Oral, and Intramuscular Administration	1977
4	Pharmacokinetics of Amoxicillin: Dosage Nomogram for Patients with Impaired Renal Function	1979
5	Comparison of Cefuroxime Axetil and Amoxicillin-Clavulanate Suspensions in Treatment of Acute Otitis Media with Effusion in Children	1994
6	Effect of Short-Course, High-Dose Amoxicillin Therapy on Resistant Pneumococcal Carriage	2001
7	HPLC determination of amoxicillin comparative bioavailability in healthy volunteers after a single dose administration	2003
8	Association of Amoxicillin Use During Early Childhood With Developmental Tooth Enamel Defects	2005
9	Pharmacokinetics of Amoxicillin in Maternal, Umbilical Cord, and Neonatal Sera	2009
10	Amoxicillin and amoxicillin plus clavulanate: a safety review	2009
11	Amoxicillin : A broad spectrum antibiotic	2011
12	Amoxicillin	2020

#### Amoxicillin, a New Penicillin Antibiotic

Amoxicillin is a modern semi-synthetic penicillin structurally similar but stronger than ampicillin. The drug was also evaluated in the treatment of 38

bacteriuria patients who received either 750 mg or 1 g/day doses for 10 days. The activity of amoxicillin was comparable to ampicillin in vitro. Amoxicillin was successful in eradicating bacteriuria but worked no better than a host of other medications currently available for the treatment of acute, uncomplicated bacteriuria for practical purposes. In vitro susceptibility of gram-negative pathogens to amoxicillin and ampicillin: The antibacterial activity of amoxicillin and ampicillin against approximately 30 isolates species is depicted which also demonstrate the effect of inoculum size on determination of the MIC. Amoxicillin or ampicillin inhibited 89 % of the strains of E.coli. Similarly, all 30 isolates of P. mirabilis were inhibited by. On the other hand high degrees of resistance to both drugs were encountered among strains of Klebsiella, Enterobacter, and indole positive Proteus species. It is obvious that amoxicillin has an antibacterial spectrum similar to that of ampicillin. The only benefit of amoxicillin is that it produces consistently higher levels of antibiotic in blood and urine than do equivalent doses of ampicillin, While in the present study amoxicillin was successful in eradicating bacteriuria due to susceptible species and was very well tolerated, the outcome of infection was most specifically linked to the diagnostic category of urinary tract infection. While amoxicillin has been shown to be better than ampicillin in the treatment of experimental infections in animals.

#### **Comparative Therapeutic and Pharmacological Evaluation of Amoxicillin and Ampicillin Plus Probenecid for the Treatment of Gonorrhoea (1974)**

Amoxicillin and Ampicillin Plus Probenecid Comparative Clinical and Pharmacological Study for the Treatment of Gonorrhoea. Single oral dose of 3.5 g Ampicillin with 1.0 g Probenecid or 3.0 g amoxicillin was given to participants with uncomplicated gonococcal infection. It was observed that 1.7 % Ampicillin with probenecide and 4.2% amoxicillin failure rate for genital and anal infection or both. For

most strains of N. gonorrhoea, minimal inhibitory concentration. Periods of Gonorrhoea up to 10 h after an oral dose of 3.0-g. Ampicillin was administered after 2.0 g with Probenecid, the serum levels exceeded those during the 5- to 12-h duration achieved and actually surpassed levels with 3.5 g of ampicillin plus probenecid attained with 3.0 g of amoxicillin administered alone over the same interval. Pharmacological studies: Amoxicillin peak concentrations were reached 1 h earlier than ampicillin and probenecid peaks, and amoxicillin serum concentrations also decreased more rapidly. By increasing the dosage of ampicillin administered with probenecid from 2.0 to 3.5 g, mean serum concentrations of ampicillin were not significantly increased from 4 to 12 h; and mean serum concentrations obtained after 2.0 g of ampicillin plus 1.0 g of probenecid were higher at all intervals from 5 to 12 h than those reached at the same intervals after 3.0 g of amoxicillin. Results of treatment: Gonococcal or both infections treated with 3.0 g oral amoxicillin had negative cultures when re-examined within 3 to 14 days of treatment. Of the 30 men and 30 women who received 1.0 g of probenecid plus 3.5 g of ampicillin, twenty-nine were cured of anal or genital infection, or both. In this review, the effectiveness of a single 3.0-g oral dose of amoxicillin alone in the treatment of uncomplicated gonococcal urethra, endocervix, and anal canal infections was not substantially different from that of a single 3.5-g oral dose of 1.0 g probenecid ampicillin, one of the latest U.S. approved treatment regimens. Single intramuscular doses of spectinomycin 2.0 to 4.0 g were also highly effective for anogenital gonococcal infection, but were unsuccessful for pharyngeal infection. Probenecid has been a useful adjunct for the single-dose treatment of ampicillin-containing gonorrhoea, although it is not clear if this is mostly due to the transfer of ampicillin into the central body compartment by probenecid or the prolongation of the serum half-life of penicillin by inhibition of renal tubular secretion. Amoxicillin tends to be likely to be



even more effective than equivalent doses of ampicillin if administered with probenecid or in two divided doses separated by a 4- to 5-h period.

#### **Pharmacokinetics of Amoxicillin: Dose Dependence After Intravenous, Oral, and Intramuscular Administration(1977)**

Amoxicillin pharmacokinetics: dosage dependency following intravenous, oral and intramuscular administration. Amoxicillin was administered through intravenous, oral and intramuscular routes to determine the serum drug level by two-compartment open model, area under the curve (AUC) and urinary recovery the variation in the pharmacokinetics parameters was examine by three way analysis of variance and linear regression equation. This Amoxicillin study confirms the complete oral absorption. Complete and reliable absorption was observed in intramuscular administration with peak drug level, AUCs and urinary recovery was found to be equivalent to that of oral route. Pharmacokinetics parameters like peak serum level, time to peak and others were found to be identical for both oral administration and intramuscular injection. In this review the comparative dependency in intravenous, oral is determined and the bioavailability after intramuscular administration was observed that Amoxicillin if provided as a complete alternative for ampicillin then it will show complete reliable absorption. Statistical significance after i.m. injection, the 1,000-mg dose resulted in proportionately lower peak serum levels and AUCs. This relation is expressed in a regression equation. Similar results occur after p.o hence Amoxicillin was rapidly absorbed after i. m. Administration, producing equivalent serum levels, and should prove therapeutically bioequivalent to p.o. amoxicillin or i.m. ampicillin.

#### **Pharmacokinetics of Amoxicillin: Dosage Nomogram for Patients with Impaired Renal Function(1979)**

Amoxicillin pharmacokinetics: Dose Nomogram for patients with impaired renal function. Patients with

normal renal function had an overall urinary recovery of 68 %. Serum half-life was strongly associated with body weight-corrected creatinine clearance ( $r = 0.967$ ). For a corrected creatinine clearance of 100 ml/min per 70 kg and 16 h in the anephric patient, the estimated half-life was 71 min. The total half-life of hemodialysis amoxicillin was 3.6 h. A medication nomogram is provided to make reasonable changes to the loading dose based on patient weight and the maintenance dose based on the corrected clearance of creatinine. Distribution Volume- No effect of renal function on the volume parameters was predicted or observed, so all 19 subjects were examined as a single group. For both  $V_c$  and for  $V_{ss}$ , with calculated weight,  $r = 0.617$  and  $0.674$ , respectively, is the highest correlation coefficient ( $r$ ). The calculated weight,  $r = 0.646$ , is correlated to  $V_b$ , with an associated P value of 0.030. Therefore, even though the correlation coefficient for BSA and LBW is greater, weight is perhaps a simpler correction for  $V_{bata}$ . Half-life of amoxicillin, there is a strong decrease with declining  $C_{cr}$  in  $K_e$  and  $\beta$ . When  $C_{cr}$  is corrected for measured weight, which we describe as the corrected creatinine clearance ( $CorC_{cr}$ ) as follows, and  $\beta$ , the maximum correlation occurs:  $CorC_c = (C_c \times 70)/\text{weight}$ . The average  $\beta$  for the four patients during hemodialysis was 0.195/h with a standard deviation of 0.140. Since the flow of the dialyzer is the same for all patients, the association of  $K_e$  and  $\beta$  with inverse patient size measurements was examined. Amoxicillin tends to have a higher absorption rate than ampicillin and a greater penetration rate. Prediction of patient kinetics-Based on patient population, the best predictions of  $V_b$  and  $\beta$  are given by the following:  $V_b$  (in liters) =  $0.660 \times \text{weight}$  (in kilograms);  $\beta$ (/hour) =  $0.0430 + 0.00545 \times CorC_{cr}$ , (in milliliters per minute per kilogram). "Although the sample size of four did not reach the statistical significance of "magic  $P < 0.05$ ," our best estimate of the rate of disappearance during dialysis, the spectrum is as follows- $\beta$ (/hour)=  $-0.524 + 0.545 \times 70/\text{weight} = 0.545 \times 70/\text{weight}$  (in

kilograms). This suggests that for a 70 kg patient, 85 % of the medication will be absorbed during an 8-h dialysis. Recommendations on dosage - Dosage adjustment is not appropriate for a patient with moderately impaired renal function (CrCl, > 30 ml/min/70 kg). Our dose interval modification guidelines are summarized. In urinary tract infection, the active drug is concentrated such that a 12-h dose interval will be sufficient for the treatment of susceptible species.

### **Comparison of Cefuroxime Axetil and Amoxicillin-Clavulanate Suspensions in Treatment of Acute Otitis Media with Effusion in Children(1994)**

Comparison of suspensions of Cefuroxime Axetil and Amoxicillin-Clavulanate in acute otitis media treatment with effusion in children: In the treatment of acute otitis media with effusion, 263 patients aged 3 months to 11 years, multicenter study comparing clinical and bacteriological efficacies and the safety of cefuroxime axetil suspension (CAE) with amoxicillin-clavulanate suspension (AMX-CL). Among 200 isolates from middle ear fluid pretreatment cultures, the primary pathogens were classified as follows: Haemophilus influenzae (39 %), over a third of which were positive for P-lactamase; Streptococcus pneumoniae (34 %); and Moraxella catarrhalis (16%). In 81 % (95 of 118) and 76 % (50 of 66) of bacteriologically evaluable patients in the CAE and AMX-CL classes, pathogens were eradicated or believed to be eradicated. In 113 (77%) of 146 clinically evaluable patients in the CAE group and in 66 (74%) of 89 evaluable patients in the AMX-CL group, adequate clinical response (cure or change with or without effusion resolution) occurred. Drug-related adverse effects occurred in 18% of patients treated with CAE, compared with 39% of patients treated with AMX-CL ( $P < 0.001$ ); diarrhea or loose stools were the most frequently recorded adverse events (CAE, 12%; AMX-CL, 31%;  $P < 0.001$ ;  $P < 0.001$ ). These results suggest that CAE administered twice daily in pediatric patients is as successful as

AMX-CL administered three times daily in the treatment of acute otitis media with effusion, but CAE was associated with substantially less adverse drug-related events. Children have been treated with CAE and 98 have been treated with CL-AMX. Bacteriological data of 184 out of 263 patients (70%) could be analyzed for efficacy review. In 81% of patients who received CAE and 76% who received AMX-CL ( $P > 0.05$ ), a "satisfactory" bacteriological outcome. The bacteriological outcomes for the isolated primary pathogens (H. influenzae, M. catarrhalis, and S. pneumoniae). Of the 263 treatment-assigned patients, 235 (89 %) were evaluated as clinically evaluable. Satisfactory clinical results (cure and enhancement) were obtained by 77% of CAE group patients and 74 % of AMX-CL group patients ( $P = 0.7$ ). To provide supporting evidence for the primary efficacy study, an intent-to-treat analysis was conducted. A pretreatment pathogen was identified in 207 patients (79%) of the 263 patients initially enrolled in the study; 95 out of 130 (73%) CAE-treated patients and 50 out of 77 (65%) AMX-CL-treated patients ( $P = 0.2$ ) eradicated the pretreatment pathogen in these 207 patients. Similarly, 113 of the 165 (69 %) CAE-treated patients and 66 of the 98 (67 %) AMX-CL-treated patients ( $P = 0.9$ ) achieved full resolution of the signs and symptoms present at the time of diagnosis. Adverse Events- One of the research drugs was administered by all 263 patients involved in the study and was included in the safety report. 18% of patients treated with CAE and 39 % of patients treated with AMX-CL experienced at least one adverse incident that the investigator judged to be drug-related ( $P < 0.001$ ). In the treatment of AOME in infants and children, we announce the results of a comparison between two oral antibiotic suspensions, CAE and AMX-CL. The present research expands the earlier clinical trial by requiring the use of tympanocentesis to obtain bacterial culture middle ear aspirates, a technique not commonly conducted in clinical practice but considered the "gold standard" by which the antibiotic's effectiveness can best be

measured in the care of AOME patients. In summary, in the current study, twice-daily dosing of CAE in pediatric patients was as effective in both clinical and bacteriological parameters as triple-daily dosing of AMX-CL in the treatment of AOME. However, CAE was associated with markedly less adverse events.

### **Effect of Short-Course, High-Dose Amoxicillin Therapy on Resistant Pneumococcal Carriage(2001)**

Impact on resistant pneumococcal carriage of short-course high-dose amoxicillin therapy. Emerging drug resistance is a challenge to the efficacy of current pneumococcal infection therapies. Modification of the antibiotic therapy dose and length can restrict the spread of resistant pneumococcal. The randomized trial was performed. Participants Children 6 to 59 months of age receiving prescription antibiotics for respiratory tract disease (n= 795). Intervention 1 of 2 twice-daily amoxicillin regimens is randomly allocated to children. Outcome Tests Non-susceptible penicillin *Streptococcus pneumoniae* carriage, evaluated in nasopharyngeal specimens obtained on days 0, 5, 10 and 28; baseline risk factors for non-susceptible pneumococcal carriage; and protocol enforcement, relative to 2 classes was determined. At day 28 of the visit, the chance of penicillin-non-susceptible pneumococcal carriage was significantly lower in the short-term, high-dose group (24%) compared to the standard-course group (32%); relative risk (RR), 0.77; 95% confidence interval (CI), 0.60-0.97; p=.03; the risk of non-susceptibility of trimethoprim-sulfamethoxazole was also lower in the short-term, high-dose group (RR, RR, high-dose group). In households with 3 or more children, the protective impact of short-term, high-dose care was higher (RR, 0.72; 95 % CI, 0.52-0.98). In the short-course, high-dose category, adherence to care was higher (82% vs 74%; P=.02). As an intervention to minimize the effect of antibiotic usage on the spread of drug-resistant pneumococci, short-course, high-dose outpatient antibiotic therapy appears promising. Project Research-This was a randomized single-center

prospective study. Since the clinical effectiveness of therapeutic regimens was previously known and was not an outcome factor, the research was not placebo-controlled. In blocks of 50 participants, randomization was performed. Children were randomly assigned to receive either amoxicillin 40 mg/kg daily (twice daily) for 10 days or amoxicillin 90 mg/kg daily (twice daily) for 5 days in 1 of 2 treatment groups. The US Food and Drug Administration recently approved a 90-mg/kg-per-day amoxicillin course and recommended the Drug-resistant *Streptococcus pneumoniae* Therapeutic Working Group for the treatment of acute otitis media in regions where pneumococcal resistance is prevalent. Adherence and Adverse Events-The amount of amoxicillin remaining in the participants' medicine bottles was assessed on the 5th and 10th visits. Parents were asked about adverse effects possibly associated with treatment (e.g., diarrhea, vomiting, rash) on the 5th, 10th and 28th visits, and participants were tested.

### **HPLC determination of amoxicillin comparative bioavailability in healthy volunteers after a single dose administration(2003)**

HPLC determination of amoxicillin comparative bioavailability after a single dose administration in healthy volunteers. For the determination of amoxicillin in human plasma samples, a reliable, accurate and sensitive HPLC assay was created to compare the bioavailability of two amoxicillin capsule (500mg) formulations in 24 volunteers of both the sexes. Using combined reverse phase liquid chromatography and UV detection ( $\lambda=229$  nm), amoxicillin concentrations were analyzed. By calculating individual peak plasma concentrations ( $C_{max}$ ) and area under the curve (AUC<sub>0-8h</sub>) ratios (test/reference), the bioequivalence between the two formulations was evaluated. As established by the US Food and Drug Administration Agency, the statistical interval proposed was 80-125 %. The assay showed excellent relationships between plasma

concentrations and peak height ratios ( $r^2 \geq 0.999$ ). For pharmacokinetic, bioavailability, and bioequivalence studies, this simple, rapid and selective method is suitable. Since the 90% CI for both  $C_{max}$  and AUC<sub>0-8h</sub> is within the 80-125% interval proposed by the Food and Drug Administration, it was concluded that in terms of both the rate and degree of absorption, Amoxicilina 500 mg capsules were bioequivalent to Amoxil® 500 mg capsules. Appropriate sensitivity, specificity and high sample throughput needed for pharmacokinetic studies are given by the alternative HPLC-UV method defined and used here for drug quantification. The retention times for AMO and the internal norm were 4.2 and 5.2min, respectively, under the chromatographic conditions defined. No endogenous interfering peaks emerged at the retention times of the compounds of interest. The LOD and the LOQ were 0.1 and 1µg/ml, respectively, for AMO. The calibration curve was linear between 1.0µg/ml and 50µg/ml, with a regression coefficient of 0.999 and an intercept that did not vary significantly from zero. The total variability (n=48) was respectively 11.0, 6.5, 5.2 and 4.8 %; and the accuracy was 102.8, 103.3, 103.0, 106.8 % . During this time, no significant degradation of AMO was observed under the storage conditions. At the administered dose, AMO was well tolerated, and no adverse effects were recorded. Other methods using HPLC in conjunction with UV detection have calculated AMO plasma levels. The lowest quantification limit obtained by UV detection was 50ng/ml, but both AMO and internal standard elution times were 31.8 and 32.8 min, respectively, far longer than those stated here in, respectively. Other more complex extraction procedures have also been documented, such as solid phase extraction (17, 18, 24-26). Solid-phase extraction methods, however, are laborious and involve SPE cartridges, raising the analysis cost. However, their assay, where the quantification limit was 10 µg/ml, was performed without an internal norm. Furthermore, because of the post column derivatization step, the method was complex. Their

survival time for the analyte was also longer (about 10 minutes compared to our 4 minutes) and was also not used in a pharmacokinetic analysis in humans where a large number of samples were tested. AMO derivatization to a fluorescent compound showed comparable sensitivity and slightly longer retention time (4.5 min for AMO), but requires a complex system of chromatography, including electrochemical detection. The pharmacokinetic analysis was carried out within 8 hours and, as recommended by the regulatory agency, the resulting value of AUC<sub>0-∞</sub> was less than 20 % higher than that of AUC<sub>0-∞</sub> for both formulations (12 and 13.9 % for Amoxicillin and Amoxil, respectively). Later samples (12 and 24 hours after drug administration) were taken and analyzed, but no better AUC<sub>0-∞</sub> estimate was observed and the variations between the values remained essentially the same.

#### **Association of Amoxicillin Use During Early Childhood With Developmental Tooth Enamel Defects(2005)**

Association of Amoxicillin Use because of Developmental Tooth Enamel Defects during early childhood: It has been suggested that the use of amoxicillin may be associated with defects in dental enamel. For fluorosis, the early-erupting permanent teeth of 579 subjects were tested using the Fluorosis Risk Index at approximately 9 years of age. Using relative risk (RR), Mantel-Haenszel stratified tests, and multivariable logistic regression, the relationships between fluorosis and amoxicillin usage were evaluated. The results of this study indicate a correlation between the use of amoxicillin during infancy and permanent teeth developmental enamel defects; further research is required. 75 % of subjects confirmed the use of amoxicillin after 12 months and 91 % after 32 months. Overall, on both maxillary central incisors, 24 % had fluorosis. The risk of fluorosis on the maxillary central incisors (RR = 2.04; 95 % confidence interval [CI], 1.49-2.78) was substantially increased by the use of amoxicillin from

3 to 6 months. The risk of fluorosis on maxillary central incisors from amoxicillin use over 3 to 6 months (Mantel-Haenszel RR = 1.85; 95 % CI, 1.20-2.78) was still statistically important following adjustment for fluoride consumption and otitis media. The increased risk of fluorosis from amoxicillin usage over 3 to 6 months was verified by multivariable logistic regression tests (odds ratio = 2.50; 95 % CI, 1.21-5.15); fluoride consumption was also statistically important. Data were collected as part of the Iowa Fluoride Study, a prospective study examining exposures to fluoride, biological and behavioral causes, and dental health of children. There were 698 subjects receiving primary dentition dental exams and 579 receiving early-erupting permanent teeth examinations. Therefore, the average annual attrition rate was 6.5% among the 1390 at 6 months of age. At 3- and 4-month intervals, from birth to 32 months of age, questionnaires were sent to parents evaluating fluoride consumption from different sources, antibiotic use, children's diseases, and breastfeeding habits. Fluoride intake in milligrams per kg body weight per day was calculated from water, beverages, and selected foods; dietary fluoride supplement; and fluoride dentifrice based on answers to a series of detailed questions. Parents reported whether the number of disease episodes for which antibiotics were used and the number of days of antibiotic usage during the reporting period were administered systemically, orally, or topically. Diffuse opacities of tooth surfaces have historically been referred to as "dental fluorosis" because the most common cause is excessive fluoride ingestion. All 12 early-erupting permanent teeth were examined for each subject: 4 mandibular incisors, 4 maxillary incisors, and 4 first molars. The examiners were blind to questionnaire data on fluoride consumption, childhood infections, and antibiotic usage. Fluorosis was distinguished based on Russell criteria 'from non fluorosis opacities Carious lesions based on colour, texture, demarcation, and gingival margin relationship.

### **Pharmacokinetics of Amoxicillin in Maternal, Umbilical Cord, and Neonatal Sera (2009)**

Pharmacokinetics of Amoxicillin in Maternal, Umbilical Cord, and Neonatal Sera: In the prevention of neonatal group B streptococcus infection, the pharmacokinetics of amoxicillin were analyzed in umbilical cord and neonatal serum relative to maternal concentrations. The subjects were 44 pregnant women who were receiving amoxicillin as an intravenous infusion of 1 or 2 g. Blood samples were extracted from the patient, the arterial and venous umbilical cord, and the neonate to measure the concentrations. Using nonlinear mixed-effects (population) modeling, the pharmacokinetics were described by a five-compartment model. To simulate the concentration-time profiles in the maternal, venous umbilical cord, and neonatal serum, pharmacokinetic parameter estimates were used. The peak concentration was 18 % of the maternal peak concentration in the venous umbilical cord serum. 3.3 min after the maternal peak concentration was reached. The neonatal serum concentration time profile was calculated by the venous umbilical cord serum profile, which in turn relied on the maternal serum profile. In addition, for more than 90 % of the 4-h dosing period, the simulated concentrations in maternal, venous umbilical cord and neonatal serum surpassed the MIC for group B streptococcus. The 2-g infusion to the mother tends to be sufficient for the prevention of group B streptococcal disease in the first approximation. However, further studies of the interindividual variability of pharmacokinetics are suggested to examine the efficacy of prophylaxis. Out of 44 pregnant patients, a total of 53 umbilical cord blood samples were collected, consisting of 25 arterial and 28 venous cord blood samples. From 23 women, both arterial and venous cord blood samples were collected. From one twin birth, four umbilical cord samples were obtained. 904 maternal serum samples were obtained in total. Cord serum concentrations ranged in the arterial umbilical cord serum from 1.0 to 16.8 mg/liter and in the venous umbilical cord

serum from 1.1 to 18.0 mg/liter. Following the peak maternal concentration. Simultaneously with the maternal and arterial and venous umbilical cord serum concentrations, the few neonatal concentration data were analysed. The peak concentration reached in neonatal serum after infusion of 2 g into the mother was 8.0 mg/liter (while in venous umbilical cord serum it was 16.0 mg/liter). Similar concentrations were reached 1.1 h after the initiation of the infusion and neonatal serum concentrations surpassed the serum concentrations for the venous umbilical cord. For the prevention of neonatal GBS disease, an intrapartum dose of 2 g amoxicillin is widely used to try to achieve bactericidal concentrations in the fetus for a reasonable amount of time. In the case of GBS, concentrations of at least 0.25 mg/liter should be achieved, according to the clinical breakpoints defined by EUCAST. The simulations showed that amoxicillin concentrations surpassed MIC for more than 90 % of the dosing period after administration of a single 2-g dose in the maternal, venous umbilical cord and neonatal serum. The use of both arterial umbilical cord serum and neonatal serum samples was the best way to characterize the neonatal compartment. The peak concentrations were lower and delayed in the venous umbilical cord and neonatal serum compared with the peak concentration in the maternal serum. The concentration in the neonatal serum reached its peak level at approximately 1 h after the start of antibiotic administration and then surpassed the concentration in the venous umbilical cord serum. After administration of a 2-g dose, venous umbilical cord and neonatal sera surpassed the MIC for 90 % of the dosing interval. Specifically, nonlinear modeling of mixed effects (population) can be used to connect the sparse umbilical data. Fetal blood concentrations can be known as arterial cord blood concentrations. After passage of the antibiotic through the placenta, venous cord blood concentrations are reached. Those concentrations were then analyzed separately. Strictly speaking, it is therefore important to independently

examine the arterial umbilical cord and neonatal serum concentrations, since there are many variations between the two. Antibiotics are removed from the fetus before clamping the umbilical cord by transplacental transport to the mother and by fetal renal excretion. The removal of amoxicillin from the neonate occurs only by neonatal renal excretion after cord clamping. In addition, several physiological changes occur in the neonate immediately after birth. These changes can affect the neonate's PKs and are more diverse than the variations in maternal PKs. Studies of PKs in the serum of the umbilical cord are rare and are not differentiated, in general, between arterial and venous umbilical cord serum. Thus, our results can be contrasted with those from previous studies that did not differentiate between arterial and venous umbilical cord serum.

#### **Amoxicillin and amoxicillin plus clavulanate: a safety review(2009)**

Amoxicillin and amoxicillin plus clavulanate: an evaluation of safety: Amoxicillin, alone or in combination with clavulanic acid, is still among the most widely used antibacterial agents in recent decades. Although they are often considered twin drugs, both in terms of antibacterial activities and in terms of safety profile, they are distinct. It is well documented that adverse reactions can be caused by the clavulanate component alone, thus exposing patients to further, and sometimes undue, risks. Although amoxicillin/clavulanate should be considered only for the treatment of resistant bacteria as an alternative agent, evidence shows that it is also often used when a narrow-spectrum antibiotic would have been just as effective. In terms of patients, this prescription habit may have serious implications for safety, as well as in terms of bacterial resistance development. Some important variations were shown in the relative toxicity of AMX and AMC. The toxicity of the liver is closely linked to treatment with AMC, whereas AMX is only slightly involved. The involvement of the portion of the CA, which is

metabolized significantly through the liver, has been confirmed by several Case-reports and analysis on post marketing. There is still a controversy about the mechanism involved in such adverse reactions; a 'immunological idiosyncrasy' against the CA portion is the most frequently evoked one. These immunogenic properties also explain the higher level of SJS occurrence with AMC, at least partially, despite the higher overall number of AMX-related cutaneous adverse reactions. Mechanism of action- The synthesis of peptidoglycan, an essential component of Gram-positive bacteria cell walls, is interfered with by  $\beta$ -Lactams. Transpeptidation promotes the final transpeptidation stage in the synthesis of the peptidoglycan layer (penicillin binding proteins). The  $\beta$ -lactam nucleus permanently binds to the penicillin-binding proteins, stopping the linear peptidoglycan polymer from final crosslinking (transpeptidation). CA binds with  $\beta$ -lactamase irreversibly, saving  $\beta$ -lactam antibiotics from being inactivated. Consequently, when combined, the spectrum of AMX activity is expanded to include bacterial strains that are AMX-sensitive and  $\beta$ -lactamase-producing. This property has become increasingly essential for respiratory pathogens, especially H. M. and Influenzae. Safety: Gastrointestinal tolerability - AMX and AMC were associated with mild/moderate GI side effects, such as nausea, vomiting, cramping (prevalence 3-6%) or diarrhoea (4-15%). The strong oral absorption of AMX makes it better tolerated compared to other beta-lactams at the GI level. Liver tolerability- AMC is the one most commonly associated with liver injury among antibiotics, as well as the most frequently prescribed medication leading to drug-induced liver disease hospitalization. Overall, two known risk factors for AMC-induced liver injury tend to be advanced age and male gender. Allergic reactions: In 0.7-8% of treated patients, allergic reactions to  $\beta$ -lactams occur. For a long time, these effects have been linked to the sensitising effect of the benzylpenicilloyl moiety generated when the beta-lactam ring is cleft. This theory stems from the fact

that CA-induced hepatitis, along with cutaneous adverse reactions, occurred in some studies and, in particular, one patient developed fatal SJS after extreme hepatotoxicity.

#### **Amoxicillin : A broad spectrum antibiotic(2011)**

Amoxicillin is used in the treatment of various diseases and bacterial infection hence its placed under class of broad spectrum antibacterial it was originally introduced in UK for oral use in early 1970s. Amoxicillin is more effective for gram positive than gram negative microorganisms. Amoxicillin was found to be more effective in treatment of middle ear (otitis media), tonsils (tonsillitis & tonsillopharyngitis), throat, larynx (laryngitis), pharynx (pharyngitis), bronchi (bronchitis), lungs (pneumonia), urinary tract (UTI), skin and to treat gonorrhoea, also some recent studies suggested it is effective as prophylaxis against bacterial endocarditis, in patients with prosthetic joint replacements and in dentistry. Amoxicillin is a clinically effective antibacterial and found to be excellent to treat various infections; it is more effective for gram positive bacteria and less effective for gram negative bacteria. Official method of analysis- Liquid chromatographic method: The liquid chromatographic (LC) system for study of pure amoxicillin and amoxicillin assay in pharmaceutical dosage form was recommended by US Pharmacopoeia. Potentiometric titration method : Indian Pharmacopoeia (1996) suggested a buffer solution of the drug titrated with 0.02 M mercuric nitrate, potentiometrically evaluating the end-point with a platinum or mercury indicator electrode and a reference electrode for mercury-mercurous sulphate and ignoring any preliminary inflection in the titration curve. Subtract the % age content of the products of degradation from the Calculated %age of total penicillin content to determine the total penicillin content Amoxicillin sodium by %age content. Triple therapy - Amoxicillin 1 gram twice daily/clarithromycin 500 mg twice daily/lansoprazole 30 mg twice daily. Dual therapy -Amoxicillin 1 gram

three times daily/lansoprazole 30 mg three times daily. Drug- drug interaction-In combination with Allopurinol can develop skin rashes, Clavulanic acid ( $\beta$ -lactamase inhibitor) enhances the effect of amoxicillin and inhibits resistance production in  $\beta$ -lactamase generating micro-organisms. Amoxicillin reduces methotrexate's renal clearance, contributing to renal impairment/toxicity. Tetracyclines, chloramphenicol and other bacteriostatic medicines can interfere with amoxicillin's bactericidal impact. It has not been entirely clarified whether amoxicillin reduces the efficacy of oral contraceptives.

### **Amoxicillin(2020)**

Amoxicillin is one of the most widely used antibiotics, with some additional gram-negative coverage similar to penicillin, covers a wide range of gram-positive bacteria. It covers most species of Streptococcus, close to penicillin. Amoxicillin is FDA approved for the treatment of infections of the genitourinary tract, ear, nose and throat infections, infections of the lower respiratory tract, infections of Helicobacter pylori, pharyngitis, tonsillitis, and infections of the skin and skin structure. It is recommended as a first-line treatment for acute bacterial rhinosinusitis. Its use for post-exposure prophylaxis for inhalation of anthrax. It also has other off-label applications, such as erysipeloid, Lyme disease and prophylaxis of infectious endocarditis, as well as prophylaxis in patients undergoing dental procedures with prosthetic joints. In conjunction with metronidazole, it can be beneficial in periodontitis and is one of the first-line therapies for streptococcus pharyngitis in group A. Amoxicillin is a common antimicrobial that nurse practitioners, primary care providers, and internists often prescribe. The drug is very effective, but before administering the medicine, it is always necessary to have a proper allergy history. Mechanism of action- Amoxicillin belongs to the class of antimicrobials of beta-lactam. By binding to penicillin-binding proteins, beta-lactams act by inhibiting a mechanism called transpeptidation,

leading to the activation of autolytic enzymes in the cell wall of bacteria. This approach contributes to cell wall lysis, and hence the death of the bacterial cell. Bactericidal antimicrobials, such as amoxicillin, are also more "time-dependent" than "concentration-dependent" in their effectiveness. Time-dependent refers to the time when serum concentrations surpass the microorganism's minimum-inhibitor-concentration (MIC). Amoxicillin is an oral antimicrobial drug, while ampicillin can be administered orally, intravenously, or intramuscularly (which is structurally similar). Adverse effect - Amoxicillin is well-tolerated, but gastrointestinal (GI) symptoms, such as nausea, vomiting, and diarrhea, may be some common complaints. Hypersensitivity reactions are another substantial complication to be aware of. Type-I, II, III, or IV reactions can result from amoxicillin. Differentiating between a type-I and type-IV hypersensitivity reaction is critical because one may be more hazardous than the other. A type-I reaction is an IgE-mediated hypersensitivity to a sensitized patient that causes widespread release of histamine, leading to urticarial symptoms such as pruritic rash or even more serious systemic symptoms, such as anaphylaxis. A type IV reaction of hypersensitivity is not induced by the release of histamine and is more popular or morbilliform and sometimes not itchy. Contraindication- A major contraindication to amoxicillin is any prior anaphylactic reaction or severe skin reaction to amoxicillin or any other beta-lactam. These reactions may have cephalosporin or carbapenem crossover sensitivity. Another significant factor is deciding whether a type-I or type-IV hypersensitivity reaction is the patient's allergic rash. Patients will sometimes experience a childhood allergy to amoxicillin, which is actually a type IV-mediated hypersensitivity reaction, often at the stage of infectious mononucleosis; this is not a contraindication of prolonged amoxicillin administration. However, a type I induced hypersensitivity reaction is a



contraindication provided that prolonged exposure puts anaphylaxis at risk for the patient.

**Clinical evidences:** Extracted from clinicaltrials.gov

**Bioavailability of Amoxicillin Dissolved in Human Milk(2020)**

**NCT01435824**

Results -The researchers suggest a two-stage analysis of amoxicillin absorption that will, for the first time, yield information leading to paediatric pharmacology guidelines for the administration of amoxicillin dissolved in human milk to infants. Adult participants will be enrolled in the study as the number of blood extractions, volume of blood needed, and topic availability dictate. Since the number of blood extractions, volume of blood needed, and subject availability, among other issues, create a number of ethical and logistical constraints that make carrying out such an intensive sampling study in infants virtually impossible, the investigators' study will recruit adult volunteers.

**2. Cefuroxime <sup>13-17</sup>**

Sr no.	Title of the research paper	Year of publication
1	Cefuroxime: Human Pharmacokinetics	1976
2	Effect of dose and food on the bioavailability of Cefuroxime axetil	1987
3	Pharmacokinetics of cefuroxime axetil in patients with normal and impaired renal functions	1993
4	Comparative pharmacokinetics of new oral cephalosporins	1994
5	Cefuroxime axetil: a review of its antibacterial activity, pharmacokinetic properties and therapeutic efficiency	1996

**Cefuroxime: Human Pharmacokinetics- 1976**

A single dose of new parental cefuroxime was given at different quantities to 44 normal male subjects. Doses

of 0.25, 0.5, 0.75 or 1.0 g were given through intramuscular injections to 33 volunteers. The serum at its mean peak concentration is assayed at 29 to 45 min. single rapid injection of doses 0.25,0.5 or 1.0 g were given to 9 of the volunteers, a mean levels were assayed at 3 min. The antibiotic has a half-life of 70 min. The doses were secreted through the volunteers, mean 95% was found in urinary recovery for all parental doses, antibiotic was also secreted through kidney tubules. Slight pain was experienced by some of the volunteers which disappeared after a few minutes. Physical laboratory investigation gave the result that cefuroxime had no adverse effects. There was also no evidence of absorption after oral Administration. The 44 volunteers are normal adult male of age 19-57 . physical test and laboratory tests are undertaken to exclude people with a history of allergy. These studies were made 2 days before and 1 day after each dose. Blood samples were tested. Urine is also examined for pH. First 33 volunteers are given single intramuscular injections; 8 were given 0.25, 0.5 0.74 and 1.0 g. 14 of the volunteers were given 0.5g of cephaloridine intramuscularly on separate occasions. The 6 volunteers are given 2 separate doses of 0.5 g of cefuroxime intramuscularly. Probenecid was given in 2 doses of 0.5g 2h before and 1h after intramuscular injections of cefuroxime. 9 of the volunteers are given intravenous injections. 2 of the volunteers are given 1g of cefuroxime by oral administration. The duration and the intensity of pain at the first site of injections are recorded. The blood of the volunteers is collected after each intramuscular injection at 30,60,90,120,180,240,360 and 480 min. After the intravenous injection the blood sample is collected from different arms at the end of bolus injection; 3, 10, 30,60, 120, 300, and 480 min. urine samples are collected from different hours after the intravenous injection. An interval of 1 week is given between the first and second part of the crossover study. Concentration of cefuroxime in specimens of serum and urine is determined. Serum samples are taken 1 h from the volunteers who had received 1.0 g of

intravenous injection. HPLC analysis is conducted . the pharmacokinetics is analysed by enabling pharmacokinetic Parameters. In the urinary recoveries and renal clearances , cefuroxime is rapidly excreted in high concentration through the kidney, and it's been recovered in urine after 6 h of injection. The renal clearance of cefuroxime is rapid and increases with increase of dosage. Renal clearance was found more rapid than measured creatinine clearance. Probenecid by mouth had effect and several pharmacokinetics parameters are studied. The renal clearance is delayed but not decreases the urinary excretion. Cefuroxime given by mouth , only 1% of dose is appeared in the urine and the serum concentration was not measurable. There were no clinical or laboratory evidence of toxicity in volunteers at any of the drug doses. The intramuscular injection was slightly painful for some volunteers , but the pain disappeared. Cefuroxime is the new antibiotic of cephalosporin. It appears to be very low toxic in lab animals. In particular it seems to have no toxic action on kidney These favourable pharmacokinetic properties with its good antibacterial activity suggests that cefuroxime is good and effective in treatment of bacterial infections in humans.

#### **Effect of dose and food on the bioavailability of cefuroxime axetil - 1987**

Cefuroxime sodium is a parental cephalosporin. Many ester derivatives have been synthesized of cefuroxime sodium, as oral absorption of cefuroxime sodium is very less. Cefuroxime axetil has been shown to have many oral bioavailability to use it clinically. Most oral antibiotics absorption reduces by co-administration with food. But in cefuroxime axetil absorption is enhanced when it is administered after a meal. The purpose of this study was to evaluate the dose proportionality of four different dose that were administered after standard meal. Also to determine the absolute bioavailability of cefuroxime axetil administered with and without food. 12 healthy male subjects of age between 21- 27 years, weight 70-90kg

were subjected to 3-min intravenous infusion of cefuroxime sodium each and also five oral doses. One of the oral doses was administered after overnight fasting. Standard breakfast was given to subjects before the four oral doses. Blood samples were collected at 0.5, 1.0, 1.5, 2, 3, 4, 5, 6, 8, 10 and 12 hours after the dose. Some additional samples were also collected 5 to 15 min after the intravenous dose. Blood samples were separated in a refrigerated centrifuge at -70°C plasma is frozen. Subjects were instructed to empty their bladder just before each dose and urine was collected for 24 h after each dose. Plasma and urine samples are analysed by HPLC technique. Area under AUC curve is calculated. First order terminal disposition is calculated. From the individual plasma concentration-time profiles the peak concentration and time of the peak concentration were obtained. 3 subjects had experienced viral illness. The mean plasma concentration – time curve for each dose is drawn. For the peak plasma concentration coefficient of variation ranges from 17-28%. Plasma concentration is declined rapidly in a biexponential way, with mean terminal elimination rate constant of  $0.55\text{h}^{-1}$  . Fasting and fed data for 500mg dose of CAE is compared. 36% of fasting and 52% of fed 500mg doses were absorbed. Urine samples are analysed for detection of cefuroxime. Cefuroxime was not detected in urine samples that were collected between 12 to 24 hours after the dose. Mean fraction of unabsorbed drug vs time is shown, absorption is relatively constant from 0.5 to 3h after dosing. For all the treatments between 1.5 to 2.0h approximately 50% of the drug was absorbed; and in 3h, 80% of the drug was absorbed. A plot of the mean fraction of unabsorbed drug vs time reveals that absorption is an apparent zero order process from 0.5 to 3h after dosing. Administration of cefaclor after meal reduces the peak serum concentration and extent of absorption. Administration of amoxicillin trihydrate with standard meal has no effect on absorption. In the presence of food there is an enhancement in 1g of oral

dose of cefuroxime axetil. This study also says that the effect of food occurs over an oral dose range of 125-1000 mg. These effects cannot be associated to food with an increase in gastric pH. Induced gastric alkalinity due to rancidity and sodium bicarbonate reduce the absorption of cefuroxime axetil. Higher plasma concentrations are observed after food could not be attributed to a change in pharmacokinetics of the drug. Food may have some effect on the luminal esterase responsible for the de-esterification of cefuroxime axetil to the less absorbed cefuroxime. From this study it is recommended that cefuroxime axetil be administered immediately after meals.

### Pharmacokinetics of cefuroxime axetil in patients with normal and impaired renal function- 1993

Cefuroxime axetil is an acetoxymethyl ester of cefuroxime. Cefuroxime is a drug with high intrinsic activity and great stability to beta lactamase from many gram-positive and gram-negative organisms. In normal volunteers and in patients pharmacokinetics of parentally administered cefuroxime has been studied with compromised renal functions. Pharmacological studies have been done with subjects with normal renal function, of oral administration of cefuroxime axetil. Objective of this study were to determine pharmacokinetics of cefuroxime axetil after oral administration in patients with normal and impaired renal function, also to determine dosage guidelines of this drug for patients with renal dysfunction. Total 28 adults (27 male and 7 female), age is between 20 years to 79 with different degrees of renal impairment. Four groups were made and each was assigned to one of the groups. Group 1,  $>85\text{ mL/min/1.73m}^2$  (6 subjects). Group 2, 50 to 84  $\text{mL/min/1.73m}^2$  (6 subjects). The group 3, 15 to 49  $\text{mL/min/1.73m}^2$  (7 subjects); group 4,  $<10\text{ mL/min/1.73m}^2$  (9 subjects). Film coated tablets of cefuroxime axetil each having 300.75 mg of cefuroxime axetil were used. Each subject was instructed to take two tablets of cefuroxime axetil with 50 mL of water after 15 min of breakfast. Blood

samples were collected in heparinized tubes. Volumes were measured. Samples were frozen at  $-20^\circ\text{C}$  until determination of cefuroxime concentrations. Serum and urine samples were collected during the study, they were also assayed for calculation of  $\text{Cl}_{\text{cr}}$ . By vertical diffusion method plasma cefuroxime concentration was determined, using *Streptococcus pyogenes* IID697 as test organism. Using *Bacillus subtilis* ATCC 6633 urine cefuroxime concentration was determined. First order elimination rate constant ( $k_{\text{el}}$ ) is determined on log concentration-time curve with the weighing factor of  $1/y^2$ . The  $t_{1/2}$  is determined by dividing 0.693 by  $k_{\text{el}}$ .  $C_{\text{max}}$  and  $T_{\text{max}}$  are read from concentration-time curve.

The mean serum concentration of cefuroxime following oral administration of 500 mg as the acetoxymethyl ester are noted. The  $C_{\text{max}}$  and  $T_{\text{max}}$  are  $2.1 \pm 1.5\text{ mg/L}$  and  $3.0 \pm 1.1\text{ h}$  in group 1,  $5.5 \pm 1.4\text{ mg/L}$  and  $3.0 \pm 1.3\text{ h}$  in group 2,  $8.6 \pm 2.7\text{ mg/L}$  and  $3.9 \pm 1.2\text{ h}$  in group 3, and were  $10.7 \pm 2.0\text{ mg/L}$  and  $6.3 \pm 2.9\text{ h}$  in group 4. The mean urinary recoveries during 48 h were  $41.9 \pm 9.3\%$ ,  $32.9 \pm 7.9\%$ ,  $34.0 \pm 5.2\%$ , and  $22.0 \pm 11.4\%$ , of the administered dose in groups 1, 2, 3, and 4. The values of pharmacokinetic parameters are summarized, there is no much difference between the four groups. The mean value for all subjects was  $0.82 \pm 0.27\text{ L/kg}$ . The  $k_{\text{el}}$ ,  $T_{1/2}$  and  $\text{AUC}_{0-\infty}$  were renal function dependent.  $T_{1/2}$  value for group 1 is  $1.4 \pm 0.33\text{ h}$ ,  $2.4 \pm 0.65\text{ h}$  in group 2,  $4.6 \pm 2.32\text{ h}$  in group 3 and  $16.8 \pm 10.2\text{ h}$  in group 4. Loss of renal function results in progressive prolongation of the serum half life of cefuroxime administered orally as cefuroxime axetil. The correlation between  $\text{Cl}_{\text{s}}/F$  versus  $\text{Cl}_{\text{cr}}$ , reflecting differences in the bioavailability between the subjects.  $\text{Cl}_{\text{s}}/F$  and  $\text{Cl}_{\text{cr}}$  is linear, this indicates that there is probably no systematic dependence of the bioavailability upon renal function. The results enable us to suggest modifications in cefuroxime axetil dose schedules in patients with reduced renal function.

### **Comparative pharmacokinetics of new oral Cephalosporin- 1994**

Comparative pharmacokinetics in healthy volunteers of new oral cephalosporin with carbacephem and loracarbef. Single dose, multiple dose studies also elderly and oral agents are noted and differences in pharmacokinetics has been observed and studied. Bioavailability of ester Cephalosporin with antacids is observed. Generally cephalosporin tends to be too hydrophilic to get easily absorbed by the intestinal mucosa. Number of oral cephalosporin agents have recently been found. The agents were divided into two groups the prodrug esters (cefetamet pivoxil, cefpodoxime proxetil and cefuroxime axetil) and the agents that are absorbed intact (cefaclor, cefixime and ceftibuten). The absorption characteristics of cefetamet pivoxil is examined in an ascending dose study in healthy and fed volunteers. No significant differences were found between 500 to 1000 mg doses in rate or extent of absorption. Studies suggest that maximum serum concentrations (C<sub>max</sub>) were higher for loracarbef and ceftibuten and then cefprozil. Protein binding of loracarbef and the new oral Cephalosporins ranges from 22% for cefetamet pivoxil to 70% for cefixime. No significant differences are marked in pharmacokinetics values received after first and last study of doses. The bioavailability of cefetamet pivoxil and cefpodoxime proxetil were found similarly between the elder and young volunteers. When ester cephalosporin is administered after food its bioavailability is enhanced compared to administration during fasting. There was a increase of 31 to 37% in C<sub>max</sub> and 41 to 78% increase in AUC also t<sub>1/2</sub> was delayed by administration of cefetamet pivoxil or cefuroxime axetil after food. Antacids have great effect on absorption of quinolone antibacterial agents therefore any possible interaction with the new oral cephalosporins is of interest to the prescribing physician. There can be an increase in pH by altered absorption of this agent. There

were small reductions evident in both the urinary recovery (23%) and AUC (6 to 12%) after co-administration with ranitidine or antacid with cefotiam hexetil. Single dose- Urinary recovery depends upon the enteral absorption, hepatic metabolism, and extra renal and renal elimination of the agent. With the exception of Cefixime, the new oral cephalosporins are characterised by moderate to high rates of urinary recovery indicating the predominant renal recovery. The low rate of urinary recovery and the high concentration of cefixime in the bile and gallbladder tissue indicate extensive hepatic elimination of the agent. According to the results of multiple dose studies, there was no evidence of accumulation of the new oral cephalosporins at the doses and regimens used. Metabolites were not detected in plasma or urine after administration of cefixime or cefprozil. Dosage adjustment of the new oral cephalosporins in elderly patients is unnecessary because the small pharmacokinetic differences observed are not clinically relevant. Food may prolong the period of contact between the drug and esterases in the intestinal mucosa as the result of delaying gastric emptying, contributing food effects are then observed. It is thus advisable to administer the ester cephalosporins after the meal. The absorption of cefpodoxime proxetil was reduced by co-administration of both H<sub>2</sub> antagonists and antacids. Taking a C<sub>max</sub> to MIC<sub>90</sub> ratio of 5 to 10 as being indicative of clinical efficacy, it summarises that all cephalosporins are highly active against *Streptococcus pyogenes*. *Escherichia coli* are highly susceptible to cefetamet pivoxil, ceftibuten, loracarbef and cefixime, with cefuroxime axetil, cefotiam hexetil.

### **Cefuroxime axetil : A review of antibacterial , pharmacokinetic properties and the therapeutic efficiency -1996**

Cefuroxime axetil is an oral cephalosporin. It is rapidly hydrolysed to the active parent compound, cefuroxime. Cefuroxime has been evaluated in the treatment of upper and lower respiratory tract

infections, by its clinical traits. It is also an efficient antimicrobial agent. Cefuroxime axetil is associated with low incidence of adverse events, with gastrointestinal distributions being the most frequently observed. Hence, cefuroxime axetil is an effective and convenient treatment for a wide range of infections. Cefuroxime axetil can also become established as an oral component of sequential treatment regimens. Cefuroxime has good activity against gram-negative bacteria, both beta-lactamase positive and negative strains of the common respiratory pathogens. Cefuroxime is inactive against enterococci and *Listeria monocytogenes*. Cefuroxime is generally active against the common urinary tract pathogen *Escherichia coli*. Studies show that cefuroxime has good activity against *P. mirabilis* and variable activity against *Klebsiella pneumoniae*. Cefuroxime axetil undergoes hydrolysis by esterases in the gastrointestinal tract to yield the active parent compound. The absorption of cefuroxime axetil increases by presence of food. Cefuroxime is not significantly metabolized and it is eliminated by the kidneys and unchanged drug, this results in high urinary concentration of cefuroxime. In adults with acute sinusitis and acute exacerbations of chronic sinusitis, consistently high clinical response rates were achieved after treatment with cefuroxime axetil. 500 mg twice-daily dosage was more effective than 250mg twice-daily dosage. Single dose was effective in the treatment of adults with urinary tract infections. Gastrointestinal disturbances, and nausea, vomiting and diarrhoea were the most frequent. Toxic epidermal necrolysis, headaches, hypersensitivity reactions and pseudomembranous colitis is also observed occasionally during cefuroxime treatment. Cefuroxime is excreted in breast milk. Cefuroxime should be strictly administered with food. Dosage of cefuroxime axetil is not required to be modified for patients with mild to moderate renal impairment, but prolongation of the dosage interval is necessary for patients with creatinine clearance. Cefuroxime axetil is a well tolerated, broad spectrum

antibacterial agent. When it is administered as a convenient twice-daily dosage regimen, it is proven to be effective treatment for various infections. Cefuroxime axetil can be considered as empirical therapy for a range of community-acquired infections, it includes infections of upper and lower respiratory tract, skin and the soft tissues, also the urinary tract. Cefuroxime axetil has been considered very useful for the treatment of infections with  $\beta$ -lactamase producing strains of the common respiratory pathogens, are identified as the causing pathogens. From the preliminary results of sequential treatment studies and pending results of further well-designed studies, cefuroxime axetil might be also established as an oral component of sequential regimens.

### 3. Amoxicillin<sup>18-26</sup>

Sr.No	Title of the Research Paper	Year of Publication.
1	Amoxicillin: in vitro and pharmacological studies	1972
2	Acute Renal Failure Following Amoxicillin Overdose	1993
3	Efficacy of Penicillin vs. Amoxicillin in Children with Group A Beta Hemolytic Streptococcal Tonsillopharyngitis	2003
4	Acute liver failure due to amoxicillin and amoxicillin/clavulanate	2005
5	Historical perspective and development of amoxicillin/clavulanate	2007
6	Common harms from amoxicillin: a systematic review and meta-analysis of randomized placebo-controlled trials for any indication	2015
7	Routine Amoxicillin for Uncomplicated Severe Acute Malnutrition in Children	2016

8	Amoxicillin Modulates ApoA-I Transcription and Secretion, Predominantly via PPAR $\alpha$ Transactivation Inhibition	2019
9	Amoxicillin-Induced Crystalline Nephropathy Presenting as Ureteral Obstruction	2020

### Amoxicillin: In vitro and pharmacological studies. (1972)

Amoxicillin is a new kind of semisynthetic penicillin, that is active in vitro against gram positive cocci. It's similar to penicillin and can kill a wide variety of bacteria including Streptococcus species, Listeria monocytogenes, Enterococcus, Haemophilus influenzae, some E.coli, Actinomycetes, Clostridial species, Shigella, Salmonella, and Corynebacteria. The Drug is found more effective than ampicillin for treating experimental infections in mice and resulting in substantially higher serum levels in humans. After a study was conducted ,it was found that only 28% of isolates of S.aureus resistant to 50 $\mu$ g of penicillin G per ml were susceptible to amoxicillin at this concentration or less , and none were susceptible to less than 12.5 $\mu$ g/ml. 76% of P.mirabilis isolates were susceptible to 1.56 $\mu$ g or less of amoxicillin per ml, but 20% were resistant to 12.5 $\mu$ g/ml or more, 57% of E.coli isolates were susceptible to 6.25 $\mu$ g/ml or less but most of the remaining were resistant to 50 $\mu$ g/ml or more. Only a few other gram negative bacilli were sensitive to amoxicillin (1). Amoxicillin and ampicillin are more similar against Proteus spp. and more active than cephalothin. It was found in the study Ampicillin was slightly more active than amoxicillin against E.coli and considerably more active against members of the Klebsiella-Enterobacter-Serratia group(1) . A comparison was done between serum levels observed after oral intake of 500mg of amoxicillin and 500 mg of ampicillin. With amoxicillin , mean peak serum level measured at 2 hr and was 6.75 $\mu$ g/ml. With ampicillin, mean peak serum level occurred at 3 hr and was 2.28  $\mu$ g/ml

(1). This study reveals that amoxicillin achieves its mean peak serum levels in lesser time and with more volume.

### Acute Renal Failure Following Amoxicillin Overdose.(1993)

Amoxicillin and ampicillin are the drugs associated with relatively few side effects. Two children were found to be experiencing acute renal failure and macroscopic haematuria immediately after ingestion of supratherapeutic doses of amoxicillin. Patient 1, after physical examination his blood pressure was 123/85 mm Hg; heart rate, 82/bpm; temperature 37.3°C . He was mildly ill, urine was grossly dark maroon, with a specific gravity of 1.012. By dipstick urine contained +1 glucose, +3 haemoglobin, and 3+ protein, with a pH of 5.0 . Microscopic study showed 400 to 500 eumorphic rbc and occasional wbc without casts or crystals. Further questioning led the parents to notify that the child had ingested nearly an entire bottle of amoxicillin (250 mg/5ml) nearly 3 hours before the onset of his haematuria. Light microscopic examination of the renal biopsy showed a patchy interstitial inflammation and renal medulla with predilection to the collecting ducts. Patient 2 was a 2.5-year-old male child, accidentally chewed 30-40 amoxicillin tablets (250 mg/tablet) After developing abdominal cramps and vomiting without diarrhoea he started feeling restless. Being brought to the emergency room after 24 hours, the patient appeared ill and mildly dehydrated. Temperature 37.5°C , pulse 122/min , and blood pressure 110/60 mm Hg. A few drops of bloody urine were obtained for urinalysis. The specific gravity was 1.019 and pH was 6. Dipstick of the urine revealed 2+ protein and 4+ blood without glucose. Microscopic analysis of the uncentrifuged urine specimen showed 40 to 50 red blood cells per high-power field (hpf), 12 to 15 WBC/hpf, and no casts or crystals. Renal biopsy demonstrated focal edema and leukocytic inflammation of the interstitium, with occasional invasion of the tubules.

The above 2 patients shows that ingestion of such drugs in large amounts may result in oliguria, macroscopic haematuria, and azotaemia. Potential mechanisms of renal toxicity due to over dose of amoxicillin includes crystallisation of the drug within the tubular lumen, renal venules, or interstitium; direct cellular toxicity; vasoconstriction' or an immediately set hypersensitivity reaction. Therefore, we can conclude by imposing that one should consider the possibility of amoxicillin overdose in evaluation of the child with acute onset of macroscopic haematuria and acute renal failure.

### **Efficacy of Penicillin vs. Amoxicillin in Children with Group A Beta Haemolytic Streptococcal Tonsillopharyngitis. (2003)**

The study was conducted to compare the bacteriologic and clinical efficacy of oral penicillin versus amoxicillin as first-line therapy for group A beta-haemolytic streptococcal (GABHS) tonsillopharyngitis. This observational study was conducted over 18 months of period (January 2000-June 2001). Children enrolled in this study had acute onset of symptoms and signs and a laboratory documented GABHS tonsillopharyngitis illness. Follow-up examination and laboratory testing occurred  $10 \pm 4$  days following completion of treatment. In total, 389 patients were enrolled (intent to-treat group): 195 received penicillin V and 194 received amoxicillin. Fifty-six of the penicillin treated and 57 amoxicillin-treated patients refused to take the drug, or were noncompliant, or did not return for the follow-up visit, leaving 276 patients in the per-protocol group: 139 penicillin-treated and 137 amoxicillin-treated. Bacteriologic cure for amoxicillin-treated children occurred in 76% versus 64% in the penicillin-treated children ( $p=0.04$ ). The clinical cure rate for amoxicillin-treated children was 84% compared to 73% in the penicillin-treated children. Since treatment allocation was not randomized, logistic regression analysis was used to

adjust for treatment group differences. The odds ratio (OR) estimates for cure for patients in the amoxicillin versus penicillin V treatment group remained significant (OR=1.84, 95% confidence interval 1.02-3.29); the same was true for clinical cure. Amoxicillin is approximated to be superior to penicillin for bacteriologic and clinical cure of GABHS tonsillopharyngitis.

### **Acute Liver Failure Due to Amoxicillin and Amoxicillin/Clavulanate. (2005)**

Ampicillin and Amoxicillin are usually associated with a very low rate of mild hepatocellular and cholestatic liver injury when used alone. Men above the age of 50 appear to be at increased risk of amoxicillin hepatotoxicity along with the patients who receive prolonged/repeated courses of treatment. Acute Liver Failure (ALF) is one of the rare but severe illnesses defined by the onset of coagulopathy and encephalopathy within 8 weeks of presentation in a patient without known underlying disease. A prospective study of 309 consecutive ALF patients demonstrated that acetaminophen (33%) and idiosyncratic drug-induced hepatotoxicity (13%) were the most commonly identified causes of ALF in the United States(2). To standardize the diagnostic criteria for drug-induced liver injury, several scoring systems have been proposed. The Council for international Organization of Medical Sciences (CIOMS) scale uses seven clinical criteria to generate a score that varies between -5 and +14 and is categorized into five levels of causality: >8 definite/highly probable, 6-8 probable, 3-5 possible, 1-2 unlikely and  $\leq 0$  excluded. The Clinical Diagnostic Scale(CDS) provides score between 6 and 20 that can be categorized into 4 levels of causality: >17 definite, 14-16 probable, 10-13 possible and 6-9 unlikely(5,6). A study was done involving 2 patients with life threatening ALF, due to amoxicillin and amoxicillin/clavulanate(7). A 59-year old Caucasian male presented with ALF 34 days after intake of

amoxicillin/clavulanate. Despite intense support and care ,he died in hospital on day 10. A 42-year-old Caucasian female presented with ALF 21 days after receiving amoxicillin. She underwent liver transplantation on hospital day 19. Patient 1 was estimated to have a CIOMS score of 9 which indicates "definite/highly probable" and a CDS score of 13 which is "Possible". Whereas Patient 2 had a CIOMS score of 9 which is "definite/highly probable" and a CDS score of 9 which is "unlikely". Insight - Recently a genetic basis for amoxicillin/clavulanate hepatotoxicity has been identified with the linkage to human leukocyte antigen (HLA) haplotype particularly in patients with immunoallergic and cholestatic features.

### **Historical perspective and development of amoxicillin/clavulanate. (2007)**

Infections were ranked as the leading global burden of disease and the leading cause of mortality in children, by the World Health Organization. Acute respiratory infections are the leading infectious cause of death in all ages. 50 years back, antibiotic resistance was a major problem. This problem still exists till today's date, selecting resistant strains of pathogenic bacteria is unavoidable and resistance to all classes of antibiotics has been identified. In the 1960's, a limited range of non-beta lactam antibacterials namely , sulphonamides, streptomycin and kanamycin, erythromycin, had certain limitations in terms of toxicity. In the period of 1960-70's challenging infections like meningitis, endocarditis, neonatal infections, penicillin resistant staphylococcus infections, new pathogens, and infections in immunocompromised patients, increased in number. This set of scenarios made an emergence in developing new Antibacterial agent fulfilling the requirements.A further objective at that time was to identify a broad-spectrum penicillin, which was realized in 1961 with the synthesis of ampicillin and later in 1970 ,with amoxicillin. Amoxicillin having a

good oral absorption and broad-spectrum antimicrobial activity, was selected as the antibiotic to be co-administered with clavulanic acid and in tablet formulation was launched in Augmentin in the UK in 1981. In 2005, after 25 years of its initial launch ,the rationale for Amoxicillin/clavulanate remains the same and the development of new high-dose regimens and pharmacokinetically enhanced formulations ,has meant that it still has an important and unique role to play in the treatment of range of community-acquired infections.

### **Common harms from amoxicillin: a systematic review and meta-analysis of randomized placebo-controlled trials for any indication. (2015)**

For this systematic review the resource searched are MEDLINE, Embase and the Cochrane Central Register of Controlled trials,for randomized participant-blinded ,placebo-controlled trials of amoxicillin or amoxicillin -clavulanic acid for any indication. The shared -opinion formation should not only just highlight the benefits , but also the possible harms of the antibiotics. Current knowledge of the harms from antibiotics are derived largely from observational analysis. In the given Meta analysis diarrhea was reported in 17 studies and was not significantly caused by Amoxicillin, except in combination form with clavulanic acid. The high heterogeneity was observed among all the studies except amoxicillin-clavulanic acid alone. Candidiasis reported in only 3 studies specifically caused by amoxicillin, with low heterogeneity. In addition to explicit candidiasis, a trial showed reports of diaper rash of about 50% among infants treated with amoxicillin-clavulanic acid. Rashes, nausea and vomiting were not reported significantly more frequently with antibiotics than placebo. Therefore in the meta analysis of randomized trials , a statistical significance of just 2 harms was found: diarrhoea from amoxicillin-clavulanic acid and candidiasis from amoxicillin with or without clavulanic acid.



Therefore this study highlights some new information about common harms of amoxicillin and amoxicillin-clavulanic acid that can contribute to better-informed discussions and decisions about the benefit-Harm trade-off for these antibiotics.

### **Routine Amoxicillin for Uncomplicated Severe Acute Malnutrition in Children.(2016)**

To decrease the chances of death from severe acute malnutrition, specialized nutritional and medical intervention is required. Bacterial infection can complicate advanced cases of severe acute malnutrition, and the risk of nosocomial infection in inpatient setting can be high. In 2007, WHO and the United Nations endorsed a community-based model for the management of severe acute malnutrition are treated at home with ready-to-use therapeutic food. A study was conducted at four health centres in rural health district of Madarounfa, Niger. All the childrens fitting certain given criterias were presented at the study centres. The study was randomized, double-blind, placebo controlled trial with sole purpose to examine the effect of routine antibiotic (Amoxicillin) use compared to placebo, on nutritional recovery from uncomplicated severe acute malnutrition. 1200 children were included in the analysis receiving placebo and 1199 included in analysis receiving amoxicillin. It was found that routine amoxicillin use has some benefits over placebo in terms of short term weight gain. However, without evidence of longer term effects on weight or height, the early growth promoting benefits of routine antibiotic use may be limited.

### **Amoxicillin Modulates ApoA-I Transcription and Secretion, Predominantly via PPAR $\alpha$ Transactivation Inhibition.(2019)**

In a recent human study, it was observed that amoxicillin treatment decreased HDL-C concentration. It was hypothesized that antibiotics

lower the transcription and secretion of ApoA-I, the responsible protein for HDL production. HepG2 and Caco-2 cells were exposed to increasing dose of amoxicillin, penicillin, and streptomycin. Secreted ApoA-I protein and mRNA transcripts were analysed using ELISA and qPCR, respectively. Besides treatment of bacterial infections, antibiotics also influence the quantity and composition of the natural microbiota, which may be involved in a wide variety of physiological processes. Relative PPAR $\alpha$  transactivation in transfected HepG2 cells treated with different concentrations of antibiotics:

Increasing amoxicillin and the combination of penicillin and streptomycin concentrations showed a significant reduction in PPAR $\alpha$  transactivation since the regression coefficient deviated from zero. ApoA-1 mRNA expression was observed to be higher in differentiated Caco-2 cells as compared to HepG2 cells. As for HepG2 cells, amoxicillin significantly ( $p < 0.01$ ) and dose-dependently was lowered ApoA-I mRNA expression in Caco-2 cells. Recently, it was observed that amoxicillin treatment for 7 days significantly lowered serum HDL cholesterol in healthy subjects (15). Therefore, it was shown that amoxicillin treatment has direct effects by lowering ApoA-I secretion and transcription. Based on evaluating alterations in KEAP1, CPT1, and CHOP mRNA expression plus PPAR $\alpha$  transactivation, it is tempting to suggest that a reduced PPAR $\alpha$  transactivation is a potential mechanism behind the observed amoxicillin-induced effects on hepatic and intestinal ApoA-I expression.

### **Amoxicillin-Induced Crystalline Nephropathy Presenting as Ureteral Obstruction. (2020)**

A 23-month-old male, having past medical history appropriate for imperforate anus status post ostomy placement and takedown, non-functional left kidney status post nephrectomy, partial urethrectomy, and persistent right sided grade 2 hydronephrosis, presented to the emergency department (ED) in April

2018 secondary to dehydration and decreased urine output. He began having diarrhoea 7 days prior to the ED visit. Two days prior to the ED visit, his diarrhea resolved but began having emesis. During hospital day 1, he was found to have oliguria (urine output 0.15 mL/kg/h) with repeated bladder scans showing <100 mL of urine. His net fluid balance was (+) 1.2 L with associated 0.8-kg weight gain. Within 12 hours following nephrostomy tube placement, the patient started spontaneously voiding and no longer had output from his nephrostomy. By 72 hours after initial ED presentation, his BUN/Cr improved to 23/0.5, HTN self-resolved, and weight returned to baseline admission weight. He was discharged home on hospital day 5 with removal of the nephrostomy tube 6 days after it was placed. Urine microscopy showed the significance for birefringent crystals with needle-shaped morphology. Crystalline nephropathy means renal injury followed with abundant crystals that are commonly found in tubules and interstitium. Amoxicillin is renally eliminated with majority (90%) through tubular secretion and the remaining (10%) via glomerular filtration. The risk of crystalluria increases with decrease in urine solubility of medication. There are several proposed mechanisms of amoxicillin-induced nephrotoxicity. The first is intrarenal precipitation with resultant medullary congestion and tubular damage leading to haematuria. Along with intratubular precipitation, crystallization can also occur in the renal pelvis causing obstructive uropathy (19). After discontinuation of the amoxicillin, crystalluria usually resolves within 24 hours, haematuria within 5 days, and renal failure within a couple weeks. Treatment is generally reserved for severe cases and consists of fluid rehydration and the consideration of urine alkalization to improve drug solubility. We can conclude by saying that, amoxicillin-induced crystal nephropathy is a rare finding followed by high-dose amoxicillin intake, especially in the pediatric population. The complication is usually mild and resolves following medication discontinuation.

**Clinical evidences:** Extracted from clinicaltrials.gov

#### **Clinical Trial of the Treatment of Acute Sinusitis With Standard-dose Versus High-dose Amoxicillin/Clavulanate NCT02340000**

An interventional study was designed with randomized allocation. Standard dose: amoxicillin/clavulanate 875/125 mg + placebo tablet twice a day for 7 days. High Dose: Time Period I (November 18, 2014-January 5, 2016): extended-release amoxicillin/clavulanate 1000/62.5 mg 2 tablets (by different manufacturer) twice a day for 7 days Time Period 2 (February 6, 2016-February 27, 2017): immediate-release amoxicillin/clavulanate 875/125 mg plus standard immediate-release amoxicillin 875 mg twice a day for 7 days. The Primary outcome was a Subjective Improvement-Day 3 (Rating of “a lot better” or “no symptoms”).

#### **4. Cefuroxime<sup>27-31</sup>**

SR.NO	TITLE	YEAR OF PUBLICATION
1	Review of the New Second-Generation Cephalosporins: Cefonicid, Ceforanide, and Cefuroxime	1985
2	Review of the Pharmacology, Pharmacokinetics, and Clinical Use of Cephalosporins	1990
3	Effectiveness of short-course therapy (5 days) with cefuroxime axetil in treatment of secondary bacterial infections of acute bronchitis.	1995
4	Formulation and characterization of Cefuroxime Axetil nanoemulsion for improved bioavailability	2012
5	Computer-Aided Design of Cefuroxime Axetil/Cyclodextrin System with Enhanced Solubility and Antimicrobial Activity	2019

## Review of the New Second-Generation Cephalosporins: Cefonicid, Cefradine, and Cefuroxime - 1985

Cefuroxime is the most active new second-generation agent which is less active against gram-positive cocci than the first-generation cephalosporins for  $\beta$ -lactamase producing *Haemophilus influenza* with advantages of smaller doses and drug cost reduction. With documented effectiveness of cefuroxime in open trails and limited comparative studies got approval for the treatment of common paediatric bacterial meningitis infection. Clinicians must be on alert for bacterial resistance development and decreased efficacy. Cefuroxime's chemical name is [(6R,7R)-3-carbamoylmethyl-7-[Z-2-methoxyimino-2-(fur-2-yl)acetamido]-ceph-3-em-4-carboxylic acid]. Its structure has two side chains attached to the 7-aminocephalosporanic nucleus. One side chain is a carbamate ester; the other is a combination of a furyl and a substituted oxime group. These chemical changes have provided improved  $\beta$ -lactamase stability and antibacterial activity over the first-generation cephalosporins. It is a monosodium salt with 42 mg of sodium (1.8 mmol) per 750 mg of active drug. Lower respiratory tract infections due to bacteria in a series of open studies have responded well to cefuroxime. In a randomized, double-blind study of 28 patients, cefuroxime was found to be as effective as parenteral amoxicillin with acute exacerbations of chronic obstructive pulmonary disease. Cefuroxime was also found to be equally effective as parenteral administration of trimethoprim-sulfamethoxazole among 40 patients with bronchopneumonia. With acute bacterial pneumonia, two groups have shown clinical improvement in paediatric patients who received cefuroxime. In the treatment of osteomyelitis (acute and chronic) and septic arthritis, several investigators have reported a positive clinical outcome in about 75 % of the patients with parenteral cefuroxime. Against many gram-negative bacteraemia Cefuroxime has been reported to be effective. With the administration of cefuroxime 200-250 mg/kg/d,

successfully treated 34 patients with bacterial meningitis (*H. influenzae*, *Salmonella*, *N. meningitidis*, *S. pneumoniae*). Cefuroxime 1.5 g administered for uncomplicated gonorrhoea produced cure rates > 98 % for non-penicillinase isolates and 100 % for Lactamase-positive strains. However, 26.9 % of the males developed post gonococcal urethritis. For urethral, oral, or pharyngeal gonorrhoea in children, a single dose of cefuroxime 25 mg/kg was safe and effective. In 96 patients who underwent total joint replacement with pre- and postoperative cefuroxime (three doses), Hugh's observed only two bone or joint infections in an open study. 128 Patients who received either cefuroxime or placebo as prophylaxis for coronary artery bypass graft surgery had equal rates (35 % each) of sternal or leg wound infections; however, cefuroxime produced significantly fewer cases of pneumonia than placebo (4 % and 33 %, respectively). A single dose of cefuroxime 1.5 g in patients undergoing high-risk gastric or biliary tract surgery is superior to placebo. Cefuroxime has received approval for the treatment of susceptible microorganisms in lower respiratory tract infections, skin and soft tissue infections, urinary tract infections, septicaemia, uncomplicated, and meningitis, and disseminated gonorrhoea and has been approved for surgical prophylaxis. The potential use of cefuroxime over other second-generation agents is an alternative treatment to standard meningitis therapy in children (i.e., ampicillin and chloramphenicol) in light of increasing lactamase-producing *H. influenzae* strains. Cefuroxime has good activity against staphylococci (including t1-lactamase-positive strains) and non-enterococcal streptococcus isolates. Cefuroxime has high in vitro activity against organisms in the Enterobacteriaceae family but is superior to cephalothin, including cephalothin-resistant organisms. Neu and Fu have shown that cefuroxime is very stable to most t1-lactamases. Gonococci, including penicillin-resistant isolates, are very sensitive to cefuroxime. "*H. influenzae*, including ampicillin-resistant isolates, are equally sensitive to

cefuroxime. Cefuroxime may have greater stability to TEM-enzymes produced by these organisms." Although cefuroxime demonstrated no inoculum effect with *S. aureus*, a small inoculum effect has been documented with several Enterobacteriaceae. The pharmacokinetics of cefuroxime can be described by a two-compartment model. Variations in the literature in observed peak concentrations of cefuroxime are probably caused by variable infusion lengths and the timing of subsequent peak serum samples. Cefuroxime has the shortest half-life of these newer second-generation agents, 1.2 hours. Cefuroxime's half-life during haemodialysis and intraperitoneal dialysis (IPD) has been reported at 3.5 and 13.5 hours, respectively. Cefuroxime has been measured in peritoneal fluid in patients without peritonitis. Cefuroxime has been measured in the bronchial secretion, gall bladder wall, sputum, bile, aqueous humour, bone tissue, pericardial fluid, uterine tissue, cervix, fallopian tubes, atrial appendage, ovaries, and prostatic tissue. Studies in pregnant women have shown that cefuroxime reaches the myometrium, amniotic fluid, placenta, and umbilical cord. Several studies have examined cefuroxime's penetration into the cerebrospinal fluid (CSF) in patients with inflamed and non inflamed meninges. The mean half-life of cefuroxime may be prolonged to 15 hours when creatinine clearance is < 10ml/min. Only cefuroxime has been documented to penetrate significantly across inflamed meningitis,

### **Review of the Pharmacology, Pharmacokinetics, and Clinical Use of Cephalosporins - 1990**

Cefuroxime is an orally available second-generation cephalosporin and considered cephamycin because of its methoxy side chain at C7. Cefuroxime is active against the same organisms as the 1st-generation cephalosporins, but have more activity against certain aerobic gram-negative bacteria and *Haemophilus influenzae*. Cefuroxime interferes with the cell-wall synthesis of bacteria, leading to lysis of the infectious organism. Cefuroxime Axetil is effective in a single

dose for uncomplicated urethral, endocervical, and rectal gonorrhoea. Cefuroxime is mainly prescribed for pneumonia, and bone and joint infections. It is active against *H. influenzae* type B (including lactamase producing strains), pneumococci, *Streptococcus pyogenes*, and *Staphylococcus aureus*. Because it covered *H. influenzae* and its degree of penetration into the cerebrospinal fluid, it has also been used to treat meningitis in the paediatric population. Third-generation cephalosporins are considered superior to earlier generations for meningeal infections because of their greater potency, superior penetration, and resultant higher bactericidal titers in the cerebrospinal fluid. Compared to the older cephalosporins, cefuroxime Axetil has increased activity *in vitro* against *E. coli* and other Enterobacteriaceae. It is as efficacious as cefaclor, amoxicillin/clavulanic acid, and cephalexin in the treatment of urinary tract infections. Cefuroxime Axetil may be useful for uncomplicated urinary tract infections that are resistant to less expensive drugs, but serious urinary tract infections require other forms of therapy. Although cefuroxime Axetil has exhibited activity against the major pathogens involved in otitis media concerns are raised about the use of cefuroxime in meningeal infections as reports are suggesting delayed sterilization of the cerebrospinal fluid, treatment failure, and relapse in patients with *H. influenzae* type-B infection.

### **Effectiveness of short-course therapy (5 days) with Cefuroxime Axetil in treatment of secondary bacterial infections of acute bronchitis- 1995**

Cefuroxime Axetil is an oral ester prodrug of cephalosporin antibiotic and is characterized by stability to  $\beta$ -lactamases and demonstrates favourable *in vitro* activity against a wide range of gram-positive and gram-negative organisms, including the bacterial pathogens commonly associated with acute bronchitis. In recent years, patients with common bacterial infections are given reducing the duration of antibiotic treatment regimens. While in treatment of

lower respiratory tract infections cefuroxime Axetil has been compared with amoxicillin-clavulanate for in many clinical trials, none have examined the effectiveness of a treatment regimen as short as 5 days. The purpose of the present study was to compare the efficacy and safety of a 5- or 10-day twice-daily course of cefuroxime Axetil with those of a 10-day three-times-daily course of amoxicillin-clavulanate in the treatment of patients acute bronchitis. Patients with the following characteristics: recent onset of productive cough, increase in the daily volume of sputum production, qualitative change in sputum and chest X rays indicating the absence of a new localized infiltrate, pleural effusion or consolidation are selected at the time of enrolment within 7 days from date of symptom onset. Sputum specimens cultures containing 10 epithelial cells per low power field (3100) and 25 polymorphonucleated leukocytes per low power field (3100) were accepted. Of the 423 patients, the response was obtained in 82, 86, and 83% of clinically evaluable patients treated with cefuroxime Axetil for 5 or 10 days. Patients demonstrated marked improvement by 3 to 5 days after initiation of therapy, as judged by the reduction in the proportion of A satisfactory bacteriologic response was obtained in 87, 91, and 86% of bacteriologically evaluable patients treated with cefuroxime Axetil for 5 or 10 days. Treatment failures in the cefuroxime Axetil (5 days) group occurred in one patient each yielding *H. influenzae*, *S. pneumoniae*, or group A  $\beta$ -haemolytic streptococcus, while the four patients in this group who were assessed as presumed bacteriologic failures yielded *H. parainfluenzae* (two patients), *H. influenzae*, or *Staphylococcus aureus*. In the one cefuroxime Axetil (5 days) patient who was assessed as a bacteriologic cure with superinfection, the pre-treatment pathogen (*H. influenzae*) was eradicated and two new pathogens (group A  $\beta$ -haemolytic streptococcus and *S. aureus*) were subsequently isolated posttreatment. The one treatment failure in the cefuroxime Axetil (10 days) group occurred in a patient yielding *H.*

*parainfluenzae*, while *Klebsiella ozaenae* was the pathogen in the one patient in this group with a bacteriologic recurrence. The three cefuroxime Axetil (10 days) patients who were assessed as presumed bacteriologic failures yielded either *H. parainfluenzae* (two patients) or both *S. pneumoniae* and *S. aureus*. Lastly, the two treatment failures in the amoxicillin-clavulanate group occurred with patients yielding *H. parainfluenzae* or *Escherichia coli*, while in the two patients in this group who were assessed as bacteriologic cures with superinfection, the pre-treatment pathogen (*H. parainfluenzae* or *Haemophilus* species) was eradicated and a new pathogen (*H. influenzae* in both patients) was subsequently isolated post-treatment. The clinical cure or improvement rate reported is (82%) with the 5-day regimen of cefuroxime Axetil at 250 mg twice daily is similar to that of previous clinical comparisons of 10-day treatments for acute bronchitis or acute exacerbations of chronic bronchitis with cefuroxime Axetil. The bacteriological cure rate achieved with the 5-day regimen of cefuroxime Axetil is (87%). The efficacy of cefuroxime Axetil in acute bronchitis may be partly related to the concentrations of cefuroxime achieved in lower respiratory tract tissue and fluids. Oral antibiotic treatment for acute bronchitis requires consideration of clinical and bacteriological efficacy and adverse event profile along with the convenience of dosing and medical costs. In this regard, a 5-day, twice-daily regimen of cefuroxime Axetil with less expense to the patient might be considered advantageous compared with a three times-daily 10-day dosing regimen of amoxicillin-clavulanate.

#### **Formulation and characterization of Cefuroxime Axetil nanoemulsion for improved bioavailability - 2012**

Poor bioavailability of cefuroxime is addressed through the formulation of cefuroxime nanoemulsion with Deoxycholic acid, Capmul MCM, Pluronic F127, Soya lecithin and distilled water. It is

recorded as drug content is at  $97.12 \pm 0.27\%$  w/v and mean globular size at 121.3 nm. Drug diffusion of nano-emulsion is  $80.7261\% > 51.0048\%$  of plain cefuroxime suspension. The marketed preparation has a very poor oral bioavailability of 25%- 30% is varied upon the presence or absence of food. Oil phase (Capmul MCM, Soya lecithin, Deoxycholic acid and Cefuroxime Axetil was heated to  $70^\circ\text{C}$ ) was gradually added to the aqueous phase (Pluronic F127 and distilled water was also heated to  $70^\circ\text{C}$  separately) under high-speed magnetic stirring to form a pre-emulsion and was sonicated at 100 W for 9 minutes to get a nano-sized emulsion. This prepared nano-emulsion was stored in a glass vial until further characterization. The mean Globule size and polydispersity index were measured at  $25^\circ\text{C}$  by photon correlation spectroscopy (PCS). Nano-emulsion had a pH between 7.4-7.6 to ensures the stability of formulation over its shelf life. The zeta potential was measured by determining the electrophoretic mobility of the oil droplets. Using transmission electron microscopy (TEM) operating at 200 kV with a resolution of 0.27 nm and magnifications of the order of 750,000X, morphology and structure of the nano-emulsion were studied. Lipid nano-emulsion of Cefuroxime Axetil was prepared by ultrasonication method. The negative zeta potential is due to charged induced surfactants utilized in the formulation. Nano-emulsion had a pH between 7.4-7.6. Comparative *in vitro* drug release study, *in vitro* intestinal permeability study and *in vivo* study demonstrated that lipid nano-emulsion can significantly improve drug solubilisation and bioavailability of a poorly absorbed drug.

### Computer-Aided Design of Cefuroxime Axetil/Cyclodextrin System with Enhanced Solubility and Antimicrobial Activity - 2019

A study was done to investigate changes in cefuroxime axetil (CA) solubility and antimicrobial efficacy when incorporated into cyclodextrin (CD). Cefuroxime an oral cephalosporin prodrug is an

*in vivo* transformed active form of Cefuroxime axetil (CA), exhibits a broad spectrum of activity against Gram-negative and Gram-positive bacteria. Dissolution profiles of CA-HP $\beta$ CD show significant improvement with an increase of the antimicrobial efficacy of CA up to 4-fold compared to pure CA. With validated *in silico* model of CD and most thermodynamically favoured Solid-state CA-HP $\beta$ CD system, a theoretical model based on docking and molecular mechanics/generalized born surface area was built using a curated dataset of API CD stability constants, differential scanning calorimetry (DSC), Fourier-transform infrared (FT-IR), and X-ray diffraction (XRPD) methods. minimal inhibitory concentration (MIC) value changes related to ones of the pure CA are used for the study of the microbiological activity of the CA-HP $\beta$ CD inclusion system. With an average correlation  $R = 0.7$ , the theoretical model was successfully validated. The designed theoretical model CA-CD system is validated with experimental data at an acceptable level of mean correlation of  $R > 0.7$  and can be successfully streamlined using *in silico* methods. A stable system with significant changes in the dissolution profile and antimicrobial activity increase for several Gram-negative bacteria species is obtained by CA solution with HP $\beta$ CD.

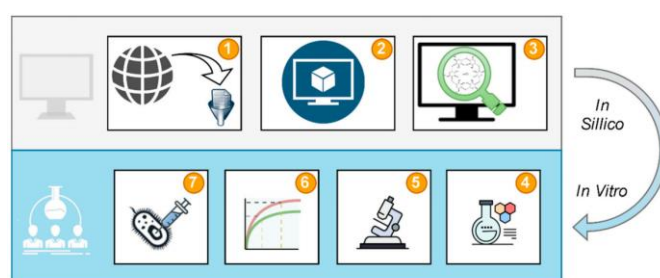


Figure 2. Study design: Data curation (1), model development (2), virtual screening (3), system preparation (4), characterization (5), dissolution tests (6), and antimicrobial efficacy tests (7).

Clinical evidences: Nil

### IV. CONCLUSION

This research review's purpose is to help the reader understand different aspects posed by the research on the comparative analysis of Amoxicillin and

Cefuroxime. This is significant because it gives insights about the antibacterial action of these antibiotics while highlighting their advantages and disadvantages and gives researchers an idea about their scope for future use. There has been much research and discussion conducted on these opinions of these antibiotics as well as the comparative analysis of Amoxicillin and Cefuroxime. Most of the research found was on the efficacy, efficiency, administration, dosage, immediate and long term effects, side effects and tolerability of the Cefuroxime and Amoxicillin. The review highlights the antibacterial effects of Amoxicillin and Cefuroxime antibiotics the bacterial infections they combat and their advantages on renal functions of the body. More research and testing is required to gain a better understanding of the comparative analysis of Amoxicillin and Cefuroxime.

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#### ETHICS APPROVAL AND CONSENT TO PARTICIPATE.

Not applicable.

#### HUMAN AND ANIMAL RIGHTS

No Animals/Humans were used for studies that are base of this research.

#### CONSENT FOR PUBLICATION

Not applicable.

#### AVAILABILITY OF DATA AND MATERIALS

The author confirms that the data supporting the findings of this research are available within the article.

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The authors whose names are listed immediately above certify that they have NO affiliations with or involvement in any organization or entity with any financial interest (such as honoraria; educational grants; participation in speakers' bureaus; membership, employment, consultancies, stock ownership, or other equity interest; and expert testimony or patent-licensing arrangements), or non-financial interest (such as personal or professional relationships, affiliations, knowledge or beliefs) in the subject matter or materials discussed in this manuscript.

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# Arbuscular Mycorrhizal Fungi : Diversity and Its Impact with Abiotic Factors in *Phoenix dactylifera* L. of Kachchh Region, Gujarat, India

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## ABSTRACT

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Mycorrhizal diversity of non-agricultural sites from Madhapar, Reladi and Anjar region of Kachchh regions were studied. Date palm is an economically important plant in dry lands of the world approach towards an investigation of AM fungi diversity and their association with the date palm in Kachchh. This is important to understand the root colonization, spore analysis and spore density in the study. The study is about the composition of AM fungi at an agricultural site. Also to understand the relevance of species composition and their relationship with abiotic factors. In the present work soil of agricultural field has been taken into consideration to understand the relevance.

**Keywords:** Date Palm, Arbuscular Mycorrhizal Fungi, Spore Analysis, Root Colonization.

## I. INTRODUCTION

Soil microorganisms play highly beneficial to the harmful role for plant growth and survival. There are several groups of beneficial rhizosphere microorganisms. Some engaged in well developed symbiotic interactions in which particular organs are formed such as mycorrhiza and root nodules, whilst others develop from fairly loose association with the root (Brockwell et al, 1995).

Microbial activity in the rhizosphere is the major factor that determines the availability of nutrients to plants and has a significant influence on plant health and productivity. It is very important to understand the basic principles of rhizosphere microbial ecology, including the function and diversity of the micro-

organisms that reside there. In this context, it is important to use a broad definition of the rhizosphere to include the rhizosphere soil, the volume of soil adjacent to and influenced by the root, the root surface (or rhizoplane) and the root itself which includes the cells of the root cortex where invasion and colonization by endophytic microorganisms has occurred (Kennedy 1998).

Arbuscular mycorrhiza-forming fungi (AMF) are obligate biotrophs that require the host plant to complete its life cycle. The fungus colonizes the root cortex and forms intracellular structures called Arbuscules (from the Latin "Arbusculum", meaning bush or little tree) where the exchange of nutrients between the partners takes place. The extracellular hyphal network spreads widely into the surrounding

soil, thereby reaching out of the nutrient depletion zone and improving the supply of inorganic nutrients, especially phosphate and nitrate (Smith et al, 2011).

Photosynthates and carbohydrates are received from the host plants by the hetero-trophic fungi. These fungi are classified in the order Glomales of Zygomycota, but in recent classification, these were classified as a different Phylum Glomeromycota. In the natural ecosystem fungi are the principle component of the flora of the rhizosphere, (Peterson et al, 1985) but, are influenced by biotic and abiotic factors (Mohammad, et.al, 2003). The diversity of AM species depends on the ecosystem itself, (Helgason, et.al, 1998) agricultural practices and soil environment (e.g. Disturbance), also the density of spores, length of mycelia, number of species (Dodd, J.C., 2000). AM Fungi is associated with 90 % of all plant species in nature (Wang & Qiu, 2006). The uptake of non-mobile nutrients such as P is the main benefit to plants promoted by the fungi, results in higher growth rates and enhances nutrition (Smith & Read, 2008).

Mycorrhizal fungi increase the yield of agricultural plants, especially in soils with low fertility. Such an increase may be due to the increase in the absorption of the roots as a result of the wide extension of fungus mycelium in the soil (Fitter AH. 1985). Date palms are considered very decisive to the ecosystem in an arid region as they guard the surrounding vegetation against desertic influence and providing an adequate microclimate for underbrush crops. One of the most significant functions about AMF is they protect plants against the environmental stress, such as soil salinity (Guissou T, et al 2001., Martin F. 1985), drought (Inoue et al, 2009) and pathogens (Newsham et al 1995b; Klironomos 2000; Maherali and Klironomos 2007; Sikes et al 2009).

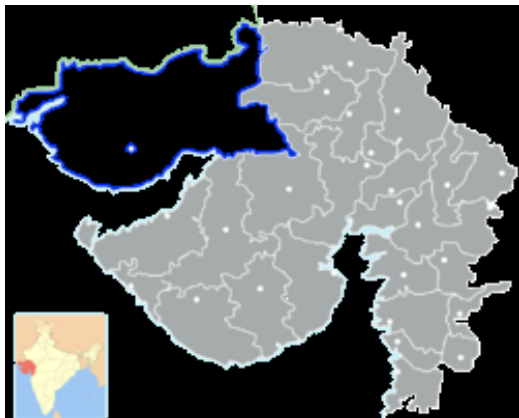
*Phoenix dactylifera* L. tree and its products are regarded as vegetables with health benefits and have

been employed traditionally to remedy many pathological conditions. Date fruits are a significant component of the diet in most of the Arab countries with low cost. The importance of the date in human nutrition comes from its rich composition of carbohydrates (70–80%), salts and minerals, dietary fiber, vitamins, fatty acids, amino acids and protein. Research proves that when dates are eaten alone or as mixed meals with yogurts they have low glycemic indexes. Recently, date pit powders are also marketed and are a source of choice for people preferring a non-caffeinated coffee with coffee-related flavor. The fleshy tissues of dates contain 0.2-0.5% oil, while the seed contains 7.7-9.7% oil. Since, Kachchh is a semiarid region and date palm plays a key role in its economy this work has been carried out to assess various species associated with *Phoenix dactylifera* in this region. It requires dry hot climate for growth and development of fruits. In the arid region, crop production is a risky proposition, where date palm cultivation contributes in achieving food security, high nutritive value food, crop diversification, desertification control, income generation and foreign exchange earnings (Singh and Murlidharan, 2016).

## II. METHODS AND MATERIAL

### Collection of the sample:

The soil sample were collected from the surface, and at the depth of 30cm & 60cm. The Rhizospheric soil sample was collected with the help of shovel and trowel and was collected in the zip-lock bags. The rhizospheric soils were collected for the screening for mycorrhizal colonization. The collection bags were closed airtight in to maintain the moisture and freshness of the sample. All the collection bags were labeled mentioning name of the plant, date, place and other important information.



### Processing of the sample in the lab for root colonization percentage

The plant root hair were washed in running tap water and were cut into small pieces of around 0.5 to 1cm in length. Then these cut root hair were treated with 10% KOH solution and then were neutralized with 10% HCL solution. Neutral-ized pieces were kept for staining in Lactophenol Cotton blue for around 24 hour. After 24 hours the extra stain was removed with the help of Lacto phenol and the samples were ready to screen under the microscope. The treated root piece were put on slide with mounting medium lacto phenol and covered with cover slip and this prepared slide was then screened under the microscope for the calculation of colonization percentage (Phillips, J.M. and Hayman D.S.1970).

### Spore Isolation and Identification:

Spore extraction and counting were carried out from soil with the help of wet sieving and decanting technique (Gerdemann and Nicolson 1963). In this

technique different sieves were used. 100g rhizospheric soil was taken in beaker and dis-solved in 1000ml distilled water and then kept for at least ½ hour so that soil particle's may settle down. After ½ hour these water was slowly poured in the sieves arranged for filter. This procedure was repeated for three times. Then filter of 500mic, 105mic, and 45mic was taken on Whatman filter paper no.1 with the help of funnel. This filter paper was then dried properly. The sample was then placed on the slide with the help fine brush. Subsequently, permanent preparations were made with alcohol and polyvinyl-glycerol (PVLG) and PVLG with Melzer's solution according to Schenck and Pérez (1990). The isolated spores were measured under light microscope. Characteristics such as number of spore layers, ornamentation of outer layers, shape and type of hyphal attachments and sporogenous cells, and the wall layer reactions to Melzer's reagent were also recorded. Junppomen, 2001.

### III. RESULTS AND DISCUSSION

The present study confirms the association of AM fungi in the rhizosphere of date palm. Variation in vesicular and arbuscular content was observed in all the three Rhizospheric soil samples studied. Sample shows highest root colonization percentage. Root colonization percentage of sample 1 is moderate and sample 2 and sample 3 is good.

### IV. CONCLUSION

As observed in all the three samples *Glomus mosseae* was predominant species. *Scutellospora*, *Acualospora* and *Gigaspora* were also recorded in all the samples. Whereas *Glomus caledonium* was recorded only in Sample 1 and sample 3, *Glomus fasciculatum* was recorded in Sample 1 and Sample 2. *Gigaspora ramisporophora* were recorded in Sample 2 and Sample 3, *Gigaspora candida* was also recorded in Sample 2 and Sample 3, *Gigaspora albida* were

recorded in Sample 1 and Sample 3. Rich diversity was recorded in Sample 3 namely *Glomus formosanum*, *Sclerocystis*, *Glomus monosporum*, *Glomus aggregatum*, and *Glomus caledonium*.

The abundance of spores recorded is very low compared to that found by Bouamri (2006) in Tafilalet's soils (2080 spores/100g of soil). Work conducted on the date palm rhizosphere of Saudi Arabia (Mohamed et al, 2010) has shown that the density of spores was 58.3 to 82.3 spores /15 g of soil (from 388.66 to 548 66/100 g of soil). The mean spore densities measured in palm grove rhizospheres reached 812 spores /100 g of soil and was found comparable to spore densities registered under similar habitats associated with other hosts, e.g. argan trees (*Argania spinosa* (L.) Skeels) from south-west Morocco (900 to 2080 spores/100g of soil) (Nouaim, 1994) and *Acacia albida* Del. in Senegal (775 to 1240 spores/100g of soil) (Diop et al, 1994).

Morphological diversity of AM fungi in the studied habitats is supposed to be underestimated and the actual number of endomycorrhizal species could be higher. This underestimation could be due to the small number of soil samples analyzed. Bouamri (2010) reported the presence of 10 species in the date palm rhizosphere of Tafilalet (five species belonging to the genus *Glomus*, three *Acaulospora* and two *Scutellospora*). In soils oases of Saudi Arabia, 25 species were detected: 18 species belong to the genus *Glomus*, two species of the genera *Scutellospora* and *Racocetra* and one species of *Acaulospora*, *Paraglomus* and *Ambiospora* (Mohamed Al-Yahya'ei and al, 2011). In the Arabian Peninsula (Arabian desert), Symanczik et al (2014) presented the characteristics of four species of AMF recovered in the rhizosphere of date palm, namely *Claroideoglomus drummondii*, *Diversispora aurantia* *Diversispora spurca* and *Funneliformis africanum*. In semi-arid areas of Jaipur (India), four genera represented by 11 species have been reported: *Gigaspora*, *Glomus*, *Scutellospora*,

*Entrophosphora* and *Sclerocystis* (Sharma et Gheek Batra, 2014). Species of the genus *Gigaspora* are considered best suited for this kind of habitats subject to drought and soil salinity (Muthukumar and Udaiyan, 2002; Fa-doua Sghir et al, 2015).

The soil analysis revealed strong alkaline soil.

Intraradical hypha, vesicles, and arbuscules were detected in all date palm root samples from the Rhizospheric soil surveyed. Root colonization reached between 30 and 74%. The highest root colonization was observed in the Sample 1 site. At the opposite extreme, the lowest level of root colonization was observed in the Soil of Sample 2. Similar to root colonization, significant differences were observed between sites for spore density parameter At the Sample 1 site, spore density reached 115 spores/100 g of soil whereas spore density reached 98 spores/100 g of soil at the Sample 2 site and 251/100 g of soil at Sample 3.

Fourteen distinct AMF species were isolated from the three palm grove sites. The genus *Glomus* was represented by 6 species: *Glomus mosseae* (Nicol and Gerd.) Gerd. and Trappe, *G. fasciculatum* Gerd. and Trappe emend. Walker and Koske, *G. formosanum*, *G. aggregatum* Schenck and Smith emend. Koske, *G. caledonium* *G. monosporum*. Three *Gigaspora* species: *Gigaspora ramisporophora* . *Gigaspora candida* , *Gigaspora albida* one *Acaulospora* species, one *Scutellospora* and one *Sclerocystis* species . *Glomus mosseae* were the most abundant and frequently observed AMF when *Glomus aggregatum* species showed up respectively at only one collecting site.

This shows that the soil was Moderately alkaline. The bulk density of all the three samples are respectively 1.20, 1.25, 1.16 g/cm<sup>3</sup>. Water holding capacity observed in sample 1 was 90.8%, sample 2 was 89.8% and sample 3 was 90.9% respectively. In a recent

paper, studies show that , Kutch provides suitable factors like a well-drained, deep, sandy type of soil having adequate aeration (12%) with a bulk density of 1-1.5 g/cm<sup>3</sup> and water holding capacity of at least 15%. (J. J. Shah , 2015)

Sr no.	Plant ( <i>Phoenix dactylifera</i> L.)	Occurrence intensity of AM Fungi Vesicles	Arbuscules	Percentage root colonization (%)
1	Sample 1-Madhapar	++	+	74
2	Sample 2-Reladi	+	+	31
3	Sample 3-Anjar	++	+	43

(+ = 1-25% : Poor ; ++ = 25-50% : Good ; +++ = 50-75% : Moderate ; ++++ = more than 75% : Excellent ; - = Absent).

Sr. no.	pH	Moisture content (%)	Water Holding Capacity (WHC) (%)	Bulk density (gm/cm <sup>3</sup> )	Porosity (%)
Sample-1	7.5	5.54	90.81	1.20	65
Sample-2	8	4.75	89.8	1.15	54
Sample-3	8	10.38	90.9	1.16	58

pH Range Soil Reaction Rating as given by Department of Agriculture, Government of India  
 <4.6 = Extremely acid; 4.6-5.5 = Strongly acid; 5.6-6.5 = Moderately acid; 6.6-6.9 = Slightly acid; 7.0 = Neutral; 7.1-8.5 = Moderately alkaline; >8.5 = Strongly alkaline.

Sr no.	Species	.45mic	.105mic	.500mic	Total spores
1	<i>Glomus sp.</i>	1	40	18	59
2	<i>Glomus mosseae</i>	9	15	1	25
3	<i>Glomus fasciculatum</i>	2	-	-	2
4	<i>Glomus formosanum</i>	-	8	4	12
5	<i>Glomus caledonium</i>	2	1	-	3
6	<i>Sceutellospora sp.</i>	2	2	-	4
7	<i>Gigaspora sp.</i>	2	3	-	5
8	<i>Gigaspora albida</i>	-	1	-	1
9	<i>Acaulospora sp.</i>	1	3	1	5

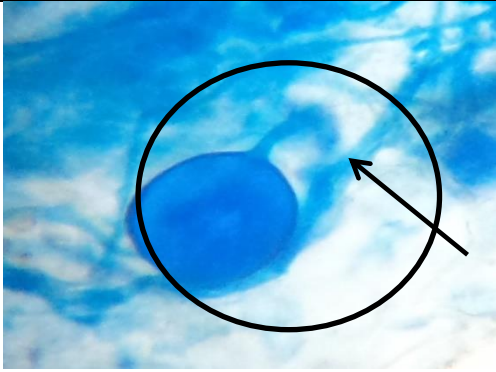
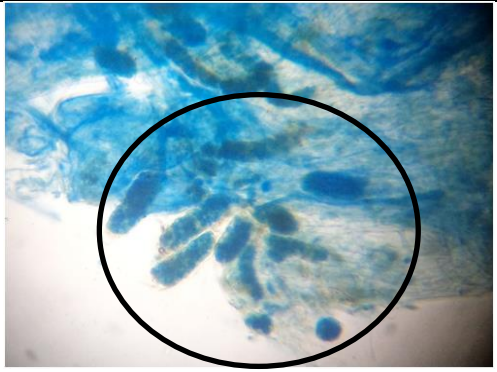
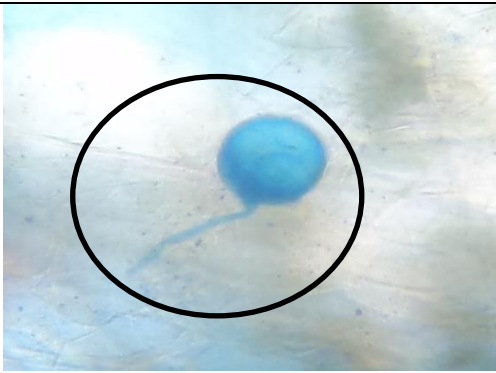
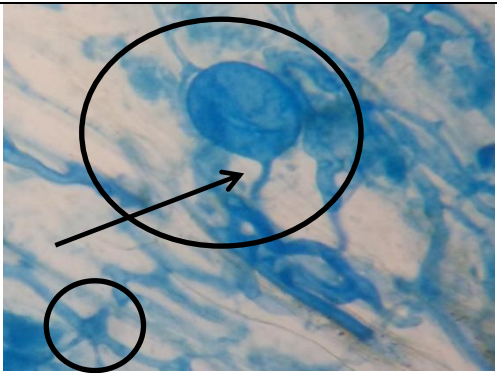


**Table 4 -** Sample 2 AM species diversity

Sr no.	Species	.45mic	.105mic	.500mic	Total spores
1	<i>Glomus sp.</i>	-	-	-	-
2	<i>Glomus mosseae</i>	29	32	17	78
3	<i>Glomus fasciculatum</i>	1	1	1	3
4	<i>Sceutellospora sp.</i>	1	1	-	2
5	<i>Gigaspora sp.</i>	-	1	1	2
6	<i>Gigaspora candida</i>	-	1	-	1
7	<i>Gigaspora ramisporophora</i>	3	2	-	5
8	<i>Acaulospora sp.</i>	2	4	1	7



<b>Table 5:</b> Sample 3 AM Spore diversity					
Sr no.	Species	.45mic	.105mic	.500mic	Total spores
1	<i>Glomus sp.</i>	1	-	-	1
2	<i>Glomus mosseae</i>	95	88	4	187
3	<i>Glomus aggregatum</i>	-	7	-	7
4	<i>Glomus formosanum</i>	6	-	-	6
5	<i>Glomus caledonium</i>	-	2	-	2
6	<i>Glomus monosporum</i>	1	1	-	2
7	<i>Sceutellospora sp.</i>	17	-	-	17
8	<i>Gigaspora sp.</i>	1	-	-	1
9	<i>Gigaspora albida</i>	4	-	-	4
10	<i>Gigaspora candida</i>	1	-	-	1
11	<i>Gigaspora ramisporophora</i>	5	1	-	6
12	<i>Acaulospora sp.</i>	15	1	-	16
13	<i>Sclerocystis sp.</i>	-	1	-	1

**Table 6 : Plates of AM species diversity**

 <p>A micrograph showing a large, circular, blue-stained vesicle. A black circle highlights the vesicle, and a black arrow points to a thin, thread-like hypha attached to its surface.</p>	 <p>A micrograph showing several blue-stained, branched, tree-like structures (arbuscules) within plant cells. A black circle highlights one of these structures.</p>
<p>Sample 1- Vesicle with hyphal attachment</p>	<p>Sample 1- Arbuscules</p>
 <p>A micrograph showing a single, circular, blue-stained vesicle. A black circle highlights the vesicle, and a thin hypha is visible extending from its base.</p>	 <p>A micrograph showing two blue-stained vesicles of different sizes. A black circle highlights the larger vesicle, and an arrow points to it. A smaller circle highlights the smaller vesicle.</p>
<p>Sample 2-Vesicles with hyphal attachment</p>	<p>Sample 2-Vesicles</p>
 <p>A micrograph showing a dense cluster of blue-stained, branched structures (arbuscules) within plant cells. A black circle highlights the cluster.</p>	 <p>A micrograph showing three blue-stained vesicles of varying sizes. A black circle highlights the group of vesicles.</p>
<p>Sample 3-Arbuscules</p>	<p>Sample 3-Vesicles</p>

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# A Review : Wetlands as Treasure of Earth by Providing Ecological Benefits, Threats to Wetlands and Conservation of Wetlands

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## ABSTRACT

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Wetlands are very important as they provide valuable services to human and ecology. It protects the land from flood, erosion and soil degradation. It is very important for biodiversity, as shelter for migratory birds. Water of wetlands are used for irrigation and drinking purposes. It is very important to know the quality of water and soil. As Wetlands has many threats due to human activities, access use of wetland products, irrigation and pollution. There are many projects for conservation of wetlands. It is necessary to take immediate action to protect wetlands.

**Keywords :** Wetlands, Water, Biodiversity, Conservation

## I. INTRODUCTION

Wetlands are the areas of land that are either permanently or temporarily covered by water exhibit enormous diversity according to their genesis, geographical location, water regime and chemistry. A wetland is a land area that is saturated with water, either permanently or seasonally, such that it has characteristics of a distinct ecosystem of the earth. Primarily, the factor that distinguishes wetlands from other land forms or other water bodies is the characteristic vegetation that is adapted to its unique soil condition (Abraham, 2015).

Ramsar Convention on Wetlands, which is an international treaty signed in 1971 for national action

and international cooperation for the conservation and wise use of wetlands and their resources, defines Wetlands (Article 1.1) as “**areas of marsh, fen, peatland or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, including areas of marine water the depth of which at low tide does not exceed six meters**”. Only 26 of these numerous wetlands have been designated as **Ramsar sites** (Ramsar, 2013).

Wetlands are of two basic types: **natural** and **constructed wetlands**. Natural wetlands are natural areas where water covers the soil, including swamps, marshes, fens, sloughs and bogs. Constructed wetlands are ecosystems similar to natural wetlands,

combining physical, chemical and biological processes (USEPA, 2000; Mitsch and Gosselink, 2007).

In terms of the proportion of the geographical area, in India Gujarat has the highest proportion (17.5%) and Mizoram has the lowest proportion (0.66%) of the area under wetlands. In terms of contribution of the total water spread area in country, highest during post monsoon was observed in the states of Gujarat (12.6%) and lowest was in Sikkim and Tripura (0.1% each) (N. Bassi *et al.*, 2014).

The global researches of wetlands mainly focus on ecology, biodiversity and conservation (Whitehouse *et al.*, 2008), water quality improvement (USEPA, 2000), circulation of materials (biogeochemical cycle) (Raich and Schlesinger, 1992), and environmental restoration (Suding *et al.*, 2004; Fink and Mitsch, 2007; Moreno *et al.*, 2007).

## II. RESULT AND DISCUSSION

One of the first widely used classification systems, devised by (Cowardin *et al.*, 1995), was associated to its hydrological, ecological and geological aspects, such as: marine (coastal wetlands including rock shores and coral reefs, estuarine (including deltas, tidal marshes and mangrove swamps), lacustrine (lakes), riverine (along rivers and streams), palustrine ('marshy'- marshes, swamps and bogs) (Wetlands of Gujarat Book).

Wetlands are often considered as nature based solutions that can provide a multitude of services of great social, economic and environmental value to humankind. Changes in land use, water use and climate can all impact wetland functions and services (Thorslund *et al.*, 2017).

In the past 100 years, vast areas of wetlands have disappeared, but programs have been initiated to restore and create wetlands to compensate for this

loss was described by (Mitsch *et al.*, 1998; Verhoeven, 2014). According to N. Bassi *et al.*, (2014) Wetlands provide numerous ecological goods and services but are under tremendous stress due to rapid urbanization, industrialization and agricultural intensification, manifested by the shrinkage I their areal extent and decline in the hydrological, economic and ecological functions they perform. Wetlands are subjected to anthropogenic pressures, including land use changes in the catchment, pollution from industries and households, encroachments, tourism and over exploitation of their natural resources.

Peterson and Baldwin (2004) showed that flooding significantly decreased plant biodiversity in a freshwater wetland, but Brock *et al.*, (1999) argued that when flooding regime are managed correctly in terms of depth and duration of flood, the number of habit typed increases, in turn positively affecting species richness. Allen-Diaz *et al.*, (2004) reported that in tropical and sub-tropical wetlands the aquatic plants act as bio filter, as they intake large amount of organic as well as inorganic nutrients from the eutrophic water bodies enriched pollutant through various dynamic processes, e.g. water cycle, nutrient cycle and food chain, therefore known as 'Kidney of the Landscape' or 'Biological Super Market' by the experts or the areas where the soil is saturated with water are crucial incubators known for the high species diversity.

Golez and Kyuma (1997) has observed that oxidation of pyrite can lead to severe acidification of soil, negatively impacting the environment by potential heavy metal release, on the other side Lamers *et al.*,(2012) if the sediment contains high amounts of iron-bound phosphorus, alternating water regimes can affect ecosystem development by including P mobilization.

Acharya and Adak (2009) had reported that the wetland water are used for irrigation, industry,

thermal power plant, potable supply and fish production under natural eco-system. Livelihoods of people are secured he explained by the example of 30,000 people is dependent on public at lake for their survival. At Chilika Lake 9000 fishing vessels are active throughout the day and night.

Seshamani *et al.*, (1994) reported that one of the finest tools of modern science is the use of remote sensing and GIS in delineating the area, discharge arte, water volume, ground water recharge, soil loss calculation as well as deposition in reservoir, pollution distribution etc. Fish farming, migratory bird movement and water transport or tourism can also be managed in an effective and efficient way using GPS systems. Marshy land and other swampy forest land area, tree coverage, timber-volume, forest fire etc., other important spatio-temporal variability in the wetland forest can be successfully delineated using remote sensing and GIS.

#### **A. Ecological Importance**

Costanza *et al.*, (1997) was investigated that wetlands are most valuable biomes on our planer providing ecosystem services such as nutrient cycle, soil formation and wastewater treatment.

Climate change and large-scale land-user changes (Seneviratne *et al.*, 2006) affect large-scale water fluxes and balances. These changes should therefore also be expected to affect wetland functions and associated ecosystem services.

Balasubramanian and Selvaraj (2003) had reported tanks are also very important from the ecological perspective as they help conserve soil, water and bio-diversity. According to Raje *et al.*, (2013) had given some of the nature-based engineered solutions already used in urban planning and water management (e.g. green roofs, bio-infiltration rain gardens, vegetation in street canyons) have demonstrated to be more efficient, cost-effective,

adaptable, multi-purpose and long-lasting than the so-called 'grey infrastructure' alternatives.

#### **B. Threat to wetland ecosystem**

As per Smakhtin *et al.*, (2004) most of the rivers basins in southern and western India are experiencing environmental water scarcity, which means the discharge in these basins has already been reduced by water withdrawals to such levels that the amount of water left in the basin is less than that required by the freshwater dependent ecosystems.

A study found that out of 629 water bodies identified in the Nation al Capital Territory (NCT) of Delhi, as many as 232 can't be revived on account of large scale encroachments. Similarly, between 1973 and 2007, Greater Bengaluru Region lost 66 wetlands with a water spreads area of around 1100 ha due to urban sprawl (Ramachandra and Kumar, 2008).

Studies reveal the removal of water bodies had led to the decline in water table. Water table has declined to 300 m from 28 m over a period of 20 years after the reclamation of lake with its catchment for commercial activities. In additional, groundwater table in intensely urbanized area such as Whitefield, etc. has now dropped to 400m to 500m (Ramachandra *et al.*, 2012)

Jiang *et al.*, (2015) had reported wetland degradation caused reduction of wetland area, water pollution, environmental degradation, and biodiversity loss among other issues. At the same time, these studies allowed that increased urbanization and agricultural activities are the reasons for wetland degradation.

#### **C. Conservation of wetlands**

In the past 100 years, vast areas of wetlands have disappeared, but programs have been initiated to restore and create wetlands for compensate for this loss (e.g. Mitsch *et al.*, 1998; (Verhoeven, 2014). Although most created wetlands have been designed



for wastewater treatment (Vymazal, 2011), they can also be designed to increase the ecological value of the ecosystems itself (e.g. Weller *et al.*, 2007).

In order to support the implementation of innovative nature-based solutions in environmental management and land use planning, valuation becomes essential; Valuation can refer to monetisation (assessing a monetary value) or to an estimation of worth or importance (Fontaine et al., 2014).

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# Phytochemical Screening of Halophytic Plant *Heliotropium curassavicum* L.

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## ABSTRACT

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According to the World Health Organization, plants are a source of compounds that have the ability to combat disease, antimicrobial, antiviral and antifungal activities. The most important of these bioactive constituents of plants are alkaloids, tannins, flavonoids and phenolic compounds. Halophytes are salt tolerant plants. They contain high amount of secondary metabolites or phytoconstituents. Correlation between the phytoconstituents and the bioactivity of plant is desirable to know for the synthesis of compounds with specific activities to treat various health ailments and chronic diseases as well. The study of the halophytic plant for the preliminary screening of different phytoconstituents is important. Here, I have done preliminary phytochemical screening of Halophytic plant *Heliotropium Curassavicum* L.

**Keywords :** Halophytes, Phytochemical Screening, Secondary Metabolites, *Heliotropium curassavicum* L.

## I. INTRODUCTION

Halophytes are a group of higher plants that grow in saline conditions (Strogonov BP. 2011; Kanakiya A. et al., 2018). They are able to tolerate salt concentration, are good sources for human food including vegetables, pickles, salad, fodder for camels, sheep, goats, wood for building material, biofuel, chemicals, landscaping, dune, etc (Lieth H. 1998; Kanakiya A. et al., 2018). Halophytes, distributed from coastal regions to inland deserts, have traditionally been used for medicinal and nutritional purposes. They synthesize many bioactive molecules and are well equipped with

powerful antioxidant system (Ksouri R. et al., Kanakiya A. et al., 2018).

*Heliotropium curassavicum* L. is a sand binder salt marsh and a perennial herb which can take from a prostrate creeper along the ground to a somewhat erect shrub approaching 0.5m (1.6ft) in height and contains smooth nutlet fruits found in Southeast Asia, America and Europe. *Heliotropium curassavicum* had been traditionally used for ulcers, wounds; local inflammations cure gonorrhoea, erysipelas, enema constipation, edema, bacterial infections cancer and diabetes (V. Katalinic et al.).



Halophytic plant *Heliotropium curassavicum L* collected from natural habitat.

## II. MATERIALS AND METHODS

### 2.1 Collection of plant materials

Halophytic plant *Heliotropium curassavicum L* were collected from Gulf of Khambhat, Khambhat region, Gujarat. Whole plant were collected and further used to study the therapeutic values and preliminary phytoconstituents screening of the plant.

### 2.2 Preparation of Extracts

For the determining the presence of phytoconstituents of the plant sample the sample were weighted. The plant sample was uniformly

shade dried and it was powdered by using a blender and sieved in to coarse powder. It was extracted with four different solvents such as acetone, methanol, petroleum ether and hexane. For the extraction I had choose Soxhlet extraction method.

### 2.3 Preparation of Soxhlet Extraction

Soxhlet extraction is only required where the desired compound has a limited solubility in a solvent, and the impurity is insoluble in that solvent. If the desired compound has a high solubility in a solvent then a simple filtration can be used to separate the compound from the insoluble substance. The advantage of this system is that instead of many portions of warm solvent being passed through the sample, just one batch of solvent is recycled. This method cannot be used for thermolabile compounds as prolonged heating may lead to degradation of compounds.

### 2.4 Phytochemical Analysis

The preliminary qualitative phytochemical investigation of *Heliotropium curassavicum L* extract in different solvents was performed to detect the phytoconstituents such as alkaloids, flavanoids, phenols, tannins, Saponins, carbohydrates/sugar, glycosides, steroids and proteins was performed by the standard procedure as described by Trease and Evans 1989, Harborne, 1973.

## III. RESULTS AND DISCUSSION

Phytochemical Screening of *Heliotropium curassavicum L*. was carried out using different tests described below:

TABLE I. Preliminary Screening Analysis for different Phytoconstituents

Phytoconstituents	Test	Observation
<b>Alkaloids</b>	<b>Mayers Test</b> (1ml extract + 2ml mayers reagent) <b>Dragndroff Test</b> ( 1ml extract + 1-2 ml Dragndroff reagent) <b>Wagner's Test</b> (1ml extract + Wagner's reagent)	Dull white precipitate  Orange-red precipitate  Reddish brown precipitate
<b>Flavonoids</b>	<b>Alkaline Reagent Test</b> (few ml extract + few drops of NaOH + dil. HCL) <b>Zinc Hydrochloride Reduction Test</b> (few ml extract + Zn dust + conc. HCL) <b>Pew Test</b> ( 1ml extract + pieces of metallic magnesium + 2 drops of conc. HCL)	Yellow color turns colorless  Red color precipitates  Brownish color precipitates
<b>Phenols</b>	<b>Ferric chloride Test</b> (few ml of extract + 5ml distilled water + few drops of 5% ferric chloride solution) <b>Lead acetate Test</b> (few ml extract + 3ml 10% Lead acetate soln.) <b>Potassium Dichromate Test</b> (few ml extract + potassium dichromate soln) <b>Alkaline Reagent Test</b> (few ml extract + sodium hydroxide NaOH)	Blue-green coloration  Bulky white precipitate  Precipitation shows presence of tannins and phenolic compounds  Yellowish red precipitation
<b>Tannins</b>	<b>Lead acetate Test</b> (few ml extract + 3ml 10% Lead acetate soln.) <b>Potassium Dichromate Test</b> (few ml extract + potassium dichromate soln)	Bulky white precipitate  Precipitation shows presence of tannins and phenolic compounds
<b>Saponins</b>	<b>Frothing Test</b> (few ml extract + 5ml distilled water + shake vigorously till froth remains persistent. 3 drops olive oils.	Formation of emulsion.
<b>Steroids</b>	<b>Liebermann Buchard Test</b> (few ml extract + few drops of acetic anhydride. Boil + cool. + add conc. Sulphuric acid.)	Brown-ring formed

	<b>Libermann sterol Test</b> (few ml extract + 1ml glacial acetic acid + 1 drop conc. Sulphuric acid)	A play off roles from red, violet, blue to green.
<b>Glycosides</b>	<b>Keller-Killani Test</b> (few ml extract + 5 ml water + glacial acetic acid + 1 drop of 5% ferric chloride soln + conc. sulphuric acid)	Reddish brown ring, violet ring below brown ring or green ring below red ring.
<b>Sugar/ Carbohydrates</b>	<b>Fehling's Test</b> (1ml extract + 1ml fehling A + 1ml fehling B soln) <b>Benedict's Test</b> (0.5 ml extract + 0.5 ml benedicts' reagent, heat.)	Brick red color precipitation  Reddish brown precipitates
<b>Protein /Amino acids</b>	<b>Millon's Test</b> (2ml extract + few drops of millon's reagents) <b>Ninhydrin Test</b> (2ml extract + 2 drops ninhydrin soln)	White precipitates  Purple color precipitation

TABLE II

Result of phytochemical analysis of *Heliotropium curassavicum L.* plant in four different solvents

Phytoconstituents	Acetone	Methanol	Petroleum ether	Hexane
Alkaloids	+	+	-	-
Flavanoids	-	-	-	-
Phenols	+	+	+	+
Tannins	+	+	+	+
Saponins	-	-	+	+
Steroids	+	+	+	+
Glycosides	-	-	-	-
Sugar / Carbohydrates	-	-	-	-
Protein / Amino acids	+	+	-	-

#### IV. CONCLUSION

Screening of *Heliotropium curassavicum L.* clearly reveals that the maximum classes of phytoconstituents are present in it. Phytoconstituents like alkaloids, phenols, tannins, steroid and protein are present in both acetone and methanol solvent but they absent in petroleum ether and hexane. So, it could be concluded that the methanol and acetone are better solvents for the preliminary screening of *Heliotropium curassavicum L.*

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## Systematic Review on Therapeutic Applications of Yeast ‘*Saccharomyces*’

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### ABSTRACT

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This article is an examination of the therapeutic applications of yeast ‘*Saccharomyces*’. The scientific development and subsequent usage of *Saccharomyces* as a potential biodrug continue to influence researchers worldwide today. This article examines the research done and published by researchers and scientists. Consideration of current trends and data in scientific queries and demonstrates further aspects of therapeutic applications of yeast ‘*Saccharomyces*’. Additionally, this article explores options for the treatment of various ailments by using *Saccharomyces* as a probiotic. Being a probiotic, *Saccharomyces* has antimicrobial activity, can modulate immune responses and competes with pathogens for adhesion sites and nutrients. It showed efficient results and can be used in diarrhea, acute and chronic gastrointestinal diseases, Acute necrotizing pancreatitis (ANP), Giardiasis, Autoimmune Encephalomyelitis (EAE), Crohn's disease, etc. It is also proved to reduced the vaginal bacterial and fungal loads, thereby aiding the treatment of vaginal diseases; even oral administration has been tested to show positive results.

**Keywords** : Probiotic, Recombinant Yeast, Intestinal disorders, Immunomodulation, Vaginal Infections

### I. INTRODUCTION

A genus of fungi is *Saccharomyces* which includes many species of yeast. This study primarily focuses on *Saccharomyces boulardii* and *Saccharomyces cerevisiae*. *Saccharomyces boulardii* is the first strain that was studied for use as probiotics in human medicine. *Saccharomyces cerevisiae* and

*Saccharomyces boulardii*, when used as a probiotic feed additive, inhibits toxins, improves microflora, has antimicrobial activity, can modulate immune responses and competes with pathogens for adhesion sites and nutrient. The use of probiotics in therapy had various advantages, including low cost of treatment, few side-effects and drug resistance. It also leads to the restoration of bacterial imbalances.



The average estimated *incidence of diarrhea* in children aged 0-6 years was 1.71 and 1.09 episodes/person/year in rural and urban areas. In India, presently the *diarrhoeal morbidity* stands at 1.07 million cases, and mortality stands at 2040 in these children. In India, prevalence rates of *Giardia* infection in patients with diarrhea range from 0.4% to 70%, and asymptomatic cyst passage has been found to be as high as 50% in rural southern India. This being the statistics of just two of many diseases that can be treated by *Saccharomyces*, one can well imagine the importance of better treatment, hence proving its importance. There have been several past attempts in treating these conditions with antimicrobial and other forms of therapy. But the most advantageous point of yeast is that it is not affected by antibacterial drugs and thus can act in synergism with them. Later it can be treated with an antifungal drug if needed. High mucus production in gerbils infected with *Giardia* was observed in patients administered with *Saccharomyces boulardii*, which showed a reduction in parasitic load by inhibiting the adherence of trophozoite on intestinal epithelium. Thereafter the oxidative stress produced due to the infection was neutralized, which together prevented Giardiasis.

*Saccharomyces cerevisiae* displayed slight/moderate antioxidant and anticancer properties. The administration of *Saccharomyces boulardii* caused a reduction in hemorrhage and inflammatory infiltration, necrosis of hepatocytes caused due to various conditions like autoimmune diseases, drug-induced liver injury (DILI), acute viral infections from hepatitis and ALF(acute liver failure). *Saccharomyces* is now used for the expression of heterologous proteins with therapeutic value against infectious diseases along with recombinant yeast (WRY), yeast surface display (YSD) and virus-like particles (VLPs), a strategy in the fight against infectious diseases and cancer with the present status of yeast-based vaccines in clinical trials.

*Saccharomyces* is considered an ideal system for the expression and accumulation of high levels of recombinant interfering RNA. *Saccharomyces* is also engineered to express antigens specific to or associated with tumor cells like Ras gene mutation, or carcinoembryonic antigen had been shown to act as a potential therapeutic vaccine. In the near future, yeast-based edible or oral vaccines may be expected on shelves in medical dispensaries or clinical stores.

Crohn's disease is believed to destroy the intestinal microbiota, and regeneration takes a long time, during which chemical relapses are very common. *Saccharomyces boulardii* is very similar to *Saccharomyces cerevisiae* due to which on the administration of this strain, the same kind of antibodies is produced in the host system, which is very specific against Crohn's disease. *Saccharomyces cerevisiae* is potent in decreasing pro-inflammatory cytokines and increasing T cells and other immune cells of innate and adaptive immunity. *Saccharomyces boulardii* and *Saccharomyces cerevisiae* are identical genetically but differ in resistance to temperature, acidic stressors and growth characteristics were effective in reversing most but not all of the stress - induced dysmotility. They have shown auto-aggregation ability, cell surface hydrophobicity, antimicrobial activity against bacteria and fungi, strong antioxidant activity, reducing power, nitric oxide and hydroxyl radical scavenging activity, brine shrimp cytotoxicity, acute toxicity, metal ion chelating activity, antibacterial activity and are found to be tolerant to stresses and produce vitamin, enzymes that prevail inside the human body.

## II. METHODS AND MATERIAL

This study was conducted using four databases: Google Scholar, SAGE, DOAJ and PubMed. The selection of papers was made based on keywords and themes relevant to this review. Further, the published

papers from these databases were arranged in systemic order with respect to the year of publication.

### III. RESULTS AND DISCUSSION

#### 3.1 *Saccharomyces boulardii*<sup>1-10</sup>

##### *Saccharomyces boulardii* as a therapeutic agent for Pseudomembranous Colitis

*Clostridium difficile*, a pathogen that causes Pseudomembranous colitis (PMC), produces two cytotoxins; Cytotoxin A that causes increased fluid secretion into the colonic lumen by altering the cytoskeleton and tight junctions between mucosal epithelial cells and Cytotoxin B causes electrophysiologic changes and tissue damage leads to release of inflammation mediators by mucosal cells and immune system cellular response. The standard therapy available for *Clostridium difficile*- positive diarrhea and PMC like Vancomycin and Metronidazole is not specific to one organism and causes the disturbance of normal flora, while *Saccharomyces boulardii* does not disturb the normal flora and can be administered orally. The study investigates the effect of *Saccharomyces boulardii* on the prevention of Pseudomembranous colitis.

The protection of *Saccharomyces boulardii* against PMC was measured with the help of three mechanisms. There was a decrease in the activity of enzymes such as lactase, maltase, sucrase in PMC, which can lead to diarrhea. After the administration of *Saccharomyces boulardii*, an increase in the activity of these enzymes was noted and was statistically significant compared with baseline. The second mechanism involved measuring the impact through secretory antibody immunoglobulin alfa IgA. IgA inhibits the proliferation of *Clostridium difficile* by preventing its attachment to the intestinal wall and therefore prevents the production of toxins. The third mechanism involved investigating the effect of protease produced by *Saccharomyces boulardii* on cytotoxins A and B. In addition to monotherapy, the

effect of this probiotic yeast was also observed in combinations.

It was concluded that no adverse effects (other than thirst and constipation) were reported in treatment with *Saccharomyces boulardii*. Administered as an oral therapy, it can prevent the development of diarrhea and PMC. In combination studies with Vancomycin and Metronidazole (administered to patients with active-antibody-associated diarrhea), *Saccharomyces boulardii* did not prevent the first relapse. However, it reduced second or further relapse to PMC.

##### Impact of *Saccharomyces boulardii* on diarrheal pathogens

Diarrhea affects the bowel's complex ecosystem and causes the invading pathogens to colonize it. Living microorganisms can be used for the prevention and treatment of intestinal infections. Probiotics or the biotherapeutic agents like *lactobacilli*, *bifidobacterial* and *Saccharomyces boulardii* can be used for gastrointestinal infections. Steady-state concentrations of *Saccharomyces boulardii* were noted in the colon within three days in Pharmacokinetic studies, which was removed 2-5 days from the stool after administration. *Saccharomyces boulardii* has a protective effect against enteric pathogens. Being a yeast, it shows resistance to antibacterial antibiotics. Therefore it is better than bacterial biotherapeutic agents. However, antifungal agents such as nystatin were able to remove it from the digestive tract.

**Table 1** Effects of *Saccharomyces boulardii* on different diarrheal pathogens

PATHOGEN	EFFECT OF <i>S. boulardii</i>
<i>Clostridium difficile</i>	Toxin A and B, associated with <i>Clostridium difficile</i> , were directly affected by <i>Saccharomyces boulardii</i> . Yeast's effects of <i>Saccharomyces boulardii</i>

	serine protease against <i>Clostridium difficile</i> were noted partially.
<i>Vibrio cholerae</i>	It was observed that a substance produced by <i>Saccharomyces boulardii</i> interfere with Ca-mediated chloride secretion and resulted in antidiarrheal effects.
Enterobacteriaceae	Phosphorylation of ERK1/2 mitogen-activated protein kinase was attenuated by <i>Saccharomyces boulardii</i> ; the modulation of the ERK1/2 pathway resulted in the decrease in bacteria.

The mechanism of action of *Saccharomyces boulardii* in different gastrointestinal pathogens was evaluated. The antimicrobial substances produced as a 54-kDa protease and 120-kDa protein inhibited *Clostridium difficile* and *Vibrio cholerae* infections. An antagonist effect against EPEC infection was exerted by *Saccharomyces boulardii* that led to the preservation of barrier function in infected cells; the signal transduction pathway during EPEC infection was also modulated by this yeast. It protected the host against diarrheal pathogens and infection by increasing the host's intestinal mucosal immune response. Therefore, *Saccharomyces boulardii* can be used as a therapeutic agent in *Clostridium difficile*-associated disease and in the prevention of diarrheal infectious pathogens.

**Effects of *Saccharomyces boulardii* in combination with antibiotics in acute amoebiasis**

Amoebiasis is caused by entamoeba histolytica, an organism that feeds on intestinal contents and can also cause abscess when moved from bowel to liver and other organs. Although this organism is avirulent, it can become virulent in people with malnutrition, immune suppression, alterations in the intestinal flora.

Additionally, it exists as cysts in the intestine. Cysts can be treated with the help of luminal amoebicides like iodoquinol, paromomycin or diloxanide furoate. *Saccharomyces boulardii*, a saprophytic and thermophilic yeast, is resistant to gastric juice and can grow in the gastrointestinal tract. The use of *Saccharomyces boulardii* in addition to the standard treatment for invasive amoebiasis was being assessed in this study. It involved the study of the efficacy of *Saccharomyces boulardii* with antibiotics in Amoebiasis.

The study involved 57 participants, out of which 2 participants were excluded due to non-compliance. It was observed that the mean duration of diarrhea, abdominal pain and fever was reduced to half while there was no effect on headache.

*Saccharomyces boulardii* was effective for the treatment and prevention of septic enteritis. Additionally, it proved to be helpful in traveler's diarrhea, colitis and Crohn's disease]. It inhibited the enteropathogens and showed antidiarrheal property; it can be used for diarrhea in children. In healthy volunteers, it also showed the tropical effects on the small intestine. Administration of lyophilized *Saccharomyces boulardii* with antibiotics resulted in the reduction of cysts and symptoms, which may be due to the restoration of normal gut flora. Thus, it proved to be useful in addition to the standard treatment for the treatment of amoebic dysentery.

**Table 2** actions of *Saccharomyces boulardii*

ANTIMICROBIAL ACTIVITY	Inhibits bacteria and parasite's growth; neutralizes bacterial virulence factors; reduces gut translocation of pathogens
ANTITOXIN EFFECTS	Inhibits toxin receptor binding sites; causes the secretion of enzymatic proteins
IMMUNE RESPONSES	Have effects in innate and adaptive immunity; promote

		mucosal anti-inflammatory signaling effects; reduces pro-inflammatory responses.
EFFECTS ON INTESTINAL MUCOSA		It prevents apoptosis, reduces mucositis, causes the production of intestinal amines; restoration of fluid transport pathways.

**Table 3** effect of *Saccharomyces boulardii*

ACUTE GASTROINTESTINAL DISEASES	
Antibiotic-associated Diarrhea	Efficacious in preventing AAD
<i>Clostridium difficile</i> Infection	No data obtained compelled the routine use of <i>Saccharomyces boulardii</i> for the treatment of CDI, although small data in children stated the effect of <i>S. boulardii</i> in CDI.
Acute Diarrhea	It May be effective as an adjunctive therapy.
Persistent Diarrhea	Useful in PD
Enteral nutrition-related Diarrhea	The reduction was noted in <i>Saccharomyces boulardii</i> group.
Traveler’s Diarrhea	<i>Saccharomyces boulardii</i> was effective.
<i>Helicobacter pylori</i> infection	It was effective in reducing the side-effects of standard triple therapy, although it was not able to eradicate it.
CHRONIC GASTROINTESTINAL DISEASES	
Crohn’s Disease	Relapsed cases were less, and improved results compared to placebo were noted.
Ulcerative Colitis	Reduce and maintain remission of Ulcerative colitis
HIV-related diarrhea	More effective than placebo

chronic gastrointestinal diseases and was helpful in protecting normal gut flora. However, care should be, and risk factors should be considered for adverse events.

***Saccharomyces cerevisiae* var. *boulardii* fungemia as probiotic agents**

Probiotics are used in the treatment and prevention of gastrointestinal diseases and systemic inflammatory processes. Cases of fungemia after the administration of probiotics in immunocompromised patients have been reported. A case of *Saccharomyces cerevisiae* var. *boulardii* fungemia in an immunocompromised patient was noted after the treatment with probiotic of *Saccharomyces cerevisiae* var. *boulardii*. The use of probiotics has caused more cases of fungemia. However, clinical trials are not successful in establishing the positive effects of probiotic use. An immunocompromised patient developed diarrhea after series of treatments for frontal lobe glioblastoma multiforme. The patient was prescribed lyophilized *Saccharomyces boulardii*; stool analysis showed the presence of fecal leukocytes and *Clostridium difficile* A and B toxins, after which Metronidazole was prescribed. The culture revealed the presence of *Saccharomyces cerevisiae* var. *Boulardii* fungemia was detected, after which probiotic treatment was discontinued. The use of *Saccharomyces cerevisiae* var. *boulardii* was established to exert an effect against *Clostridium difficile* by neutralizing toxin A and B due to the production of proteases. It was being used in antibody-associated diarrhea and CDI treatment. However, as reported in many cases, patients with severe systemic gastrointestinal disease or immunosuppressed individuals it has reported causing fungemia, specifically from *Saccharomyces boulardii*. Therefore, caution must be taken, especially in the case of critically ill patients in the use of probiotics for treatment.

*Saccharomyces boulardii* was considered to be a good therapeutic agent for the treatment of acute and

### **Impact of *Saccharomyces boulardii* CNCM I-745 on microbiota-gut-brain axis in a humanized mouse model of Irritable Bowel Syndrome**

Irritable bowel syndrome (IBS), accompanied by psychiatric comorbidities like depression and anxiety, is a disorder of gut-brain communication. It is associated with chronic abdominal pain, altered bowel habits. Patients with IBS show disturbances in composition, temporal stability, metabolic activity. The study involved the impact of probiotics on gut dysfunction and psychiatric comorbidities. A strain of *Saccharomyces boulardii*, CNCM I-745, was used to examine the therapeutic effects of this strain on anxiety-like behavior and gut dysfunction in a humanized mouse model of Irritable Bowel Syndrome with anxiety.

Anxiety-like behavior was normalized due to the administration of the *Saccharomyces boulardii*. 30% faster gastrointestinal transit was observed in Ex-germ-free mice induced with microbiota from IBS+A patient than mice colonized with HC (Healthy Control) microbiota, although the gastrointestinal transit did not cross the statistical significance level. A two-fold increase in the expression Trpv1, the gene associated with visceral hypersensitivity and anxiety, was noted in IBS+A microbiota colonized mice than in the control group. The expression was decreased after the administration of *Saccharomyces boulardii*, although the result was not statistically significant. The microbiota profiles of IBS+A and HC were seen to be clustered in beta-diversity analysis while the profiles of IBS+A receiving water or *Saccharomyces boulardii* coincided. The differences discovered during the analysis at family and genus levels between IBS+A and HC were normalized after the treatment with *Saccharomyces boulardii*. The number of bacterial genes for indole alkaloid biosynthesis, indoles are the activators of Aryl hydrocarbon Receptor (AhR), were 20-fold higher in IBS+A mice treated with *Saccharomyces boulardii* than in those

receiving water. The AhR activity (measured in mouse feces) was increased in IBS+A treated with *Saccharomyces boulardii* than in control and IBS+A that received water. Additionally, indol-3-acetic acid (IAA) and indole-producer *Lactobacillus* were also higher in *Saccharomyces boulardii* treated IBS+A. Therefore, it was noted that microbial indole production was increased by *Saccharomyces boulardii* in vitro.

Several factors contributed to the development of IBS, like intestinal dysfunction, impaired brain-gut interactions, psychosocial status. Induction of fecal microbiota from IBS+A in germ-free mice resulted in gut dysfunction and anxiety-like behavior. It can be inferred that the anxiety-like behavior was reduced after the treatment of *Saccharomyces boulardii* in a humanized mouse model through various mechanisms like increased production of indole metabolites, IAA, suggesting the usefulness of this strain of *Saccharomyces boulardii* in IBS. Therefore, this probiotic agent can be used in patients with Intestinal Bowel Syndrome and for its comorbidities.

### **Clinical evidence : as extracted from clinicaltrials.gov *Saccharomyces boulardii* in Irritable Bowel Syndrome (SB-IBS)**

It was an interventional, randomized, parallel assignment, Triple (Participant, Investigator, Outcomes Assessor) masked study. The primary outcome included testing clinical symptoms, cytokine levels, histology features before and after the intervention within six weeks and then the impact of *Saccharomyces boulardii* in the safety of the drug was assessed. (no results posted)

### **The Effect of Probiotics on *E.coli* induced Gastroenteritis**

The study involved 60 participants in an interventional, randomized, triple masked (Participant, Investigator, Outcome assessor)

experiment. It involved two groups: Probiotic group and Control group. The primary outcome was to compare the enterotoxigenic *E. coli* (ETEC) excretion over time curve between the two groups. Bowel habits, the severity of gastrointestinal symptoms were also measured. (no results posted).

#### **Effects of *Saccharomyces boulardii* and Amoxicillin/Clavulanate on Gut Microbiota**

The trial involved four groups: Probiotic-*Saccharomyces boulardii*; Antibiotic- Amoxicillin Clavulanate; Combination of both; Control. It was a randomized, parallel assignment, open-label trial. The results were assessed according to the Gastrointestinal System Rating Scale; an increased score meant increased symptoms. It was observed that the mean gastrointestinal symptom rating scale scores were lower in the combination group in comparison to other groups (data are taken till 21 days). Also, most of the days, the value was less in the probiotic group than the antibiotic group.

#### **Effectiveness of *Saccharomyces boulardii* for Gastrointestinal Bacterial-overgrowth in Systemic Sclerosis**

The study was carried out to test the effectiveness of *Saccharomyces boulardii* oral tablet (given for 2 weeks, then 2 weeks rest and continued for 2 months) in combination with Metronidazole. Randomized, parallel assignment, the open clinical trial consisted of 39 participants. Breath test using hydrogen monitor was used to see small intestinal bacterial overgrowth and gastrointestinal symptoms were noted before and after the intervention. (results not posted).

#### **Impact of Additional Treatment with *Saccharomyces boulardii* on Quality of Life in Patients with Mild Forms of Ulcerative Colitis and Crohn Disease**

The trial was carried out to study the effect of *Saccharomyces boulardii* and dietary supplements in ulcerative colitis and Crohn disease. The study divided patients into two groups: treatment and control and was assessed after 4 weeks of initiation of

therapy through a questionnaire. It was a randomized, parallel assignment trial with Quadruple (Participant, Care Provider, Investigator, Outcomes Assessor) masking. (results not posted).

#### **Efficacy and Safety of *Saccharomyces boulardii* in the Treatment of Small Intestinal Bacterial Overgrowth**

Involved in testing the efficacy of *Saccharomyces boulardii* with low fermentation diet administration. It was a randomized, parallel assignment, an open-label trial involving 71 participants. The severity of symptom was measured using Irritable Bowel Syndrome Symptom Severity Scale. (no results posted)

### **3.2 *Saccharomyces cerevisiae*<sup>11-21</sup>**

#### ***Saccharomyces cerevisiae* used to investigate the response to anticancer agents.**

The development of new strategies for cancer therapeutics focuses on yeast *Saccharomyces cerevisiae* as a model system by the use of mutant yeast panels to mimic cancer phenotypes, screen and study tumor features and synthetic lethal interactions. *Saccharomyces cerevisiae*, the first eukaryote to have its genome fully sequenced, used as a compatible model organism to study cell cycle control, DNA repair, aging, gene expression, autophagy and molecular and cellular pathways of human diseases, including cancer. Identification of the alkylating agent cisplatin and the topoisomerase II poison mitoxantrone, characterization of the doxorubicin and bleomycin resistant profiles introduces a way to mimic a variety of cancer phenotypes in the yeast-conserved genetic background. Yeast-based systems have proved to be a useful tool in small molecules screening for HDAC activity. Yeast Rpd3 deacetylase shares a 60 % identity to human class I HDAC proteins. Yeast also presents limitations, its cell wall, lack of important human proteins in anticancer research such as tumor suppression, apoptosis and drug metabolism. The use of *Saccharomyces cerevisiae* represents a faster and cheaper solution to screen anticancer drugs and cytotoxicity, providing an

basic and manipulating system to mimic the numerous combination of genetic alterations in cancer cells that may be explored using the synthetic lethal approaches. Treatment effects of beneficial microbes on stress-induced dysmotility microbial effects on intestinal propulsive motility and neuromuscular machinery. *Saccharomyces boulardii* and *Saccharomyces cerevisiae* are identical genetically but differ in resistance to temperature, acidic stressors and growth characteristics were effective in reversing most but not all of the stress-induced dysmotility. A need to identify the bioactive molecules released by the yeasts *Saccharomyces cerevisiae* and *Saccharomyces boulardii* clinical trials further support the therapeutic potential of *Saccharomyces* yeasts in humans.

#### ***Saccharomyces cerevisiae* IFST062013 as a potential probiotic for Antimicrobial and antioxidant activities**

This study tells us the probiotic or health-beneficial potential of *Saccharomyces cerevisiae* IFST 062013 strain which showed auto-aggregation ability, cell surface hydrophobicity, antimicrobial activity against bacteria and fungi, strong antioxidant activity, reducing power, nitric oxide and hydroxyl radical scavenging activity, brine shrimp cytotoxicity, acute toxicity, metal ion chelating activity, antibacterial activity. Thus, Isolate improves lymphocyte proliferation and cytokine production in treated mice considered to be used therapeutically.

A potential probiotic (*Saccharomyces cerevisiae* IFST 062013) (Accession no- HM134859.1) was isolated from fruit identified and characterized on the basis of morphological and biochemical characteristics and phylogenetic analysis. *Saccharomyces cerevisiae* has clinically proven to have a beneficial effect on the host by improving its intestinal microbial balance showing moderate autoaggregation ability and cell surface hydrophobicity that provides adhesion of the microorganisms to intestinal epithelial cells of

patients and to be tolerant to stresses and produce vitamin, enzymes that prevail inside the human body. The resistance to antibiotics makes it suitable for use in patients. Culture supernatant showed least antimicrobial activity indicating that the antimicrobial compounds showed antagonistic activity against human pathogens, strong antioxidant activity, reducing power, nitric oxide and hydroxyl radical scavenging activity, significant brine shrimp cytotoxicity and acute toxicity and metal ion chelating activity possessing significant anti-inflammatory activity in mice. *Saccharomyces cerevisiae* strain stimulates a T-lymphocyte specific proliferative and thus maintains a balance between Th1 and Th2 type cytokines, which is important for host immunity. It is clear that microflora of the human body can be prevented by the use of appropriate probiotics. Further research should be done to ensure safe and efficient therapeutic applications.

#### **Therapeutic use of *Saccharomyces cerevisiae* strain (OBS2) from fermented nectar of toddy palm**

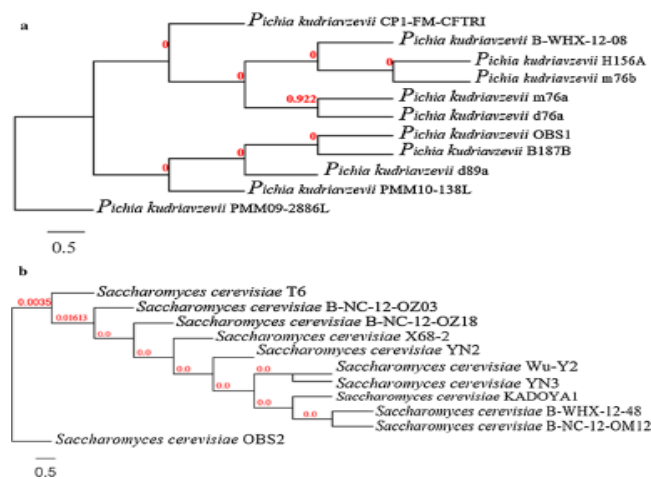
15 yeast strains from the nectar of toddy isolated and characterized. Selected antibiotic resistance strain evaluated in vitro for tolerance to gastrointestinal conditions and for their pathogenicity and adherence to intestinal epithelial cells; as a result, the 2 yeast isolates characterized as *Pichia kudriavzevii* OBS1 (100%), and *Saccharomyces cerevisiae* OBS2 (96%) using BLAST analysis were deposited in the GenBank data library. *Saccharomyces cerevisiae* OBS2 displayed slight/moderate antioxidant and anticancer properties. Hence, strain OBS2 can be utilized and explored as a potential probiotic for therapeutic applications.

A total of 53 yeast isolates (OBS1-OBS53) were isolated from the nectar of toddy palm.

Fifteen yeast isolates (OBS1-OBS15) were selected culturally and morphologically characterized, based

on the results of morphological, cultural and antimicrobial drug sensitivity profiles, 8 isolates were selected. Stress tolerance was tested among the 7 yeast isolates; OBS1 and OBS2 were noticed to tolerate extreme conditions of the gastrointestinal tract like temperature, low pH, organic acids and digestive enzymes, i.e., pepsin and amylase in the stomach and trypsin and bile in the upper intestine expressed a strong adhesive ability of more than 40 yeast cells adhering to the monolayer considered as non-pathogens. Both showed 96% *Saccharomyces cerevisiae* and 100% identity with *Pichia kudriavzevii*, respectively. Accession number KP998094 for *Saccharomyces cerevisiae* OBS2 and KP998095 for *Pichia kudriavzevii*, OBS1 were obtained. Further Therapeutic properties were tested where OBS2 resulted in a slight reduction in percentage cell viability of neuroblastoma cell line IMR32 and increased absorbance with increased concentration of autolysate antioxidant property.

Culturally and morphologically characterized yeast isolates were resistant to the majority of the antibacterial drugs. Based on resilience properties to gastrointestinal parameters, antimicrobial agents' sensitivity, antagonistic activity, pathogenicity, co-cultural activity, adherence ability to intestinal epithelial cells, 2 yeast isolates. Selected and characterized as *Pichia kudriavzevii* OBS1 and *Saccharomyces cerevisiae* OBS2. Two isolates, *Saccharomyces cerevisiae* OBS2 have a cytotoxic effect on cancer cells and antioxidant activity. Hence, it can be used for human probiotic and therapeutic applications.



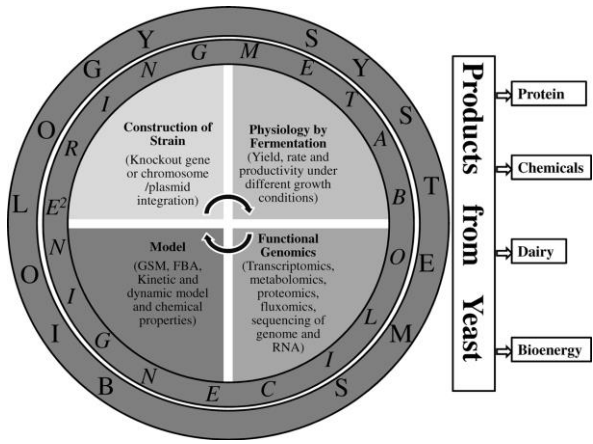
### Biotechnological approach and applications of sustainable yeast

*Saccharomyces cerevisiae* in biotechnology with known genetic and physiological background the availability of large-scale fermentation and biological conversion and in the formation of products such as ethanol, organic acids, amino acids, enzymes, and therapeutic proteins. Thus, sustainable solutions are used to overcome various environmental effects on yeast.

The study mainly focuses on the development of *Saccharomyces cerevisiae* for the production of chemicals, protein, enzymes. *Saccharomyces cerevisiae* is the most dominated in cell factories as 40% of the biopharmaceuticals had been produced by using Chinese Hamster Ovarian cell lines (CHO cells). *Saccharomyces cerevisiae* is chosen to be the most suited organism as a host in microbial production. Engineered yeast help for the production of fatty acid-derived oleochemicals, biofuels, biochemicals metabolites and enzymes such as invertase and lactase, where *Saccharomyces* species are used. A lot of yeast strains are involved in the formation of different milk products like cheese. *Kluyveromyces lactis* and *Debaryomyces hansenii* strain they have actively grown on soft-cheese model curds (SCMC) surface by taking 31 days periods for the ripening, kafir which proved therapeutic properties as a natural probiotic beverage alcoholic fermented beverages and yogurt.



Therefore, available tools from yeast engineering, product optimization will be simpler day by day.



Overview of biopharmaceutical products

Product/s	Industry/Sector	Therapeutic application	Potential market value (USD)
Human serum albumin (Hiro et al., 2012)	Oryzagen	Surgery	US\$57M by 2020 ( <a href="http://www.transparencymarketsearch.com/albumin-market.html">http://www.transparencymarketsearch.com/albumin-market.html</a> )
Hirudin (Hiro et al., 2012)	Minapharm, Keyken, Abbott, Sahbrin, Pfizer	Blood coagulation disorders, Tumor disease, Thrombosis disease	Traditional remedies in China (\$115B) and modern age drugs.
Levemir (Wahb, 2006)	Novo Nordisk	Diabetes	\$6.98B yearly sales ( <a href="http://www.pharmaceutical-technology.com/features/features-the-worlds-top-selling-diabetes-drugs-465244/">http://www.pharmaceutical-technology.com/features/features-the-worlds-top-selling-diabetes-drugs-465244/</a> )
Glucagon (Hiro et al., 2012)		Diabetes	\$30M yearly sales ( <a href="http://www.evaluategroup.com/View/12386-1002-modData/product/glucagon_g_novo">http://www.evaluategroup.com/View/12386-1002-modData/product/glucagon_g_novo</a> )
Valproin (Wahb, 2006)	Biopartners	Growth disturbance	\$20.2B yearly sales ( <a href="http://www.biopharma-reporter.com/Market-Regulations/Biogenic-Case-in-Europe-basis-up">http://www.biopharma-reporter.com/Market-Regulations/Biogenic-Case-in-Europe-basis-up</a> )
Gardasil (Wahb, 2006)	Merck	HPV Vaccination	\$1.2B yearly sales ( <a href="http://www.fierce.com/story/2012/04/23/features-low-key-pharmaceuticals-gardasil-problem.html">http://www.fierce.com/story/2012/04/23/features-low-key-pharmaceuticals-gardasil-problem.html</a> )
Antigen (Hiro et al., 2012)		Hepatitis Vaccination	Over billions per year (\$ 20.6 B in 2006, <a href="https://www.zdxc.dz.mil.th.gov/pubmed/17691948">https://www.zdxc.dz.mil.th.gov/pubmed/17691948</a> )

Recombinant protein production from *S. cerevisiae* (Wahb, 2003; Gengenou, 2004).

Product/s	Industry/Sector	Therapeutic application
Regraxen	Ortho-McNeil pharmaceuticals, Janssen	Diabetic ulcers
Factor 8c	Cilag	
Pasturec	Sanoel-Synthelabo	Hypertaricaemia
Recombinax	Merck	Prevention of hepatitis B
Refluxan	Hoechst Marion Roussel/Behringwerke AG	Anticoagulant therapy for thrombocytopenia
Rescue	Aventis	Prevention of venous thrombosis
Acrapid/velonin/monotard/instantin/propheane/mastard/acraphean/ultrastard	NovoNordisk	Diabetes
Novolog/Novolog mix 70/30	Novo Nordisk	Diabetes
Novomix 30	Novo Nordisk	Diabetes
Novolin	Novo Nordisk	Diabetes
Novorapid	Novo Nordisk	Diabetes
Glucagen	Novo Nordisk	Hypoglycemia
Ambrix	GlaxoSmithKline	Prevention of hepatitis A and B
Pediarix	SmithKline Beecham	Prevention of hepatitis B
TriHemix HB	SmithKline Beecham	Vaccination against hepatitis B, diphtheria, tetanus and pertussis
HBVADP60	Aventis Pharma	Prevention of hepatitis B
Triwix	GlaxoSmithKline/SmithKline Beecham	Prevention of hepatitis A and B
Convax	Merck	Vaccination against H. influenzae type B and hepatitis B
Infantina beta	SmithKline Beecham	Prevention of diphtheria, tetanus, pertussis, Haemophilus influenzae type B, hepatitis B and polio
Infantina (type B)	SmithKline Beecham	Prevention of diphtheria, tetanus, pertussis and hepatitis B
Infantina/Penta	SmithKline Beecham	Prevention of diphtheria, tetanus, pertussis, hepatitis B and polio
Hexavix	Aventis Pasteur	Prevention of diphtheria, tetanus, pertussis, hepatitis B, Haemophilus influenzae type B and polio
Primovax	Aventis Pasteur	Prevention of diphtheria, tetanus, hepatitis B

Recombinant protein production from other yeast species also.

Protein	Application/Sector	Yeast species
Human serum albumin and interferon alpha2b fusion protein (HSA-IFNalpha2b) (Zhao et al., 2008)	Used as immunostimulants with potential application for the treatment of HIV infection in medical field	PMK1-disrupted <i>Pichia pastoris</i>
Fibroblast growth factor 20 (FGF20) (Yang et al., 2013)	Involved in embryonic development, cell growth, morphogenesis, tissue repair, tumor growth and invasion and help in effective drug development	<i>P. pastoris</i> strain with P1 stem cell factor
Germarin, a 35 residue polypeptide, (Sigulike et al., 2012)	Used as sweet taste-suppressing protein and in study of sweet taste transduction in rat for drug development	<i>P. pastoris</i>
Human P53 tumor suppressor (Mokhad Gargouri et al., 2012)	Used as therapeutic protein in medical field	<i>P. pastoris</i> with strong and inducer promoter AOX1
Protein P-aminopeptidase NapA (Heyland et al., 2013)	Used in protein hydrolysis industry. It helps in measuring the activity of the YCA cycle of yeast	<i>Pichia pastoris</i>
Viral H1N1Ag protein (Mokhad Gargouri et al., 2012)	Used as therapeutic protein in medical field	<i>Saccharomyces cerevisiae</i> with strong and inducer promoter Gal10/Cyc1
Recombinant hepatitis B small (S) and medium (M) proteins (Liu-Björk et al., 2009)	Used as powerful adjuvant to develop an immune therapy for chronic hepatitis B virus infection in pharmaceutical industry	<i>S. cerevisiae</i> containing S and preS2-6 genes under inducible condition
Insulin protein (Liu et al., 2012)	Used for diabetic treatment in pharmaceutical industry	<i>S. cerevisiae</i> strain with SIC
Human hemoglobin (Liu et al., 2010)	Used as an oxygen carrier substitute in medical field	<i>S. cerevisiae</i>
Recombinant aquaporin Ppal protein (PPSI), (Carmichael et al., 2017)	Used to glycerol uptake/efflux facilitator protein as drought and salinity response in <i>Xenopus laevis</i> plant in agriculture.	<i>S. cerevisiae</i> with gpdA, arf6A, gnc1 and YJH20MS1
Hepatitis B surface antigen (Gruvatt et al., 2015)	Used to produce hepatitis vaccines	<i>Schizosaccharomyces pombe</i>
Green fluorescent protein or a fluorescent single-chain antibody fragment (Klein et al., 2015)	Used to monitoring dynamic processes in cells or organisms which is infected by virus	<i>S. pombe</i> strain NCV C0306 with plasmid pT2p-GFP

Few examples of biofuel (normal and advanced level) shown with involved respective yeast strains.

Biofuels	Carbon sources and pathways	Yeast
Ithanol (Chen et al., 2008; Stanley et al., 2010)	Operated in fed batch mode system. This yeast metabolizes glucose in the absence of oxygen to produce ethanol and carbon dioxide in cellular energy pathway. Genetic engineered yeast strain developed improves ethanol tolerance property.	<i>S. cerevisiae</i> ATCC 20002
1-Propanol or n-propanol (Grafici et al., 1993; Nishimura, 2016)	Capability to utilizing not only glucose but also xyllose. Efficient microbial strain to have less hydrogen sulfide formation nature and try to develop the metabolic engineered strain <i>S. cerevisiae</i> to develop 2-ketobutyrate Biosynthetic Pathway	Wild strain <i>S. cerevisiae</i>
Isopropanol (Tamaoka et al., 2013; Walther and Franqui, 2016)	Disruption of several endogenous genes and simultaneous overexpression of acetyl-CoA synthetase and acetyl-CoA acetyltransferase shows glucose consumption for a isopropanol yield of 41.5 %	Genetically engineered strain yeast <i>Candida utilis</i>
n-Butanol (Casarone, 2008; Swidah et al., 2015; Jung et al., 2012; Schwabeg and Bödes, 2016)	Glucose consumed via synthetic acetone-butanol-ethanol (ABE) pathway and endogenous pathways dependent on threonine or glycine catabolism and adh1 mutants of <i>S. cerevisiae</i> A267/ES68K improves the n-butanol yield significantly. It creates butanol resistant strain, reproducibly generated up to 1.5-2 fold higher levels of butanol	<i>S. cerevisiae</i> A267/ES68K
Isobutanol (Matsuda et al., 2013; Kondo et al., 2012)	Eliminating competing pathways and resolving cofactor imbalance with deletion of genes encoding members of the pyruvate dehydrogenase complex (PDH). Batch fermentation at 50 mL scale from 100 g/L glucose with engineering or overexpression of cytoplasmic enzymes. Compartmentalization of the Ehrlich pathway into mitochondria increased isobutanol production by 260%	Genetically engineered <i>S. cerevisiae</i> YPH 499 strain
3-Methyl-1-Butanol (Amilor et al., 2013; Ash et al., 2014)	Medium containing glucose and yeast extract	Wild strain of <i>K. lactis</i> G0799, <i>S. cerevisiae</i> and <i>Pichia pastoris</i> KM71H, GS115 and X33

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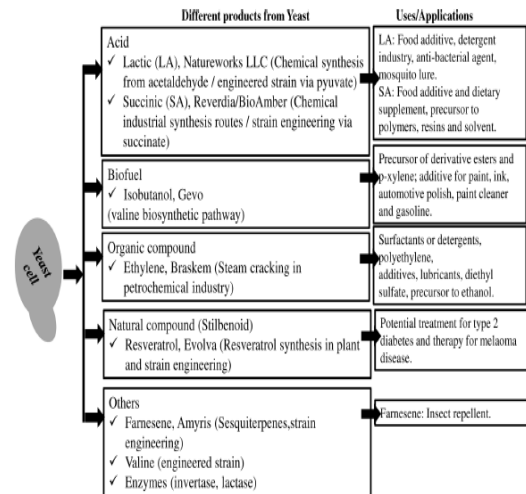


Fig. 3. Chemicals produced from yeast based fermentation on industrial or commercial scale. The largest producers are listed here with different applications or uses from these products.

Dairy products modified with respective yeast strains.

Milk products	Role	Yeast species
Cambembert (Lazard et al., 2012)	Maturation and aroma formation	<i>K. lactis</i> IMA-437 / <i>D. hansenii</i> IMA-1019
Kefir (de Oliveira Leite et al., 2013)	Lactose fermentation in kefir and kefir grains	<i>Kluyveromyces marxianus</i> /Candida kefir, <i>K. lactis</i> , <i>D. hansenii</i>
Yogurts (Suriyachai and Fleet, 1981)	Ability to grow at low temperatures and fermenting lactose with hydrolysis of milk casein	<i>Torulopsis candida</i> K. Fragilis <i>S. cerevisiae</i>
Koumiss (Mou et al., 2012)	Improving aroma and texture of product with addition of nutrients to human health	<i>C. parapsilosis</i> , <i>K. marxianus</i> , <i>Pichia deorulans</i> , <i>P. fermentans</i> , <i>S. cerevisiae</i>
Acidophilus yeast fermented milk (Durrell et al., 2012; Goodrich and Nambuchipudi, 1979)	Antioxidant properties of beverage with improvement of viability of bacterial strain <i>L. acidophilus</i>	<i>Saccharomyces boulardii</i> <i>S. cerevisiae</i>
Cream cheese (Mordal et al., 2015; A Report by Philadelphia, 2013)	During maturation a special mixture of yeast and mold is added that gives a unique flavour to cream	<i>G. candidum</i> (peast like mold) <a href="https://www.specialtyfood.com/news/article/gestricum-yeast-also-wrinks-vermont-butter-cheese-cream">https://www.specialtyfood.com/news/article/gestricum-yeast-also-wrinks-vermont-butter-cheese-cream</a>

## Development and uses of Yeast based vaccines

This study focuses on *Saccharomyces cerevisiae* and *P. pastoris* expression of heterologous proteins with therapeutic value against infectious diseases along with recombinant yeast (WRY), yeast surface display (YSD) and virus-like particles (VLPs), a strategy in the fight against infectious diseases and cancer with the present status of yeast-based vaccines in clinical trials. Heterologous protein species, including the first commercialized recombinant vaccine, the hepatitis B

vaccine, were produced in *Saccharomyces cerevisiae*. The oral administration of recombinant yeast is important in both the recognition and killing of tumor cells. CEA vaccine in adults with metastatic. DENV envelope (E) protein-based Virus-like particles (VLPs) generated using *P. pastoris* shows results against dengue, HIV, inhibit the growth of *P. falciparum* CC1/HN and 3D7 lines in rabbit and rhesus monkeys, *Lactobacillus pleuropneumonia*, *aspergillosis* and *coccidioidomycosis*, *coccidioidomycosis*, candidiasis, *Necator americanus* infection, *Ancylostoma caninum* and *Ancylostomaceylanicum*. *Boophilus microplus* and *Ascaris suum*. *Saccharomyces cerevisiae* and *P. pastoris* emerge as a most promising candidate for the expression of heterologous proteins for vaccine development. In the near future, yeast-based edible or oral vaccines may be common on shelves in medical dispensaries or clinical stores.

#### ***Saccharomyces cerevisiae* a model system for Interfering RNA Expression and Delivery System**

The study is about the commercial development of yeast interfering RNA expression and delivery systems. *Saccharomyces cerevisiae* is considered an ideal system for the expression and accumulation of high levels of recombinant interfering RNA. Recent research focuses on optimization of interfering RNA expression in *Saccharomyces cerevisiae* industrial-sized scaling of recombinant yeast cultures in which interfering RNA molecules expressed the development of methods for large-scale drying of yeast that preserve interfering RNA integrity and identification of encapsulating agents that promote yeast stability in various environmental conditions. The food and pharmaceutical industry will facilitate further development.

siRNAs can suppress viral infections, tumorigenesis, inflammatory disorders, and cardiovascular disease used for the control of human disease vector insects. *Saccharomyces cerevisiae* had been investigated as a

potential vaccine carrier useful for the oral delivery system for biological molecules to intestinal DC cells. In agricultural biotechnology communities of siRNA induces mosquito larval lethality and also useful in food and alcoholic beverage, bioreactor resulted in higher yields renewable and cost-effective manner. In biopharmaceutical industries, half of the global supply of insulin is produced in *Saccharomyces cerevisiae* and production of shRNA-based biopharmaceuticals and biopesticides. Therefore, technology is an efficient method for the industrial production of probiotics. Thus, many potential agents for microbial encapsulations are available, and this will be a critical area of exploration for the improvement of yeast RNA delivery systems. The microbe in both the food and pharmaceutical industry will benefit the development of this microbe as a production and delivery system for interfering RNA molecules. Develop scaled methods were used for drying yeast that preserves the integrity of the interfering RNA molecules.

#### **Probiotics based on *Saccharomyces cerevisiae* as an antimicrobial agent for the prevention and treatment of vaginal infections**

70% of women worldwide are affected by the vaginal infection, mainly VVC and BV, which are difficult to treat. Standard antimicrobial agents are used for the prevention and treatment of these vaginal infections. This study focuses on a new approach of yeast-based probiotics VVC and BV are the most prevalent vaginal infections caused by fungi *Candida albicans* (*C. albicans*) and *Trichomonas vaginalis* respectively, lead to the destruction of the protective mucus on the vaginal epithelium damaging the female reproductive organs. Various Therapeutic approaches Fluconazole amphotericin B, nystatin, and flucytosine for VVC and oral or intravaginal Metronidazole, intravaginal clindamycin cream, clindamycin and tinidazole secnidazole, a second-generation 5-nitroimidazole agent and tinidazole for BV are used with limitation of a long-term defensive barrier. Therefore, Probiotics administration represents an alternative

therapeutic approach for treating vaginal infections. *Saccharomyces boulardii* CNCM I-745 was the first strain studied. Live and inactivated *Saccharomyces cerevisiae* and vaginal administration of *Saccharomyces* proved to reduce the vaginal bacterial and fungal loads. *Saccharomyces cerevisiae* based approaches open the door to future clinical studies for the treatment of vulvovaginal candidiasis and bacterial vaginosis.

### **Recombinant *Saccharomyces cerevisiae* expressing antigens - Ras mutations and Carcinoembryonic antigen as therapeutic vaccines against tumors**

*Saccharomyces cerevisiae* engineered to express antigens specific to or associated with tumor cells like Ras gene mutation or carcinoembryonic antigen had been shown to act as a potential therapeutic vaccine. They had been shown to increase in Dendritic cells, Helper T cells (CD4<sup>+</sup>) and Cytotoxic T cells (CD 8<sup>+</sup>), providing cell-mediated immunity. These vaccines prepare the immune system of the host only to act against the infected cells but also to not act against the normal cells. Effect of different doses, frequency of doses, number of sites of dose administration and side effects like autoimmune responses had been monitored on mouse models against the control groups. Recombinant *Saccharomyces cerevisiae*, along with popular anticancer drugs like Cisplatin and gemcitabine, can modulate the immune responses in a specific manner. Positive results against infected cells with these recombinant vaccines with no or negligible side effects have made them a potential treatment choice against conventional chemotherapy. Specific immune responses had been generated in carcinogen-induced lung tumors in mice when treated with specific Ras mutation expressing recombinant yeast in a dose-dependent manner enhanced by various booster doses (Fig-2). It had been shown 90% of 33 patients treated with Ras mutation expressing *Saccharomyces cerevisiae* generated Ras specific T cells with no toxicity. Recombinant *Saccharomyces cerevisiae* expressing

carcinoembryonic antigen had increased the number of specific dendritic cells, T cells and co-stimulatory molecules in mice models. T helper cells response had been increased in mice upon an increasing number of sites of administration (Fig-3).

Tumor cells evade the immune system as they are not presented to T cells by Antigen Presenting Cells, and also, not strong co-stimulatory signals are produced. Recombinant *Saccharomyces cerevisiae* had been shown to activate dendritic cells, which process antigen and present it on class I and class II, eliciting cytotoxic cell and helper T cell responses. Also, they are being tested along with conventional drugs. Due to their less toxic effects in initial testing, they can be considered for other diseases as well. The only question which arises now is how to generalize these vaccines and make them cost-effective if they pass clinical trials.

### **Therapeutic potential of *Saccharomyces cerevisiae* to treat neonatal diarrhea in piglets**

Neonatal diarrhea reduces the production potential and growth rates of pigs. This has increased dependence on medicines like antibiotics which in turn has led to drug resistance in pigs. To counter this problem, the effect of a single dose of *Saccharomyces cerevisiae* CNCM-1-1079 had been monitored in pigs suffering diarrhea for 7 days. A decrease in the number of diarrhea days ( $p=0.008$ ) and the fecal score ( $p=0.01$ ), i.e., making feces firmer, has been observed. There had been a significant decrease in the number of diarrhea days in the first week in the experiment group ( $n=23$ ,  $p=0.008$ ) as compared to the control group, which received a placebo ( $n=23$ ) upon administration of *Saccharomyces cerevisiae* CNCM-1-1079. Both the groups had the same birth weight and parity and only supplement of *Saccharomyces cerevisiae* CNCM-1-1079 had affected days of diarrhea (Table 2). More piglets had a lower fecal score during the first 7 days of treatment ( $p<0.01$ ). A lower fecal score indicates firm feces, and a higher

fecal score indicates watery feces characteristic of diarrhea. A negative correlation between Average Daily Weight and diarrhea days had been found ( $p < 0.01$ ). A positive correlation between the number of days and mortality had been found ( $p < 0.05$ ).

Single-dose of *Saccharomyces cerevisiae* var *boulardii* (CNCM-1-1079) given after birth (within 24h) to pre-weaning piglets had decreased the number of diarrhea days, and a negative correlation had been established between average daily weight and diarrhea days. Thus, yeast had improved the average weight of the piglets, which is lost in diarrhea. Also, there had been a positive correlation between diarrhea and mortality. So, this yeast had decreased the chances of mortality indirectly. *Saccharomyces boulardii* reduces diarrhea by improving osmotic balance. It had been proven rats treated by *Saccharomyces boulardii* increased expression of sodium/glucose co-transporter 1 and helped in water, electrolyte and glucose reabsorption. For pig production and avoiding drug resistance and toxicity in them, supplementation of *Saccharomyces boulardii* is a good option as enteric health can affect the lifetime health of pigs.

#### **Training of the immune system by chitin content in the cell wall of *Saccharomyces cerevisiae***

Gut microbiota protects against pathogens by not allowing them to grow and also by training the immune system to act against it in the future. Similarly, *Saccharomyces cerevisiae* had been proven to be training stimuli for monocytes. *Saccharomyces cerevisiae* had trained cells to effectively produce cytokines like IL-6 and TNF - alpha. This immunomodulation is mediated by chitin which induces epigenetic modifications.

Primary stimulation of monocytes with *Saccharomyces cerevisiae* (experiment group) and *Candida albicans* (positive control group) and secondary stimulation with Lipopolysaccharides, *Candida albicans* or Pam3Cys4 in the experimental group had increased TNF- alpha similar to the control

group. Different amounts of increase in TNF- $\alpha$  had been observed on treatment with yeasts from different sources, the clinical strain being more potent. Trained immune response (TNF-alpha, IL-6) and cytokine production had been induced by Chitin isolated from cell walls of different strains of *Saccharomyces cerevisiae*. Monocytes trained with chitin, i.e., given primary stimulus of chitin, had shown a high percentage of *E.coli* containing and *Candida albicans* containing phagolysosomes which can degrade the pathogen. Histone methyltransferase had been inhibited by chitin trained immunity suggesting epigenetic changes involved by the action of chitin.

Trained immunity is a type of defense against pathogens due to the ability to fight pathogens provided by an initial encounter with a training microbe. Primary stimulation with *Saccharomyces cerevisiae* strains trains the immune system for any second stimuli due to chitin content in the cell wall. Chitin trains monocytes by epigenetic modulations like methylation, and it had been shown that beta-glucan induced trained immunity is due to epigenetic mechanisms. Although chitin content is considered favorable, there had been some cases of fungi increasing a disease like intestinal inflammation increases inflammation in colitis models. So, their proper effect and dose are to be tested.

#### **Therapeutic potential of recombinant yeast expressing glucagon-like peptide -2 in the intestine of weaned rats**

During the weaning period, enteric health is established and affects the long-term gut structure, functioning and microbiota. So, to improve gut health during the weaning period, therapeutic potentials of the recombinant yeast expressing glucagon-like peptide-2 had been monitored by administrating these recombinant yeasts to the weaned rats for 14 days. It had been observed that recombinant yeasts had stimulated erythrocyte proliferation ( $p < 0.01$ ), had

increased Average Daily Weight ( $p < 0.05$ ), had increased height of villus in the jejunum ( $p < 0.05$ ) and had increased activity of digestive enzymes in the jejunum ( $p < 0.01$ ).

Recombinant Glucagon-like peptide-2 (GLP-2) expressing *Saccharomyces cerevisiae* had significantly stimulated enterocyte proliferation ( $p < 0.01$ ) in vitro studies as compared to the control and was similar to rats treated with human recombinant GLP-2 ( $p > 0.05$ ). After 14 days of supplementation of 480uL of water, non-recombinant yeasts, GLP-2 *Saccharomyces cerevisiae* and human recombinant GLP-2 (rh-GLP2) to 4 groups of rats (each group  $n=12$ ), it had been observed- Average Daily Gain of GLP yeast group had been higher than that in the water-treated control group and non-recombinant yeast group ( $p < 0.01$ ) and had been equivalent to the positive control group rh-GLP2 ( $p > 0.05$ ). Height of mucosal villus had significantly increased in GLP 2 *Saccharomyces cerevisiae* group, but there was no difference in crypt depth in all the groups. Crypt cells in the jejunum region had shown proliferation. There had been a significant increase in activities of digestive enzymes like Creatine Kinase (CK), Alkaline Phosphatase (AP) and Lactate Dehydrogenase (LDH) in the jejunum ( $p < 0.01$ ).

Glucagon-like peptide-2 (GLP-2) has been known to stimulate mucosal growth, absorption and enzyme secretion. The effect of recombinant yeast had been seen in the jejunum as the receptors for GLP-2 are present in the jejunum predominantly. Recombinant yeast had stimulated erythrocyte proliferation ( $p < 0.01$ ) as it reduced apoptosis by inhibition of proapoptotic caspases-3, caspase- 7 and caspase-9. An increase in the activity of digestive enzymes had been observed ( $p < 0.01$ ). The previous study had shown that GLP-2 had increased villus height due to an increasing number of crypt cells upon administration of 40ug/kg/day in pigs.

#### **Therapeutic effects of *Saccharomyces cerevisiae* and *Saccharomyces boulardii* on intestinal dysmotility**

*Saccharomyces cerevisiae* is known to have probiotic potentials, and this makes it a good candidate to prevent and treat gut-related problems. Stress-induced intestinal dysmotility suffering mice had been treated with *Saccharomyces cerevisiae* and genetically similar *Saccharomyces boulardii*. Mice had been sacrificed, and propagating contractile clusters velocity, frequency and amplitude had been monitored with the help of video recordings. It had been observed that *Saccharomyces boulardii* is quite effective as well as yeast supernatants were effective in opening new scopes to find bioactive compounds involved.

Propagating Contractile Clusters(PCC) velocity and frequency in jejunum had been decreased but had been increased in the colon upon induction of dysmotility in the mice. However, the amplitude of PCC had increased significantly in the jejunum ( $p < 0.01$ ). PCC velocity had been increased by 43% ( $p < 0.01$ ) and frequency had been increased by 69% ( $p < 0.01$ ) in the jejunum and PCC velocity had been decreased by 32% ( $p < 0.01$ ), and frequency had been decreased by 29% ( $p = 0.01$ ) in colon on treatment with *Saccharomyces boulardii*. Amplitude change had not been significant. PCC velocity had been increased by 14% ( $p = 0.013$ ), and frequency had been increased by 74% ( $p < 0.001$ ) in the jejunum and PCC velocity had been decreased by 37% ( $p < 0.01$ ) in the colon on treatment with *Saccharomyces cerevisiae*. But there had been an insignificant change in the frequency in the colon region ( $p = 0.994$ ). Amplitude had increased by 27% ( $p = 0.013$ ) in the jejunum. However, the amplitude increase had been insignificant in the colon. Supernatant of centrifuged *Schharomyces boulardii* increased velocity ( $p < 0.01$ ) and frequency ( $p = 0.067$ ) in the jejunum but decreased velocity ( $p = 0.038$ ) and frequency ( $p = 0.024$ ). There was no significant change in amplitude in both regions. The supernatant of centrifuged *Saccharomyces cerevisiae* only significantly decreased velocity in the colon ( $p = 0.002$ ), increased frequency in the jejunum ( $p = 0.003$ ) and decreased amplitude in the jejunum ( $p = 0.0016$ ).

*Saccharomyces boulardii* and *Saccharomyces cerevisiae* both had shown the ability to reverse dysmotility. However, it had been observed *Saccharomyces boulardii* is more efficient. This can occur due to their different response-ability concerning temperature, acidic stressors and growth characteristics. Also, it had been observed supernatants have therapeutic potentials of the yeast cell as they were efficient in treating intestinal dysmotility. Thus, to understand this bioactive molecule in the supernatant need to be identified and also it would decrease the need for administration which sometimes may not be safe. The therapeutic action of these yeasts starts within 10 minutes, indicating that the therapeutic effect is drug-like.

**The therapeutic effect of *Saccharomyces cerevisiae* in irritable bowel syndrome**

Intestinal Bowel Syndrome is a common intestinal disorder that causes a lot of abdominal pain along with bloating. Two random clinical studies had shown an effect of *Saccharomyces cerevisiae* CNCM - I- 385 on Intestinal Bowel Syndrome was analyzed. It was observed that yeast relieved symptoms in affected individuals during the second month, significantly reducing abdominal pain and bloating.

Abdominal discomfort had been significantly different between the experimental group ( IBS-C>2)and the placebo group (p=0.0417), and there had been bloating trend in favor of the active group at the end of two month period. IBS -C>2 is the group suffering from irritable bowel syndrome (IBS) constipation type (C) with abdominal discomfort less than or equal to the score of 2. The maximum effect, however, had been seen in the second month. Bloating had been decreased in IBS-C (p=0.0463), in IBS-C>2 (p=0.0145) and in intent to treat (ITT) (p=0.0105) populations. Abdominal pain also had reduced in all three populations. In the IBS-C group, abdominal pain (p<0.0001) as well as bloating (p<0.0001) had reduced significantly in both the active group and placebo group. IBS-C >2 had slightly

higher abdominal pain than the IBS -C group but abdominal pain within active and placebo groups of IBS-C >2 reduced significantly. A significant improvement had been observed in stool consistency upon administration of the yeast.

From the meta-analysis of two random clinical trials, it became clear that *Saccharomyces cerevisiae*, to a large extent, decreased abdominal pain and bloating. However, the effect of yeast can be seen in the second month. This is because there is some delay before the analgesic effect of the yeast to relieve abdominal pain.

**Clinical Trials** : as extracted from clinicaltrials.gov

Sl no.	Title of the Clinical Trials	NCT Number
1	A Comparison of Three Medications to Treat Diarrhea in Adults.	NCT00807326
2	Impact of Probiotics in Modulation of Intestinal Microbiota	NCT01895530
3	The Effect of Probiotics on E. Coli-induced Gastroenteritis (PROTETEC)	NCT01709266
4	Impact of Probiotics on the Intestinal Microbiota	NCT01609660
5	Effects of S. Boulardii and Amoxicillin/Clavulanate on Gut Microbiota	NCT01473368
6	Effects of Pre-, Pro- & Anti-biotics on Gut Microbiota	NCT01414010

**A comparison of three medications to treat diarrhea**

Combined treatment of Loperamide-simethicone 2 mg/125 mg caplets and chewable tablets along with probiotic *Saccharomyces boulardii* 250 mg capsules were provided to the patients. This is a phase 4 clinical trial. Loperamide-simethicone was found superior to *Saccharomyces boulardii*. All the

medications proved that they prevented the recurrence of diarrhea and reduces bowel discomfort,

Results published: <https://pubmed.ncbi.nlm.nih.gov/26541878/>

### **Impact of Probiotics in the modulation of Intestinal Microbiota**

Supplement of *Saccharomyces boulardii* (100mg yeast capsule daily for seven days prior to surgery ) was given to patients suffering from colorectal cancer and who was going to take resection colon. The expression of some specific genes ( IL10, IL1B, IL23A, TNF, IL12B, INFJ, IL17A) of intestinal cells was studied prior to surgery.

Results published: Not provided

### **The effect of Probiotics on E. Coli-induced Gastroenteritis (PROTETEC)**

Selected candidates were provided with placebo and probiotics supplements for two weeks twice daily. Then they were subjected to enterotoxigenic E. Coli (ETEC). ETEC increased watery stool output and GI-related problems. The probiotics were not effective in providing resistance against ETEC.

Results published: <https://pubmed.ncbi.nlm.nih.gov/25369827/>

### **Impact of Probiotics on intestinal Microbiota**

A phase 4 clinical trial was done on patients treated with colorectal cancer, where they were treated with 100mg of *saccharomyces boulardii* every day. An intestinal biopsy was done to study the efficacy of probiotics under stressful conditions.

Results published: Not provided

### **Effects of *Saccharomyces boulardii* and Amoxicillin/Clavulanate on Gut microbiota**

The study was done to understand the effects of probiotic *Saccharomyces boulardii*(500mg, twice daily) and antibiotic drug Amoxicillin/Clavulanate(875/125 mg 2 times daily) on healthy individuals. This combined treatment resulted in the production of secondary bile acid resulting in the prevention of antibiotic-related *C. difficile* infection.

Results published: <https://pubmed.ncbi.nlm.nih.gov/30881353/>

### **Effects of pre-, pro-, and antibiotics on Gut Microbiota**

The study was done to understand the reversible effects of prebiotic (*Trametes versicolor*, 1200mg thrice daily), probiotic (*Saccharomyces boulardii*, 250mg thrice daily) and antibiotic (Amoxicillin, 250mg thrice daily) agent on a healthy intestinal microbiota. It is believed that the treatment induces a reproducible fecal microbiota that is reversible once the treatment is discontinued.

Results published: Not provided

### **3.4 *Saccharomyces boulardii***

#### **Effects on the mucosal system due to oral administration of *Saccharomyces boulardii***

This article is regarding the experiments performed on a group of rats and humans who have been administered with oral doses of either lyophilized or heat-killed *Saccharomyces boulardii*. There were no gastric complications in the species. The oral administration of the yeast was given for a period of five days. The intestine was removed in the rats, and in the case of humans, a biopsy on the intestine was performed. Enzymatic activity was studied in vitro. The incorporation of *Saccharomyces boulardii* into the enzymatic activity was also studied by enzyme assays.

Human studies: There was no change in villus height or crypt depth. But an increased activity of maltase, lactase and sucrase was observed. The overall mucosal protein content was not changed. The volunteers did not suffer through any abdominal complications during the experiment tenure.

Animal studies: The results were similar to that of Human studies. Yeast cells were found on the inner lumen of the intestine in contact with the villus cells, and there were no signs of inflammation. The overall protein content was unchanged, but there was a slight increase in aminopeptidase activity.

*Saccharomyces boulardii* induces no toxic effects on the gut. It is given as a treatment for diarrhea and for other diseases that include degradation of the intestinal microbiota. *Saccharomyces boulardii* is antibiotic-resistant and protects intestinal cells from gastric activity. Human fecal matter is rich in yeast cells, whereas in rats, the villus cells do incorporate with the yeast cells, and there is a less amount of excretion. The lactase biogenesis levels were similar both in control mice and treated mice. The mannose content in the cell wall may be the reason behind the increased disaccharide activity. The rate of DNA synthesis was studied to justify the increased disaccharide activity by incorporating thymidine. No difference was observed.

#### ***Saccharomyces boulardii* in the prevention of relapse of Crohn's Disease and as a supporting treatment**

In several studies, it has been proved that 5-aminosalicylic acid (5-ASA, mesalamine) is a more effective treatment than placebo. In this study, the authors performed an experiment with 32 patients placed in two groups, A and B. They were all diagnosed with Crohn's disease of the ileum and colon. Group A patients were given mesalazine 500 mg in a sustained-release preparation in ethylcellulose microgranules (Pentasa), 2 capsules three times a day. Group B has given *Saccharomyces Boulardii* 500 Mg 2 capsules in the morning 1 Pentasa 500 mg two capsules twice a day. It was found that clinical relapse was found more in Group A patients compared to Group B. The authors tried to explain the reason behind this result.

The remission of the disorder was measured in terms of Crohn's disease activity index (CDAI). CDAI <150 was considered safe. In Group A, six patients suffered clinical relapse within the time frame of 6 months, while in Group B, only one patient suffered from clinical remission.

It was found that patients treated with mesalamine and *Saccharomyces boulardii*(6.25%) had a lesser

chance of clinical remission compared to that of patients treated with mesalamine(37.5%) alone. Crohn's disease is believed to destroy the intestinal microbiota, and regeneration takes a long time, during which chemical relapses are very common. *Saccharomyces boulardii* is very similar to *Saccharomyces cerevisiae* due to which on the administration of this strain, the same kind of antibodies is produced in the host system, which is very specific against Crohn's disease. Other than this, *Saccharomyces boulardii* is a probiotic agent that exerts certain trophic effects on the intestine, for example, regulation of immune response by the release of IgA, reducing the effects of antibiotic-induced diarrhea, and regeneration of the intestinal microbiota.

Thus, *Saccharomyces boulardii* has shown positive results in improving the CDAI parameters. *Saccharomyces boulardii* is yet to undergo several trials before being accepted for routine use as maintenance treatment for Crohn's disease.

#### ***Saccharomyces boulardii* in the enhancement of immune response in host organism in case of *Clostridium difficile***

The main area of interest in this study is to understand the action of the host immune response in the presence of a probiotic agent, *Saccharomyces boulardii*, when affected by *Clostridium difficile*. The pathogen produces two toxins, A and B. Toxin A is primarily responsible for the infection (fluid secretion, inflammation). Toxin B causes injury to the colon. *Saccharomyces boulardii* is a probiotic agent that reduces the effects of diarrhea and clinical remission. Other than the antibodies produced by the host cells in response to toxin A, *Saccharomyces boulardii* increased the secretion of immunoglobulin A. Four groups of BALB/c mice were taken for the study. The first group was for control, the second group was treated with formalin-inactivated toxoid A, the third group was treated with *Saccharomyces*



*boulardii* with drinking water, and the fourth group was treated with both *Saccharomyces boulardii* and inactivated toxoid A. After a certain period, they were all sacrificed, and their intestine and serum samples were taken for further studies. Antibodies against the toxins were studied by ELISA.

IgA levels were increased in group 3 by 1.9 fold compared to that of controls. In the fourth group, the increase was 1.8 fold, but the difference was that the IgA was toxin A specific. There was an increase of antitoxin A IgA when the rats were treated with both toxoid and *Saccharomyces boulardii*.

Coadministration of *Saccharomyces boulardii* with *Clostridium difficile* has resulted in the production of anti-A toxin IgA. *Clostridium difficile* has been studied, and it has been proved that they do not trigger a vigorous immune response; instead, they remain asymptomatic. Thus this study proves that *Saccharomyces boulardii* exhibit protective effects against diarrhea caused due to *Clostridium difficile*.

#### ***Saccharomyces boulardii*: A preventive treatment against bacterial translocation**

The case study portrays the effects of *Saccharomyces boulardii* on preventing bacterial translocation in rats affected by obstructive jaundice. Bacterial translocation is usually caused due to bacterial overgrowth in the intestine, deficiencies in the host immune system or due to increased permeability in the mucus layer or the epithelial cells.

The study was done with 60 adult rats taken into five different groups. Group 1 was the sham-operated group (they had mobilization of the common bile duct); Group 2 was the common bile duct ligation group; Group 3 was the *Saccharomyces boulardii* group; Group 4 was the ampicillin-sulbactam group, and group 5 was the *Saccharomyces boulardii* plus ampicillin-sulbactam group. All the rats were given a dose of *saccharomyces boulardii* along with antibiotics for 7 days. After this time period, the rat had laparotomy and samples of blood, liver, spleen

and lymph nodes were taken for microbial studies. Bacterial translocation percentages were 0% in the sham-operated group, 83% in the first group, 42% in groups 3 and 4 and 33% in group 5. Bacterial translocation rates were 0% in the sham-operated group, 83% in group 2, 42% in group 3, 42% in group 4 and 33% in group 5. In groups 2, 3, 4 and 5, the serum bilirubin levels, Alkaline phosphatase and alanine aminotransferase, and aspartate aminotransferase activities were significantly higher compared to Group 1. In groups 2, 3, 4 and 5, there is a decrease in the heights of ileal villi compared to that of group 1. Bacterial translocation can be caused due to several factors other than obstructive jaundice. This can lead to loss of the intestinal microbiota as well as the loss of occludin proteins that maintain the tight junctions of the epithelial cells of the intestine. Bacterial translocation in immunosuppressed patients may turn into fatal sepsis. Experimentally, *Saccharomyces boulardii* has been found very effective against bacterial translocation and improvement of intestinal barrier function.

#### **The effects of *Saccharomyces boulardii* CNCM I-745 in restoring intestinal microbiota after dysbiosis**

The review article is about understanding the intestinal microbial population in a healthy system as well as the population imbalance during dysbiosis. During a healthy environment, the intestinal microbiota is protected by *Saccharomyces boulardii*. Due to dysbiosis caused by diarrhea, there is a collapse of the original microbial species in the intestine. *Saccharomyces boulardii* also induce regeneration of the microbiota. Within the intestine, there is a large microbial population that produces several secondary metabolites (vitamin) and substances like butyrate that carry out several regulatory functions. The intestinal microbiota is also responsible for the maintenance of water and electrolyte levels and inducing a general immune response. On the other hand, in the case of dysbiosis,

a disruption of the mucus layer causes inflammation, and the administration of antibiotics leads to the depletion of the microbial population that is present in the intestine. Food remains in the intestinal lumen for a long along with osmotic water resulting in the formation of watery stools. The immune response that is induced by the bacteria increases the leukocyte infiltration and damages the potential bacterial population helpful for the intestine. *Saccharomyces boulardii* is resistant to antibiotics and can withstand oxidative stress. They do not transfer their resistant genes to other bacteria due to their fungal nature. They are not predominantly found in the intestinal microbiota and excreted within 3 days of administration. It also exhibits high acid tolerance, which is optimum for survival in the intestine. The beta glycans present in the fungal cell wall bind with the receptors on the dendritic cells, thus inducing an immune response. The NF- $\kappa$ B and the MAP kinase pathways are inhibited that demonstrates the anti-inflammatory activity. The cell wall provides a substrate for increased microbial activity, and there is an increased SCFA Production.

This study tells us the importance of *Saccharomyces boulardii* in the regeneration of intestinal microbiota after the treatment of an antibiotic. Diarrhea is a common factor of death for many immunodeficient patients and even among children and old people. A steady administration of *Saccharomyces boulardii* can successfully maintain the gut flora and reduce the risk of diarrhea. Other than this, it also provides several positive effects like reducing weight by the production of butyrate and relieves constipation by the secretion of anti-inflammatory chemokines.

### **The adaptation capability of *saccharomyces boulardii* in host organisms makes it a perfect probiotic agent.**

The article is about the genetic makeup of *Saccharomyces boulardii*, which makes it different from other yeast species and a successful probiotic agent. *Saccharomyces boulardii* compete with

pathogens in the gut and can even withstand the high pH in the intestine. The qualities of toxicity and antibiotic resistance are not shared with any other bacteria. In this article, the author tried to explain the reason behind the distinguishable characters of *Saccharomyces boulardii* and its mode of mechanism. Genes that were expressed for protein synthesis(RPL31A,RPL41A,RPS24B,RPL2BandRSA3) and stress response (HSP26,SSA3,SED1,HSP42,HSP78 and PBS2) had a higher copy number. There was an increased number of alterations seen in SDH1 and WHI2 genes as compared to *S. cerevisiae*, and this results in an increased amount of acetic acid production. The ability of faster pseudohyphal growth is due to increased expression of CDC42, DFG16, RGS2, CYR1 and CDC25. A point mutation in the PGM2 gene inhibits *Saccharomyces boulardii* from using galactose as a carbon source. The mechanism of yeast action can be divided into four groups: modulating an immune response, removal of the pathogen, antimicrobial properties and certain trophic effects. Removal of the pathogen is achieved by the binding of the pathogen with the yeast and further hindering their pathway of virulence. *Saccharomyces boulardii* release several metabolites(bacteriocins, hydrogen peroxide) and polyamines that inhibit the growth of the pathogens. The intestine provides a favorable environment for the growth of *Saccharomyces boulardii*, and thus it actively competes with the microbes for nutrition. *Saccharomyces boulardii* exhibits certain antimicrobial properties. A number of proteins(54-kDa, 63-kDa and 120-kDa proteins) synthesized by the yeast has a number of antimicrobial effects. The genomics of *Saccharomyces boulardii* explained the reason for its adaptability in the human gut. The immunomodulatory response that is triggered by the yeast species and the suppression of IL-8 has a unique two-fold effect on the intestinal microbiota. There are several other questions that remained unanswered about the 54-kDa, 63-kDa and 120-kDa proteins that are secreted by the yeast and have antimicrobial

activity. Their specific mechanism of cleaving the microbial toxin is not fully understood. The mechanism of regulation of the immune response by *Saccharomyces boulardii* is not defined completely.

**Clinical evidence:** as extracted from clinicaltrials.gov

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**IV. CONCLUSION**

This research review’s purpose is to help the reader understand different aspects posed by the research on therapeutic applications of yeast '*Saccharomyces*'. This is significant because it gives insights into how *Saccharomyces* can be

used as a potential probiotic/vaccine/immunomodulator in various diseases. There has been much research and discussion of these opinions of *Saccharomyces cerevisiae* and *Saccharomyces boulardii* and their therapeutic application. Most of the research found was on the possible treatment of various diseases by different pathways. In some cases, such as Intestinal disorders, they act as probiotics. Whereas sometimes they show potential as a recombinant vaccine. Other times it is used to elicit an immune response and secrete IgA. They also found applications as antioxidants and anticancer agents. More research and testing are required to gain a better understanding of the therapeutic applications of yeast '*Saccharomyces*'.

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#### HUMAN AND ANIMAL RIGHTS

No Animals/Humans were used for studies that are base on this research.

#### AVAILABILITY OF DATA AND MATERIALS

The author confirms that the data supporting the findings of this research are available within the article.

#### FUNDING ACKNOWLEDGEMENT AND CONFLICT OF INTEREST

The authors whose names are listed immediately above certify that they have NO affiliations with or involvement in any organization or entity with any financial interest (such as honoraria; educational grants; participation in speakers' bureaus;

membership, employment, consultancies, stock ownership, or other equity interest; and expert testimony or patent-licensing arrangements), or non-financial interest (such as personal or professional relationships, affiliations, knowledge or beliefs) in the subject matter or materials discussed in this manuscript.

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# Alleviating Salinity Stress During Seed Germinating by Priming Techniques : A Review

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## ABSTRACT

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Seed germination and seedling growth are the two critical stages for crop establishment. These stages are the most sensitive to abiotic stresses, which decreases the germination percentage and increases germination time. Due to such abiotic stress, the germination of crop fails in adverse conditions. Salinity is one of the major abiotic stress, which adversely affects almost every aspect of the plant's physiology, biochemistry and decreases yield. Salinity is the most severe threat to agriculture and major environmental factors that limit crop growth and productivity. Various techniques have been shown to improve emergence and stand establishment under salt stress. One of the most frequently utilized technique is seed priming. The seed priming process deals with the prior exposure of abiotic stress, making a seed more resistant to future exposure. Seed priming stimulates pre-germination metabolic activities and enhances radicle protrusion. It enhances the antioxidant defense system and the repair of membranes. The process of seed priming and the mechanism of the effect of salinity on seed germination have been discussed. The physiological, biochemical, and molecular changes induced by priming leading to seed enhancement have also been covered.

**Keywords:** Seed Germination, Salt Stress, Seed Priming, Antioxidant Defense System

## I. INTRODUCTION

The crop production depends on the quality of seed, which demands each seed to be readily germinable and produce a vigorous seedling for higher yield (Suruthi, Sujathal & Menaka, 2019). As a seed is a fundamental factor in crop production, optimum seed

germination is the key to good stand establishment (Tania et al., 2020). Due to unfavorable growth conditions such as salinity, the percentage of seed germination, emergence, and vigor has been adversely affected. This adverse event could lead to crop failure. However, salt-stress effects on crops depend on the concentration, time of exposure to salt, plant



genotype, and environmental factors (Alves et al., 2019). There are various seed enhancement technologies available to enhance seed germination in such type of unfavourable environmental conditions. Seed priming is one of the most straightforward technique which acts as an effective measure to good stand establishment under abiotic stresses. Seed priming is a pre-sowing treatment that can improve seed germination and performance and tolerate abiotic stress (Anwar A et al., 2020).

**Seed priming techniques often provide rapid synchronized seed germination, leading to enhanced crop yield and reducing the use of fertilizers (Pawar & Laware, 2018).**

## II. THE PHENOMENON OF SEED PRIMING

“Seed priming is a pre-sowing treatment given to the seeds which allow uptake of water to initiate early germination events but does not permit radicle protrusion, followed up by drying” (Powell & Matthews, 1988; Donald, 2000). Priming promotes germination under three phases’ imbibition, germination, and growth. Phase I is imbibition, which is rapid in which proteins are synthesized, DNA, and mitochondria are repaired using existing mRNA. Phase II is the lag phase called the activation phase, where the minimal net gain of water occurs for metabolic activities, including the synthesis of proteins and mitochondria from new mRNA. The final phase, i.e., phase III, involves more water uptake coupled with radicle elongation (Bradford, 1995). Phase II is the critical phase in germination as it is much sensitive to environmental factors than the third phase (Come & Thevenot, 1982). Priming allows phase I and phase II but does not allow seeds to enter the last phase. Hence, it is sufficient to initiate pre-germinative metabolic activities but insufficient for radicle protrusion (Bradford, 1986).

**Phase I and II are the foundations of priming; the primed seeds have passed through the second critical**

**phase hence primed seeds could germinate under the unfavorable condition as compared to unprimed ones (Corbineau & Come, 2006).**

## III. METHODS OF SEED PRIMING

There are various techniques of seed priming, broadly classified into conventional and advanced methods. The conventional techniques include hydro-priming, halo-priming, osmo-priming, bio-priming, priming with plant extracts, nutrient priming, and chemical priming, and priming with plant growth regulators. The advanced techniques comprise seed priming through physical agents and nanoparticles (Hasanuzzaman, 2019).

## IV. SEED PRIMING AND GERMINATION UNDER SALT STRESS

Seed priming causes some changes in metabolic activities in the seeds for plumule emergence (Farooq et al., 2007). Seed priming techniques are considered to be very vital for enhancing seed germination under adverse effects like salinity. It has been recorded that priming treatment enhanced the seed germination and seedling growth of *Cynanchum bungei* Decne under salt stress (Zhang, 2015). Studies have shown increased germination percentage and seedling growth of *Medicago sativa* under salinity stress (Younesi & Moradi, 2014). Seed priming with salicylic acid increases the salt tolerance in *D. moldavica* seedlings (Shaikh-Abol-hasani & Roshandel, 2019). Priming treatment has also enhanced salt stress *Glycyrrhizauralensis* seedlings (Zhang et al., 2015) and cauliflower (Wu et al., 2019). The role of seed priming could be considered catalytic, related to a series of physiological, biochemical, and molecular changes. Among them, the typical stress-tolerance response is by inducing the antioxidant system. The antioxidant enzymes act as a defense mechanism responsible for reducing reactive oxygen species (ROS). The accumulation of ROS leads to oxidative

stress, eventually affecting the germination. The increased level of antioxidant enzymes has been reported through seed priming (Panuccio et al., 2018).

#### V. Physiological, biochemical and molecular changes by seed priming

Salinity causes osmotic, ion, and oxidative stresses during seed germination (Munns 2002; Ibrahim 2016). Under salinity, there is a decrease in the external osmotic potential, which results in less water uptake during the imbibition phase of germination. Seed priming increases osmolytes (e.g., sugar, amino acids, etc.), which helps in reducing the osmotic potential inside the seed. This reduced osmotic potential facilitates the absorption of water, speeding up the germination process under salinity stress.

Due to salinity excess influx of Na<sup>+</sup> results in K<sup>+</sup> deficiency. This alters the protein and lipid composition of the membrane eventually affects the membrane permeability. Priming with polyamines has shown to retard membrane deterioration and also maintain the bilayer surface (Basra et al., 1994; Hussain et al., 2019)

Salt stress imposes a water deficit condition, leading to the formation of reactive oxygen species (ROS) such as Hydrogen peroxide, superoxide, and hydroxyl radical. These ROS can disrupt the metabolism and could also cause DNA damage affecting the cell cycle. Seed priming enhances the antioxidant defense system, which acts as ROS scavengers. Halo priming with sodium chloride in *Vigna radiata* alleviates the oxidative stress caused by salinity by enhancing the antioxidant defense system (Saha et al., 2010). Seed priming has shown to up-regulate many germination-related genes required for biochemical processes during seed germination in Chickpea seeds (Sharma et al., 2015).

#### VI. CONCLUSION

Based on the previously reviewed literature, it is concluded that seed priming is a commercially used technique that is developed mainly to accelerate seed germination by minimizing the adverse effects of salinity. Seed priming is a practical and innovative approach for achieving rapid and uniform germination and stand establishment, which plays a significant role in higher productivity in crop plants, especially under unfavorable conditions. However, all priming methods may not lead to significant germination and uniform emergence; hence further in-depth studies on the physiology of seed are required for selecting specific priming methods, and the same could help us to identify the suitable molecular markers to optimize the priming treatment under salinity stress.

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# Work-Life Balance: A Study of Selected Nationalized Banks in Ambala District (Haryana)

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## ABSTRACT

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Work-life and personal life are two sides of the same coin. Increasing work burdens, globalization and industrial development have made it an issue with both the sexes, all professionals, working across all levels and all businesses throughout the world. The banking industry is one that is fronting the force of the threat of work-life imbalance. Due to this work burden, it becomes exceedingly difficult to maintain work-family life. Many a time, people, in the quest for reaching the top, work so hard, that they miss out on the real pleasures of life. While it is absolutely great to have a flourishing career, it is equally domineering to have a life external work. Work-life balance can be defined as the perfect integration between work and life both not interfering with each other. There are a number of variables that affect positive and negative impact on Work-life balance. So the present study examines the "Work-life balance - A study of selected nationalized banks in Ambala District (Haryana). The study revealed that most employees satisfied with Work-life balance policy offered by banks.

**Keywords** : Work-Life Balance, Work Pressures, Occupational Stress, Employees of Banks, Ambala.

## I. INTRODUCTION

Work-life and personal life are interconnected and interdependent. Spending more time in office, allocating with customers and the burdens of the job can delay and affect personal life, sometimes making it difficult to even complete the domestic responsibilities. On the other hand, personal life can also be demanding if you have a kid or ageing parents,

financial problems or even problems in the life of a dear relative. It can lead to skiving from work, creating pressure and lack of awareness at work. Work-personal life conflict occurs when the burden, commitments and responsibilities of work and family roles become mismatched. The obligation of one can force an individual to neglect the other.

There is no 'one size fits all' pattern of work-life balance practices. It is important for employers to offer practices that appeal to all employees. Employers may incur extra costs in assuming strategies to support work-life balance, including enlarged managerial capabilities.

### 1.1 Factors Influencing Work-Life Balance

In the globally competitive world, the term Work-Life Balance is gaining importance and its time for companies to start thinking strategically and come up with innovative solutions which provide a better balance between work and life for its employees.

**Works-Overloaded**– There are many dimensions to work demands, such as time pressure-tight deadline, high speed of work, and the quantity of work (work-load). Work overload is likely to have a dual effect on work-life conflict. The high workload is likely to increase work hours and also to contribute to feelings of strain and exhaustion.

**Training Programmers**–Training programmers for employees help to built skills, and to encourage employees to use technology more efficiently. This will build confidence in the employees which will help in increasing the performance and the productivity of the organizations and useful training programs should be provided to have better work-life balance.

**Working environment**–While determining the work-life balance of an employee the presence of a comfortable environment inside the organization encourages the employee and motivates them to complete the task assigned in the specific time. The ability to complete the job in time itself is a strong factor to achieve work-life balance.

**Work-life programmers**–The indent of various work-life programmers aims to free the employees from the hectic work schedule so that he or she can spend more time with the family.

**Relocation**–When an employee climbs up the ladder of the career in the job leads to the dislocation of the family which badly affects their work-life balance.

**Working hours**– Excessively long working hours force employees to escape many of their family responsibilities, which imbalances their work and family lives. Since these negative emotional regulation decreases job satisfaction and increases turnover, employers are now becoming more conscious about implementing such policies as streamlining the work and family of their employees.

**Fringe Benefits**– Fringe benefits are those which are being paid to employees in addition to their salary. It includes paid holidays, subsidized food, maternity and paternity leave, health insurance, educational facilities for children, etc.

**Childcare**– Women, especially Indian women, pay more attention to the family than their career. The need to take care of the children while away from home is a vital factor which disturbs their mind and diverts their attention from their office work.

**Family Support system**– the support from the employee family contributes to the work-life balance. The need to take care of the children while away from home is a vital factor which disturbs their mind and diverts their attention from their office work.

### 1.2 Indian Banking Sector

Banking Sector in India has undergone a transformation after liberalization in 1990 by Narsimha Rao government where they issued a license to a small number of private banks. Banks have also diversified their activities in new products and services as per the requirement of the business. Due to the dynamic nature of the financial markets and the rapid changes in the economic reforms, a need for efficient products and services in the banking sector had become important for its survival and existence.



An increase in educated customers and the emerging competition had generated high expectations from such a banking industry. The new rules of the competition and the advancement in technology have revolutionized the Indian financial and banking sector. These changes demand more effective employees to help the banks achieving its objectives.

## II. Review of Literature

**Sindhuja, K., and S. Sekar Subramanian (2020)** examined the effectiveness of the work-life Balance of bank employees and its impact on employee retention in the selected banks in Sivakasi, Virudhunagar district. The findings of the study reveal that 44 percent of the respondents have a low level of work-life balance, 40 percent of the respondents have a medium level of work-life balance, and only 16 percent of the respondents perceived a high level of work-life balance. The study also identified that there is a significant difference between the work-life balance levels among the public sector and private bank employees.

**Ms. Simarpreet kaur, Dr. Kavita Aggarwal (2019)** examined that what types Work life balance policy offered by nationalized banks in Mohali District. One independent (occupational stress) and one dependent variable (WLB) was taken to know the exact condition of Work life balance policy followed by the banks. Through the study it was analyzed was the employees were gratified with the WLB policy offered by the selected banks. It was found that that Occupational stress had a negative relation to the employees work-life balance in the selected banks in Mohali District.

**Dr. Sumati Ray, Dr. K.C. Paul (2019)** examined and compared the stress on work in public and private sector bank employees in India. This paper is having Indian experience with reference to West Bengal

State on comparison of stress between Public and private bank employees. The study concludes that the both sector bank employees were overburden with the work load in their workplaces and banking sector is not playing an active role in Stress Management programs for the employees in both private sector as well as public sector banks. The stress is more in private banks compare to public sector banks as both the banks employees are bound to give business to the bank but the pressure is more in private sector banks than public sector banks subject to the job security.

**Kshirsagar R. Sonali (2018)** examined on Women Employee Work-Life Balance of service sector namely Academics, Banks and Health care sector of Aurangabad Region. An attempt was done to study the existence of Work-Life Balance problem among the working women in the specified area. It was tried to examine how the factor affecting work-life balance influence quality of life of married working women. The study revealed that 83.33% of the Women employees were found saying that the Work Life provided to them was worst, they may be under substantial stress due to lack of work-life balance. 10% of the employee were in moderate state depicts that they are not entirely in happy work-life balance, but in a good position not to let the situation get out of control and 6.6% were in Best state that they have a balanced work-life and able to effectively manage their families.

## III. Objectives

- To study the work-life balance of selected nationalized banks in Ambala District.
- To study the Occupational stress of selected nationalized banks in Ambala District.
- To investigate the relationship between occupational stress with employees Work-life Balance in selected banks of Ambala District



- To study the HR policies and practices being adopted by the selected Nationalized banks to promoting healthy work-life balances

#### IV. Scope of Study

The study will be conducted at all the three levels i.e. top, middle and lower levels of the employees will be present the comprehensive picture of Work-life Balance in the respected selected banks.

The following banks will be selected- :

##### Nationalized Banks

- Punjab National Bank
- State Bank of India

#### V. Research Methodology

In the present study, both Primary and Secondary data is considered. Primary data is collected through questionnaire and distributed to the 60 employees of selected nationalized banks in the Ambala District using five-point Likert Scale. In addition to this, the secondary data was collected from various newspapers, magazines, books, websites, and research journals etc.

##### 5.1 Research Design

The research design of the present study comprises of one independent variable (Occupational stress) and one dependent variable (Work-life Balance). Besides

its demographic variables such as Age, Education, Gender and Marital status were taken to check the relationship between Work-life Balance and Occupational stress.

##### 5.2 Independent Variable

###### Occupational Stress

Occupational or workplace stress can be defined as the change in one's physical or mental state in response to a workplace that poses an appraised challenge or threat to that employee. Causes of occupational stress include environments, organizational climate, and a conflict arises from the job demands of the employees. Psychologic disorders may lead to poor work performance, higher absenteeism, less work productivity even injury. Stressful working conditions can lead to behavioural, physical, and psychological strains.

##### 5.3 Dependent Variable

###### Work-life Balance

Work-life balance is about creating and maintaining supportive and healthy work environments, which will enable employees to have a balance between work and personal responsibilities and thus strengthen employee loyalty and productivity. It helps us in addressing all those areas of our life that should co-exist peacefully, in spite of belonging to different spheres.

#### VI. Data Analysis and Discussion

**Table-1.** Demographic characteristic (based on questionnaire in the area of Ambala District)

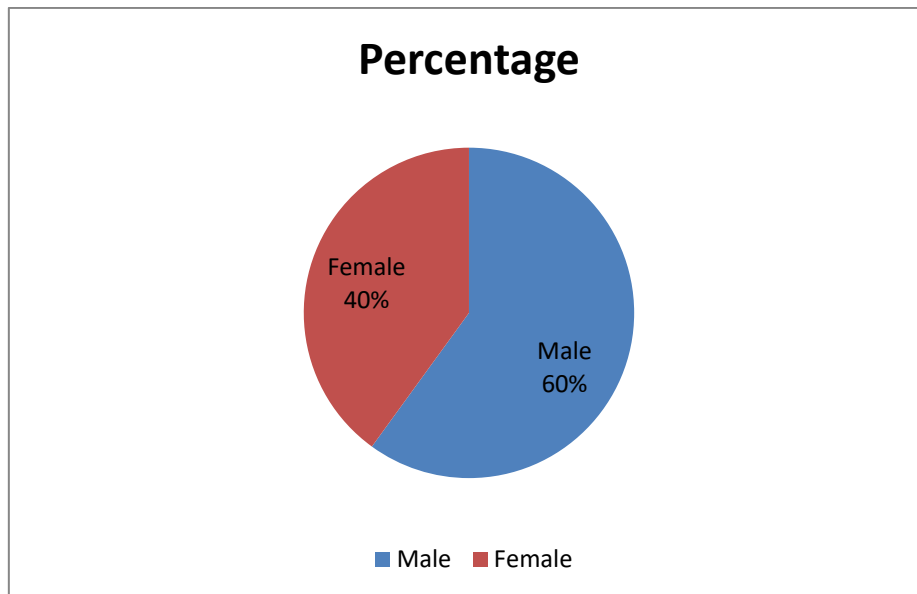
Variables	Categories	No of Respondents	Percentage
Gender	Male	32 + 4 = 36	60
	Female	18 + 6 = 24	40
Age	20-25	4 -1=3	5
	26-30	9 +3=12	20
	31-35	18 +3=21	35
	36-40	11 +4=15	25
	Above 40	8+1=9	15



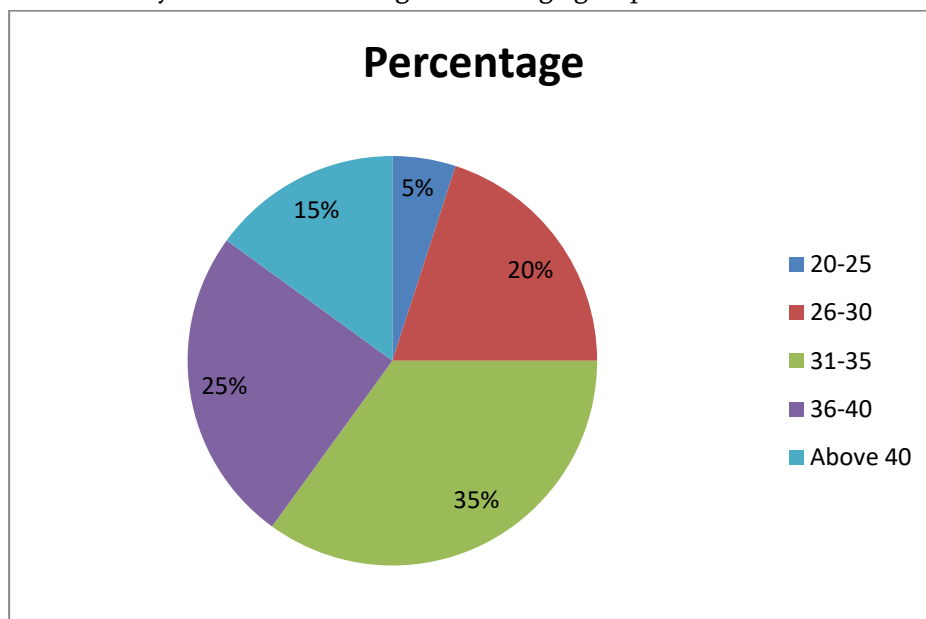


Education	Matric	0	0
	Higher Secondary	5 +1=6	10
	Graduate	21 +3=24	40
	Post Graduate	20 +1=21	35
	Others	4+5=9	15
Marital status	Married	31 +2=33	55
	Unmarried	19+8=27	45

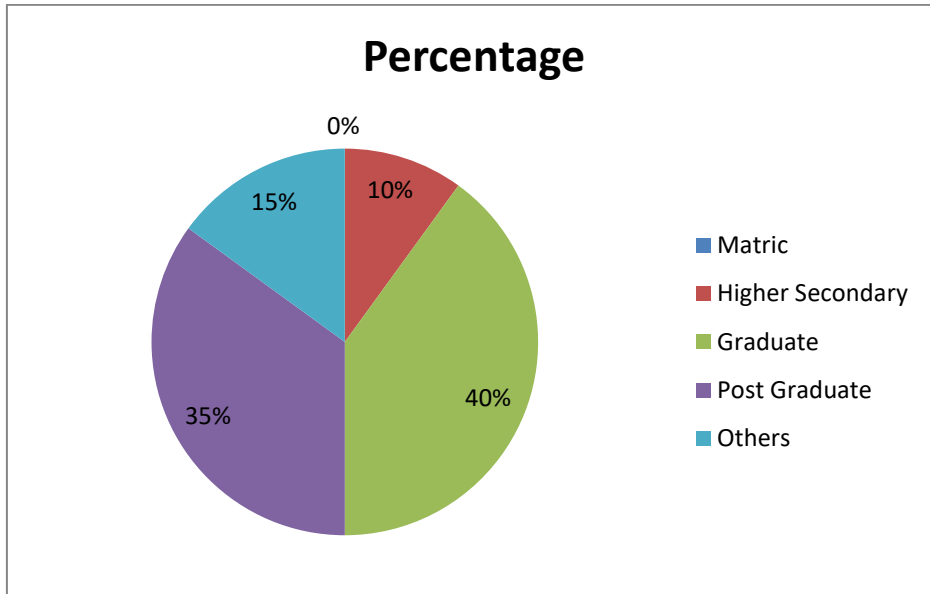
On the basis of Gender: Among the respondents, 60% are male whereas 40% are female.



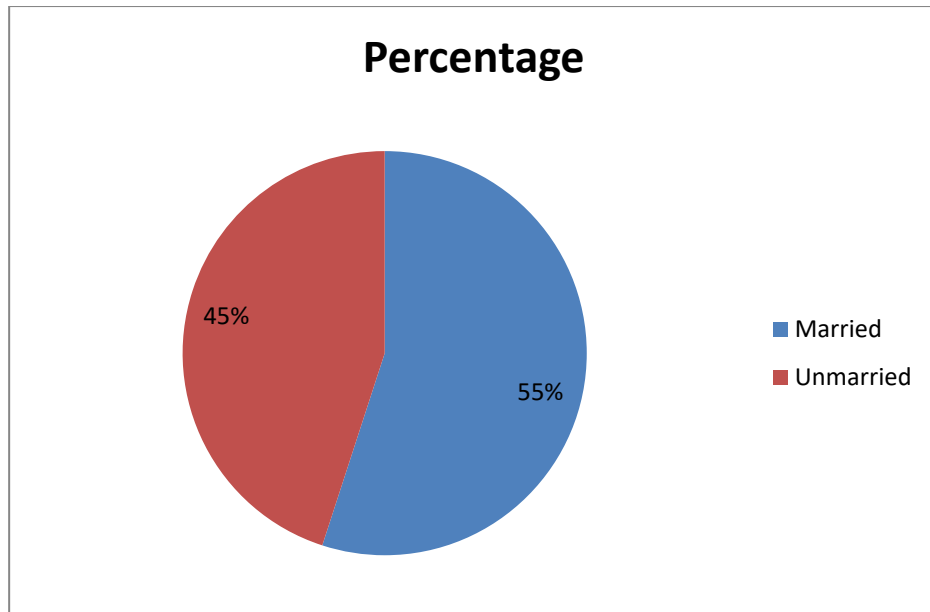
On the basis of the Age the respondents: Among the respondents 35% belong to the age category of 31-35 years followed by 25% in 36-40 years, 20% in age group of 26-30 years, 15% age group belong to the above 40 years and 5% belong to 20-25 age group.



On the basis of Educational qualification of the respondents: 40 & 35 % are graduates and post-graduates and 10 & 15 % are higher secondary and others. There is no respondents belong the matric qualification.



On the basis of Marital Status: Among the respondent is 55% were married and 45% are unmarried.

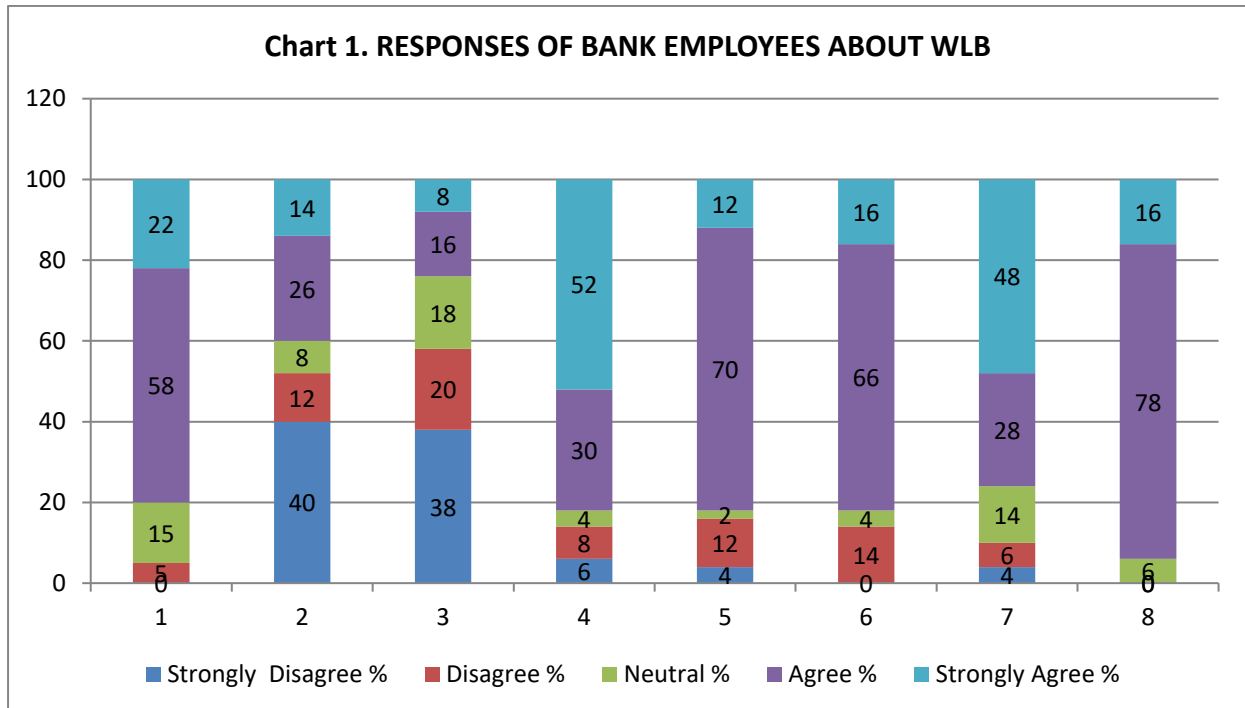


**Responses of Bank employees regarding the Work-life balance in the nationalized bank situated in Ambala District.**

1	I leave work/office on time on most of the days
2	Employers take long working hours for granted
3	I often take my office work at home
4	Management can be trusted to do things that employee want to do in their own way



5	My performance targets set by management are reasonable
6	I can devote sufficient time for household responsibilities
7	Employees are treated with equal fairness
8	I am satisfied with the balance between my work and personal life

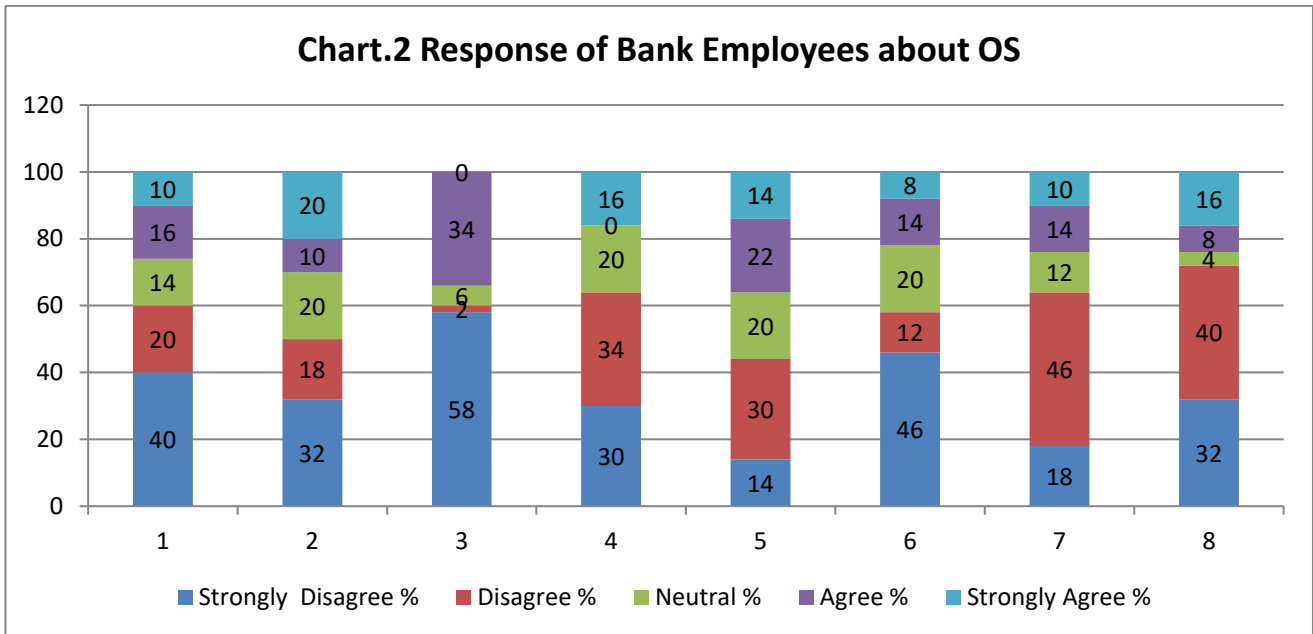


It can be seen from the table-2 that most of the respondents were satisfied by the policy of work-life balances offered by the nationalized banks in Ambala. They offered policy like -leave the office at the time, management trusted employees and equal fairness to all employees and they can give proper time to household responsibility. In bar graph responses of eight questions has been mentioned in Percentage.

**Table -3.** Responses of Bank employees regarding the Occupational Stress in the nationalized bank situated in Ambala District.

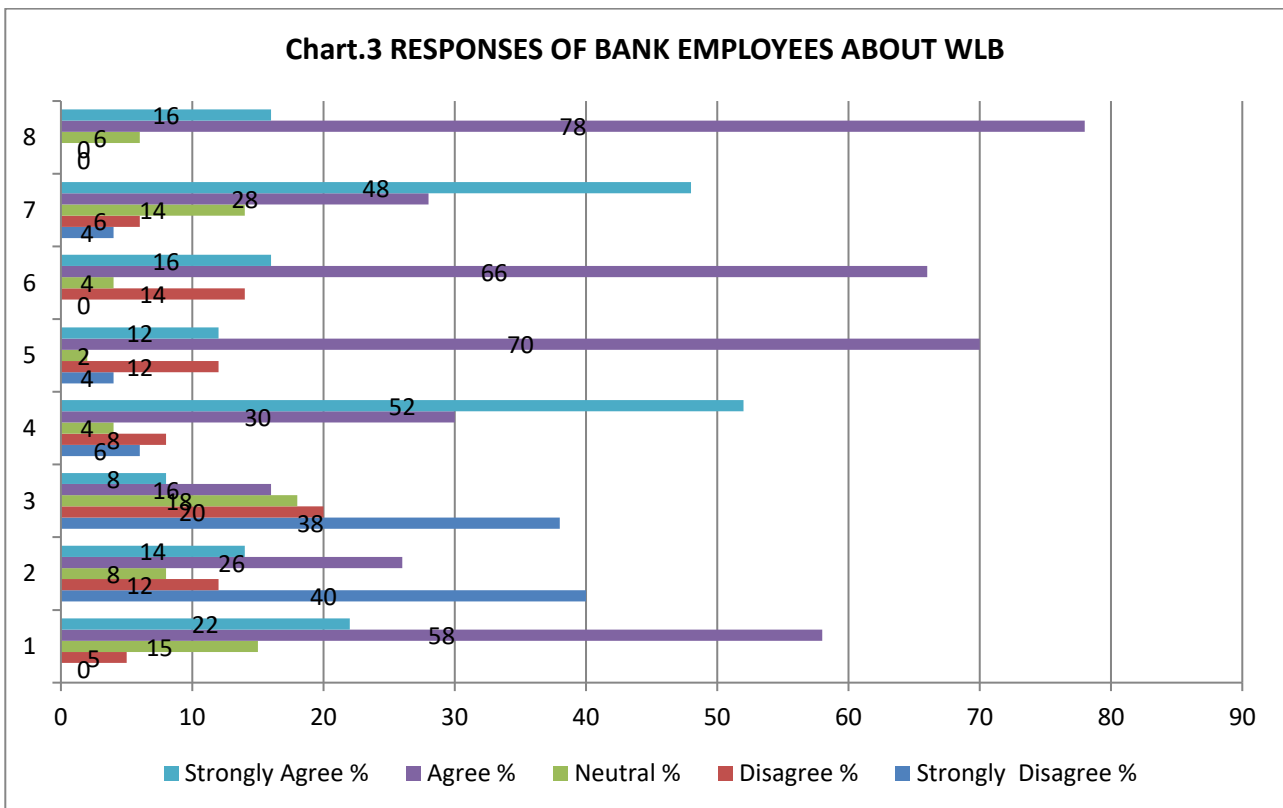
1	I am paid a low salary as compared to my labour and work
2	I find it difficult to establish an equilibrium between political/group pressures and formal rules and instructions.
3	When new work is assigned to me, neither clear instructions are given nor are adequate means provided.
4	Some of the work is risky and complicated.
5	The limits of my work and powers are uncertain and ambiguous.
6	Some of my colleagues and subordinates try to defame me.
7	I have experienced that because of the job my life has become a burden.
8	I have to do some work unwillingly due to mass political pressure.

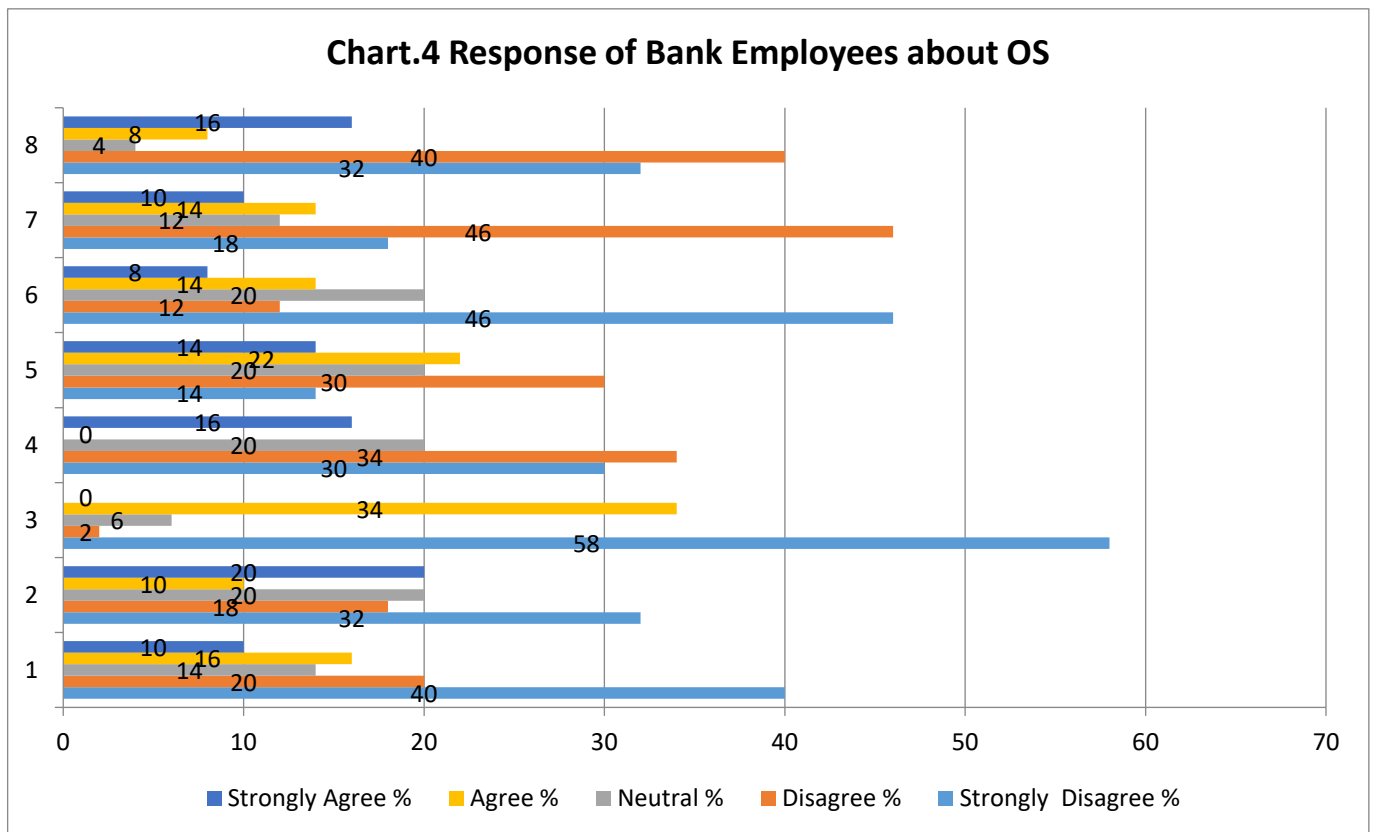




According to the table-3, it can be concluded that Occupational stress had a negative related to the employee's work-life balance in the selected banks in Ambala District. Most of the employees disagree to have occupational stress in their organization. In bar graph responses of eight questions has been mentioned in Percentage.

The Relationship between Work-life Balance and Occupational stress among Nationalized banks.





In chart-1 represent the Work-life balance and Chart-2 depict the Occupational stress in the nationalized banks in Ambala. The Occupational stress was the independent variable and Work-life balance was dependent. It was cleared showed that Work-life balance depends on the Occupational stress. In this study, it was found that Occupational stress had a negative relation to the employee’s work-life balance in the selected banks in Ambala District. Through the study, it was analyzed that the employees are satisfied with Work-life balance policy offered by the selected banks. Since nationalization banking sector is considered to be one of the major employees, even people prefer banks as a career as the social status and wages are good enough. Indian worker feelings are very emotions and any legal contract will not motivate them. Instead there should be psychological or emotional bond between employees and the organization. HR policies and practices being adopted by the selected nationalized banks to promoting healthy

work-life balance were providing flexible leave arrangements to suit employee’s personal needs and Safety and healthy environment were provided to the employees. The non-financial reward was agreed to the employees.

### VII.CONCLUSION

The goal of this study was to augment the knowledge of work-life balance existing in the selected banks of Ambala. A satisfied and happy and hardworking employee is the biggest asset of any organization, including banking sector also. The study focused on what types Work-life balance policy offered by nationalized banks in Ambala District. One independent (Occupational stress) and one dependent variable (WLB) was taken to know the exact condition of Work-life balance policy followed by the banks. Through the study it was analyzed that the employees were gratified with the WLB policy offered by the selected banks. They are satisfied with

working hours, salary, and cooperation of employer, healthy work environment. It was found that Occupational stress had a negative relation to the employee's work-life balance in the selected banks in Ambala District.

Limitation faced during research process were many bank branches were visited after their normal working hours because during the working hours, it was difficult to get complete information due to public dealing and some respondents showed the little interest in filling the questions.

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# Diversity of aquatic Angiosperms and Associated Species of Heranj Wetland, Kheda – Gujarat for Sustainability

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## ABSTRACT

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Wetlands are one of the most productive and fertile ecosystems on earth. They cover about 6.4% of the land area of the earth (Mitsch and Gosselink, 1986). Wetlands are tremendously valuable pools of biodiversity and genetic resources, but unsustainable development is intimidating the bio-wealth and even initiating species extinction. Floodplains, mangroves, sea grasses, saltmarshes, arctic wetlands, peat lands, freshwater marshes and forests are very diverse habitats, with different stressors and aquatic angiosperms act as primary creators in aquatic ecosystems and they maintain energy flow in whole bionetwork. Wetland systems are vulnerable to fluctuations in quantity and quality of their water supply, and it is expected that climate change will have a pronounced effect on wetlands through alterations in hydrological regimes with great comprehensive variability. Wetland habitat responses to climate change and the implications for restoration will be realized differently on a regional and mega-watershed level, making it important to recognize that specific restoration and management plans will require examination by habitat. The present study reveals a total of 28 species of Aquatic angiosperms were recorded from the Heranj wetland ( Taluka: Matar District: Kheda, Gujarat ) that include 8 species of submerged, 2 species of free floating, 5 species of rooted with floating leaves and 13 species of emergent Aquatic angiosperms. *Najas* sp., *Hydrilla* sp., *Typha* sp., *Potamogeton* sp. are dominant species in Freshwater wetland and hence, different management and restoration techniques are needed for its sustainability.

**Keywords** : Aquatic angiosperms, Heranj pond, Wetland , Ecosystems.

## I. INTRODUCTION

Wetlands are one of the most productive and fertile ecosystems on earth. They cover about 6.4% of the

land area of the earth (Mitsch and Gosselink, 1986). In india, wetland also cover 1-5% of the land area(SAC, 2011). Gujarat have both coastal and inland wetland habitat diversity (Stanley, 2004). As per SAC

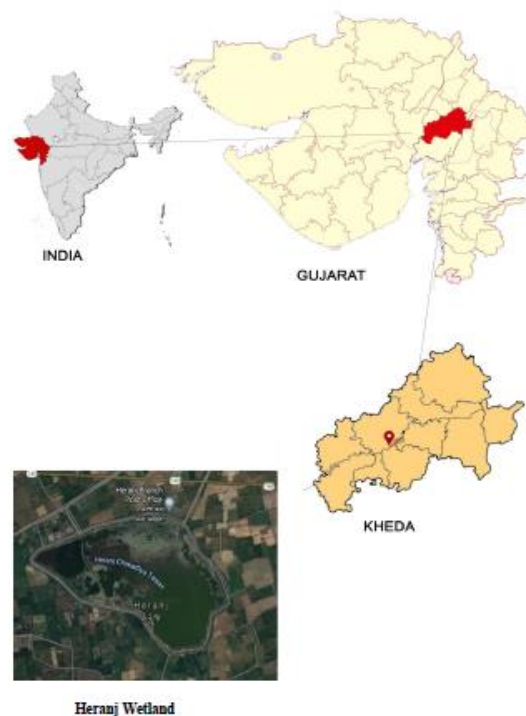


(2011) Gujarat has total 23,891 wetlands (Both Coastal and Inland wetlands), of which, 9,708 wetlands are those having an area less than 2.25 ha. Total area of these 23,891 wetlands has been estimated at 34,749.50 sq. km which accounts for about 17.56% of geographical area of the State and 22.7% of the total wetland area of the country. The area of the Gujarat State under coastal wetlands (coral reefs, creeks, inter-tidal flats, sand/beach, coastal marsh mangroves, etc.) are approximately 28,071 sq. km and that under inland wetlands (ponds, rivers, tanks, streams, oxbow lake) has been approximately 6,582 sq. km.

The present study of inland wetland has been carried out for knowing the diversity of the aquatic angiosperms and Associated Species of Heranj wetlands of Gujarat. This is a man-made wetland having an Open Water, emergent hydrophytic vegetation growth, water with *Nymphaea/Nelumbo* cover, water with decomposing submerged vegetation mat as the predominant habitat component within it.

## II. STUDY AREA

The study covered one Prioritized wetlands sites from Central Gujarat, Viz., Heranj Wetland. Heranj wetland is located in Matar taluka at 22°40'9.7"N latitudes and 72°41'28.5"E longitudes. It is situated at the distance of just 27 km north of Tarapur on Tarapur-Kheda State highway, 50 km from Ahmedabad and 50 km from Khambhat. The big lake of heranj is approximately kms. in area with depth varying between 2 ft to 10 ft.



**Figure 1:** Satellite image of Heranj Wetland (Source: Google Map)

## III. METHODS AND MATERIAL

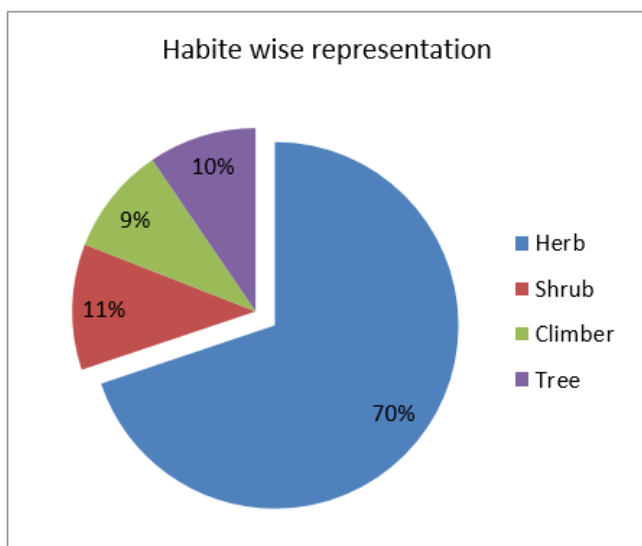
The field survey was started with a reconnaissance survey of Heranj Wetland located at Khambhat District of Gujarat state, India. Further, data collection was carried out in each of the season i.e., Summer, Monsoon and Winter. For flora study, a Belt- Transect with stratified random sampling method were carried out. The entire area of wetlands was covered by satisfied sampling and belt transect. The transects were decided and marked in such a way that each transect would represent a type of habitat. The data of flowering plants collected in each season from selected transect-based for habitat stratification. Heranj wetland endowed with six habitat components, i.e. inlet, outlet, open water, emergent hydrophytic vegetation growth, water with *Nymphaea/Nelumbo* cover, water with decomposing submerged vegetation mat. The plants were identified

with the help of standard literature and based on micro-morphological plants Characters and flowers.

#### IV. RESULTS AND DISCUSSION

##### Qualitative analysis

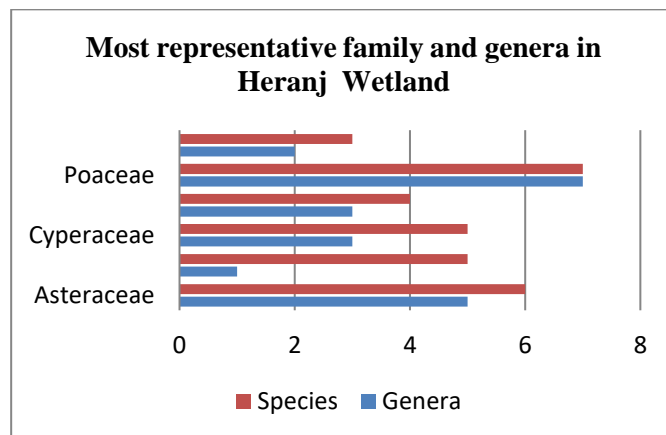
During the present study, a total of 63 species belonging to 32 families and 53 genera of flowering plants have been recorded from the in and around the Heranj wetland. Dicots represented by 40 species belong to 33 genera and 23 families while Monocots represented by 23 species belongs to 20 genera and 9 families. **Graph 1** showed habit wise analysis of plants i.e., tree, shrubs, climber, herbs, etc. Furthermore, plant checklist was prepared based on the visual observation in the quadrats as well transects (**Table 3**).



Out of 32 families, 47 genera are represented by single species of each genus. Asteraceae is largest families among the dicot while Poaceae and Cyperaceae are largest among the monocots which are poorly represented. A total of 63 species of flowering plants, 44 species are herbs, 7 species are shrubs, 6 species are climbers and 6 species are trees. This study show that herbaceous plants are dominating in the wetland and its surrounding areas.

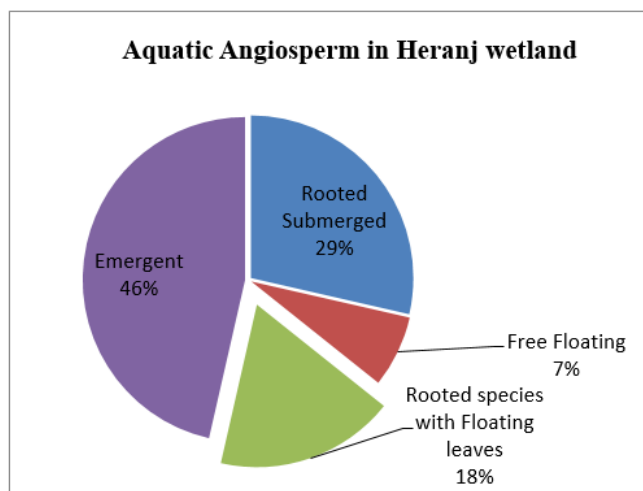
##### Most representative family and genera in Heranj Wetland

Most representative family, genera and species of Heranj are Poaceae (7 species), followed by Asteraceae (6 species), Cyperaceae (5 species), Convolvulaceae (5 species), Convolvulaceae (5 species) etc. as given in graph 2.



##### Aquatic Angiosperms

The Angiosperms are classified into submerged, free floating, rooted floating and emergent vegetation. Total 28 species recorded under this study belonged to 15 families. Majority of the species are recorded from emergent (13 species) vegetation followed by submerged (8 species), Rooted floating (5 species) and Free floating (2 species) Vegetation, etc. (**graph 3**)



**Table 1:** List of Aquatic Angiosperms at Heranj Wetland

Sr. No.	Botanical Name	Family	Status	Habit	Indicator status
1	<i>Ammannia baccifera</i> L.	Lythraceae	Emergent	Herb	FAC
2	<i>Cyperus difformis</i> L.	Cyperaceae	Emergent	Herb	FACW
3	<i>Cyperus iria</i> L.	Cyperaceae	Emergent	Herb	FACW
4	<i>Cyperus rotundus</i> L.	Cyperaceae	Emergent	Herb	FACW
5	<i>Cyperus bulbosus</i> Vahl	Cyperaceae	Emergent	Herb	FACW
6	<i>Eichhornia crassipes</i> (Mart.) Solms	Pontederiaceae	Free Floating	Herb	OBL
7	<i>Fimbristylis aestivalis</i> Vahl	Cyperaceae	Emergent	Herb	FACW
8	<i>Hydrilla verticillata</i> (L.f.) Royle	Hydrocharitaceae	Submerged	Herb	OBL
9	<i>Hygrophila auriculata</i> (Schum.) Heine	Acanthaceae	Emergent	Herb	FACW
10	<i>Ipomoea aquatica</i> Forssk.	Convolvulaceae	Routed Floating	Climber	FACW
11	<i>Ipomoea carnea</i> Jacq.	Convolvulaceae	Emergent	Climber	FACW
12	<i>Ipomoea marginata</i> (Desr.) Verdc.	Convolvulaceae	Routed Floating	Climber	FACW
13	<i>Ipomoea triloba</i> L.	Convolvulaceae	Routed Floating	Climber	FACW
14	<i>Lemna minor</i> L.	Lemnaceae	Free Floating	Herb	OBL
15	<i>Limnophyton obtusifolium</i> (L.) Miq.	Alismataceae	Emergent	Herb	FACW
16	<i>Ludwigia adscendens</i> (L.) Hara	Onagraceae	Emergent	Herb	FACW
17	<i>Najas marina</i> L.	Hydrocharitaceae	Submerged	Herb	OBL
18	<i>Najas minor</i> All.	Hydrocharitaceae	Submerged	Herb	OBL
19	<i>Nelumbo nucifera</i> Gaertn.	Nelumbonaceae	Routed Floating	Herb	OBL
20	<i>Nymphaea nouchali</i> Burm.f.	Nymphaeaceae	Routed Floating	Herb	OBL
21	<i>Persicaria glabra</i> (Willd.) M.Gómez	Polygonaceae	Emergent	Herb	FACW
22	<i>Potamogeton crispus</i> L.	Potamogetonaceae	Submerged	Herb	OBL
23	<i>Potamogeton nodosus</i> Poir.	Potamogetonaceae	Submerged	Herb	OBL
24	<i>Scirpus littoralis</i> Schrad.	Cyperaceae	Emergent	Herb	FACW
25	<i>Stuckenia pectinata</i> (L.)	Potamogetonaceae	Submerged	Herb	OBL

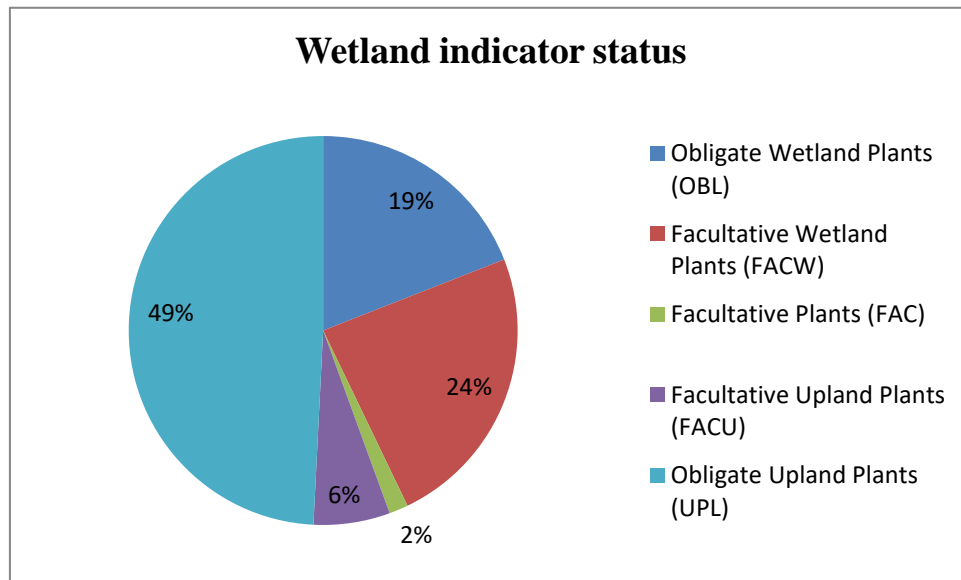
	Börner				
26	<i>Typha angustifolia</i> L.	Typhaceae	Emergent	Herb	FACW
27	<i>Utricularia inflexa</i> Forssk.	Lentibulariaceae	Submerged	Herb	OBL
28	<i>Vallisneria spiralis</i> L.	Hydrocharitaceae	Submerged	Herb	OBL

(\* Obligate Wetland Plants (OBL), Facultative Wetland Plants (FACW), Facultative Plants(FAC), Facultative Upland Plants (FACU), Obligate Upland Plants (UPL)).

During fieldwork at Heranj wetland 28 species of aquatic macrophytes were identified and listed based on the visual observation in the quadrats as well transects by using Cook (1996) and Shah (1978). The given table show list of aquatic macrophytes with their indicator statuses, habit, family, class etc.(**Table:1**)

**Wetland indicator status**

The National List of Plant Species that Occur in Wetlands is a list of wetland plants and their assigned indicator statuses. The five indicator statuses are: Obligate Wetland Plants (OBL), Facultative Wetland Plants (FACW), Facultative Plants (FAC), Facultative Upland Plants (FACU), Obligate Upland Plants (UPL). Based on these indicator statuses total of 63 species of plants were categories and represented. Out of these 31 species belong to Obligate Upland Plants, 15 Facultative Wetland Plants, 12 Obligate Wetland Plants, 5 Facultative Upland Plants and 1 naturalized, 1 Facultative Plants. (**Graph 4.**)



**Table 2.** Role of Species involved in wetland Sustainability:

Sr. No	Species	Role	References
1	<i>Hydrilla verticillata</i>	Cleaning of wetland water	Toth & Anderson., 1998
		Helps in Phosphorus removal	Gu., 2006.
2	<i>Ipomoea aquatica</i>	Bio-accumulation lead, cadmium and arsenic	(Ghosh, 2010)
3	<i>Eichhornia crassipes</i> and <i>Hydrilla verticillata</i>	Phosphorus removal efficiency	Shardendu <i>et al.</i> , 2012.
4	<i>Phragmites</i> sp. and <i>Typha</i> sp.	Sequential nitrogen detoxification, removal of BOD and TSS of	Brix,1997
5	<i>Scirpus</i> Sp.	Removing ammonia	Brix,1997
6	<i>Typha</i>	Accumulation of phosphorous	Brix,1997
7	<i>Eleocharis</i> spp, <i>Nymphaea odorata</i>	Increases nitrogen content	Zweig et al 2008

**Table 3 :** Check list of flowering plants of Heranj Wetland

Sr. No.	Botanical Name	Local name	Family	Habit
1	<i>Abutilon indicum</i> (L.) Sw.	Mudra, Petari, Karandi	Malvaceae	Shrub
2	<i>Achyranthes aspera</i> L.	Anhedhi	Amaranthaceae	Herb
3	<i>Alternanthera sessilis</i> (L.) R.Br. ex DC.	-	Amaranthaceae	Herb
4	<i>Ammannia baccifera</i> L.	Jal agiyo	Lythraceae	Herb
5	<i>Azadirachta indica</i> (L.) Juss.	Neem, Limdo	Meliaceae	Tree
6	<i>Blumea lacera</i> (Burm.f.) DC.	-	Asteraceae	Herb
7	<i>Blumea mollis</i> (D. Don) Merr.	-	Asteraceae	Herb
8	<i>Calotropis procera</i> (Aiton) Dryand.	Akado	Asclepiadaceae	Shrub
9	<i>Chloris barbata</i> Sw.	-	Poaceae	Herb
10	<i>Cocculus hirsutus</i> (L.) W.Theob.	Vevdi	Menispermaceae	Climber
11	<i>Coix lacryma-jobi</i> L.	-	Poaceae	Herb
12	<i>Commelina benghalensis</i> L	-	Commelinaceae	Herb
13	<i>Cyanthillium cinereum</i> (L.) H.Rob.	-	Asteraceae	Herb

14	<i>Cynodon dactylon</i> (L.) Pers.	Darbh	Poaceae	Herb
15	<i>Cyperus difformis</i> L.	-	Cyperaceae	Herb
16	<i>Cyperus iria</i> L.	-	Cyperaceae	Herb
17	<i>Cyperus rotundus</i> L.	Dilo	Cyperaceae	Herb
18	<i>Dichanthium annulatum</i> (Forssk.) Stapf	Darbha	Poaceae	Herb
19	<i>Digitaria abludens</i> (Roem. & Schult.) Veldkamp	Bondya	Poaceae	Herb
20	<i>Eclipta prostrata</i> (L.) L.	-	Asteraceae	Herb
21	<i>Eichhornia crassipes</i> (Mart.) Solms	-	Pontederiaceae	Herb
22	<i>Eragrostis tenella</i> (L.) P. Beauv.	-	Poaceae	Herb
23	<i>Euphorbia hirta</i> L.	-	Euphorbiaceae	Herb
24	<i>Ficus virens</i> Dryand. ex Ait.	-	Moraceae	Tree
25	<i>Fimbristylis aestivalis</i> Vahl	-	Cyperaceae	Herb
26	<i>Glinus lotoides</i> L.	-	Molluginaceae	Herb
27	<i>Grangea maderaspatana</i> (L.) Poir.	-	Asteraceae	Herb
28	<i>Heliotropium supinum</i> L.	Prostrate Heliotrope	<u>Boraginaceae</u>	Herb
29	<i>Hydrilla verticillata</i> (L.f.) Royle	-	Hydrocharitaceae	Herb
30	<i>Hygrophila auriculata</i> (Schum.) Heine	-	Acanthaceae	Herb
31	<i>Ipomoea aquatica</i> Forssk.	Vel	Convolvulaceae	Climber
32	<i>Ipomoea carnea</i> Jacq.	Bush Morning Glory	Convolvulaceae	Climber
33	<i>Ipomoea marginata</i> (Desr.) Verdc.	-	Convolvulaceae	Climber
34	<i>Ipomoea pes-tigridis</i> L.	-	Convolvulaceae	Climber
35	<i>Ipomoea triloba</i> L.	-	Convolvulaceae	Climber
36	<i>Lantana camara</i> L.	-	Verbenaceae	Shrub
37	<i>Launaea procumbens</i> (Roxb.) Ramayya & Rajagopal	Gadjepi	Asteraceae	Herb
38	<i>Lawsonia inermis</i> L.	Mahendi	Lythraceae	Shrub
39	<i>Lemna minor</i> L.	-	Lemnaceae	Herb
40	<i>Limnophyton obtusifolium</i> (L.) Miq.	-	Alismataceae	Herb
41	<i>Ludwigia adscendens</i> (L.) Hara	-	Onagraceae	Herb
42	<i>Mangifera indica</i> L.	Ambo	Anacardiaceae	Tree
43	<i>Najas marina</i> L.	-	Hydrocharitaceae	Herb
44	<i>Nelumbo nucifera</i> Gaertn.	Kamal	Nelumbonaceae	Herb
45	<i>Nymphaea nouchali</i> Burm.f.	Poynu	Nymphaeaceae	Herb
46	<i>Polygonum plebeium</i> R.Br.	-	Polygonaceae	Herb
47	<i>Potamogeton crispus</i> L.	-	Potamogetonaceae	Herb
48	<i>Potamogeton nodosus</i> Poir.	-	Potamogetonaceae	Herb

49	<i>Prosopis cineraria</i> (L.) Druce	Khijdo	Leguminosae	Tree
50	<i>Prosopis juliflora</i> (Sw.) DC.	Gando Baval	Leguminosae	Shrub
51	<i>Rungia repens</i> (L.) Nees	-	Acanthaceae	Herb
52	<i>Salvadora persica</i> L.	Piludi	Salvadoraceae	Shrub
53	<i>Scirpus littoralis</i> Schrad.	-	Cyperaceae	Herb
54	<i>Senna auriculata</i> (L.) Roxb.	Tarvad, Awal	Leguminosae	Tree
55	<i>Sida cordifolia</i> L.	-	Malvaceae	Herb
56	<i>Solanum surattense</i> Burm. f.	Boyringni	Solanaceae	Herb
57	<i>Sporobolus coromandelianus</i> (Retz.) Kunth	-	Poaceae	Herb
58	<i>Stuckenia pectinata</i> (L.) Börner	-	Potamogetonaceae	Herb
59	<i>Typha domingensis</i> Pers.	Gha Bajariu	Typhaceae	Herb
60	<i>Vachellia nilotica</i> (L.) P.J.H. Hurter & Mabb.	Baval	Leguminosae	Herb
61	<i>Vallisneria spiralis</i> L.	-	Hydrocharitaceae	Herb
62	<i>Ziziphus jujuba</i> Mill.	Bor	Rhamnaceae	Tree
63	<i>Ziziphus nummularia</i> (Burm.f.) Wight & Arn	Chani-Bor	Rhamnaceae	Shrub

## V. CONCLUSION

Anthropogenic activities have impacted on wetland ecosystem services across the world. Restoration of wetlands are needed. Present study show the species composition of aquatic angiosperm are play vital role for wetland sustainability as well as it can be consider throughout the wetland restoration activity. Study will also helpful to recreate wetland diversity precisely to Kheda District which have maximum number of wetland in Gujarat state. Furthermore, study can be also helpful for understanding the complexity of wetland ecosystem.

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## Impact of Digital Technology on Preschoolers : A Review

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### ABSTRACT

This paper shows how the advent of digital technologies is driving a reconceptualization of the underlying assumptions of innovation policy. There is conclusive evidence that digital equipment, tools and resources can, where effectively used, raise the speed and depth of learning for preschoolers. There is indicative evidence that the same can be said for some aspects of literacy, especially writing and comprehension. Digital technologies and electronic media devices appear to be appropriate means to improve basic literacy and social skills, especially in primary settings. The level of impact is generally similar to other changes to pedagogies which are effective in raising attainment although the use of digital learning has other benefits. Additionally, the extent of the effect may be influenced by the level of capability of teachers to use digital learning tools and resources effectively to achieve improved learning outcomes.

**Keywords :** Aquatic Angiosperms, Heranj Pond, Wetland , Ecosystems.

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### I. INTRODUCTION

The rapid expansion of technology into the worlds of young people has created a new generation which can use computers, mobile devices and other digital technologies as easy as winking. Nevertheless, in the context of early childhood settings there are some influences that may differentiate the technology use behaviors of preschool children which are generally constructed at home or school environment.

Technology use is becoming increasingly prominent in both K-12 settings and the workplace. Early childhood education is often a time for preparing

students with the basic skills they need for K-12 education, so digital literacy may be another area in which early childhood education could help prepare young children. When we talk about technology in education, we mean the tools or machine in the classrooms. Like computers, tablets, printers and music system and all. In preschool classroom technology can take many forms. Young children enjoy to listening songs, books and stories. When a teacher is not available to read with a student, they can listen on a digital player, like compact disk player or electronic device such as iPod.

Still, not everyone agrees that technology should be in early childhood education. Debates about the role of technology in early childhood education are ongoing, with some providers, parents, and others yet to be convinced about the potential benefits of technology.

Nowadays, children are fascinated to play with technology and electronic media devices like smart phones, internet connected TVs, video games, high speed internet etc. Children have propensity to be more active consumer of technology and many electronic digital products are intend to the youth market. This is also very true that parents & youngsters use devices and gadgets to keep their children quiet busy and engaged for a long period of time so that they can be free and do their work.

**According to Julie Lewis**, The researchers are clear that if children spend too much time watching electronic screens in their early age then the adverse effect can be seen. Parents should know about correct and appropriate use of media technology which is useful for their children as well as the time limit related to screen timings spend by child on daily basis. **Interior Health** suggests a time limit according to the age range, regarding how much time children should be using technology

- from 0 to two years of age: (None)
- Children from three to five years of age: (1 hour per day)
- Children from six to twelve years of age: ( 2 hours per day)

If we see the teaching approach or teaching styles, it is very true that there is a unorganized connection between what is taught and what actually happens in the outside world or real world or society, so in order to catch up with the real world to the schools and early childhood centers they need to incorporate with advanced technology in their curriculum. Since media devices are taking used in life style, it is very important to include or integrate technology into learning environment. The quality of experiences

encountered by young children during this period has immense and vast impacts on their personal growth and development and also their learning abilities.

## II. REVIEWS

**Alper T. Kumtepe (2006)** investigates the effect of use of computer on children's social skills in kindergarten. The total sample included 12,929 children. Results indicate that children, use computers more competently and masterly, show better effective social skills and less behavioral problem, rated by their teachers.

**Teresa Ann Shanahan-Braun (2009)** this study was done to know how useful and advantageous computers are related to overall development like, language development, cognitive development, and social development with preschoolers. Result showed that as compared to traditional preschool activities, computers have not been proven to be more beneficial for the typical developing child. However, technology is here to stay and preschool children who do not have access to computers need to be prepared to use technology by the time they enter into preschools.

**H. Fierman et al (2010)** aim of this study to know the relationship between media exposure in infancy and developmental outcomes in children from families with low socioeconomic status in the United States. Result show strong and powerful evidence in support of no media exposure or screen time needed to age 2 years, although further research is needed.

**Lorna Savage (2011)** aim of this study was to gives factual information to explore 3 to 5 year old children's social interactions on media or technology-rich local authority of preschools by: identifying the observable child interactions as children busy with media or technology in preschools. The study adopts an inclusive definition of technology and gives a broad range of resources, providing new concepts related to the role of digital technologies in social

interaction and education. And the all round development of children.

**Joseph Juzwiak (2012)** discusses that use e-Books as a means of technology integration in classrooms, and in the area of emergent literacy. In this study researcher focused on answering the research question: “How does e-Books support emergent reader’s literacy development”? This study also and looks at the effect of reading e-Books on students “motivation to read”.

**Ruth Nancy Zomer, (2014)** the research show the effect of technology use on learning, educating and engagement for children age range from 3 to 6 in early childhood educational settings. Thirty peer-reviewed articles, selected from an extensive search of the literature, are organized and discussed by topic: literacy, numeracy, social interactions and engagement. Methodological concerns include sample sizes, reliability and validity of data collection tools, lack of control groups, pedagogy and basic design issues. Key findings specify that 94% of results describe in the studies show a positive influence of technology use. A disproportionate number of studies focus on literacy.

**Fathi Ihmeideh (2015)** purpose of the study to investigate the effect of e- book on enhancing preschool children’s emergent literacy, in comparison to children who were exposed to regular printed books. Both experimental and control group were taken for this study. Total 92 children were selected for pre test and post test on print awareness, alphabetic knowledge, and vocabulary to know the effectiveness of e- book. The result indicates children in experimental group performed better than control group and significant differences were found on the based of gender, as the female children show superior skill on emergent literacy to the male children. On the basis of this result it’s recommended that preschool centers should include or integrate e- book activities into their classrooms.

**Nancy R. Zomer & Robin H. Kay (2016)** this study provides literature review of students who use technology in early childhood education. 30 peer-

reviewed articles from 11 countries, selected from a comprehensive search of the literature. Methodological concerns included limited sample sizes and descriptions, and the limited number of technology tools used. Fewer studies show that technology and media had a positive impact on engagement, and mathematics skills, social interactions. So many studies also show that technology had a positive impact on sequencing, to develop visual perception, creative thinking, and fine motor capability.

**Ciera Brianna Mills, Lexington et al (2016)** this study analyze the efficacy of digital media on emergent literacy skills, specially alphabet knowledge, print awareness, and phonological awareness, on children birth to four year. A systematic search on literature review identified. Results show useful and positive effects of digital media on emergent literacy skills. A checklist was prepared to guide clinicians, parents, and others for correct use of screen media.

**Hyong Yoon Chang et al (2017)** aim of this study was to explore the exposure of smart digital devices among 2-5 years of children from Korea. 400 parents of 2-5 year old children were the sample of this study. Demographic data information and the frequency of media use, time of media use, age at first use of media was self-reported. This study gives detailed information and comprehensive facts on children’s contemporary and present time use of media access.

**Katie A. Pacigathis (2017)** research report synthesizes the research work, and practices that involved technology and media for young children. A combination of snowball sampling, systematic database searches, reverse searches, and hand searches are used. Results show that there were fewer examples from research and practice related to infants and toddlers than other age groups. Result show that children’s interactions with digital media and technology are encouraging the overall development of children.

**Cristina E. Kuta (2017)** discusses the effects of excessive screen time on language development for

children under 6 years and analyzes interventions to reduce screen time. Toolkit was created. Being consistent about providing a few minutes of screen time education at every wellness visit from 2-months-old to 5 years-old sets a solid foundation for parents and children to create healthy screen time habits at home.

**Michelle M. Neumann (2017)** this study was a current discovery on using touch screen mobiles and tablets in reinforcing the development of early year literacy within a conceptual framework. Findings show that tablets have the latent qualities to strengthen children's emergent literacy skills. although, the optimum use of tablets for early literacy learning might be based upon the type of scaffolding used by teacher or parent and the availability and best quality of literacy tablet applications. Practical association, implications and suggestions for further future researches are discussed.

**Aitchison, Emily (2018)** this study the researcher investigate that how technology could be put into practices in early childhood education and he also demonstrate that how it works on children. The data were collected from using case study method which involved children from 3-5 year. The result showed that including technology in education is far easier than many practitioners expect, and it need to be flexible, fun and relevant to the children, so that the young children can have exposure, learning experiences and sense of self control.

**Himanshu Rastogi (2019)** the paper is based on secondary source of information gathered from various authentic websites, research papers, newspapers and magazine articles. The result show that education is transforming with rapid pace from being traditional chalk and talk based and book based study to internet based education system. The traditional class rooms with black boards are being replaced by smart classes fitted with audio and visual system.

**Sezan Sezgin et al (2021)** this study seeks to define the possible influences; effects and praxis of technology

use in early childhood settings, and also intend to explore the current research trends about technology use in the field of early childhood education. Data were gathered from several scientific databases. Review of the articles and scientific documents were conducted in two rounds. Review process was repeated by two researchers different from the first round, and a different set of two researchers were cross checked in the second round. This study also draws on a discussion about pedagogical effects of technology use in early childhood settings.

### III. CONCLUSION

Our review of digital technology suggested that early childhood literacy affected successfully, technology is on very top and play a major and significant role in supporting and reinforcing the early year literacy. Now a day's children have opportunity to explore with different electronic devices like touch screens loaded with variety of interactive media experiences with proper well designed search engine etc.

Electronic devices can be very useful but at the same time we have to know that it can be very dangerous for children because it has negative impact also if they are excessive over-used.

The review based findings showed that this is important and crucial to be aware about the effective and right use of mobile phone and digital technology should different across both informal and formal settings and also how technology can be used as additional material for classroom settings for both inside and outside and early childhood curriculum, so further more researches, exploration and effective work is required to know and to understand that how to adapt the environment of early years to meet the variety of optimal needs of young children and their families.

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# Surveying the Association Between Blood Type and COVID-19 Infection

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## ABSTRACT

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The COVID-19 spreads rapidly around the world which has brought a global health crisis. Virus infectivity is mediated by the binding of Spike transmembrane glycoprotein to specific protein receptors present on cell host surface. Studies have noted that some ABO blood types are more susceptible to COVID-19 virus infection. The present survey-based study aimed to further confirm the relationship between different blood groups and COVID-19 infection. The survey is carried out in the area of Gautam Budh Nagar, located in Western part of Uttar Pradesh. The present study was started in the month of September, 2020 and finished in the month of January, 2021.

**Keywords :** ABO blood system, COVID-19

## I. INTRODUCTION

The novel coronavirus disease (COVID-19) is caused by enveloped RNA viruses (SARS-CoV-2). SARS-CoV-2 viruses (order Nidovirales, family Coronaviridae, and subfamily Orthocoronavirinae) are mostly spherical, given electron microscopic morphology, although some are polygonal. The virus is approximately 125 nm in diameter and is enveloped with spikes (glycoproteins) that are nearly 9 to 12 nm, creating the virus's coronal form. The virus

morphology is compatible with others in the coronavirus family, particularly SARS-CoV and MERS-CoV [1,2]. The target cell receptor is the key to determining how the virus reaches the cell and which tissues are targeted. The spike glycoproteins engage the viral envelope with the targeted cell cytomembrane. Current research studies showed that angiotensin-converting enzyme 2 (ACE2) is expected to be the COVID-19 cell receptor [3]. The COVID-19 virus causes a severe respiratory infection associated with a considerable mortality rate. This rapidly

spreading viral infection was proclaimed a pandemic by the World Health Organization (WHO) in March 2020 [4].

Individuals with particular ABO blood groups are more prone to various types of infections [5]. For example, blood types A and AB predispose subjects to aggravated malaria, while type O causes resistance to several protozoal infections. Furthermore, this blood grouping system exhibit direct or indirect association with some cardiovascular conditions [6]. Recently, Groot et al. reported that people with A, B, and AB blood types are more susceptible to thrombosis and myocardial infarction, while those bearing the O blood group are more prone to hypertension [7]. In addition, individuals having the A antigen are also predisposed to a higher risk of metabolic disorders, such as hyperlipidemia and diabetes mellitus [8]. After the outbreak of the COVID-19 infection, the likelihood of association between ABO blood groups and the susceptibility to COVID-19 exposure has been reported in patients from three hospitals in Wuhan, Shenzhen, and China. The study results showed that individuals with blood group A had a markedly greater risk of COVID-19 exposure, whereas those with blood group O had a significantly reduced risk of COVID-19 infection.

However, the researchers recommended more studies to confirm the association between the ABO blood grouping and COVID-19 viral infection [9]. In a meta-analysis of two different case-control cohorts, type A blood was reported to confer a greater risk of aggravated COVID-19, while type O blood may offer protection against COVID-19 infection [10]. In the face of this challenging pandemic, the current retrospective cross-sectional study aimed at surveying the influence of ABO blood grouping type on the vulnerability to COVID-19 infection.

## II. METHODS AND MATERIAL

### Study Protocol

This was a retrospective cross-sectional study conducted on participants from Gautam Budh Nagar, Uttar Pradesh India. Gautam Buddh Nagar is a largely suburban district of Uttar Pradesh. It is part of the National Capital Region (India). It is divided into 3 sub-divisions: Noida Sadar, Dadri and Jewar. The survey was carried out over five months, from the September, 2020 and finished in the month of January, 2021. Google form questionnaires were designed for the COVID-19-recovered patients (COVID-19 group), and the other one for the healthy people (Control group). The questionnaires were distributed via social media (mainly Facebook and WhatsApp). Communication between the researchers and the participants was conducted by electronic mail when needed. The COVID-19 questionnaire comprised of questions such as age group, gender, nationality, blood group, and Rhesus factor (Rh). All participants were allowed to terminate the survey at any time. All measures were taken to keep the confidentiality of the data. In this study, 82 subjects completed the COVID-19 questionnaire.

## III. RESULTS AND DISCUSSION

The study was conducted by comparing the blood group distribution in 82 confirmed patients with COVID-19. The ABO blood group in 82 patients infected with COVID-19 infection, showed a distribution of 47.36 %, 55.26 %, 14.28 %, and 25.7 % for A, B, AB and O, respectively. The results showed that blood group B is associated with a higher risk for acquiring COVID-19 compared to other blood groups, whereas blood group AB and O was associated with a lower risk for the infection.

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# Decision Support Systems for Assessing the Teaching Materials Quality in e-Learning and Designing Teaching Materials Management using Learning Style and High Technology Spiritual Communication Methods

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## ABSTRACT

High Technology Spiritual Communications is a communication system first introduced by a doctor who graduated from Harvard University, Indrawan Hatoguan Siregar, Ph.D., a permanent lecturer at Panca Budi Development University. One of his studies explains how we value other people by understanding their thinking patterns because basically, all humans have four types of thought patterns, and one of them is more dominant. Respect others' mindset, meaning that we also have empathy for them, and communication will also be established and information will be conveyed well and easily understood. In the teaching and learning process, this is very important during the face-to-face learning process and online learning. Students and lecturers do not face each other in online learning but use the internet and LMS (Learning Management System) as the communication media. Implementing HTSC (High Technology Spiritual Communications) and Learning Style into lecturer teaching materials packaged as attractive as possible can be a solution in conveying learning objectives to students. Students can understand teaching materials according to their character, mindset and learning style.

**Keywords :** DSS, HTSC, SAW, Decision, Teaching, Learning, Lecturer

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## I. INTRODUCTION

In face-to-face lectures and online lectures, both must be able to measure the level of student understanding of the courses given, which are usually outlined in the semester learning plan [1]. However, in e-Learning-based lectures, a lecturer must understand several

differences, namely the method/technique/pattern of teaching. There must be a modification, concept development, difficulty level, and changing patterns from simple patterns to moderate patterns and more complex patterns to change the learning pattern from Teacher Lead-Learning to Student-Infatuated Learning. The facts and facts found in the field are

that the interaction only exists with the lecturers without any students' feedback; teaching materials are only limited to power points and .pdf files. After evaluating the cause is because students do not understand what is conveyed on the lecturer PowerPoint slides, and students are not interested in the material given / monotonous [2].

It means that the teaching materials presented have not been translated according to students' different thinking patterns, so that learning outcomes will also not be achieved. With this research, the author will provide solutions on how to manage teaching materials and how to delivery system techniques [3] e-Learning-based learning that is attractive and able to be understood by students by understanding student thinking patterns and student Learning Styles and then translated into [4] teaching materials using HTSC (High Technology Spiritual Communications) as the method. This research is fundamental to be implemented in permanent lecturers in all study programs within the Panca Budi Development University to support the Distance Lecture and Accreditation program at the point of developing learning techniques [5]. Many state and private universities have moved to improve infrastructure and change the system to support the teaching and learning process by utilizing technology as a learning medium, and it is known as e-Learning [6]. E-Learning itself is a learning system that utilizes information and communication technology that allows students and lecturers to interact without facing each other by relying on the internet network and LMS (Learning Management System) as intermediate media [7].

## II. METHOD

The Five Thinking Process can be done in face-to-face learning systems in class, and it can also be in e-Learning based learning. In e-learning based learning, five thinking processes and learning styles are

implemented into teaching materials [8]. Teaching materials are arranged using five patterns according to their respective characteristics. The following are the results of the analysis of the readiness of teaching materials in e-Learning based learning using three learning styles, such as [9] :

1. The study program which is the target of the analysis/respondent is the Computer System
2. The number of respondents is 63 people
3. Subjects that are targeted for analysis are Decision Support Systems, Research Methodology, Professional Ethics.
4. The system used is a Decision Support System (DSS)
5. The data analysis method used is HTSC.
6. The data processing method used is Simple Additive Weighting (SAW) [10]

### Simple Additive Weighting

The following are the stages of a decision support system using the SAW method [11]:

1. Determine alternatives
2. Determine the assessment criteria
3. Determine the weight of preference or level of importance ( $W$ ) of each criterion. Formula:

$$W = [ W_1 , W_2 , W_3, \dots, W_j ]$$

4. Creating a rating table of the suitability of each alternative on each criterion
5. Make a decision matrix ( $X$ ) which is formed from the suitability rating table of each alternative on each criterion.
6. Perform normalization. Formula:

$$r_{ij} = \frac{x_{ij}}{\begin{matrix} \text{Max } x_{ij} \\ i \\ \text{Min } x_{ij} \\ i \\ x_{ij} \end{matrix}}$$

Description:

$r_{ij}$  = normalized performance rating value

$x_{ij}$  = attribute value owned by each criterion

$Max_{xij}$ = the greatest value of each criterion i

$Min_{xij}$ = the smallest value of each criterion i

$$v_i = \sum_{j=1}^n w_j r_{ij}$$

$r_{ij}$  is the normalized performance rating of the alternatives  $A_i$  on the  $C_i$  attribute;  $i = 1, 2, \dots, n$  and  $j = 1, 2, \dots, n$ . The preference value for each alternative ( $V_i$ ) is given the following formula:

Description:

$V_i$  = ranking for each alternative

$W_j$  = weight value of each criterion

$r_{ij}$  = normalized performance rating value

### III. RESULT AND ANALYSIS

After experimenting, there are several calculation results obtained. A complete explanation of the SAW calculation results is described in tables 1 and 2.

Table 1. The Ability of Lecturers to Teach E-Learning

	Lecturer readiness	Length of lecture time	Lecturer ability	Lecturer ability	Lecturer clarity	Lecturer ability	Structured assignments	Special time provided by the lecturer	Provide feedback on assignments	Evaluation	Value conformity	Suitability of the exam material
MK 1	4,10	4,10	4,30	4,25	4,05	4,15	4,15	4,05	4,10	4,00	4,25	4,15
MK 2	3,00	2,60	2,00	2,50	2,55	2,40	2,80	2,25	2,60	2,25	2,85	2,45
MK 3	4,15	4,05	4,10	4,15	4,00	4,10	4,25	4,10	4,10	4,05	4,15	4,30
Weight	2	1	5	3	4	4	3	2	2	2	1	4
Max	4,15	4,10	4,30	4,25	4,05	4,15	4,25	4,10	4,10	4,05	4,25	4,30
Decision Matrix	4,10	4,10	4,30	4,25	4,05	4,15	4,15	4,05	4,10	4,00	4,25	4,15
	3,00	2,60	2,00	2,50	2,55	2,40	2,80	2,25	2,60	2,25	2,85	2,45

4,15 4,05 4,10 4,15 4,00 4,10 4,25 4,10 4,10 4,05 4,15 4,30

**Table 2.** Auditory

Decisi on Matrix	Teaching materials	Teaching materials	Easy to absorb learning	listening to the lecturer voice	Always download teaching materials di	Can repeat the material presented	Likes to do assignments in groups	Likes to discuss in discussion forums
	4,30	4,25	4,50	4,10	4,40	4,15	4,50	4,35
2,25	2,75	2,60	2,70	3,15	2,35	2,50	2,50	
4,20	3,80	4,25	4,00	4,30	4,00	4,25	4,20	
2	5	4	3	3	5	2	2	
4,30	4,25	4,50	4,10	4,40	4,15	4,50	4,35	
4,30	4,25	4,50	4,10	4,40	4,15	4,50	4,35	
2,25	2,75	2,60	2,70	3,15	2,35	2,50	2,50	
4,20	3,80	4,25	4,00	4,30	4,00	4,25	4,20	
	Decisi on Matrix	4,25	4,25	4,35		4,30		4,10
		2,60	1,95	2,90		2,15		2,40
		4,10	4,40	4,15		4,25		4,30

**Table 3.** Kinesthetic

Decisi on Matrix	Like it when lecturers' teaching materials are in the form of attractive images and good tones	ble to understand teaching materials if teaching are explained slowly	teaching if teaching explained	Lecturer teaching materials are made using direct examples in the form of teaching videos/simulation videos	Able to absorb teaching material if it is explained in actual form and the learning video has sound
	4,20	4,35		4,35	4,45
2,80	2,80		2,75	2,30	
4,15	4,40		4,45	4,25	
4	2		5	3	
4,20	4,40		4,45	4,45	
4,20	4,35		4,35	4,45	
2,80	2,80		2,75	2,30	
4,15	4,40		4,45	4,25	

**IV. CONCLUSION**

From the above research, it can be concluded that the teaching materials in each e-Learning-based learning course must be in the form of a video and pay attention to the learning style elements. The students can absorb the teaching materials presented because

the e-Learning-based learning process is only learning on the internet and LMS network between students and lecturers. The advantage is that students can watch videos of teaching materials anytime, anywhere without having to spend unforgettable time reading; even students can listen to them while working.

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## Lung Cancer Prediction Using Chest X-Rays

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### ABSTRACT

Cancer is the most important cause of death for both man and women .The early detection of cancer can be helpful in the curing of the disease completely. So the requirement of techniques to detect the occurrence of cancer in early stage is increasing. To design a model that can be useful in early identification and prediction of a lung diseases have become a necessity in the research, as it can facilitate the subsequent clinical management of patients. Here, we establish a diagnostic tool based on a deep-learning framework for the screening of patients with common treatable blinding retinal diseases. Our framework utilizes a technique, which trains a neural network with a fraction of the data of conventional approaches. For such purpose, we employ the Deep learning techniques and machine learning approaches to train the data and evaluate the efficiency of our proposed research.

**Keywords :** Deep Learning, Cancer Prediction, ConvNet, Chest Xray, CNN

## I. INTRODUCTION

The most common cause of lung cancer is long-term exposure to tobacco smoke, which causes 80-90% of lung cancers. Cancer cells can be carried away from the lungs in blood, or lymph fluid that surrounds lung tissue. Lymph flows through lymphatic vessels, which drain into lymph nodes located in the lungs and in the centre of the chest. Lung cancer often spreads toward the centre of the chest because the natural flow of lymph out of the lungs is toward the centre of the chest. As for the stages, in general there are four stages of lung cancer; I through IV. One of the major reason for non-accidental death is cancer. It has been proved that lung cancer is the topmost cause of cancer death in men and women worldwide. The death rate

can be reduced if people go for early diagnosis so that suitable treatment can be administered by the clinicians within specified time. Cancer is, when a group of cells go irregular growth uncontrollably and lose balance to form malignant tumours which invades surrounding tissues. Cancer can be classified as Non-small cell lung cancer and small cell lung cancer. The various ways to detect lung cancer is by the used of image processing , pattern recognition and artificial neural network to develop Computer aided diagnosis. In this research we used the techniques and algorithm used in image processing to detect cancer in three types of medical images. In this system first of all the medical images are recorded using a suitable imaging system. The images obtained are taken as input for the system where the image first go through

the various steps of image processing like pre-processing, edge detection, morphological processing ,feature extraction.

Lung cancer which is among the five main types of cancer is a leading one to overall cancer mortality. Cancer is a serious health problem among various kinds of diseases. World Health Organization (WHO) reports that worldwide 7.6 million deaths are caused by cancer each year. Uncontrollable cell development in the tissues of the lung is called as lung cancer. Lung nodule is an abnormality that leads to lung cancer, characterized by a small round or oval shaped growth on the lung which appears as a white shadow in the CT scan. These uncontrollable cells restrict the growth of healthy lung tissues. If not treated, this growth can spread beyond the lung in the nearby tissue called metastasis and, form tumours. In order to preserve the life of the people who are suffered by the lung cancer disease, it should be pre-diagnosed. The overall 5-year survival rate for lung cancer patients increases from 14 to 49% if the disease is detected in time. So there is a need of pre-diagnosis system for lung cancer disease which should provide better results.

The main purpose of the research is to predict the cancer patients from Chest X-ray CXR image dataset. Our proposed deep learning algorithm is used to predict the cancer patient more accurately and increase the system performance to gives the result and saves the time from the clinical and Avoid the sparsity problems. We believe the early diagnosis and prognosis of a cancer type have become a necessity in cancer research, as it can facilitate the subsequent clinical management of patients. The main scope of the research is to identify the cancer from chest X-ray CXR image. The deep learning algorithm is used to increase the system performance to predict the cancer accurately.

## II. METHODOLOGY

The basic methodology of the research were designed on two principles, 1) **Review research** and 2) **Building up a new algorithm**.

### 1.1. Review research

This study was conducted using four databases: Google Scholar, SAGE, DOAJ and PubMed. Selection of papers was done based on keywords and theme relevant to this review. Further, the published papers from these databases were arranged in systemic order with respect to year of publication for better understanding.

### 1.2. Building up a new algorithm

After a careful inference from review research, the proposed algorithm was developed. The algorithm was divided into seven modules shown in Fig (1).

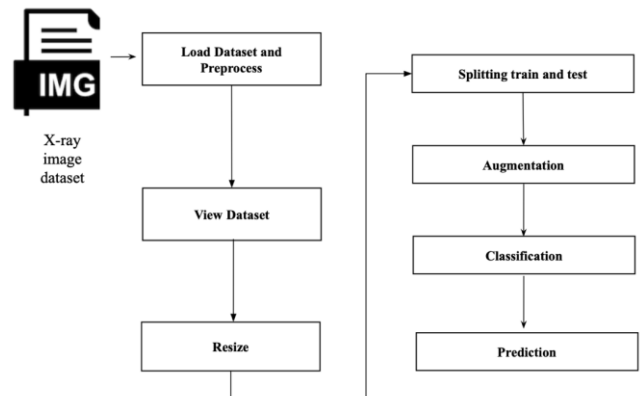


Fig (1). Show the seven modules of algorithm.

## III. RESULTS AND DISCUSSION

### REVIEW INFERENCE:

#### a. Understanding of a convolutional neural network

It has been observed that the CNN has an excellent performance in machine learning problems. Specially the applications that deal with image data, such as largest image classification data set (Image Net), computer vision, and in natural language processing (NLP) and the results achieved were very amazing. In

this paper, all the elements and important issues related to CNN, and how these elements work were explained and defined. In addition, the parameters that affect CNN efficiency were stated. The interest in having deeper hidden layers has recently begun to surpass classical methods performance in different fields; especially in pattern recognition. One of the most popular deep neural networks is the Convolutional Neural Network (CNN).

#### **b. Diagnosis of Liver Disease Using Machine Learning Techniques**

Different techniques to see which model has good prediction accuracy were used. The objective of this study was to improve the diagnosis and prediction of the liver disease with the machine learning algorithms. There are different data mining methods like classification, clustering, association, and pattern matching and data visualization. In this paper various data mining techniques development were surveyed through a literature review.

**c. Efficient CNN for Lung Cancer Detection:** The seven layer combination was chosen to improve the lung cancer detection results. EFFI-CNN was developed based on the experiments performed in ICDSSPLD-CNN and EASPLD-CNN. Normal Lung Image-Cancerous Lung Image showed the Lung cancer data set taken from LIDC-IDRI. It was used to display the difference between normal lung and cancerous lung.

**d. A Review of Deep Learning with Recurrent Neural Network:** The main aim was to showcase the recurrent Neural Network (RNN) which is a deep learning model that uses the concept of supervised learning. Deep learning belongs to the family of machine learning. It is also called hierarchical learning or deep structured learning. The classic machine learning algorithms are definite, while the deep learning algorithms follow a chain of command. Deep learning has the

capability to deal with more complex neural networks and it mainly deals with sequential data. Recurrent networks can process examples one at a time, preserving an element, that reflects over a long period of time.

- e. Deep neural network ensemble for pneumonia localization from a large-scale chest x-ray database:** The main aim was to showcase Pneumonia is a bacterial, viral, or fungal infection of one or both sides of the lungs that causes lung alveoli to fill up with fluid or pus, which is usually diagnosed with chest x-rays. This work investigated opportunities for applying machine learning solutions for automated detection and localization of pneumonia on chest x-ray images. It further, proposed an ensemble of two convolutional neural networks, namely Retina Net and Mask R-CNN for pneumonia detection and localization. It was validated by the solution on a recently released dataset of 26,684 images from Kaggle Pneumonia Detection Challenge and it was scored among the top 3% of submitted solutions. With 0.793 recall, we have developed a reliable solution for automated pneumonia diagnosis and have validated it on the largest clinical database publicly available to date.
- f. Malignant Lung Nodule Detection using Deep Learning:** The main aim was to showcase an approach to detect malignant pulmonary nodules from CT scans using Deep Learning. A pre-processing pipeline was used to mask out the lung regions from the scans. The features were then extracted using a 3D CNN model based on the C3D network architecture. The LIDC-IDRI is the primary dataset that was used along with a few resources from the LUNA16 grand challenge for the reduction of false-positives. The end product is a model that predicts the coordinates of malignant pulmonary nodules and demarcates the corresponding areas from the CT scans. The final



model achieved a sensitivity of 86 percent for detecting malignant Lung Nodules and predicting its malignancy scores.

## ALGORITHM CREATION

**Data selection and loading:** Data selection is the process of selecting the data for cancer chest X-ray image. In this research, Cancer chest X-ray image was used to find cancer and normal patient. The dataset contains information about chest X-ray image of test, train and valid. Three datasets contained cancer and normal patient X-ray as a Gray scale image.

**Data processing:** Image data pre-processing is the process of getting rescale data from the dataset.

- a. Resize image dataset: Rescale the Gray scale chest x-ray image size into 200.
- b. Getting data: Categorical data is defined as variables with a finite set of rescaled values. Most deep learning algorithms require array input and output variables.

**Splitting dataset into train and test data:** Data splitting is the act of partitioning available data into two portions, usually for cross-validator purposes. One Portion of the data is used to develop a predictive model and the other to evaluate the model's performance. Separating data into training and testing sets is an important part of evaluating data mining models. Typically, when you separate a data set into a training set and testing set, most of the data is used for training, and a smaller portion of the data is used for testing.

**Classification:** Classification involves predicting which class an item belongs to. Some classifiers are binary, resulting in a yes/no decision. Others are multi-class, able to categorize an item into one of several categories. Classification is a very common use case of machine learning—classification algorithms

are used to solve problems like email spam filtering, document categorization, speech recognition, image recognition, and handwriting recognition.

In this context, a neural network is one of several machine learning algorithms that can help solve classification problems. Its unique strength is its ability to dynamically create complex prediction functions, and emulate human thinking, in a way that no other algorithm can. There are many classification problems for which neural networks have yielded the best results.

**Prediction:** It's a process of predicting the Pneumonia from the dataset. This project has effectively predicted the data from dataset by enhancing the performance of the overall prediction results.

**Algorithm:** CNN in deep learning, a convolutional neural network (CNN, or ConvNet) is a class of deep neural networks, most commonly applied to analysing visual imagery. They have applications in image and video recognition, recommender systems, image classification, medical image analysis, natural language processing, brain-computer interfaces, and financial time series. CNNs are regularized versions of multilayer perceptions. Multilayer perceptions usually mean fully connected networks, that is, each neuron in one layer is connected to all neurons in the next layer. The "fully-connectedness" of these networks makes them prone to over fitting data. Typical ways of regularization include adding some form of magnitude measurement of weights to the loss function. CNNs take a different approach towards regularization: they take advantage of the hierarchical pattern in data and assemble more complex patterns using smaller and simpler patterns. Therefore, on the scale of connectedness and complexity, CNNs are on the lower extreme. Convolutional networks were inspired by biological processes in that the connectivity pattern between neurons resembles the organization of the animal visual cortex. Individual

cortical neurons respond to stimuli only in a restricted region of the visual field known as the receptive field. The receptive fields of different neurons partially overlap such that they cover the entire visual field.

**A. Existing Model**

Cancer chest X-ray Gray scale image based on test, train and valid was used. Detection of pneumonia patients and Normal patients can only be done with this model and X-ray image was tough to predict. The existing system was used to predict the low level accuracy based on image processing. The existing system didn't effectively classify and predict the pneumonia chest X-ray image.

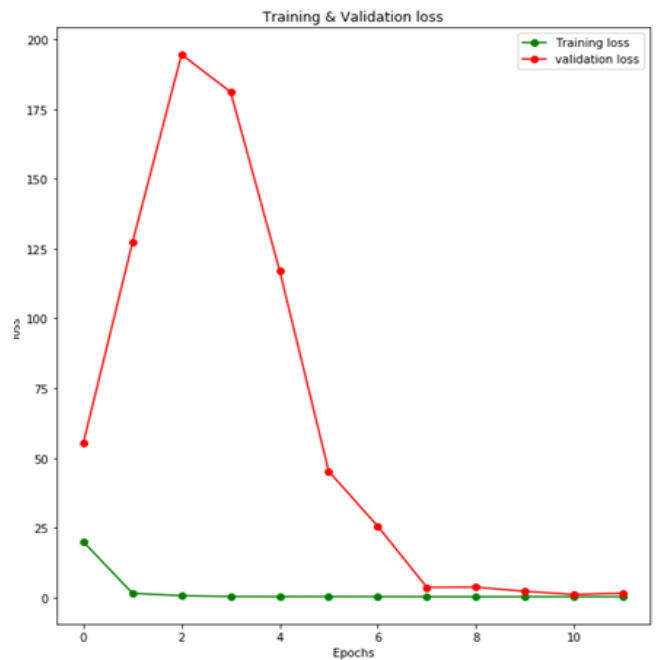
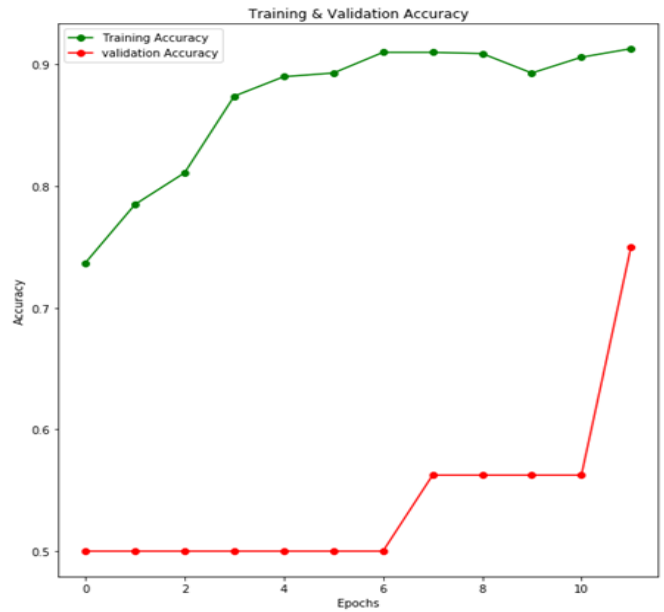
**B. Proposed System**

The proposed model was introduced to overcome all the disadvantages that was raised in the existing system. This system will increase the accuracy of the neural network results by classifying the chest X-ray Gray scale image dataset using Deep learning algorithm. It has enhanced the performance of the overall classification results. It also predicts the Gray scale image of chest x-ray to find the accuracy in a more reliable way.

**Prediction:** It's a process of predicting the Pneumonia from the dataset. This project has effectively predicted the data from dataset by enhancing the performance of the overall prediction results.

**Result generation:** The final result was generated based on the overall classification and prediction. The performance of this proposed approach was evaluated using some measures like 1) **Accuracy**, 2) **Precision**, 3) **Recall**, 4) **F-measure**, 5) **Confusion matrix**

**IV. RESULTS BY ALGORITHM**



	precision	recall	f1-score	support
cancer 0	0.77	0.87	0.82	150
Normal 1	0.85	0.74	0.79	150
accuracy			0.80	300
macro avg	0.81	0.80	0.80	300
weighted avg	0.81	0.80	0.80	300

The *Fig 2* show that the percentage of accuracy increases as the number of epochs increases. The training accuracy and validation accuracy are plotted in the graphs where the accuracy increases with the epochs and another graph of training loss with validation loss are plotted which decreases with increasing epochs.

The main aim of this chapter is to introduce how lung cancer is an incredibly complex problem and how important is the reliability and validity of the proposed system.

## V. HUMAN AND ANIMAL RIGHTS

No Animals/Humans were used for studies that are base of this research.

## VI. AVAILABILITY OF DATA AND MATERIALS

The author confirms that the data supporting the findings of this research are available within the article.

## VII. FUNDING ACKNOWLEDGEMENT AND CONFLICT OF INTEREST

The authors whose names are listed immediately above certify that they have NO affiliations with or involvement in any organization or entity with any financial interest (such as honoraria; educational grants; participation in speakers' bureaus; membership, employment, consultancies, stock ownership, or other equity interest; and expert testimony or patent-licensing arrangements), or non-financial interest (such as personal or professional relationships, affiliations, knowledge or beliefs) in the subject matter or materials discussed in this manuscript.

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# Laboratory Scale Production of bio-oil from *Oscillatoria* algae and its Application in Production of biodiesel

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## ABSTRACT

Conventional sources of fuels such as diesel and petroleum are threatening to the global climate. They are non-renewable and highly toxic sources of energy which are depleting at an alarming rate due to their high demand. Thus, there is an urgent requirement for alternate sources. Many such renewable, less toxic, and inexpensive solutions are available, including biodiesel from macroalgae. Algal cells contain 50% intracellular lipids in them which plays an important role in their use as a substrate for production of biodiesel. *Oscillatoria* is a genus of one such Blue Green Algae (BGA) usually found floating on the surface of fresh water sources such as pond, lakes, rivers and streams. *Oscillatoria* algae was isolated from pond water and grown in selective media for blue-green alga: BG11 and Chu's medium. The algae were allowed to grow to reach a high cell density to obtain maximum lipid concentration. It was then dried to form a fine powder. The fine algal powder was then used to extract its lipid content or "bio-oil" employing Soxhlet Apparatus using petroleum ether as the solvent. Alternatively, the bio-oil was also extracted using Solvent extraction with the above solvent using a separating funnel. The verification of the obtained bio-oil was carried out by estimating its R<sub>f</sub> or retardation factor using Thin Layer Chromatography (TLC). Transesterification of the bio-oil was carried out using methanol in presence of potassium hydroxide catalyst using a condensation reaction giving crude biodiesel and glycerol as the products. This biodiesel can be purified industrially and can be used as an energy source of the future.

**Keywords:** Algae, *Oscillatoria*, Soxhlet, TLC, Biodiesel

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## I. INTRODUCTION

Fossil fuels can be defined as a class of hydrocarbon containing biological materials occurring within the earth's crust which are to this day used as the primary

source of energy. There are various disadvantages of fossil fuels such as land degradation, water pollution, toxic emissions, and global warming. Biodiesel is a clean and renewable fuel which can be used as the ideal fossil fuel substitute which can be used either in

the pure form or it in the blended form with petrol/diesel. The various advantages of biodiesel include reduced greenhouse emissions; it is nontoxic as well as biodegradable and most of all that it is a renewable source of energy.

Algae are simple organisms, ranging from microscopic to macroscopic in size, usually found in or on the surface of water. These organisms possess the unique capability of performing photosynthesis by utilizing energy from the sun, and carbon dioxide from the atmosphere to produce oxygen. They can be regarded as the common source responsible for the photosynthetic machinery in both plants and algae, which makes them both agriculturally as well as environmentally important. Cyanobacteria ("Blue-Green Algae"), such as *Oscillatoria* sp., are a heterogeneous group of bacteria found almost everywhere but majorly occur in freshwater systems. They are usually un-branched with a filamentous body and derive their name from their characteristic slow, rhythmic oscillating movement.

Algae possess a wide range of applications such as: Algae play a critical role in the aquatic ecosystem as they are the major food producers and help the organisms thrive in lakes, ponds, and streams. They can be employed in wastewater and environmental bioremediation. Algae have also shown a potential application in the food industry, pharmaceutical industry, and the cosmetic industry. However, the most important application of algae is the ability to produce Biofuel/Biodiesel which is largely due to their rapid growth rate and high lipid content. Biodiesel from algae can be produced by a process known as Transesterification, which is a reaction between the algal bio-oil and an alcohol (methanol) in the presence of a catalyst (KOH). This reaction of transesterification produces two final products - glycerol as the top layer and the corresponding ester called biodiesel. The work aims to produce a renewable, less toxic, and inexpensive solution using

algal biomass to create a sustainable biofuel as a replacement to traditional sources of energy.

## II. METHODS AND MATERIAL

### 1. Isolation of *Oscillatoria* sp. from pond water and incubation.

#### Collection of samples.

Various visible green algae samples were collected from the surface of stagnant freshwater bodies: Tuls lake in Sanjay Gandhi National Park, Vasai lake in Vasai, Banganga lake in Walkeshwar.

#### Sample identification using wet mount technique.

A nichrome loop was used to obtain the organisms from the bottom of each of the bottle containing the algae. Smears of the samples were placed on a clean grease free slide and covered with a coverslip/ a drop of cedar wood oil was added and observed under 40x lens. The slides were then examined under the microscope and all the observations were recorded. The selected strain was identified based on the cultural and morphological characteristics as observed under the microscope.

#### Sample preparation

The visible green portion from the water samples was carefully obtained by removing the top clear layer of water.

A suspension of the same was prepared in 1 ml of Sterile saline, which was then added to Sterile Blue-Green 11 (BG11) media broth and half strength Chu's medium broth. This media was then incubated at room temperature for 5-7 days in presence of sunlight.

### 2. Screening of various liquid media for maximum growth.

Selection of media

For maximal growth of the algae, two media broths were selected- Blue-Green 11 (BG11) media and half strength Chu's media broth.

#### **Medium preparation**

All the above media were prepared in 250 ml flasks. All the components were dissolved in distilled water, the pH was adjusted and autoclaved at 121°C for 1 hr.

#### **Inoculum preparation and incubation time and temperature**

A loopful of culture was picked up from the collected sample and added to the flasks containing the media. Optimal incubation time was determined by incubating the inoculated media for a total period of 5-7 days at room temperature ( $28 \pm 2^\circ\text{C}$ ) with plenty of direct sunlight.

The growth of the samples was determined using a spectrophotometer and a growth curve was plotted accordingly based on which, BG11 media was selected as a suitable media for further cultivation.

#### **pH of the medium**

The pH of pond water was found to be 7 which is neutral using a pH paper. Hence, care was taken to maintain the pH of the media's used- BG11 and Half strength Chu's media to pH 7 to provide similar environmental conditions for the optimum growth of algae.

#### **Cell harvesting from the media.**

Oscillatoria growing in the broth was harvested using high speed centrifugation. The media containing the cells was transferred from the flask to clean and dry falcon tubes of 10ml volume. These tubes were then placed in a centrifuge and centrifuge at 5000 rpm for 15 minutes. On completion of centrifugation, the tubes were carefully removed. The supernatant was discarded, and the pellet was collected. Cells of the pellet will now be disrupted using two methods, heating in a microwave and manual grinding which

will help break the outer cell membrane of the organism and allow the contents to flow out in the media.

#### **Disruption of the cells to release lipids.**

Disruption of the cells was done using two methods, heating using a microwave and manual grinding with solvent.

**Microwave heating:** The pellet obtained from centrifugation was added in a 250ml flask and heated using a microwave oven at a high temperature, about 100 °C and 2,450 MHz for 5mins. This method helps break the outer cell membrane of the organism and allows the contents to flow out in the media.

**Manual grinding:** Manual grinding of the pellet was carried out using a mortar and pestle with petroleum ether solvent.

### **3. Production of bio-oil**

#### **Drying of the pellet obtained**

The pellet obtained was dried completely in a hot air oven at 55° C for 2 hours.

#### **Bio-oil production by solvent extraction using a separating funnel.**

Petroleum ether is used as a solvent to separate the lipid components from the rest of the cell materials. 100ml of petroleum ether was added to a separating funnel (volume 250 ml) containing 50 ml of the disrupted algal sample and mixed thoroughly. This was then allowed to settle for 3 days without any disturbance. Upon incubation, 3 layers were obtained. The lowermost layer contained the cell debris, middle layer contained the desired lipids, and the topmost layer contains the solvent. The contents of these three layers were extracted carefully and the middle lipid layer was used for further processing. Upon separation, the middle layer containing oil was carefully extracted from the funnel and oil yield efficiency can be measured using the formula:

Extracted oil efficiency (%) = [(Volume of oil extracted)/ (The total volume of algae)] × 100

Algal oil can be efficiently extracted using chemicals by extraction method. Solvent Extraction technique is favoured than mechanical pressing method since it recovers all the oil leaving just 0.5–0.7% leftover oil in the algae biomass.

#### **Production of Bio-oil using Soxhlet extraction.**

Soxhlet extraction is used since the desired compound has significant solubility in petroleum ether solvent. 50g of the dried and powdered algae was placed in a Whatman filter paper made into a thimble. This was then placed in a Soxhlet extractor. The Soxhlet was then equipped with condenser setup. A round bottom flask was filled with solvent petroleum ether in the ratio 1:2. The solvent was heated to many refluxes for three hours at 60°C. After such reflux cycles, a portion of oil was dissolved in hexane. This solution along with the insoluble portion of the algae remained in the thimble.

#### **Testing of algal oil components using Thin Layer Chromatography**

Thin layer chromatography was employed to check for the presence of lipids in the sample obtained. 202 ml of the solvent system of Hexane: Ether: Acetic acid (60:40:1) was used in a 3000 ml chromatographic chamber to run the sample. The chamber was covered and allowed to saturate for 30 minutes before loading the plates. With a 10 µl capillary pipette, spot 1-2 µl of the sample onto the previously prepared silica gel plate making sure the spot remains smaller than 4 mm in diameter. The spots were allowed to dry making sure that the loading area is above the level of the solvent. The plates were placed in the chamber to develop and the lid was closed immediately. The samples were allowed to run for approximately 60mins, until the solvent front reached the upper line. The plates were removed and placed in the iodine

chamber for spotting. Lipids were yellow spots on the plate in 2-5 minutes. The retardation factor (Rf) was calculated using the following formula:

Retardation factor (Rf) = (Distance travelled by the solute (cm))/ (Distance travelled by the solvent (cm))

#### **Conversion of bio-oil to biodiesel using Transesterification process.**

100 ml of the extracted algal oil was taken in a round bottom flask along with 70 ml of methanol. A catalyst, freshly prepared 0.5M potassium hydroxide was also added to speed up the reaction. A piece of porcelain was added to the round bottom flask to have uniform boiling throughout the solution and avoid bumping of the solution due to uneven heating. This flask was then affixed with a condenser setup and placed on a heating mantle. The temperature of the mantle was set to 60°C and was switched on. The reaction was left to be carried out for 2 hours making sure that the condenser does not overheat. At the end of 2 hours, the flask was left to cool at room temperature and 2 layers were obtained-The upper layer containing glycerol while the lower layer containing crude biodiesel which can be further purified using water and dry washing technologies.

### **III.RESULTS AND DISCUSSION**

#### **Sample collection and identification of the algal species**

Various visible green algal samples were collected from the surface of stagnant fresh water bodies (Tulsi Lake, Walkeshwar Lake, Vasai Lake) and were identified using wet mount technique. The sample was examined under the microscope and was found to be *Oscillatoria* algal species due to the presence of the distinct hyphae. All 3 samples showed distinct *Oscillatoria* characters. This work can also be compared with Darienko et al., (2010)

Screening of media for maximum growth



For maximising the growth of the algae, 2 different media broths: Blue green 11 media which is a universal medium and half strength Chu’s media were chosen. After incubating the 3 samples for 7 days, their growth was studied in BG-11 and half strength Chu’s media, using a growth curve. Media for maximum growth of the cells was chosen based on the growth curve plotted using absorbance at 540nm measured by the UV spectrophotometer. Absorbance readings and growth curve for algal samples in BG-11 Media and Chu’s media is given below. Similar studies were carried out by Chand Shah et al. (2012) and Rai et al. (2014) where they have used half strength Chu’s media and BG-11 media for the screening and growth of green algae species. Absorbance readings and Growth curve of BG 11 media and half strength Chu’s media is given in table 1 and table 2.

TABLE 1. ABSORBANCE READINGS FOR ALGAL SAMPLES IN BG 11 MEDIA

Time (in days)	Absorbance at 540 nm		
	<i>Vasai lake sample</i>	<i>Tulsi lake sample</i>	<i>Walkeshwar lake sample</i>
1	0.050	0.31	0.62
2	0.042	0.48	0.12
3	0.023	0.29	0.17
4	0	0.3	0
5	0	0	0
6	0	0	0
7	0	0	0

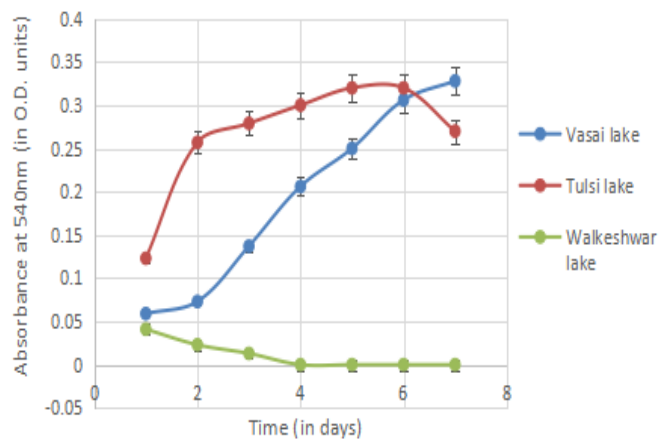


FIGURE 1. GROWTH CURVE OF OSCILLATORIA IN BG 11 MEDIA

TABLE 2. ABSORBANCE READINGS FOR ALGAL SAMPLES IN HALF STRENGTH CHU’S MEDIA.

Time (in days)	Absorbance at 540 nm		
	<i>Vasai lake sample</i>	<i>Tulsi lake sample</i>	<i>Walkeshwar lake sample</i>
1	0.059	0.123	0.041
2	0.073	0.257	0.023
3	0.137	0.279	0.013
4	0.206	0.3	0
5	0.25	0.32	0
6	0.306	0.32	0
7	0.328	0.27	0

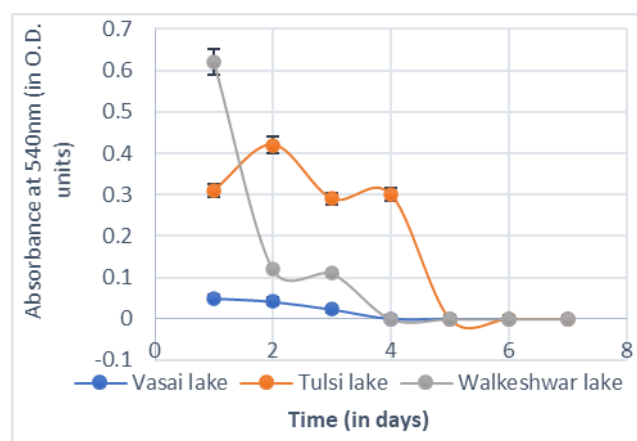


FIGURE 2. GROWTH CURVE OF OSCILLATORIA IN HALF STRENGTH CHU’S MEDIA

Since Vasai lake samples showed the most preferable growth curve in BG-11 Media, it was chosen as the most suitable for the project.

### **Cell Harvesting.**

Cell harvesting was done by centrifugation at 5000rpm for 15 mins and this method separates the media into two layers upper layer contained the media and lower layer contained the algal cells.

### **Collection and disruption of cells to release the lipids.**

Cell disruption is done to obtain the intracellular fluid without disrupting any of its components. Cell wall disruption is considered essential to release the carbohydrates and sugars to maximise biodiesel yields. Cell disruption method was carried out to release the lipids from the *Oscillatoria* species. 2 methods were used for cell disruption: Manual Grinding and Microwave. Microwave heating at 100°C at 5 min intervals led to browning of the sample. This may be due to burning of their lipid content. Thus, this method was not used. Manual Grinding method led to formation of lipid bubbles in the ceramic mortar which were then collected in the same way thus manual grinding was used. In the same way Zheng et al., (2011) used manual grinding for the disruption of cells to release lipids.

The solution obtained was dried completely in a hot air oven at 55 degree Celsius for 2 hrs.

### **Production of Bio-oil**

Production of Bio-oil was done by two methods solvent extraction using a separating funnel and by using Soxhlet extraction. Solvent extraction was found to be more efficient as 100ml of algal oil was obtained using 250ml of the culture giving an extraction efficiency of 50% as compared to soxhlet extraction which yielded 12ml of algal oil with an extraction efficiency of 6% using the same amount of culture and the same solvent. Earlier studies conducted also confirms that bio-oil production by Soxhlet extraction and by solvent extraction using a separating funnel are effective methods for the

extraction of oil from the *Oscillatoria* algal species. (Konga et al., 2017)

### **Testing of algal oil components using Thin Layer Chromatography**

Lipid analysis can be done using Thin Layer Chromatography. Algal oil obtained was spotted on the TLC plate and the sample was run in solvent system of Hexane: Ether: Acetic acid (60:40:1) was used in a 3000 ml chromatographic chamber. After the TLC plate was run in the solvent system, for the analysis of lipids from the algal oil, it was placed in an iodine chamber for 5 minutes. After which yellow spots were observed. The retardation factor was calculated using the formula and was found out to be 0.46. This corresponds to the Rf value that should be obtained for oils, fats, and lipids ,0.5, according to Harrata et al.,2015.

### **Conversion of bio-oil to biodiesel using Transesterification Process.**

Transesterification is the process of making biodiesel. In the transesterification process, a glyceride reacts with an alcohol (methanol) in the presence of a catalyst (KOH) forming fatty acid alkyl esters and an alcohol. Alkyl esters obtained act as biodiesel. This technique was performed by adding 70ml methanol to 100ml bio-oil in a round bottom flask. On completion of several refluxes that is at the end of 2 hours two layers were obtained in the flask. The upper layer contained glycerol and the lower layer contained crude biodiesel, due to their differences in densities. Similarly, Anastopoulos et al., (2009) converted bio-oil by using transesterification process.

## **IV. CONCLUSION**

*Oscillatoria* Algae was isolated from pond water and grown under laboratory conditions. Two media were employed for achieving maximum growth. Blue green

(BG) 11 media and half strength Chu's media. After incubation and plotting of growth curve, BG 11 media was found to be more favourable for the growth of the algae. Bio-oil was extracted from the algae by Solvent extraction and Soxhlet extraction. Solvent extraction was found to be more efficient with an extraction efficiency of 50% obtained by using Petroleum ether as the solvent however Soxhlet extraction gave only 6% efficiency. Lipid analysis of the bio-oil was also performed using Thin layer Chromatography and detection was done using Iodine vapours. A yellow spot was obtained with a Rf value of 0.46 corresponding to the value that should be obtained. The chemical conversion of bio-oil to biodiesel was carried out by the process of Transesterification using Potassium Hydroxide as a catalyst. An upper layer containing glycerol and a lower layer containing crude biodiesel was obtained. Thus, this Biodiesel extracted from Oscillatoria Algae can potentially prove be a suitable solution for the future as it is less toxic and can meet the ever-increasing demand for energy.

Biodiesel is less toxic, biodegradable and a renewable source of energy which can be used as a suitable alternative for petroleum, diesel. Biodiesel can be used in existing diesel engines in form of blends with petroleum diesel and replace fossil fuels as the primary transport energy source.

#### V. ACKNOWLEDGEMENT

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# Bioaccumulation of Heavy Metals in *Lycopersicon Esculentum* Grown with Tannery Sludge across Some Selected Farmlands in Dawakin Kudu LGA of Kano State, Nigeria

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## ABSTRACT

Human health has been adversely exposed to many inauspicious threats due to human activities. Evidently, ecotoxicological studies documented that industrial and agricultural wastes tremendously contribute to the contemporary environmental pollution and subsequent associated health issues. Meanwhile, the application of tannery sludge as fertilizer has been recently reported in Dawakin Kudu LGA of Kano State, Nigeria and this sludge was suspected to have contained a large quantity of toxic metals. This study was aimed to investigate the presence of toxic metals including Cd, Cr and Pb in the fruits of Tomato (*Lycopersicon esculentum*) grown with tannery sludge in the selected farms in the study area in order to ascertain their suitability for human consumption. The toxic metals (Cr, Cd and Pb) were found to be incorporated into the tissue of tomato's fruits and were all above the permissible limits of WHO/FAO except for the Cr in sampling location 1 and 2, and Pb in location 2. The study also demonstrated that pH of the soil influence the rate of uptake of heavy metals into tomato cells. Analysis of variance (ANOVA) at  $p < 0.05$  revealed that there is no significant difference in the concentration of heavy metals between and within groups while pollution index for metals like Cd has indicated a potential pollution. It was recommended that leather industries should dispose wastes far from residential areas and out of reach of farmers while coming up with tertiary methods of sludge treatment before disposal.

**Keywords:** *Lycopersicon Esculentum*, tannery sludge, Dawakin Kudu, Bioaccumulation, toxic metals

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## I. INTRODUCTION

During the last two decades, the increasing demand of food safety has stimulated research regarding the risk associated with the consumption of heavy metal

contaminated foods. Heavy metals can enter the human body through consumption of food crops grown in metal contaminated soil. However, the prediction of exposure to potentially toxic metals from the ingestion of these crops is more complicating

because uptake of metal by plants depends on soil properties and plant physiologic factors (Oyeleke et al., 2015; Abdallah et al., 2017; Khadija & Ibrahim, 2019).

Heavy metals are non-biodegradable, toxic and persistent environmental contaminants that have devastating effects in living systems (Ibrahim et al., 2017). The tendencies of these heavy metals to bioaccumulate in biological systems makes them a potential health hazard due to their toxicity by which they break down the immune system and serve as pathways for the occurrence of different diseases.

Nanven and associates (2015) carried out an assessment of heavy metals in some vegetables grown in a farm treated with urban solid waste in Kuru Jantar, Plateau State, Nigeria. Following their research, the use of dumpsite soils as organic manure is widespread in Plateau and the practice is upheld because it improves soil characteristics such as organic matter, nutrients, porosity, water retention, aggregate stability, and bulk density and as a result increases plant productivity. (Ogunyemi et al., 2003; Oluyemi et al., 2008).

Most of the leather industries process raw hides and skins to a leather products. A lot of wastes, both liquid and solid, is generated and indiscriminately discharged into the nearby waterways and dumpsites (Angela et al., 2019; Ibrahim, 2019). Although the effluents are treated in treatment plants, the resultant dry cake known as sludge, possesses some toxic slurry of chemical constituents of which heavy metal is a key. According to Gupta and Sinha (2007), high content of inorganic elements such as Chromium (Cr), Cadmium (Cd), Nickel (Ni), and Lead (Pb) exist in tannery sludge and these could lead to environmental pollution and damage to human health.

The farmers grow vegetables and cereals for household consumption and sell the surplus to other villagers at the local market. Basically, environmental

health concerns arise when this sludge is used by farmers to grow vegetables like tomato, pepper, onions, lettuce to mention but a few, and cereals like maize and millet (Brempong et al., 2019). The potential bioaccumulation of these heavy metals from the tannery - sludge amended soil could constitute high risks and the danger of spread of epidemic diseases lying in the ultimate consumption of plants such as tomatoes grown with the tannery sludge necessitates the analysis of its fruits. Therefore this study was aimed to assess the level of heavy metals accumulated in the fruits of the tomatoes grown with tannery sludge.

## II. METHODS AND MATERIAL

### 2.1 Materials

#### 2.1.1 Plant Material

This study utilized the fruits of Tomato (*Lycopersicon esculentum*) as the plant material for the study.

#### 2.1.2 Reagents

Nitric acid ( $\text{HNO}_3$ ) with analytical grade of 69 - 72%, 30% Hydrogen Peroxide ( $\text{H}_2\text{O}_2$ ), nitrates of Cr, Pb and Cd (to be used in preparing stock solutions (1000 mg/L, in 2%  $\text{HNO}_3$ ) of the metal ions and Deionized water (used as diluent for preparing desired working standards of the metal ion solutions).

#### 2.1.3 Research Tools

The materials used in this research include, sample containers mortar and Pestle, 2 mm sieve, drying oven, weighing balance, crucibles, pair of tongs, beakers, standard volumetric flasks, whatman filter paper No 42, watch glass, hot plate, refrigerator, and Atomic Absorption Spectrophotometer (Buck Scientific 200A Model).

### 2.2 Methods

#### 2.2.1 Samples and Sampling Technique

##### 2.2.1.1 Plant samples

Plant samples from three different mega farms in Dawakin Kudu LGA of Kano State were collected purposefully. One farm where tannery sludge was not used served as control to be used in comparing the concentration of heavy metals in the other two farms where tannery sludge was applied. All sampled plants were oven dried to constant weight using standard laboratory drying oven and analytical precision weighing machine (0.001 precision) at 70°C overnight and weighed to estimate the plant biomass concentration in mg/kg.

### 2.2.2 Sample Preparation

The plant samples were taken to the Chemistry laboratory, Federal University Dutse, Nigeria where they were properly washed with 20% Nitric acid, rinsed with deionized water and oven dried at 70 °C for 24 hours until a steady weight was attained. The oven dried plant tissues were then pounded with crucible to fine powder and sieved through a 2 mm sieve, and transferred into a well labeled container for easy identification and laboratory analysis (figure 1a).

### 2.2.3 Laboratory Analysis of Plant Samples

Two gram of each plant sample was weighed into Erlenmeyer flask using the US EPA 3050 method. As depicted in figure 1(b), 20mL of HNO<sub>3</sub> was added and the mixture was allowed to boil for 20 minutes on a hot plate at 100 °C. The digest was then allowed to cool and another 10mL of HNO<sub>3</sub> was added and heating continued for 30 minutes at 100 °C. The digest was further allowed to cool. 10mL of deionized water (DIW) was added when effervescence subsided and 20mL of 60% H<sub>2</sub>O<sub>2</sub> was added and heating continued for another 15 minutes. The final digest was allowed to cool and then filtered. The final volume of digest was made up to 50mL with DIW after which it was labeled and stored in a refrigerator for AAS analysis. The metal analysis was conducted in the Soil and Water Lab, Department of Geography, Bayero University Kano, Nigeria. Prior to analysis, the wave length, lamp current, burner alignment and slit

width was optimized for each element. Puro-Graphic™ standards of Buck Scientific Model for AAS standards in 2% nitric acid for each metal was used.

### 2.2.4 Statistical Analysis

Data collected was analyzed using Descriptive Statistics and Analysis of Variance (ANOVA) in SPSS and Excel ToolPak. The probability level of certainty in the research was at 95 % confidence limit or  $\alpha = 0.05$ .

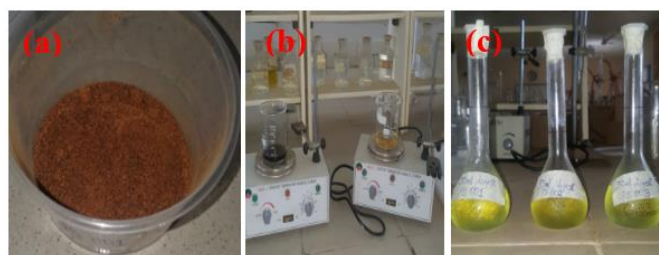


Figure 1: (a) tomato plant samples after grinding (b) hot plates used for digestion (c) Plant digest for AAS analysis

## III. RESULTS AND DISCUSSION

### 3.1 Results

Table 1: Concentration of heavy metals in tomato plant samples

Sample ID	Cr (mg/kg)	Cd (mg/kg)	Pb (mg/kg)
PSL 001	1.85	5.0	4.35
PSL 002	3.7	7.5	1.1
PSL 003	1.85	10.0	3.26

Where PSL = Plant Sampling Location

Table 2: Instrumental operating conditions

Element	Wave length(nm)	Detection limit(mg/L)	Slit width(nm)	Lamp Current(mA)
Cr	357.9	0.03	0.7	2
Cd	228.8	0.005	0.7	2
Pb	283.3	0.1	0.7	2

Table 3 : Absorbance values as displayed by AAS Buck Scientific VGP 210

Sample ID	Cr	Cd	Pb
PSL 001	0.002	0.002	0.004
PSL 002	0.004	0.003	0.001
PSL 003	0.002	0.004	0.003

Calibration curves for each heavy metal was generated. Using the relationship below, heavy metal concentration in mg/kg was determined.

$$x = \frac{y}{\text{slope}} \times \frac{\text{volume of digest}}{\text{weight of sample}} \dots\dots\dots \text{eq. 1}$$

Where;

x = Concentration in mg/kg

y = absorbance values

Slope values for Cr, Cd and Pb = 0.027, 0.010 and 0.023 respectively.

Volume of digest = 50mL

Weight of plant sample = 2g

Table 4: Pollution indices for heavy metals in tomato plant

Samples	Cr	Cd	Pb
PSL 001	0.80	5.00	2.18
PSL 001	1.60	7.50	0.55
PSL 003	0.80	10.0	1.60

Table 5: ANOVA of plant samples (a) Mean and variance in plant samples

Groups	Count	Sum	Average	Variance
PS 001	3	11.2	3.733333	2.765833
PS 002	3	12.3	4.1	10.36
PS 003	3	15.11	5.036667	18.97303

(b)ANOVA

Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	0.646822	2	0.323411	0.376702	0.701271	5.143253
Within Groups	5.1512	6	0.858533			
Total	5.798022	8				

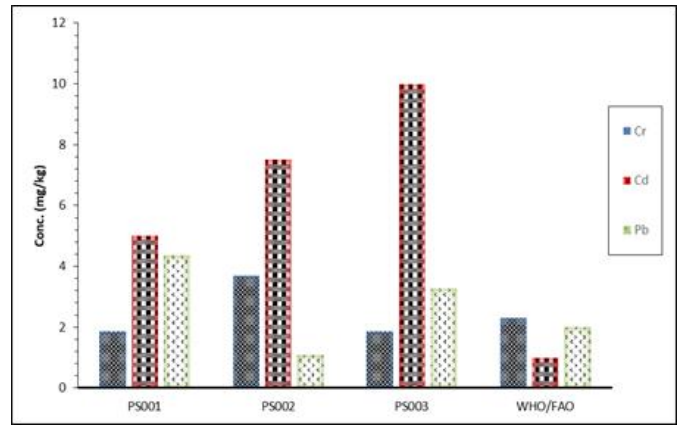


Figure 2: Comparison of heavy metal concentration in plant with that of standards

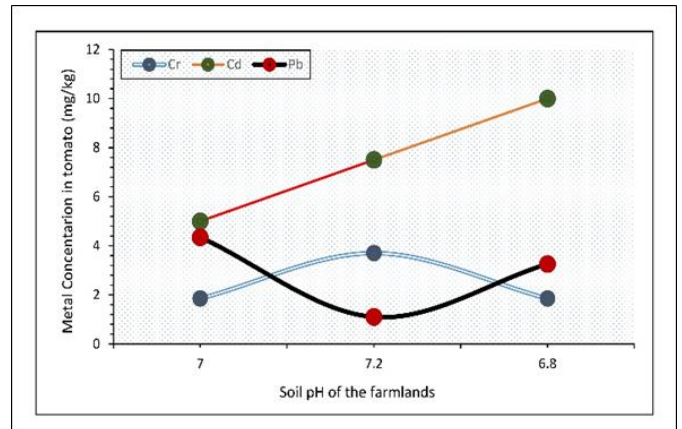


Figure 3: The relationship between the soil pH and metal uptake by tomato

### 3.2 Discussion

#### 3.2.1 Heavy Metals in Tomato

##### 3.2.1.1 The Chromium (Cr) content in the tomato's fruits

From Table 1, the concentration of Cr in PSL 001 and PSL 003 (control) was below threshold of 2.3mg/kg (Weigert,1991) and they showed pollution indices (PI) less than 1 (PI < 1) thus indicating an absence of pollution (Table 4). PSL 002 had high Cr content (3.7mg/kg) and PI greater than 1 indicating severe pollution. The above threshold values obtained for the tomato plant sample indicated the evidence of Cr bioaccumulation.

##### 3.2.1.2 The Cadmium (Cd) content in the tomato's fruits

Cd was found to exceed 1.0mg/kg, the stipulated WHO/FAO guideline for metals in vegetables, in all



the samples with concentrations ranging from 5.0mg/kg - 10.0mg/kg. It is paramount noting that the severity of Cd pollution was high ( $PI > 1$ ) and Cd was significantly concentrated in the tomato's fruit as shown in Figure 2.

### 3.2.1.3. The Lead (Pb) content in the tomato's fruits

For Pb, in PSL 001 and PSL 003 (control) metal concentrations were 4.35mg/kg and 3.26 mg/kg, respectively. These values were above threshold of 2.0mg/kg (WHO/FAO, 1989) with pollution indices standing at 2.18 and 1.6, respectively which invariably reflected a severe pollution Table 4. PSL 002 however showed Pb concentration within safe limits (1.1mg/kg), it was deduced that there was no bioaccumulation of the metal in the plant and pollution index of  $PI < 1$  (0.55) showed that there was no pollution (Table 4). This could be as a result of different factors such as rate of volatilization, translocation effects and rhizosphere condition. More often plants accumulate heavy metal at extremely high concentrations without manifesting damages due to transforming effect caused by interdependent action of metal and chelator molecules (Gupta and Sandalion, 2012).

In recent times, researchers have reported that so many types of vegetables such as spinach, carrot, lettuce, radish, tomato, and chickpea were contaminated by heavy metals of Pb, Cd, As, Zn and Cu (Cobb 2000; Arora et al. 2008; Astawan 2008). The high levels of heavy metals was found to be contained in vegetables grown in polluted area or agricultural soils, such as soils located close to roadway, nearby smelter, and soils irrigated with wastewater (Cui et al. 2004; Kachenko and Singh 2004; Okoronkwo et al. 2005; Behbahaninia and Mirbagheri 2008). Hence, it was concluded that vegetables, particularly leafy crops, grown in polluted soils would typically contain higher concentration of heavy metals than those grown in unpolluted soils (Voutsas et al. 1996; Ibrahim et al., 2017). The high heavy metal content found in

the control might be traced to the waterways, or a polluted industrial wastewater used to irrigate the plants.

### 3.2.2 Analysis of Variance (ANOVA)

The non-parametric Analysis of Variance at  $p < 0.05$  revealed that there is no significant difference or variability in the concentration of heavy metals within and between groups. It can be observed that the F calculated is less than the F critical ( $p > 0.05$ ), this gives sufficient evidence that there is no significant difference in the concentration of heavy metals within and between groups (Table 5a and b).

### 3.2.3 The relationship between the soil pH and metal uptake by tomato

Figure 3 showed different concentrations of Cr, Cd and Pb with respect to pH values of the soil on which the tomato plants grew. The highest concentration of Cd (10.0 mg/kg) was detected in those tomatoes grown at slightly acidic soil (pH 6.80). In contrast, the concentration of Cr (3.70) was found in the tomatoes that were cultivated on the neutral soil (pH 7.2). Conversely, the highest concentration of Pb was examined to be 4.35 mg/kg and 3.26 mg/kg in tomatoes raised on soil with pH 7.0 and 6.8, respectively. This outcome therefore, presented the evidence that tomatoes cultivated in slightly acidic environment might have greater risk of being polluted by Cd. Whereas, Cr can be easily bioaccumulated into tissue of tomato plants at neutral pH environment. However, the Pb representation showed the dynamicity of taking up highly at pH 7.0 and likewise in slightly acidic environment.

## IV. CONCLUSION

The concentration of Cr, Cd and Pb incorporated into the tissue of tomato's fruits were all above the permissible limits of WHO/FAO except for the Cr in sampling location 1 and 2, and Pb in location 2. The study also demonstrated that alkalinity as well as

acidity of the soil influence the uptake of heavy metals into tomato cells. Farmers will thus be alerted on the possible implications of using tannery sludge for plant growth boosting strategy, and further research is needed on the likely health implications attendant to consuming tannery sludge-grown vegetables on a long term basis following the biomagnification of the heavy metals in the human body.

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Journal URL: <https://ijrst.com/IJSRST218238>

# A Review on Wireless Smart Home Automation using IoT

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## ABSTRACT

The Internet of Things (IoT) is an extension of the existing internet that enables contact, interaction, and internet functioning between different devices or physical objects referred to as "Things." The Internet of Things (IoT) concept refers to the ability of network devices to sense and gather data from their environment, and then exchange the data through the Internet where it can be processed and used for a number of interesting purposes. The Internet of Things is made up of smart machines that connect and communicate with other machines, artifacts, environments, and infrastructures. Nowadays, everyone is linked to everyone else through a variety of communication networks, the most common of which is the internet, so we can assume that the internet, which connects people, can also connect things.

**Keywords** : Home Automation, IoT, Smart Home, LAN, Internet, Home security

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## I. INTRODUCTION

The Internet of Things can be described as connecting various types of objects to the internet, such as smart phones, personal computers, and tablets, allowing for very novel types of communication between things and people, as well as between things [2]. With the introduction of IoTs, home automation research and development have become increasingly popular in recent years. Many machines are regulated and tracked in order to assist humans. Furthermore, various wireless technologies assist in communicating from remote locations in order to enhance the

intelligence of the home world. When a human being needs to communicate with other objects, an advanced network of IoT is created. IoTs technology is used to come up with creative concepts and exponential development for smart homes in order to boost people's living standards. The internet enables us to provide immediate solutions to several problems while also allowing us to communicate from any remote location, which leads to overall cost savings and energy consumption [3]. In recent years, there has been a surge in customer interest in the smart home model. The status of the connected devices is described and recorded by the home automation

system in an intuitive, user-friendly interface, enabling the user to communicate with and monitor different devices with the touch of a few buttons. Bluetooth, Wi-MAX and Wireless LAN (Wi-Fi), ZigBee, and the Global System for Mobile Communication (GSM) are some of the main communication technologies used by today's home automation systems [1]. In this case, we're making use of a Wi-Fi module. It provides the user with full access control over the appliances through a remote interface. The use of control systems and information technology to control equipment, industrial machinery, and processes reduces the need for human interaction [2]. A software development environment that connects applications, command, control, and routing processing, and node and system protection is required for the broad range of potential IoT applications. Although the role of software in MCU solutions has grown in recent years, MCUs supporting IoT will require even more software, resources, and enablement. To allow the development of embedded processing nodes and IoT applications, a wide ecosystem with easily accessible support is important. Nowadays, IoT is being used all over the world to make the world smarter. We can see many smart devices around us as a result of IoT. Many people, including myself, believe that cities and the environment will be overlaid with sensing and actuation, with many embedded in "things," resulting in what is known as a smart world. Many homes, for example, already have sensors for attempting to save energy and home automation; automobiles, taxis, and traffic lights have systems to attempt to enhance safety and transportation; people have smart phones with sensors for running many useful apps; industrial plants are connecting to the Internet; and healthcare facilities are relying on increased home sensing to help remote medicine. A global sensing and actuation utility linked to the Internet is one possibility. Water and energy are two utilities that can be used for a number of purposes. Sensing and actuation in the form of an IoT platform will be made available as a

service. IoT would be viewed as a vital, interconnected framework upon which many applications and services will operate, rather than as individual systems. Some applications will be personalized, such as digitizing everyday operations, while others will be city-wide, such as reliable, on-time transportation, and still others will be global, such as global distribution systems. Perhaps there will be no traffic lights and even 3D transportation vehicles in cities. Smart buildings can incorporate personal comfort, energy savings, protection, and health and wellness elements into comfortable and efficient spaces, rather than only managing energy or security. Individuals can be fitted with patches of bionic skin that detect physiological parameters and transmit them to the cloud, which houses his digital health, as well as to the surrounding smart spaces, for enhanced comfort, health, performance, and protection. Indeed, smart watches, tablets, body nodes, and clothing can serve as customized feedback to optimize city-wide services that support both individuals and community [10]. Gartner listed ten "critical" developments and innovations influencing IT over the next five years, including the Internet of Things [5]. All of these objects have an IP address and can thus be monitored. The Internet is expanding into enterprise properties as well as consumer products such as vehicles and televisions. The issue is that most businesses and technology suppliers have yet to investigate the possibilities of an expanded Internet and are thus not operationally or organizationally prepared.

This can be extended to people, objects, facts, and locations, and hence the "Internet of Things" will be replaced by the "Internet of Everything." Figure 1 illustrates the Internet of Things. The following are the basic features of the Internet of Things:



Figure 1 Internet of Things

- **Interconnectivity:** With regard to the IoT, anything can be interconnected with the global information and communication infrastructure.
- **Things-related services:** The IoT is capable of providing thing-related services within the constraints of things, such as privacy protection and semantic consistency between physical things and their associated virtual things. In order to provide thing-related services within the constraints of things, both the technologies in physical world and information world will change.
- **Heterogeneity:** The devices in the IoT are heterogeneous as based on different hardware platforms and networks. They can interact with other devices or service platforms through different networks.
- **Dynamic changes:** The state of devices change dynamically, e.g., sleeping and waking up, connected and/or disconnected as well as the context of devices including location and speed. Moreover, the number of devices can change dynamically.
- **Enormous scale:** The number of devices that need to be managed and that communicate with each other will be at least an order of magnitude larger than the devices connected to the current Internet.

The ratio of communication triggered by devices as compared to communication triggered by humans will noticeably shift towards device-triggered communication. Even more critical will be the

management of the data generated and their interpretation for application purposes. This relates to semantics of data, as well as efficient data handling.

## II. RELATED WORK

As a consequence, we will often be implicitly connected into the new utility. New services provide instant and constant access to the right information for the job at hand, whether it is commuting to work or a conference, exercising, shopping, socializing, or visiting a doctor. Often these things will be interactive, including the use of avatars or robots. Many user outputs and displays can be holographic. Credit cards can be phased out, and biometrics such as speech or retina recognition can provide secure access to homes, ATMs, and transportation systems. A sensing and actuation utility would be accessible not only in public spaces, but also in houses, apartments, and condominiums. On the infrastructure, people will be able to run health, energy, protection, and entertainment apps. Installing and running new applications would be as simple as plugging in a new toaster into the power outlet. One app may help track and regulate heart rate, another may perform financial and investment services, another may automatically order food and wine, and yet another may foresee an imminent medical condition that should be resolved as soon as possible to alleviate or even prevent the problem. Humans can often be essential components of the IoT scheme. The Industrial Internet is a subset of the Internet of Things in which the computers (things) are artifacts in manufacturing plants, dispatch centers, process control industries, and so on[11].

According to Jayavardhana [12], Kevin Ashton coined the word "Internet of Things" in 1999 in the sense of supply chain management. However, over the last decade, the term has become more inclusive, encompassing a broader spectrum of applications such as healthcare, utilities, transportation, and so on.

While the concept of 'Things' has changed as technology has progressed, the main objective of making a machine sense knowledge without human interference has remained constant. A fundamental transformation of the current Internet into a network of interconnected objects that not only gather information from the environment (sensing) and communicate with the physical world (actuation/command/control), but also use existing Internet protocols to provide services for information transfer, analytics, applications, and communications. IoT has emerged from its infancy, fuelled by the proliferation of devices allowed by accessible wireless technologies such as Bluetooth, radio frequency identification (RFID), Wi-Fi, and telephonic data networks, as well as embedded sensor and actuator nodes, and is on the verge of transforming the existing static Internet into a fully integrated Future Internet. The Internet revolution resulted in unparalleled levels and rates of interconnection between citizens. The interconnection of artifacts to create a smart world would be the next revolution. According to John A. Stankovic's vision [10], Many technological communities are actively exploring research topics that relate to the Internet of Things. Today, as sensing, communication, and control become more sophisticated and widespread, there is considerable overlap in these cultures, although from slightly different perspectives. More group cooperation is welcomed. A vision for how IoT will improve the world in the near future to serve as a foundation for discussing open research issues in IoT.

Salah Addin Ahmed created the Smart GSM-Based Home Automation System in 2013. In recent years, there has been a surge in customer interest in the smart home model. Home entertainment consoles, security systems, lighting, access control systems, and surveillance are all examples of connected devices in smart homes. Intelligent home automation systems are integrated into smart homes to provide homeowners with comfort, convenience, and security.

The status of the connected devices is described and recorded by the home automation system in an intuitive, user-friendly interface, enabling the user to communicate with and monitor different devices with the touch of a few buttons. Bluetooth, WiMAX and Wireless LAN (Wi-Fi), ZigBee, and the Global System for Mobile Connectivity are some of the main communication technologies used by today's home automation systems (GSM). GSM is one of the world's most commonly deployed cellular technologies. With the increasing number of GSM subscribers, research and development are being heavily funded to further investigate GSM implementation [1].

Clients may use cloud data to migrate data from their machines to cloud servers. As a result, the customer is relieved of the responsibility of maintenance while still providing high-quality data storage facilities [5]. Cloud storage raises many security concerns. Cloud service providers and data servers are not without defects. The user is worried with whether or not the information stored on the cloud is in place. The homomorphic hash algorithm is used in this article. Furthermore, for data dynamics, this facilitates dynamic operations such as insert, update, remove, and alter at the block stage. The Merkle Hash Tree is used to aid in determining the position of each complex operation. A third-party inspector verifies the correctness of the user's data and certifies the consistency of the data stored on the cloud server. The overhead of communication and computation is minimized. The deduplication technique is used to determine whether or not the file that the user wants to store in cloud storage already resides on the cloud server. This system is successful and safe against malicious server-launched replace attacks.

Nikhil Singh, Shambhu Shankar Bharti, Rupal Singh, and Dushyant Kumar Singh developed the Remotely Controlled Home Automation System in 2014. They developed a server and an android-based home automation system. The software is structured in such

a way that if no one is at home, all home appliances are turned off automatically. Proteus Design Suite was used for design purposes. The design consists of a basic home automation design with a "motion sensor" for counting the number of people inside the house, "a speed operated fan," "a light bulb," and "a LCD" for displaying the status of home appliances. "a microcontroller ic" for device control "a port" for device link

### III. RESEARCH GAP AND FUTURE PROSPECTS

If a GPRS link is not accessible in an existing GSM-based home automation device, the entire system will not work. Budget-friendly: As we all know, most devices use GPRS, which is more costly than Wi-Fi. Data Pack is required: Some systems rely on GPRS, which necessitates the use of a data pack, which must be recharged every month. Some architectures employ the Wi-Fi idea, but these architectures usually employ the Raspberry Pi, which is costly. Some basic features, such as automatic monitoring of outside lighting, are still missing from home automation systems. Home automation systems often lack a feedback feature that enables users to take action in response to the notification.

As can be shown, there are several defects in previous methods. This segment focuses on the use of the Internet of Things (IoT) for advanced, energy-efficient, and self-learning home automation systems. The key goal is to develop and incorporate a low-cost, smart home automation system. For connectivity between the server and the home appliances, we use a Wi-Fi-based approach. This smart home automated system will be built with software and hardware implementation. The project proposes the implementation of an Internet of Things (IoT)-based smart home automated system that allows users to monitor home appliances remotely via Wi-Fi. The ESP8266 low-cost Wi-Fi module is used to build Smart Units. The user can use the Android App to

monitor home appliances such as lights, fans, and televisions. The server will be connected to relay hardware circuits that will power the home appliances.

### IV. CONCLUSIONS

A study of various home automation systems demonstrates that various technologies are used to implement this type of system. In this paper, all of the proposed systems have been discussed and compared, revealing some of the systems' advantages and disadvantages. Web-based, Bluetooth-based, mobile-based, SMS-based, ZigBee-based, Arduino microcontroller-based, android app-based, IOT-based, and cloud-based home automation systems were addressed in this study. Because of its accuracy, simplicity, low cost, and dependability, home automation systems are gaining traction in the global market, and the day when every home is a smart home is not far off. So, in this article, we primarily investigate the internet of things and conduct a comparative analysis of home automation techniques. IoT-enabled home automation has a lot of potential in the future.

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# A Survey on Cluster Head Placement for Optimal Energy in Wireless Sensor Networks

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## ABSTRACT

Data aggregation is exceptionally critical methods in wireless sensor network. Since with the assistance of data aggregation we lessen the vitality utilization by wiping out excess. At the point when wireless sensor network sent in remote regions or threatening condition. In the wireless sensor network have the most difficult assignment is an existence time so with help of data aggregation we can improve the lifetime of the network. In this paper we talk about the data aggregation approaches based on the directing conventions, the calculation in the wireless sensor network. And furthermore talk about the favourable circumstances and detriments or different execution measures of the data aggregation in the network.

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## I. INTRODUCTION

The wireless sensor network is specially appointed network. It comprises little light weighted wireless hubs called sensor hubs, sent in physical or natural condition. Furthermore, it gauged physical parameters, for example, sound, weight, temperature, and moistness. These sensor hubs conveyed in substantial or thousand numbers and work together to shape a specially appointed network fit for answering to data gathering sink (base station). Wireless sensor network have different applications

like territory observing, building checking, wellbeing observing, military survival spear and target following. However wireless sensor network is an asset requirement in the event that we discuss vitality, calculation, memory and constrained correspondence abilities. All sensor hubs in the wireless sensor network are interface with each other or by moderate sensor hubs.

A sensor hubs that produces data, based on its detecting instruments perception and transmit detected data bundle to the base station (sink).

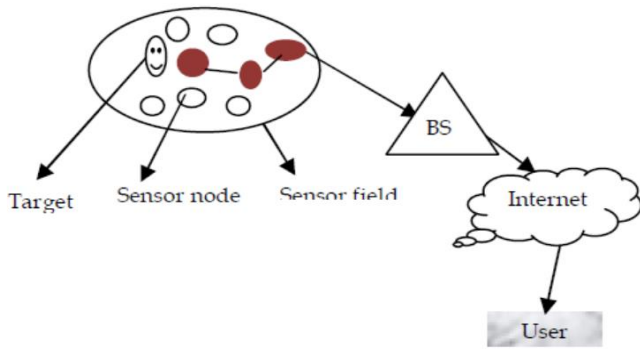


Figure 1 Architecture of the Sensor network

This procedure fundamentally coordinate transmission since the base station may found extremely far from sensor hubs needs. More vitality to transmit data over long separations so a superior method is to have less hubs send data to the base station. These hubs called aggregator hubs and procedures called data aggregation in wireless sensor network.

## II. RELATED WORK

### A. Clustering In WSN

Sensor hub are thickly conveyed in wireless sensor network that implies physical condition would deliver fundamentally the same as data in near to sensor hub and transmitting such sort of data is pretty much repetitive. So every one of these realities support utilizing some sort of collection of sensor hubs to such an extent that gathering of sensor hub can be consolidated or pack data together and transmit just smaller data. This can diminish limited activity in singular gathering and furthermore lessen worldwide data. This gathering procedure of sensor hubs in a thickly conveyed huge scale sensor hub is known as clustering. The method for brushing data and pack data having a place with a solitary cluster called data combination (aggregation).

Issues of clustering in wireless sensor network:-

1. What number of sensor hubs ought to be taken in a solitary cluster? Determination method of cluster head in an individual cluster

2. Heterogeneity in a network, it implies client can put some power full hubs, in term of vitality in the network which can carry on like cluster head and basic hub in a cluster fill in as a cluster part as it were. Numerous conventions and calculation have been proposed which manage every individual issue.

### B. Data Aggregation

In run of the mill wireless sensor networks, sensor hubs are generally asset compelled and battery-constrained. Keeping in mind the end goal to spare assets and vitality, data must be collected to abstain from overpowering measures of activity in the network. There has been broad work on data aggregation conspires in sensor networks, the point of data aggregation is that takes out excess data transmission and improves the lifetime of vitality in wireless sensor network. Data aggregation is the procedure of one or a few sensors at that point gathers the recognition result from other sensor. The gathered data must be prepared by sensor to diminish transmission load before they are transmitted to the base station or sink. The wireless sensor network has comprised three sorts of hubs. Straightforward standard sensor hubs, aggregator hub and queried. Normal sensor hubs sense data bundle from the earth and send to the aggregator hubs essentially these aggregator hubs gather data from various sensor hubs of the network, totals the data parcel utilizing a some aggregation work like total, normal, tally, max min and afterward sends totals result to upper aggregator hub or the queried hub who produce the question.

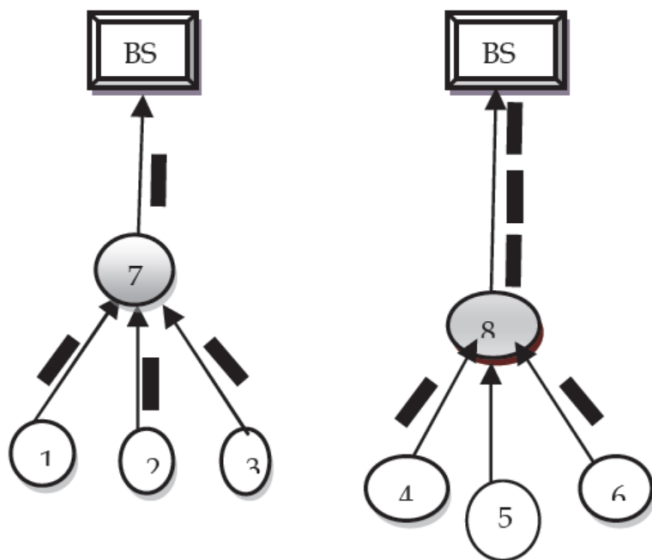


Figure 2 Data aggregation model and Non data aggregation show

It can be the base station or in some cases an outer client who has authorization to associate with the network. Data transmission between sensor hubs, aggregators and the querier devours part of vitality in wireless sensor network. Figure 2 contain two models one is data aggregation model and second is non-data aggregation demonstrate in which sensor hubs 1, 2, 3, 4, 5, 6 are general hubs that gathering data bundle and announcing them back to the upper hubs where sensor hubs 7,8 are aggregators that perform detecting and totaling in the meantime. In this aggregation demonstrate 4 data parcel went inside the network and just a single data bundle is transmitted to the base station (sink). What's more, other non-data aggregation demonstrate likewise 4 data parcel went inside the network and all data bundles are sent to the base station(sink), implies we can state that with the assistance of data aggregation process we diminish the quantity of data bundle transmission. And furthermore spare vitality of the sensor hub in the wireless sensor network. With the assistance of data aggregation we upgrade the lifetime of wireless sensor network. Sink have a data parcel with vitality productive way with least data idleness. So data idleness is critical in numerous uses of wireless sensor network, for example, condition observing, wellbeing,

checking, where the freshness of data is likewise an imperative factor. It is basic to create vitality proficient data-aggregation calculations so network lifetime is upgraded. There are a few components which decide the vitality effectiveness of a sensor network, for example, network engineering, the data aggregation instrument, and the fundamental steering convention. Wireless sensor network has conveyed handling of sensor hub data. Data aggregation is the system. It depicts the preparing technique that is connected on the data got by a sensor hub and in addition data is to be steered in the whole network. In which lessen vitality utilization of the sensor hubs and furthermore decrease the quantity of transmissions or length of the data parcel.

Elena Fosolo et al in [5] portray "In network aggregation is the selective procedure of gathering and directing data through a multi hop network. Handling of data parcel with the assistance of halfway sensor hubs. The goal of this approach is expanding the life time of the network and furthermore diminishes asset utilization. There are two sort of approach for in network aggregation. With estimate diminishment and without measure lessening .In network aggregation with estimate decrease. It is the procedure in which join and compacting the data got by a sensor hub from its neighbors keeping in mind the end goal to lessen the length of data bundle to be sent towards the base station. Case, in some situation a hub gets two data bundles which have a corresponded data. In this condition it is pointless to send the two data parcels. At that point we apply a capacity like MAX, AVG, and MIN and again send single data parcel to base station.

With help of this approach we lessen the quantity of bit transmitted in the network and furthermore spare a considerable measure of vitality. In network aggregation without measure lessening is characterized during the time spent data bundles got by various neighbors in to a solitary data parcel

however without preparing the estimation of data. This procedure additionally decreases vitality utilization or increment life time of the network.

**a. Advantage and Disadvantage of Data Aggregation in WSN**

Preferred standpoint: With the assistance of data aggregation process we can improve the power and precision of data which is acquired by whole network, certain excess exists in the data gathered from sensor hubs subsequently data combination handling is expected to lessen the repetitive data. Another preferred standpoint is those diminishes the activity load and monitor vitality of the sensors.

Disservice: The cluster head implies data aggregator hubs send meld these data to the base station .this cluster head or aggregator hub might be assaulted by noxious assailant. In the event that a cluster head is traded off, at that point the base station (sink) can't be guarantee the accuracy of the total data that has been send to it. Another downside is existing systems are a few duplicates of the total outcome might be sent to the base station (sink) by uncompromised hubs. It increment the power expended at these hubs.

**b. Performance measure of Data Aggregation**

There are critical execution measures of data combination calculation. These exhibitions are exceptionally subject to the coveted application.

- **Vitality Efficiency:** By the data-aggregation plot, we can build the usefulness of the wireless sensor network. In which each sensor hubs ought to have spent a similar measure of vitality in each datum assembling round. A data aggregation conspire is vitality proficient in the event that it augments the usefulness of the network. Network lifetime, data exactness, and inertness are a portion of the critical execution measures of data-aggregation calculations. The meanings of

these measures are exceptionally subject to the coveted application.

- **Network lifetime:** The network lifetime is characterizing the quantity of data combination rounds. Till the predefined level of the aggregate hubs passes on and the rate rely upon the application .If we discuss some application, simultaneously working of the all the sensor hubs is vital thus the lifetime of the network is number of round until the main hubs which enhances the vitality proficiency of hubs and improve the lifetime of entire network.
- **Idleness:** Latency is assess data of time defer encounters by system, implies data send by sensor hubs and got by base station (sink).basically postpone associated with data transmission, steering and data aggregation.
- **Correspondence overhead:** It assesses the correspondence unpredictability of the network combination calculation.
- **Data precision:** It verifies the proportion of aggregate number of perusing got at the base station (sink) to the aggregate number of created. There are diverse writes data aggregation conventions like network engineering based data aggregation conventions, network-stream based data aggregation conventions and nature of administration (QOS) - mindful data-aggregation conventions intended to ensure QOS measurements. Here network design based conventions are depicted in detail.

**c. Impact of Data Aggregation in WSN**

In this section we talk about the two principle factors that influence the execution of data aggregation strategies in wireless sensor network, Such as vitality sparing and delay. Data aggregation is the procedure, in which collecting the data bundle originating from the distinctive sources; the quantity of transmission is decreased. With the assistance of this procedure we can spare the vitality in the network. Deferral is the inactivity associated with aggregation data from

neither sources may need to be kept down at transitional hubs keeping in mind the end goal to join them with data from source that are more remote away. Fundamentally aggregation technique based on the position of the sources in the network, number of sources and the network topology. On the off chance that it analyses the variables, we think about the two models of the source arrangement. The occasion sweep (ER) model and arbitrary source demonstrate [14]. The demonstrating says us that where the source are clustered close to each other or found haphazardly, noteworthy vitality picks up are conceivable with data aggregation. These increases are most noteworthy when the quantity of sources is vast, and when the sources are found generally near each other and a long way from base station. The displaying through, additionally appears to the recommend that aggregation inertness could be non-immaterial.

### III. LITERATURE SURVEY

Data aggregation process is performed by particular steering convention. Our point is totalling data to limit the vitality utilization. So sensor hubs should course bundles based on the data parcel content and pick the following hop with a specific end goal to advance in network aggregation. Essentially steering convention is isolated by the network structure that is the reason directing conventions is based on the thought about methodologies.

#### a. Tree-Based Approach

The tree based approach is characterizing aggregation from building an aggregation tree. The type of tree is least traversing tree, sink hub consider as a root and source hub consider as a clears out. Data streaming of data begin from surrenders hub over to root implies sink (base station). Disadvantage of this approach, as we probably am aware like wireless sensor network are not free from disappointment .if there should arise an occurrence of data bundle misfortune at any level

of tree, the data will be lost for single level as well as for entire related sub tree too. This approach is reasonable for outlining ideal aggregation procedures'. Enrage et al. in [6] data driven convention know as Tiny aggregation (TAG) approach. The working of TAG is relying upon two stages: circulated stage and accumulation stage.

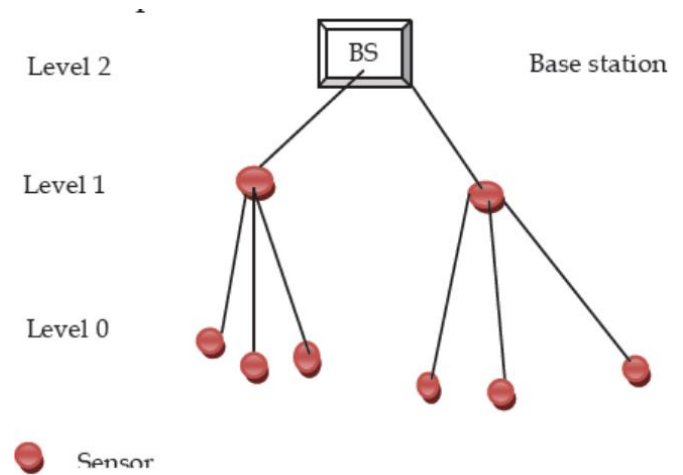


Figure 3 Tree based data aggregation in wireless sensor network

#### b. Cluster-Based Approach

In vitality obliged sensor networks of expansive size, it is wasteful for sensors to transmit the data straightforwardly to the sink in such situations, Cluster based approach is various leveled approach. In cluster-based approach, entire network is isolated in to a few clusters. Each cluster has a cluster-head which is chosen among cluster individuals. Cluster-heads do the part of aggregator which total data got from cluster individuals locally and after that transmit the outcome to base station (sink). As of late, a few cluster-based network association and data-aggregation conventions have been proposed for the wireless sensor network. Figure 4 demonstrates a cluster-based sensor network association. The cluster heads can speak with the sink specifically by means of long range transmissions or multi hopping through other cluster heads.

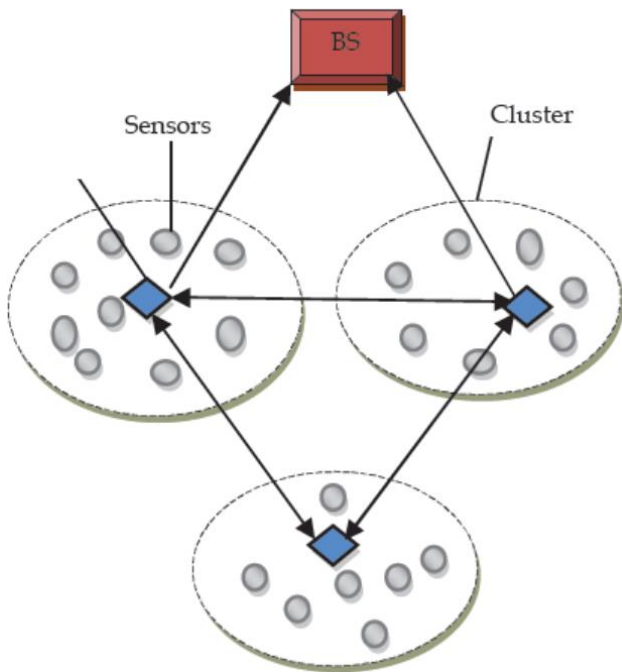


Figure 4 Cluster based sensor network.

The bolts show wireless correspondence joins K. Dasgupta et al. in [7] proposed a most extreme lifetime data aggregation (MLDA) calculation which discovers data gathering plan gave area of sensors hub and base-station, data bundle size, and vitality of every sensor hub. A data gathering plan determines how data bundle are gathered from sensors hub and transmitted to base station for each round. A calendar can be thought of as a gathering of aggregation trees. In [4], they proposed heuristic-avaricious clustering-based MLDA based on MLDA calculation. In this they parceled the network in to cluster and alluded each cluster as super-sensor. They at that point register greatest lifetime plan for the super-sensors and after that utilization this timetable to build aggregation trees for the sensors. W. Choi et al. in [1] introduce a two-stage clustering (TPC) conspire. Stage I of this plan makes clusters with a cluster-head and every hub inside that cluster frame a direct associates with cluster-head. Stage I the cluster-head revolution is restricted and is done based on the rest of the vitality level of the sensor hubs which limit time change of sensors and this prompt vitality sparing from pointless cluster-head turn. In stage II, every hub inside the

cluster looks for a neighbour nearer than cluster-head which is called data transfer point and setup up a data hand-off connection. Presently the sensor hubs inside a cluster either utilize guide connection or data hand-off connection to send their data to cluster head which is a vitality proficient plan. The data transfer point totals data at sending time to another data hand-off point or cluster-head. In the event of high network thickness, TPC stage II will setup superfluous data transfer connect between neighbours as nearly conveyed sensor will detect same data and this prompt a misuse of vitality.

### c. Multi-Way Approach

The disadvantage of tree based approach is the constrained power of the system. To conquer this disadvantage, another approach was proposed by numerous analysts .in which sending somewhat collected data to single parent hub in aggregation tree, a hub could send data over different ways. In which every single hub can send data bundles to its conceivably various neighbours. Hence data parcel spill out of source hub to the sink hub along numerous way, part of transitional hub between source hub to sink hub so aggregation done in each middle hub. Utilizing this approach we will make the system hearty yet some additional overhead. The case of this approach like ring topology, where network is separated in to concentric hover with characterizing level levels as indicated by hop remove from sink.[3]propose another procedure have the two issues : vitality proficiency and power. In which single way to interface every hub to the base station it is vitality sparing however high danger of connection disappointment. Yet, on the other head multipath approach would require more hubs to take an interest with ensuing misuse of vitality. Creators show a cunning utilization of multi-way just when there is loss of parcel which is actualized by shrewd reserving of data at sensor hubs. Creators additionally contend that in numerous down to earth circumstance data

might be assembled just from a specific area, so they utilize an alternate approach that depends on a spreading over tree and gives elective ways just when a failing is identified. Calculation embraces a tree-based approach for sending bundles through the network. In the perfect circumstance when no disappointments happen, this is positively the best decision, as the base number of hubs is occupied with the transmission stage. Within the sight of connection or hub disappointments, the calculation will find elective ways, so as guarantee the conveyance of however many bundles as would be prudent inside the time limitations. The issue with this approach is that it might cause the emerging of problem areas and hubs along favoured ways will devour their vitality assets rapidly, conceivably causing disengagement in the network.

TABLE I

ROUTING PROTOCOL FOR TREE, CLUSTER, MULTIPATH AND HYBRID APPROACH

Protocols/algorithms	Tree	Cluster	Multipath	Hybrid
TAG	✓	-	-	-
Directed Diffusion	✓	-	-	-
PEGASIS	✓	-	-	-
DB-MAC	✓	-	-	-
EADAT	✓	-	-	-
LEACH	-	✓	-	-
Cougar	-	✓	-	-
Synopsis	-	-	✓	-
Diffusion	-	-	✓	-
Tributaries and Deltas	-	-	-	✓

#### IV. CONCLUSIONS

In this paper we show wireless sensor network is comprise a substantial number of sensor hub.

Furthermore, these hubs are asset limitation. That is the reason lifetime of the network is constrained so the different methodologies or convention has been proposed for expanding the lifetime of the wireless sensor network. In this paper we talk about the data aggregation are one of the vital systems for upgrading the life time of the network. Furthermore, security issues is data respectability with the assistance of honesty we decrease the bargained sensor source hubs or aggregator hubs from altogether adjusting the last aggregation esteem. Sensor hub in a sensor network is effectively to bargained. Bargained hubs have a capacity to adjust or dispose of messages. Technique for secure data aggregation: There are two kind of strategy for securing data hop by hop encryption and end to end encryption, the two strategies takes after some progression.

1. Encryption process must be finished by detecting hubs in wireless sensor network.
2. Unscrambling process must be finished by aggregator hubs.
3. After that aggregator hubs totals the outcome and afterward encode the outcome once more.
4. The sink hub gets last amassed outcome and unscramble it once more.

We additionally examine the different methodologies for data aggregation or likewise talk about the favorable position and disservices and different execution measures of the data aggregation.

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# Hand Gesture Recognition Using OpenCV

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## ABSTRACT

In human-computer interaction or sign language interpretation, recognizing hand gestures and detecting fingertips become ubiquitous in computer vision research. Hand gesture recognition provides an intelligent and natural way of human computer interaction. Its applications range from medical rehabilitation to consumer electronics control. In order to distinguish hand gestures, various kinds of sensing techniques are utilized to obtain signals for pattern recognition. This system can be divided into three parts according: Hand detection, hand gesture recognition, Edge detection for images, Integrating media. The system has two major advantages. First, it is highly modularized, and each of these steps is capsuled from others; second, the edge/contour detection of hand as well as gesture recognition is an add-on layer, which can be easily transplanted to other applications. The techniques used for image processing are hand gesture detection, edge detection, thresholding, contour detection. Using OpenCV, which provides a library collection of functions for different image processing techniques, these input images can be processed and corresponding key strokes will be generated.

Keywords : Fingertip detection, Gesture recognition, Handy algorithm.

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## I. INTRODUCTION

Hand gesture recognition provides an intelligent and natural way of human computer interaction (HCI). Its applications range from medical rehabilitation to consumer electronics control (e.g. mobile phone). In order to distinguish hand gestures, various kinds of sensing techniques are utilized to obtain signals for pattern recognition. Acceleration-base and

electromyogram-based techniques are two research branches in the field of hand gesture pattern recognition. Acceleration-based (ACC-based) gesture control is usually studied as a supplementary interaction modality. It is well suited to distinguish noticeable, larger scale gestures with different hand trajectories of forearm movements. With ACC-based techniques some subtle finger or hand movement may be ignored whereas electromyogram-based (EMG-

based) gesture recognition techniques use multi-channel EMG signals which contain rich information about hand gestures of various size scales. Due to some problems inherent in the EMG measurements, including the separability and reproducibility of measurement, the size of discriminable hand gesture set is still limited to 4-8 classes. In order to realize a natural and robust gesture-based HCI system, the selection of input hand gestures that are well discriminable from each other is of crucial importance. Considering the complementary features of ACC- and EMG-measurements, we believe that their combination will increase the number of discriminable hand, wrist and forearm gestures and the accuracy of the recognition system. This paper describes in IP Gaming we are proposing a system in which without using sensors and Devices, we are detecting the hand and gesture with Simple Web camera and performing the Image Processing technique in which using those gesture, we can control the media on console. In Image Processing the motions are detected through a web camera. These images are then passed for the image processing. The techniques used for image processing are hand gesture detection, edge detection, thresholding, contour detection. Using OpenCV, which provides a library collection of functions for different image processing techniques, these input images can be processed and corresponding key strokes will be generated.

## II. LITERATURE SURVEY

Motion capture and depth sensing are two emerging areas of research in recent years. With the launch of Kinect in 2010, Microsoft opened doors for researchers to develop, test and optimize the algorithms for these two areas. J Shotton proposed a method to quickly and accurately predict 3D positions of the body joints without using any temporal data. Key prospect of the method is they are considering a single depth image and are using an object recognition approach. From a single input depth

image, they inferred a per pixel body part distribution. Leyvand T discussed about the Kinect technology. His work throws light on how the Identity of a person is tracked by the Kinect for Xbox 360 sensor. Also a bit of information about how the changes are happening in the technology over the time is presented. With the launch of Kinect, there is a sea change in the identification and tracking techniques. The authors discussed the possible challenges over the next few years in the domain of gaming and Kinect sensor identification and tracking. Kinect International Journal of Engineering Research & Technology (IJERT) Vol. 2 Issue 3, March - 2013 ISSN: 2278-0181 IJERT identification is done by two ways: Biometric sign-in and Session tracking. A method to track fingertips and the center of palms using Kinect was presented by Raheja. It applied thresholding on the depth of hand regions for segmentation. Then the palm was filtered and subtracted from the hand, so that only the fingers were left in the image. Under most situations when the hand was in front of the user, the fingers should be closest to the Kinect with the shallowest depth. Therefore, by determining the minimum depth, fingertips were found. The center of the palm was determined by finding the maximum of distance within the image of the hand. When fingers were extended, the accuracy of detecting fingertips was nearly 100% accuracy, and that of palm center was around 90%. However, this method did not attempt at gesture recognition. He proposed another approach using depth data provided by Kinect to detect fingertips. First, it found hand points by thresholding on depth elata, and then generated the convex hull containing the hand by Graham Scan. Fingertips were detected by calculating the angle between candidate points. After fingertips were found, the mouse clicking motion was recognized and tested on the popular game Angry Bird; that is, it recognized only one gesture.

### 1. EDGE DETECTION

Edge detection is an image processing technique for finding the boundaries of objects within images. It works by detecting discontinuities in brightness. Edge detection is used for image and data extraction in areas such as image processing, computer vision, and machine vision. Since computer vision involves the identification and classification of objects in an image, edge detections is an essential tool.

### 2.HANDY ALGORITHM

Handy algorithm is especially used to detect the hands and gestures. One of its key features is the ability to display the spatialization process, aiming at transforming the network into a map, and ForceAtlas2 is its default layout algorithm. The latter is developed by the Gephi user's typical networks.

### 3. THRESHOULD

Frequently we have done many layers of processing steps and want either to make a final decision about the pixels in an image or to categorically reject those pixels below or above some value while keeping the others. The OpenCV function `cvThreshold()` accomplishes these tasks. The basic idea is that an array is given, along with a threshold, and then something happens to every element of the array depending on whether it is below or above the threshold. The `cvThreshold()` function handles only 8-bit or floating-point grayscale source images.

1. Capture the images using web camera. 2. On applying Image Processing technique we will be able to detect the hands and Gesture and perform some console based operation.

- i. Edge Detection: Edges are the sharp black shadow surrounding the objects.
- ii. Threshold Control: for controlling sharpness of edges.
- iii. Finding Contours, contours are nothing but shadow areas of hand.

- iv. Set the proper beginning of the contours.
  - v. Detect Convexity Defect in the picture. Defects are the points which are having thick edges.
  - vi. Detect Convexity Defect ending points for the tip of our hand detection.
  - vii. Draw Circles on the defects we obtained.
  - viii. Save the Co-ordinates of the Defects obtained in each areas.
3. Trigger Image Capture.
4. Background Subtraction is done for clearing background.

### III. ALGORITHM FOR HAND DETECTION

#### Finger Identification Algorithm

1. The first and easiest step is to identify the thumb and the index finger, since the distance between them is the largest among all neighboring fingers.
2. The little finger is identified as the farthest finger away from the thumb; meanwhile the middle finger is identified as the closest one to the index finger.
3. The remaining one is the ring finger. The process of detecting hands and identifying fingers are performed every time when the input data source changes. If the same object still exists in the current frame with some transformation compared to the previous frame, all properties of this object is mapped from the previous frame to the current frame; otherwise the disappeared object is collected by an unmapped item collector.

Fingertip Detection, The distance between  $P_0$  and the line made by  $P_1$  and  $P_2$  is apparently larger than that of  $p^{\sim}$  and the line made by  $p^{\sim}$  and  $p_j$ . Thus a threshold distance could be used to differentiate fingertip points and non-fingertip points.

### IV. SYSTEM ARCHITECTURE

The architecture diagram consists of:

- System
- OpenCV Library
- Background Subtraction
- Hand Gesture Detection

The motions are detected using web camera and passed to the system for processing.

## VI. CONCLUSION

The system consists of OpenCV and Java Application, using these Hand Detection and Background subtraction is done. This processed image in the checked in which area it has occurred and its corresponding key event is called for action to be performed. These steps are repeated till the end of the recognition.



Fig.1.Process of Hand Gesture Recognition

## V. RESULT AND DISCUSSIONS

The purpose of this project is to recognize hand gesture with more accuracy. The design is very simple and the user doesn't need to wear any type of hand gloves. Although this recognition application can be run in an ordinary computer having a web camera, but ideally it requires system having camera with at least 1.4GHz processor and at least 1GB RAM. The algorithm can detect the hand gestures with 99.95% recognition rate if the user interacts in right way.



Fig.2. Hand Gesture Recognized

In this paper, we have discussed how camera can be used for Detection hand gestures and can be applied to any . We are using camera as a detecting device as well as input device for Augmented Reality System. The proposed system helps reduce the burden on experts to look into few regular activities. Instead, they can use our system for such activities. Also, the work simplifies the documentation process. The supervisor can keep track of current status of activity from his desk. Also, stepwise verification is possible as the system keeps track of each step. Through the introduction of our system, we will bring new opportunities for mechanical engineering based companies to use Augmented Reality for simplification of their complex tasks. This will add new dimensions to the conventional way of maintenance activities.

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# Studies on floristic diversity of some endangered plant species from Western Ghats of Nasik district, Maharashtra

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## ABSTRACT

The present study deals with floristic diversity and taxonomy along with the observations with respect to precise locations, flowering, fruiting period and potential threats of some endangered plant species of Western Ghats in Nasik district of Maharashtra. Total 30 endangered plant species belonging to 14 families; were recorded during an extensive field surveys and botanical excursions; conducted from 2018 to 2020 at several places mainly forest pockets and hilly regions from Nasik tehsils like Sinnar, Trymbakeshwar, Igatpuri, Chandwad, Kalwan etc. The occurrence of endangered plant species focusing their floristic and taxonomical aspects were monitored continuously so as know the current status of these species in the study area. It was observed that the probable reasons for consistent decrease in number of endangered plant species in the study area; are destruction of natural habitats due to increasing illegal acquisition of forest land, massive deforestation and urbanization. The present study thus highlights an effective monitoring and conservation strategy to be adopted for the sustainable use of endangered plants.

**Keywords :** Endangered Plants, Nasik, Western Ghats.

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## I. INTRODUCTION

Western Ghats is a hot-spot of plant biodiversity. Many endangered and threatened plants are found growing naturally in this area. The Western Ghat has 6% of India's landmass with 30% of plants and animals. There are specific patches in the Western Ghats that are of special significance as they constitute habitats of endangered species several of

which are on IUCNs endangered species list. (Gunawardene et al. 2007; Bharucha et.al.;2010).

The plant species which were abundant previously in this region are being exploited consistently. Several species of plants are already extinct or on verge of extinction. The alarming rate of loss of biodiversity in Western Ghats is a major concern today. Many plant species are under constant anthropogenic pressure on account of their economic value. With population explosion, shifting cultivation, grazing, encroachment

for agriculture, extraction of timber and fuel wood, spread of invasive alien weeds, and selective removal of certain species such as the medicinal plants have all resulted in clearing of the natural vegetation. (Rao; 2019)

An endangered species is one, which is in danger of extinction throughout all or of a significant portion of its range.(Bryde, 1979; Smith 1980; Nayar and Sastry; 1990). Many medicinal plant species have gone into threatened category due to their increased demand and these need to be assessed as endangered or even critically endangered or have to be put under legal protection. (Mehta et.al.; 2020). Some species are critically endangered in the wild and therefore it is essential to take urgent steps to conserve the wealth of medicinal plants. The present investigation was undertaken in order to survey and document endangered plant species of Western Ghats of Nasik district which is found to be under huge human pressure due to which numbers of species are being included under rare endangered and threatened (RET) category. In recent years; increasing loss of biodiversity has created serious threat to the survival of mankind. Harvesting, grazing, shifting cultivation and uprooting of plant species for the purpose of food, fodder and medicines by tribal and local people are found the major cause for their threats. Most part of Western Ghats especially northern Western Ghats harbors dry habitats including coastal plains (Devgad, Malvan, Konkan), lateritic plateaus (Ratnagiri), high-elevation plateaus (Kaas, Gothane), steep rocky areas (Gaganbawda, Kumbharli Ghat), dry deciduous forests (Satara, Wai), and rocky mountain tops (Nashik). This underlines the need for exhaustive floristic explorations to understand their actual distribution (Surveswaran et.al.;2020). Though the several efforts are underway worldwide to conserve critically endangered species, the efforts in India are far too few that might be due to expensive and time-consuming species recovery programmes and lack of focus. However; long-term monitoring involving

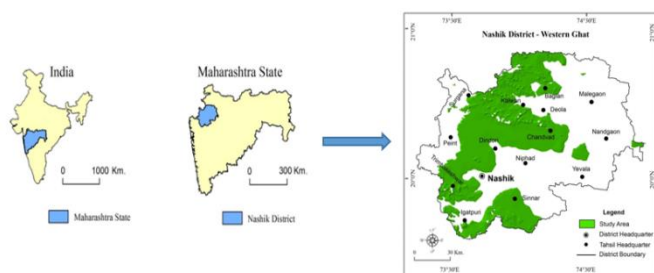
periodical assessment of the population changes of the species need to be developed so as to potentially delist them from the red-list. (Ravikanth and Aravind et.al.;2018).

## II. METHODS AND MATERIAL

The Nasik district is located between latitudes 19°35' and 20°50' and the longitudes 73°30' and 74°55' and extends over an area of 15,582 sq.km. The forests of the district cover an area of 3,446.28 sq.km. The vegetation of the Nashik region is semi-moist to dry deciduous forest type but mixed with the members of thorny stunted plants in moderate rainfall zone (600-1000 mm). The tree vegetation is sparse with low density and stunted growth mainly restricted to valleys and slopes. (www.nashiknic.in). The study area i.e. Western Ghats of Nasik district includes mainly forest pockets and outskirts of Peith, Kalwan, Surgana, Baglan, Sinnar, Chnadwad and Trymbakeshwar tehsils. (Fig.1).

The collection, identification and documentation of endangered plant species observed during an extensive survey from the months of July 2015 to December 2020. The field data such as distribution, number of individuals, habit and habitat was recorded and documented as photographs also. The collected specimens were identified by referring to various floras like flora of presidency of Bombay (Cooke;1958), flora of Nasik (Lakshminarasimhan and Sharma), flora of Dhule and Nandurbar districts (Patil;2003). The nomenclature, IUCN category of collected plant species has been adapted and list of observed plant species has been updated according to the available online resources and databases of ICBN, IUCN red list. (www.iucnredlist.org.). (Ahmedullah and Nayar; 1987; Nayar and Sastry; 1987-1990; Mishra and Singh; 2001).





**Fig.1.** location map showing study area

### III. RESULTS AND DISCUSSION

The results of the study have revealed that 30 plant species belonging to 14 families 19 genera, 28 species and 2 varieties. Of these; 22 plant species were herbs, 04 were twiners 2 were shrubs and one climber one was an epiphyte. (Fig.2-B). Among these; majority of the herbs and twiners were dicot plants and few were monocots. (Fig.2-C). In the present study; the maximum number of endangered plant species were found to be belonging to the family Apocynaceae which covered total of 8 species, followed by Liliaceae, and Orchidaceae with total of 6 and 4 species respectively (Table 1, Fig. 2-A). Present study has revealed that in the area there were 30 endangered flowering plant species found to be under endangered category according IUCN; 1993, and 2000 guidelines. Of these; the dominance of plant families like Apocynaceae has also been reported in wide-ranging tropical forests of Western Ghats and is also evident in this study. Sukumaran and Raj;2007, Sarvalingam and Rajendran;2016). The possible causes of these plant species getting endangered are illegal trade, overexploitation, habitat loss, habitat fragmentation, over grazing, soil erosion, climate changes, loss of reproduction, low seed germination etc. A major concern is the conservation of outlying hill ranges, low plateaus or isolated hills and elevated areas which can have immense bioresources with endemic and endangered ground flora. (Bharucha et.al.;2010). Even though the species *Gloriosa superba* L. was reported as an endangered species according to IUCN reports and earlier studies; it was observed as quite abundant

during the present studies. (Sarvalingam and Rajendran;2016). Plant species like *Ceropegia mahabalei*, *Ceropegia sahyadrica*, *Chlorophytum bharuchii*, *Sonerila scapigera*, *Begonia phrixophylla*, *Begonia trichocarpa* etc. were found to be growing mostly on dry cliffs and hill passes of Western Ghats which are known to support ecologically specialized microhabitat to some vascular plant species. (Datar and Watve; 2018). Also, during the present study; it was observed that some plant families have been represented by few endangered or critically endangered and newly added pant species to Nasik flora; especially in case of family Apocynaceae represented by total 8 species of genus *Ceropegia* only; Liliaceae by genus *Chlorophytum* (03 species), similarly Orchidaceae and Bigoniaceae have been represented by genera like *Habenaria* and *Begonia* (02 species each) respectively. (Garud and Shinde 2018). However; it was found that most of these species especially *Ceropegia hirsuta*, *Ceropegia lawii*, *Gloriosa superba*, *Canscora diffusa* etc. can be cultivated and conserved through reintroduction in the college garden and in particular reserved areas. There is however, now an urgent need to evolve a sound strategy for the management and conservation of these plants on a long-term basis. To evolve suitable strategies for conservation the domestic cultivation of endangered plants must be adopted.

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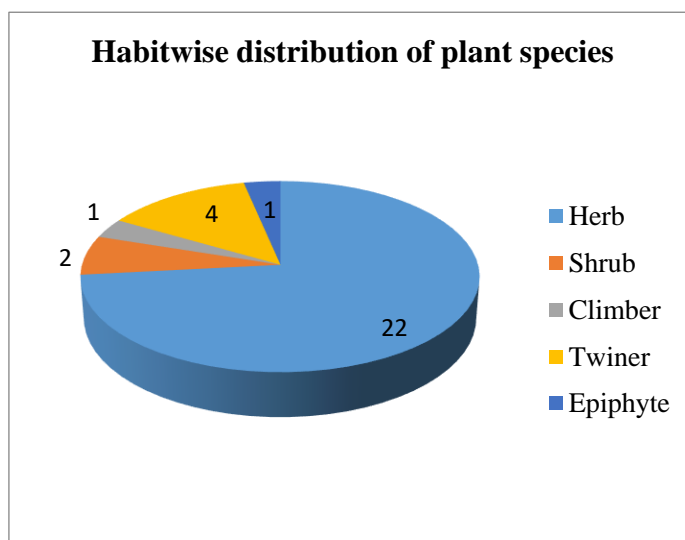
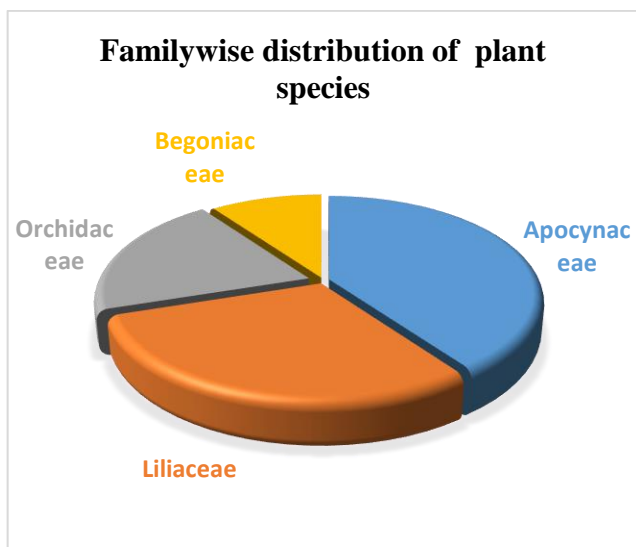
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**Table 1** : List of endangered plant species recorded within the study area

Sr. No.	Plant species	Family	Local Name	Habit
1.	<i>Ceropegia anjanerica</i> Malpure, Kamble & Yadav	Apocynaceae	Lahan kharpudi	Herb
2.	<i>Ceropegia bulbosa</i> var. <i>balbosa</i> Roxb.		Hamil	Twinner
3.	<i>Ceropegia bulbosa</i> var. <i>lushii</i> (Grah.) Hook f.		Gavtya hamil	Twinner
4.	<i>Ceropegia hirsuta</i> Wight & Arn.		Hamil	Twinner
5.	<i>Ceropegia lawii</i> Hook.		Moti Kharpudi	Herb
6.	<i>Ceropegia media</i> (Huber) Ansari		Medi Kharchudi	Twinner
7.	<i>Ceropegia mahabalei</i> Hemandri		Kharchudi	Herb
8.	<i>Ceropegia sahyadrica</i> Ansari & Kulkarni		Kharpudi	Herb

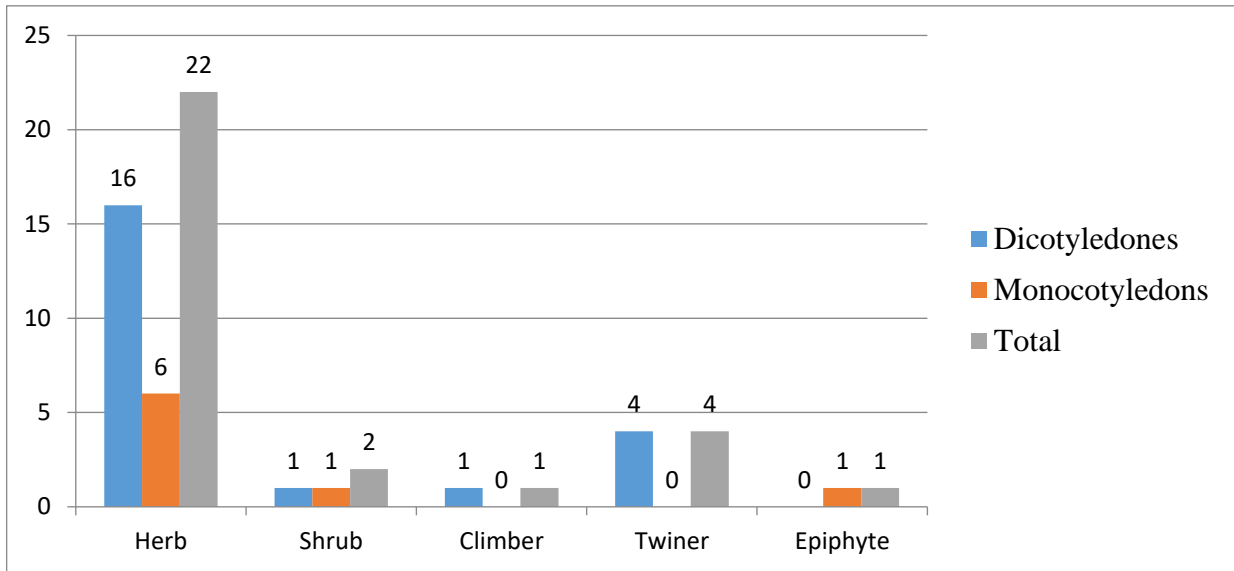
9.	<i>Asparagus racemosus</i> Willd.	Liliaceae	Shatavari	Shrub
10.	<i>Chlorophytum borivilianum</i> Sant. & Fernand.		Kolu	Herb
11.	<i>Chlorophytum bharuchii</i> Ansari		Musali	Herb
12.	<i>Chlorophytum tuberosum</i> (Roxb.) Baker		Safed musali	Herb
13.	<i>Dipcadi concanensis</i> (Dalz.) Baker		Konkan dipkadi	Herb
14.	<i>Gloriosa superba</i> L.		Kal-lavi	Herb
15.	<i>Dendrobium barbatulum</i> Lindl	Orchidaceae	Vasant abri	Epiphyte
16.	<i>Eulophia ochreatea</i> Lindl		Amarkand	Herb
17.	<i>Habenaria suaveolens</i> Dalz.		Habe abri	Herb
18.	<i>Habenaria panchganiensis</i> Sant. & Kap.		Panchgani habeabri	Herb
19.	<i>Begonia phrixophylla</i> Blatt. & McC.	Begoniaceae	Shimpli	Herb
20.	<i>Begonia trichocarpa</i> Dalz		Pandari shompali	Herb
21.	<i>Thalictrum dalzellii</i> Hook.	Ranunculaceae	Swetamber	Herb
22.	<i>Maytenus rothiana</i> (Lawson) Lobreau	Celastraceae	Lokhandi	Shrub
23.	<i>Cayratia trifolia</i> (L.) Domin	Vitaceae	Ambatvel	Climber

24.	<i>Vigna khandalensis</i> (Sant.) Raghavan	Fabaceae	Budmug	Herb
25.	<i>Sonerila scapigera</i> Dalzell	Melastomataceae	Sonerila	Herb
26.	<i>Neanotis sahyadrica</i> Billore & Mudaliar	Rubiaceae	Kapar chandani	Herb
27.	<i>Canscora diffusa</i> (Vahl) var. <i>tetraptera</i> R. Br	Gentianaceae	Kilwar	Herb
28.	<i>Leucas deodikarii</i> Billore & Hemadri	Lamiaceae		Herb
29.	<i>Zingiber diwakarianum</i> R. Kr. Singh.	Zingibearaceae	Shindvan	Herb
30.	<i>Arisaema sahyadricum</i> Yadav et al.	Araceae	Saapkand	Herb



**Fig. 2 - A** Familywise distribution of plant species

**Fig.2 B.** Habit wise distribution of plant species



**Fig.2-C** Habit wise distribution among Dicot and Monocot plant species





A- *Thalictrum dalzellii*, B- *Dendrobium barbatulum*, C- *Zingiber devakarianum* , D- *Arisaema sahyadricum* E- *Gloriosa superba*, F- *Ceropegia anjanerica*, G- *Ceropegia sahyadrica*, H- *Ceropegia lawii* , I- *Ceropegia hirsuta*, J- *Ceropegia mahabalei*, K- *Ceropegia media*, L- *Ceropegia bulbosa* var. *balboas* M- *Ceropegia bulbosa* var. *lush,i* N- *Vigna khandalensis*, O- *Sonerila scapigera*, P- *Canscora diffusa*, Q- *Habenaria panchganiensis*

**Fig. 3.** Photo plate showing floral diversity of recorded endangered plant species.

# A Review : On Phytochemical Analysis and Antioxidant activities with Medicinal uses of Combretaceae Family

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## ABSTRACT

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The Combretaceae family consists of 600 species of trees, shrubs and lianas in about 18-20 genera. Plants belonging to this family are found in tropical and subtropical regions, mostly in Africa and India. Combretum and Terminalia are the largest and most widespread genus of Combretaceae. Species of Combretaceae family are reported for treating many diseases and have important secondary metabolites with antioxidant activities. This review focuses on 11 medicinal plants, 9 phytochemical containing plants and 33 plants having antioxidant activity.

**Keywords :** Phytochemical Analysis, Antioxidant Activity, Medicinal Uses and Combretaceae Family.

## I. INTRODUCTION

In recent years, plants have received attentions as its derived products have pharmacological properties which includes antioxidant, antimicrobial and antitumour activities (Karthikumar *et al.*, 2007). Plant produces rang of bioactive molecules which have probably evolved as chemical defence against predation or infection (Mangoyi R *et al.*, 2012). Bioactive chemical substance that are produced by plants have definite biochemical and physiological actions on human body which are alkaloids, flavonoids, tannins, phenolic compounds etc (Hills, 1952; Cho *et al.*, 2004; Edeoga *et al.*, 2005). Plant parts

like root, stem, leaf, fruit, seed, flowers, tuber, buds, rhizomes, etc which are having many medicinal uses which are helpful for treating many diseases. M.A. Aderogba and others in 2012 stated that many species of family Combretaceae have extensively used in traditional medicines against infections and inflammation, and although its antibacterial, antifungal, antitumor and antioxidant activities have been reported. It is also used by many cultures in folk medicines for the treatment of microbial infections and several inflammatory diseases such as abdominal pains, toothache and headache (Eloff *et al.*, 2001; Hutchings *et al.*, 1996).



## II. MEDICINAL USES

Medicinal plants have tremendous alternative remedies which are used worldwide to prevent and treat infectious diseases (Bokhad M. N *et al.*, 2012; Soulsby EJ., 2005). It is very important source for the development of novel chemotherapeutic agents (G.Shivapriya *et al.*, 2019). Umar *et al.*, 2007 reported that 50% of natural products represents all drugs in clinical uses, with 25% of the total representing higher plant derived natural products. Many different cultures in folklore record lead to useful medicinal properties in plants (G.Shivapriya *et al.*, 2019).

Several compounds have been isolated from species of Combretaceae family including flavonoids, phenanthrenes, stilbenes, cyclobutanes and triterpenoids which are widely spread in the tropical climes of Africa, South America and Asia. Its species are important in traditional medicinal practice and some of them are used for treating syphilis, abdomen pains, toothache, diarrhoea, conjunctivitis and other alimentary problems Masoko P *et al.*, 2006; Martini ND *et al.*, 2004.

Kerharo *et al.*, 1950 reported that *Combretum zenkeri* is used for treating dysentery which contains appreciable level of alkaloid and flavonoid (C. O. Ujowundu *et al.*, 2010) which have been used to treat diuretic, anti-inflammatory, antispasmodic and analgesic effects, (Owoyele *et al.*, 2002) and it is used externally and internally for the treatment of certain disorders like diarrhoea, Oedemas, fungal infection, dropsy, gout and swellings (Bouquet *et al.*, 1974).

Thomas (1974) reported that leaves of this plant is used by Igbos in worm-treatment.

Eloff, 1999b; Eloff *et al.*, 2006; Martini *et al.*, 1998; McGaw *et al.*, 2001 have confirmed many species of *Combretum* having antimicrobial activity. In *Combretum apiculatum*, Serage in 2003 reported that

it includes pinocembrin, alpinetine and flavokawain which acts as antimicrobial compounds. *Combretum zeyheri* Sond, *Combretum apiculatum* Sond, *Combretum molle* Engl. and Diels, *Combretum kraussii* Hochst, *Combretum elaeagnoides* Klotzsch and *Combretum imberbe* Wawra were studied by Mangoyi R and others in 2011 for their antifungal properties and used as Zimbabwe traditional medicine. *Combretum mole* is used to treat fever and stomach complaints by Engl. And Diels (Mangoyi R *et al.*, 2012). *Combretum imberbe* Wawra is used to cure cough, cold, diarrhoea and *Combretum apiculatum* Sond can treat bites of scorpion and snake, leprosy, bloody diarrhoea, conjunctivities, abdominal disorder and weak body (Rogers *et al.*, 1996). *Combretum zeyheri* Sond can cure the bites of snake and can cure coughs, diarrhoea, stomachache and rectal prolapse (Ruffo *et al.*, 1991). Mangoyi R *et al.*, 2012 reported *Combretum kraussii* Hochst is used as antidiuretics, lotions for eye infections as well as antiseptics. *Terminalia ivorensis*, of Combretaceae family plant, is widely used traditional medicinal to treat dermal diseases and also having antibacterial substances contained in the trunk barks of *Terminalia ivorensis* (Coulibaly k *et al.*, 2014). *Buchenavia tetraphylla* have antimicrobial activity, as described in the section on quinones, may be related to their ability to inactivate microbial adhesins, enzymes, cell envelope transport proteins, and so forth by M.M. Cowan in 1999. A. Mann *et al.*, 2008 obtained in his study that showed the ethanolic extracts of stem bark, root bark and leaves of *Terminalia avicennioides* has antimicrobial activities on test organisms used in this study and also concluded that it acts against the clinical isolates of complicated respiratory tract infectious diseases in Niger state, Nigeria. The leaves of the *Combretum glutinosum* plant are used to treat diseases like malaria, anorexia, anemia, cough, bronchitis, fever, diarrhea, liver disease and liver failure and to combat microbial agents (Kerharo *et al.*, 1974; Nacoulma *et al.*, 1996). The leaves or stem bark are crushed and used for dressing wounds (Bukill,

2000; PROTA 3, 2005). *Anogeissus leiocarpus* is a tree that is considered to be sacred and used for treating diseases. The decoction and maceration of the stem bark are used against constipation, malaria, jaundice, eczema, itching, anorexia, wounds, carbuncles, psoriasis, boils and various forms of ulcers and the decoction of the leaves is used in amoebic dysentery, various forms of hepatitis and treatment of jaundice (Kerharo *et al.*, 1974, Nacoulma *et al.*, 1996).

### III. PHYTOCHEMICAL ANALYSIS

Bokhad M. N *et al.*, 2012 studied about *Combretum albidum*. He carried out preliminary phytochemical analysis using six solvents according to the polarity that are Benzene, chloroform, acetone, ethanol, petroleum ether and water respectively by Soxhlet method for 18 hours. He used standard procedure for identification of its constituents, as describe by Harborne *et al.*, 1984, Trease *et al.*, 1979. The preliminary Phytochemical screening of leaf, stem, flower and fruit shows that there is presence of alkaloid, carbohydrate, proteins, cardiacglycoside, coumarin, tannin, flavonoid and phenolics compound and from these coumarin was present in all parts of plant which is very important to treat several anticoagulants. Bokhad M. N *et al.*, 2012 had concluded that presence of this compounds in *Combretum albidum* G.Don would use to treat diseases which are associated with the heart, anticoagulant, anti-inflammatory action, dysentery and diarrhea. G. Shivapriya in 2019 studied about in vitro cytotoxic activity of methanolic extract of *Combretum ovalifolium* against MCF7 Cancer cell lines and in that study, he had done phytochemical analysis of *Combretum ovalifolium*. Qualitative chemical test was performed to detect glycosides, alkaloids, glycosides, saponins, phenolics, terpenoids and flavonoids (Horbone *et al.*, 1973). It showed absence of saponins in leaf extract of methanol. Further Quantitative phytochemical analysis of phenolic content of methanol extract shows

0.308mg/g and flavonoid content of methanol extract shows 0.08mg/g in leaves of *Combretum ovalifolium*. Result of this study showed that it had significant radical scavenging activity which is co related to their scavenging effect.

Rumbidzai Mangoyi *et al.*, 2012 studied about Antifungal Activities and Preliminary Phytochemical Investigation of Combretum Species from Zimbabwe which is *Combretum zeyheri* extract was subjected to various phytochemical test as described by Kaur *et al.*, 2009. The result showed the presence of Saponins, flavonoids, alkaloids, tannins and cardiac glycosides from which flavonoid was found to have antifungal and antimicrobial activity Aliyu AB *et al.*, 2008.

Quantitatively determined of alkaloid was done according to the method of Harborne (2005), saponins was done according to Obadoni BO *et al.*, 2001 and determination of tannin content was performed according to the method of Burden JPV *et al.*, 1969. Percentage yield extract of alkaloid is 1.08, saponin is 0.8 and tannin is 21.5 respectively.

C. O. Ujowundu in 2010 studied about Phytochemical and chemical composition of *Combretum zenkeri* leaves. Studies on the phytochemical, mineral, proximate and vitamin content of the leaves of *Combretum zenkeri* were carried out. The quantitative phytochemical composition shows that it contains  $7.90 \pm 0.10$  mg/100 g alkaloid,  $10.5 \pm 1.31$  mg/100 g saponin,  $4.2 \pm 0.10$  mg/100 g flavonoid,  $20.088 \pm 0.91$  mg/100 g cyanogenic glycosides and  $31.86 \pm 2.10$  mg/100 g tannin. The macro and micro-minerals obtained includes;  $11.477 \pm 3.129$  mg/100 g calcium,  $0.0388 \pm 0.953$  mg/100 g magnesium,  $0.621 \pm 0.274$  mg/100 g phosphorous,  $17.500 \pm 1.44$  mg/100 g potassium,  $0.0083 \pm 0.06$  mg/100 g iron,  $0.008 \pm 0.007$  mg/100 g zinc,  $0.275 \pm 0.086$  mg/100 g selenium,  $0.047 \pm 0.016$  mg/100 g manganese and  $2.000 \pm 1.414$  mg/100 g sodium. Vitamin A,  $9.51 \pm 0.11$  mg/100 g and ascorbic acid was  $28.48 \pm 0.85$  mg/100 g. This

study revealed that *Combretum zenkeri* is a very good source of phytochemical, minerals, vitamins and macronutrients which is used in medicinal and chemoprotective benefits and serve as a good source of nutrients.

Coulibaly k *et al.*, 2014 studied Antibacterial properties studies of trunk barks of *Terminalia ivorensis* (Combretaceae), a commercial and medicinal specie, on some methicillin-resistant Staphylococci spp strains. It is woody species and phytochemical analysis was carried on bark which indicates traces of alkaloid, presence of saponins, tannins, flavonoids, sterols or terpens, polyphenols and coumarins. Results are found good in 70% ethanol as compared to the 70% of water. These classes of secondary metabolites are known to possess antibacterial activities by Cowan in 1999. Ygor Lucena Cabral de Oliveira *et al.*, 2012 reported in Antimicrobial Activity and Phytochemical Screening of *Buchenavia tetraphylla* (Aubl.) R. A. Howard (Combretaceae: Combretoideae) about phytochemical analysis that shows presence of flavonoids, saponins, saponins, anthocyanins, quinones, anthraquinones, coumarins, alkaloids and reducers compounds which was done according to the method of Kokate (1994) and Harborne (1998). A. Mann *et al.*, 2008 studied phytochemical analysis of *Terminalia avicenni* and had followed method describe by Harborne (1998); Evans (1989) and Sofowora (1993).

Bioactive ingredients such as alkaloids, saponins, tannins, phenols, steroids and glycosides were detected in most of the plant parts tested but anthraquinone was not detected in any of the plant extracts. SORE Harouna *et al.*, 2012 studied about two species of family Combretaceae found in Burkina Faso they are *Anogeissus Leiocarpus* (DC) Guill. and Perr. and *Combretum Glutinsum* Perr. Ex DC. According to the method of Ciulei (1982) phytochemicals which are tannins, flavonoids, alkaloids, coumarins, saponins, sterols and triterpenes were screened. In the

methanol extracts the presence of gallic and ellagic tannins, coumarins and saponins was observed from both plants and the presence of flavonoids, aglycones, sterols and triterpenes were only found in *Combretum glutinosum*. Maryam Bashir *et al.*, 2015 studied about *Conocarpus erectus* which contains phenols such as flavonoids and tannins as major constituents. The extract from different parts (leaves, stems, fruits, and flowers) showed high antioxidant, anticancer and hepatoprotective activity due to the presence of phenolic compounds. Tannins have high antimicrobial activity than other phenolic compounds.

#### IV. ANTIOXIDATIVE ACTIVITY

Antioxidation means opposite of oxidation. Oxidation is a word which is very essential in living organism for the acquirement of energy in catabolism. Oxidative damage is done by the free radical which may relate to aging and diseases such as atherosclerosis, cancer, diabetes and cirrhosis (Halliwell *et al.*, 1999). Free radical is natural by products of human metabolism which can harm our body by attacking our cells and breaking our cellular membrane, reacting with the proteins, nucleic acids and enzymes present in the cells. These attacks by free radical are known as oxidative stress, which is capable for cell malfunctioning. They are produced by our body while using oxygen during respiration process and they are also generated by the environmental pollutants (Li *et al.*, 1994). Nose *et al.*, 2000 stated that there is a balance between quantity of free radicals generated in the body and the antioxidants defence system which scavenge these free radicals preventing them from deleterious effects in the body. But when there is increase in free radical due to environmental factors or by infection in our body it leads to oxidative stress (Finkel *et al.*, 2000). So many plants have antioxidation properties which can be helpful for curing diseases. Zheng *et al.*, 2001 and Cai *et al.*, 2003 stated that fruits, medicinal herbs, vegetables, etc in plants may contain a wide variety of

free radical having scavenging molecules such as phenolic acids, flavonoids, quinones, coumarins, lignans, stilbenes, tannins which are phenolic compounds; alkaloids, amines, betalains which are nitrogenous compounds; vitamins; terpenoids including carotenoids and some other endogenous metabolites which are rich in antioxidant activity. Owen *et al.*, 2000; Sala *et al.*, 2002 had studied about epidemiological studies which shows antioxidant compounds possess antitumor, antibacterial, antimutagenic, anti-inflammatory, anticarcinogenic, anti-atherosclerotic and antiviral activities to a greater or lesser extent. M.A. Aderogba *et al.*, 2012 he studied that some species of Combretaceae family have antioxidant activities. Cheng *et al.*, 2003 studied about species of Combretaceae family in which *Terminalia chebula* extract have different level of antioxidant activity for anti-superoxide radical formation, free radical scavenger activity and anti-LPO. It is also used in the treatment of piles, fever, cough, vomiting, etc. *Terminalia arjuna* bark is used as a cardioprotective agent. The bark powder is used as antioxidant effect in humans by Gupta *et al.*, 2001. Mabogo *et al.*, 1990 concluded that in water extract of *Terminalia sericea* and *Gunnera perpensa* higher scavenging activity as compared to methanol extract. Bouchet *et al.*, 1996 and in 1998 studied about *Guiera senegalensis* in which he showed that galloyl quinic acid is derived from the galls and have shown antioxidant activities. Martini *et al.*, 2004 showed that *Combretum erythrophyllum* possess antioxidant compound named 5-hydroxy-7,4'-dimethoxyflavone and synthetic chemicals such as phenolic compounds have strong radical scavenger effect (Imaida *et al.*, 1983). Blois *et al.*, 1958 also reported antioxidant activity of methanol extract of aerial parts of *Combretum ovalifolium*. M.A. Aderogba *et al.*, 2012 studied about Isolation of antioxidant constituents from *Combretum apiculatum* subsp. *apiculatum* in that he had isolated four antioxidant compounds from the leaves and structures of this compounds were determined by spectral analysis.

P. Masoko *et al.*, 2007 had studied screening of twenty-four south african Combretum and six *terminalia* species (Combretaceae) for antioxidant activities. In that he concluded that in TLC-DPPH screening method *Combretum hereroense* having 16 and *Combretum collinum* ssp. *Taborense* having 10 prominent antioxidant compound followed by 22 other combretum they are *Combretum celastroides* ssp. *celastroides* , *Combretum celastroides* ssp. *orientale* , *Combretum imberbe*, *Combretum padoides*, *Combretum caffrum*, *Combretum erythrophyllum*, *Combretum kraussii*, *Combretum woodii*, *Combretum collinum* ssp. *Suluense*, *Combretum zeyheri* , *Combretum albopunctatum*, *Combretum apiculatum* ssp. *Apiculatum*, *Combretum edwardsii*, *Combretum moggi*, *Combretum mole*, *Combretum petrophilum*, *Combretum microphyllum*, *Combretum paniculatum*, *Combretum bracteosum*, *Combretum mossambicense*, *Combretum acutifolium* and *Combretum nelsonii*. Acetone extracts of all tested *Combretum* species had 53 active bands and methanol had 55. All *Terminalia* species extracted with acetone and methanol had antioxidant activity. *Terminalia gazensis* and *Terminalia mollis* methanol extracts had 11 and 14 active compounds respectively in one of the solvent systems used. The qualitative DPPH assay on TLC was successfully used in this study to systematically assess the total antioxidant activity of the *Combretum* and *Terminalia* species extracts. *Terminalia prunioides* M.A.Lawson , *Terminalia brachystemma* Welw. ex Hiern , *Terminalia sericea* Burch ex DC , *Terminalia gazensis* Bak.f. , *Terminalia mollis* Laws and *Terminalia sambesiaca* Engl.&Diels are 6 terminalia species from which *Terminalia gazensis* and *Terminalia mollis* have most prominent antioxidant compounds in methanol extracts having 11 and 14 active compounds in them and they concluded that to study antioxidant activity qualitative DPPH assay on TLC was successfully used in *Combretum* and *Terminalia* species. Sunita Bhatnagar *et al.*, 2012 studied that *Combretum roxburghii* is positive for antioxidant

activity and in all the three solvent (hexane, DCM and chloroform) 27 bands of antioxidant are found.

## V. CONCLUSION

This study revealed that species of Combretaceae family are widely used traditionally for treating hepatitis, malaria, respiratory infections, and cancer. They also have anti scavenger activity, antimicrobial and anti-cancerous activity and main objective was to review species of Combretaceae family having important secondary metabolite, having antioxidant activity with medicinal uses which can be help in future for further analysis. This study provides information of 11 medicinal plants, 9 phytochemical containing plants and 33 plants having antioxidant activity. To be quite optimistic that this review article will surely stimulate present day researcher to undertake more systematic research work on this important species of Combretaceae family so as to isolate more phytochemicals showing antioxidant activities having medicinal uses and to discover other significant biological activities of the plants.

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# Effect of Different Solutions on Seed Germination and Physiological Changes in *Cicer arietinum*

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## ABSTRACT

The chickpea is rich source of vitamins, fibers and minerals; it provides variety of health benefits like aiding weight management, improving digestion and lessens the risk of several diseases. The chickpea is high in protein and it is the best way to replace meat in vegetarian and vegan diets. For seed germination of chick pea generally used growth hormones like gibberellic acid (GA), IAA, IBA, salicylic acid and etc, PEG (polyethylene glycol) and control is used for comparison. In present work, the seeds of chickpea (*Cicer arietinum*) are treated with hormones like gibberellic acid salicylic acid solutions, PEG solution and as stress there is salt stress (NaCl) and citric acid (CA) solutions to see the seeds germination under this circumstances, and seeds also germinated in control (distilled water) condition for comparison in petridish on whatman paper for 10 days after that the germinated seeds (PEG, gibberellic acid and distilled water) transferred to the mud pot with the soil and irrigate with their respective solutions for 20 days and take measurement and weight of plants after every 5 days interval.

**Keywords** : Vitamins, Fibers, Minerals, Hormones, *Cicer Arietinum*, PEG, Gibberellic Acid, Salicylic Acid, Salt Stress and Citric Acid.

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## I. INTRODUCTION

Seeds plays important role in world's diet, as it takes half of per capita energy intake all over the globe; it comprises about 90% of all cultivar, in plant physiology, seed biology is one of the most researched area [1]. The genetics and physiology research manifest the importance of hormones (abscisic acid and gibberellic acid) in regulation of dormancy and seed germination [2]. In plant growth hormones plays

important role in seed germination, hormones like ABA, gibberellic acid, ethylene, IAA, cytokines and etc [3]. The radical initiation, elongation and development can be regulated by growth hormones, it is mainly affected by sun light and its intensity, water availability, aeration of soil, amount of carbohydrate efficiency and nutrients (macronutrients and micronutrients); the soil consist micro-organisms, mesofauna and macrofauna which can increase or decrease the rate of root growth as the *sarietinum* is



important pulse crop grown and consumed as diet all over the world, it contains carbohydrate and protein; other than sulphur containing amino acid it has significant amount which can be complemented by adding cereals to the daily diet; it has good influence on some of the human disease like diabetes type 2, some cancer, digestive disease and CVD; it is an important pulse crop with diverse array of potential nutrition and health benefits [5]. The utmost aim of *Cicer arietinum* propagation is to increase the production the genetic potential of cultivars or by removing the effect of drought, cold, disease and insect [6].

## II. MATERIALS AND METHODOLOGY

### A. Chemicals/solutions

1. NaCl –The legume crop like chickpea is an important food in Turkey and it is vastly grown on low moisture or saline for human consumption. To see the effect in effect in electric conductivities (4.5, 8.6, 12.7 and 16.3 dS/m) and in seed sizes (7, 8 and 9) on germination and in beginning seedling growth of 3 popular chickpea cultivars (AKN-97, Gokce and Uzunlu-99), the use of small seeds of chickpea was seems to reduce the production costs in saline soils [7]. In chickpea plant, NaCl induced reactive oxygen species generation and antioxidative reactions in the leaves investigated in concentration-dependent manners, the concentration of NaCl was assisted by a step rise in the H<sub>2</sub>O<sub>2</sub> and O<sub>2</sub><sup>-</sup>. In chickpea, NaCl does trigger the antioxidative response and concluded that the plant is a good source of natural antioxidants [8]. In my experiment NaCl solution is used to see if the chickpea can survive the stress.

2. Salicylic acid – The foliar application of salicylic acid concentration 10<sup>-4</sup>mol/L, 10<sup>-5</sup>mol/L and 10<sup>-6</sup>mol/L was used to increase the dry mass per plant, nodule dry mass and leghemoglobin content, the effective concentration was 10<sup>-5</sup>mol/L >10<sup>-6</sup>mol/L >10<sup>-4</sup>mol/L > control in chick pea seeds [9]. The hormone plays a

vital role in induction of plant protection against a variety biotic and abiotic stress through physiological, morphological and biochemical mechanism, from the concentration of salicylic acid 1, 1.5 and 2mM, the 1.5mM seems favorable to plant and protect against biotic and abiotic stress in chick pea plant [10]. The salicylic acid solution in my work is used to see the chickpea germination and growth.

3. Gibberellic acid – The seeds of *Cicer arietinum* soaked in four concentrated GA solutions 0, 10<sup>-7</sup>, 10<sup>-6</sup> and 10<sup>-5</sup> for 4, 8 and 12 hours and then sown in pots; the number of pods per plant, yielding of seed and protein content stimulated by 82.69%, 5.44% and 54.32% respectively [11]. In low temperature stress chickpea is sensitive, mainly during germination and stand formation, to rescue chickpea seed from chilling stress by priming them with GA in combination with GA in combination with hydropriming in different concentrations, GAs can be used for crop growth, maintaining high relative water content, good stand establishment and reducing electrolyte leakage [12]. the GA solution in my experiment is used to see the chickpea seed germination and physiological growth.

4. Citric acid – Ameliorate the phytoextraction of Cd (cadmium) by the application of citric acid on hydroponic plants under controlled condition, the citric acid increases the Cd absorption and decreases the Cd stress it is beneficial for phytoextraction of Cd through hyper accumulation of *Brassica napus* [13]. In both chickpea and *Lens culinaris* (Lentils) has changed in saponin and composition as they were investigated after soaked in distilled water, sodium bicarbonate and citric acid solutions. Soaking does not modify the content of saponin or composition of chickpeas and lentils even so the pH of the soaking solution, overall decreasing of saponin content was found in lentils but not for chickpea [14]. The citric acid stress is given to the chick pea in my experiment to see if it's going to survive or not.

5. PEG (polyethylene glycol) – The effect water shortage induced by different potential level (0, -0.4, -0.6 and -0.8) of PEG 6000 and NaCl treatment on chick pea cultivars, lines at germination and early growth stages by sampling them after 4<sup>th</sup> and 8<sup>th</sup> day of incubation, PEG is showing more successful in inhibition than NaCl at the MPa level tested, all the genotypes tested could be classified as tolerant, moderately tolerant and sensitive one. Some species like Canitez and ILC-3279 are tolerant to PEG but ILC-3279 was sensitive to NaCl treatment [15]. The seeds of chick pea (GG-1 and GJG-3) with seed coat, for seed priming with 6 treatments including KNO<sub>3</sub> 200pm, PEG 6000 (-1.2MPa), Bavistin (2g/kg), neem oil (3%), control in complete randomized design (CRD) with three replications, seeds will be soaked for 8 hrs for priming respectively air dried and put it on germination test by keeping them in between paper at 25°C, at the end seeds with radical are counted as germinated [16]. In my work, chick pea seeds are treated with PEG solution to see the germination and seedling growth.

#### B. Source of seeds and solutions:

The seeds of *Cicer arietinum* are purchased from supermarket in Ahmedabad, Gujarat, India. The experiment is done at home and solutions (PEG, Salicylic acid, Citric acid, gibberellic acid NaCl and Mercuric chloride) are made in laboratory with the help of lemon, gibberellic acid, salicylic acid, NaCl, PEG, glass ware (flask, beaker, pipette and measuring cylinder) and machines (water bath and weighing machine). Glass ware like petridish, glass container to put the solution in it and whatman paper are provided from laboratory of Department of Botany, Bioinformatics and climate change impact management of Gujarat University, Ahmedabad, India 380009; during February and March 2021.

#### C. Making of solutions and pH

The solutions made in lab for citric solution 30ml of citric juice with 220ml of distilled water, for NaCl solution 5.845gm of NaCl powder with 1 liter of distilled water, for PEG solution first to warm 500ml of distilled water with 2.5ml of PEG, for salicylic acid solution 500ml distilled water with 0.006gm of salicylic acid powder and for gibberellic acid solution 248ml of distilled water with 2.5ml of GA from stock solution. For sterilization of seeds HgCl<sub>2</sub> is used and its solution is made with 100ml of distilled water with 0.052gm of mercuric chloride.

TABLE NO.1- PH OF SOLUTIONS

Solutions	pH
Citric acid	3.96
NaCl	7.44
Salicylic acid	7.85
Gibberellic acid	6.86
PEG	7.84
Distilled water	7.20

The table no.1 shows that citric acid solution is more acidic compare to other solution.

#### D. Seed germination and seedling growth

The seeds of chick pea were sterilized with mercuric chloride for 3 minutes and washed with distilled water thoroughly to remove the traces of mercuric chloride, and then seeds air dried after that the seeds put in petridish which are 10cm in diameter with whatman paper, they are 12.5cm in diameter and with their respective solution. There are 6 petridishes one for each 5 solutions and distilled water and each petridish had 20 to 30 seeds of chickpea for 10 days. Next step for seedling growth is to transfer the germinated seeds in mud pot with soil and irrigate them with their respective solution and distilled water.

### III. RESULT AND DISCUSSION

#### A. Total number of seeds and number of germinated seeds

The total number of seeds *Cicer arietinum* are 105 and number of germinated seeds are 85, in which 28 germinated seeds of gibberellic acid solution, 26 germinated seeds of PEG solution and 30 germinated seeds of distilled water.

#### B. Effect of solutions on the seeds

The germination is seen only in PEG solution, gibberellic acid solution and distilled water but did not give result in NaCl solution, citric acid solution and salicylic acid solution.

#### Result tables:

TABLE NO.2: WEIGHT OF *CICER ARIETINUM* PLANT

Days	Solutions	Leaves (gm)	Roots (gm)	Shoots (gm)
After 5 days	PEG	0.087	0.078	0.153
	GA	0.069	0.081	0.209
	TW	0.142	0.069	0.281
After 10 days	PEG	0.123	0.080	0.442
	GA	0.159	0.094	0.350
	TW	0.333	0.095	0.557
After 15 days	PEG	0.295	0.084	0.524
	GA	0.244	0.130	0.513
	TW	0.364	0.096	0.649
After 20 days	PEG	0.274	0.048	0.514
	GA	0.172	0.030	0.475
	TW	0.202	0.047	0.417

The table no.2 shows the highest result in after 15 days of plant's weight than after 20 days and in after 15 days, GA shows good result in root and tap water gives good result in leaves and shoots. (**Abbreviatio:** PEG- Polyethylene glycol, GA- gibberellic acid and TW- tap water)

TABLE NO.3: LENGTH OF ROOTS AND SHOOTS (*CICER ARIETINUM* PLANTS)

Days	Solutions	Roots (cm)	Shoots (cm)
After 5 days	PEG	0.8	9.2
	GA	1.8	10.2
	TW	2.0	12.6
After 10 days	PEG	3.3	10.2
	GA	4.3	23.7
	TW	5.5	28.4
After 15 days	PEG	6.7	32.3
	GA	4.5	29.0
	TW	3.7	32.5
After 20 days	PEG	3.7	35.2
	GA	4.5	36.5
	TW	2.5	30.5

Table no.2 shows the after 15 days plant shows good height than after 20 days; in after 15 days the root of PEG is the highest and shoot of tap water is the highest compare to other.

TABLE NO.3: LENGTH AND WIDTH OF PLANT'S LEAF AND ITS LEAFLET (*CICER ARIETINUM*)

Days	Solutions	Length (cm)		Width (cm)	
		Leaf	Leaflet	Leaf	Leaflet
After 5 days	PEG	1.5	0.4	0.8	0.3
	GA	1.0	0.4	0.8	0.4
	TW	0.6	0.6	1.1	0.4
After 10 days	PEG	3.8	0.8	1.5	0.5
	GA	4.4	0.8	1.5	0.7
	TW	5.3	1.0	2.0	0.8
After 15 days	PEG	4.6	0.8	1.6	0.6
	GA	4.5	0.8	1.6	0.7
	TW	5.4	1.0	2.0	0.8
After 20 days	PEG	4.3	0.9	1.5	0.7
	GA	4.0	0.5	1.1	0.5
	TW	4.5	0.9	1.6	0.7

The table no.3 shows the after 15 days leaf and leaflet is wider than after 20 days; in after 15 days tap water leaf and leaflet is giving the good growth than other.

**Graph of the result tables (table no. 2, 3 and 4):**

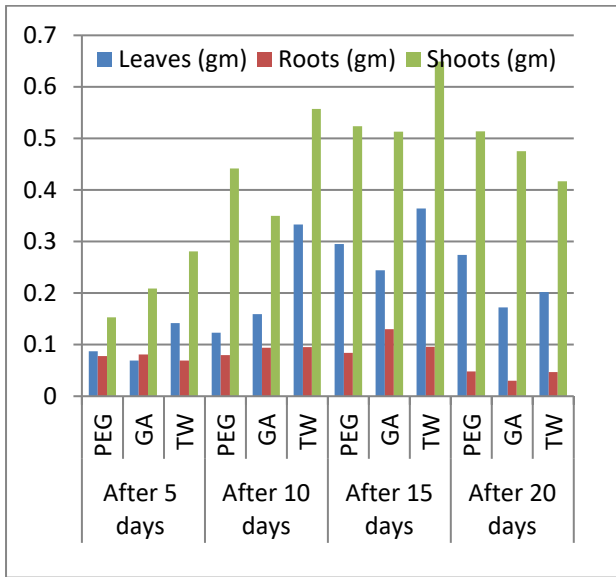


Figure 1 : weight of *Cicer arietinum* plants (leaves, roots and shoots)

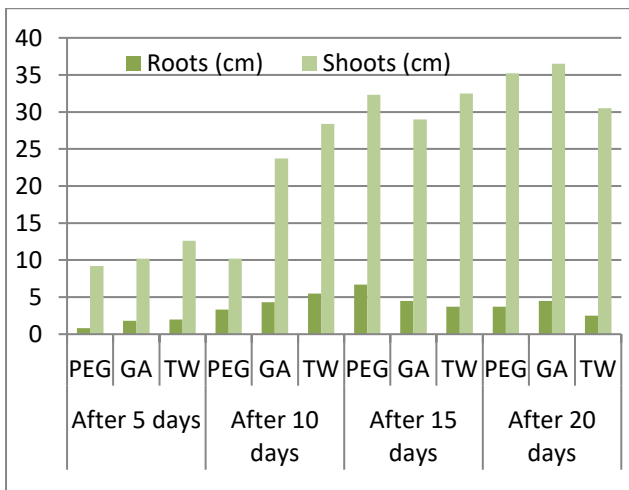


Figure 2 : length of *Cicer arietinum* plant (roots and shoots).

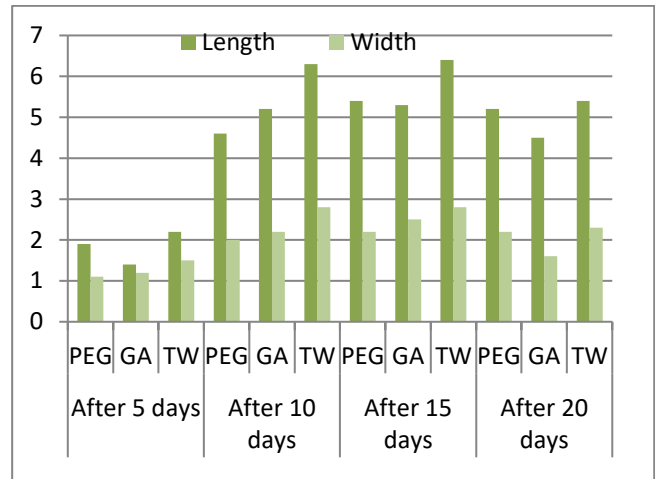


Figure 3 : length and width of *Cicer arietinum* leaves.

**IV. CONCLUSION**

It turns out that the most of *Cicer arietinum* seeds germinated in PEG solution, gibberellic acid solution and control (distilled water). In salicylic solution, NaCl solution and citric solution doesn't germinate and get blackish in colour, busted and contaminated. In pot PEG and tap water gives more result than gibberellic acid solution.

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# Study of Traffic Management on Congested Intersections, By Redesign of Signal

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## ABSTRACT

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The use of traffic signals is the common practice in every cities having heavy traffic volume that is on clogged intersection. The signal phases are different at various intersections. The cycle time also differs as per traffic density at each intersection. Out somewhere it happens that there is green signal & no vehicle on the route and despite that somewhere there is long queue although there is red signal. The proposed system first targets scattering any queue that was developed during red span and reduction in travel time. This study leads to the change in phases and redesign of present signal system, which not only gives a reduction in the queue length but also reduces travel time and decrease in fuel consumption. This change will positively results in improving traffic efficiency.

**Keywords :** Traffic, Intersection, Congestion, Queue, Signal

## I. INTRODUCTION

In India traffic is a troublesome issue in such urban zones. Road traffic is one of the major concerns in transportation. It has been seen that introducing impelled control methods from framework speculation into metropolitan activity, which is worthy over the development of the establishment in the city, is the valuable and gainful way to deal with improve the viability of metropolitan traffic running. Without a doubt, traffic blockages can have genuine unfavourable effects on people prosperity, step by step activities and individual fulfilment, coming to fruition into productive, regular and prosperity

inconvenience for the Governments and affiliations. Intersection focuses are convergences of in any event two movement streams. They have a high centrality on account of the speed of incident event. Accordingly, the streaming representation of activity through them ought to be fittingly sorted out to guarantee a made sure about drive for street clients. Control over traffic on congested intersection has been huge issue in crowded zone. Congestion of traffic is paying extra time for the void roads in lights of red signal. Once in a while it happens that on a couple of roads straight going traffic is more than right turning yet the signal isn't giving honest to goodness value to that traffic, green signal grants both

right and straight going together, in any case it exhausts time for straight going traffic. [1] Mahindra Deshmukh, et al. (2019) studied the passenger car unit (PCU) at different traffic densities ranging from somewhat low to clogged conditions. He found that there is no huge distinction between the field noticed qualities and those acquired from the model. He further states that 'the proposed methodology and simulation model is authentic'. [2] Chandan K, et al. (2017) Authors proposed a unique algorithm for traffic state data estimation from GPS data and using fuzzy switching linear models. The employment of fluffy switches permits the portrayal of halfway traffic states, which provides more precise estimation of activity information contrasted with the traditional hard exchanging models, and so gives the capacity to propose better proactive and in-time choices.

[3] This paper gives the possibility of supplanting existing traffic lights with a framework to screen the traffic stream consequently in traffic lights where sensors are fixed in which the time feed is made dynamic and programmed by handling the live recognitions. [6] The proposed calculation is unsupervised and performs in sensible time, which inspires its convenience in. The calculation has been tried on open activity datasets gathered in England, 2014. The results of the trials are promising, with a most extreme supreme relative mistake of around 9%. Be that because it's going to, more analyses are required to assess the execution of the calculation with versatile tests, either utilizing end-clients' cell phones or GPS-prepared vehicles.

## II. METHODOLOGY

According to goals and objectives, step by step procedure adopted for this research work. The methodology adopted will come closer to the required results. The overall methodology is taken on the basis of literature review.

## 1. Site Description

The study was conducted on the busy intersections of Nagpur- Amravati highway, at Nagpur. Three intersections are taken for the study which is very congested in every peak hours. These intersections use traffic signal located and having fixed cycle time for each. During peak hours there is rush and suffer from traffic jams. The image below shows the study area. This study area is of total 2 km span. The public transports are more on it. As it is highway connected to the city the heavy vehicles are more and personal cars are also the part of the traffic. This highway is made up of flexible pavement and is of 6 lane highway having lane width 3 meters each. The traffic on the highway is heterogeneous like all over the India.

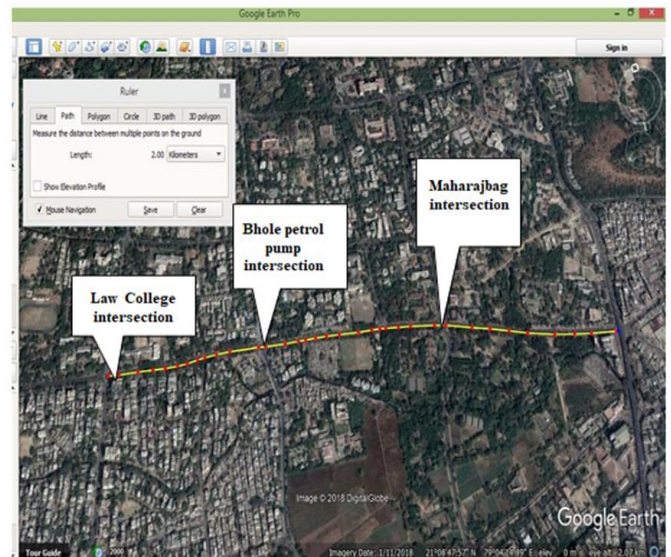


Fig -1: Google Earth Image Shows Study Area

## 2. Work Flow Chart

The following work flow chart is referred for the study of this particular work.

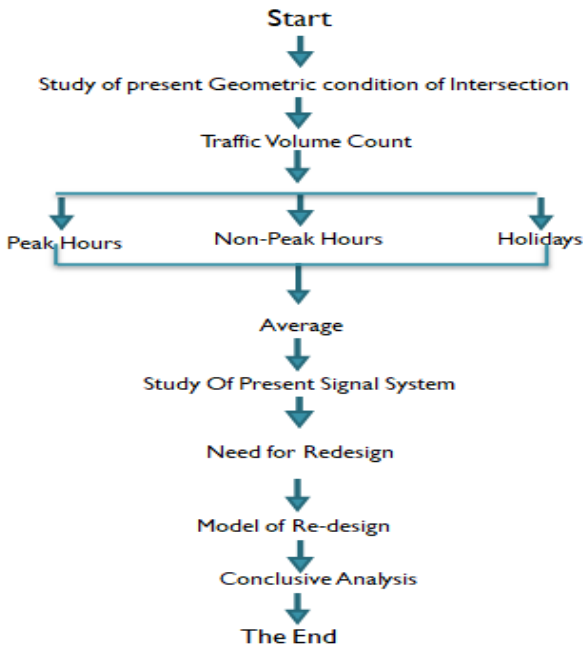


Chart -1: Work Flow Chart

**3. Study of Present Signal System**

The use of traffic signals of incompatible streams of vehicular and pedestrian traffic is vast in most of towns and cities. In Nagpur particularly in this study area the signal is fixed time signal. The Indian method is to have an amber period of 3 seconds as and transition interval between closing of related green movement and display of a red and indication or within termination of a red indication and initiation of related green movement. Here in this study area the green session and hence the cycle lengths are predetermined and of fixed duration. These types of signals are known of fixed time signals. The signal designs of these squares are dependent on the basis of the traffic volume count. The signal is four phase signal and green intervals are designed by considering the traffic volume on that particular intersection.

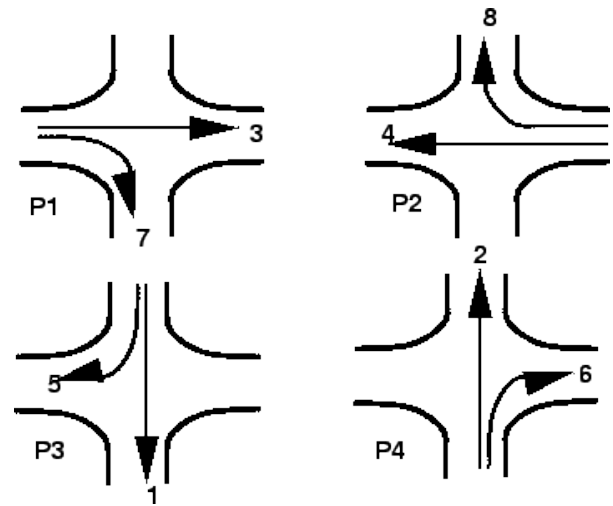


Fig -2: Existing Signal Phases

The phase system is shown in the figure. The left turning in this signal is always green that is allowed. The figure, it shows that the signal when turned into green it allows vehicles to go towards right and straight. The tables below shows the actual signalized system, the present signal system is fixed time signal time, with amber time 3 sec., at various intersections and the phases of those signals are as shown in above figure.

Table -1 : Existing Signal Intervals in Seconds

Maharajbag Intersection				Bhole Pump Intersection				Law College Intersection			
Phases	Green Time	Red Time	Amber Time	Phases	Green Time	Red Time	Amber Time	Phases	Green Time	Red Time	Amber Time
I	19	76	3	I	25	81	3	I	25	95	3
II	18	77	3	II	24	82	3	II	32	88	3
III	25	70	3	III	22	84	3	III	31	89	3
IV	21	74	3	IV	26	80	3	IV	24	96	3
Cycle length=95 sec				Cycle length=109 sec				Cycle length=123 sec			

**4. Data Collection**

The traffic using a road is composed of variety of vehicles ranging from simple peddles cycles to the motorcar and heavy commercial vehicles. Each type having an influence all the performance of the road in its own way, a simple volume count, without classifying the vehicles into distinct types is of limited



use it is therefore the normal practice to classify the vehicles into distinct types when doing the volume counting.

There are various types or methods of volume count such as

- Manual methods
- Combination of Manual and Mechanical methods
- Automatic devices
- Moving Observer method
- Photographic methods

After studying all the types of data collection method the data collected for this work is by manual method, this method is preferred because it gives vehicle classification details with number of occupants; the data can be collected giving the details of traffic movement in each direction; specific vehicular movement such as left turns, right turns, straight ahead at a junction can be noted and recorded. Manual method enables any unusual conditions obtaining at the time of count to be recorded. This will help in understanding and analysing the traffic characteristics. Such unusual conditions can be adverse weather conditions traffic breakdown, temporary closer of any length of the highway for maintenance operations etc. The data collected by considering different parameters such as peak hours, non-peak hours, week days and holidays. The percentage of relative flow and total PCUs of all traffic volume count collected by considering above parameters is in the table below for different intersections.

Table -2(a) : Traffic Volume & Percentage of Relative Flow at Maharajbag Intersection

Parameters	ROAD DETAILS	LEFT GOING	RIGHT TURNING	STRAIGHT GOING
Week Day, Peak Hours, Morning time	West-East	1085	664	4340
	East-West	889	1438	3583
	North-South	1328	1789	2638
	South-North	1252	732	1314
Week Day, Non- Peak Hours, Afternoon time	West-East	469	222	2336
	East-West	361	705	1452
	North-South	662	894	1354
	South-North	554	332	695
Weekend, Holiday	West-East	215	115	1404
	East-West	259	332	821
	North-South	337	443	789
	South-North	281	204	336
Week Day, Peak Hours, Holiday	West-East	378	290	2020
	East-West	280	625	1257
	North-South	527	668	1216
	South-North	510	289	592

Average Volume Count		
	Total PCU/hr	Relative Flow %
West - East		
Left	537	16.5
Right	323	9.9
Straight	2395	73.6
East - West		
Left	447	14.9
Right	775	25.82
Straight	1778	59.27
North - South		
Left	714	23.11
Right	949	30.73
Straight	1425	46.16
South - North		
Left	645	36.62
Right	390	21.96
Straight	734	41.41



Fig -3(a): Maharajbag Intersection

Table -2(b) : Traffic Volume & Percentage of Relative Flow at Bhole Petrol Pump Intersection

Parameters	ROAD DETAILS	LEFT GOING	RIGHT TURNING	STRAIGHT GOING
Week Day, Peak Hours, Morning time	West-East	575	732	3651
	East-West	657	256	2993
	North-South	379	1132	2748
	South-North	575	1510	2186
Week Day, Non- Peak Hours, Afternoon time	West-East	280	359	1830
	East-West	293	131	1508
	North-South	170	510	1664
	South-North	284	236	678
Weekend, Holiday	West-East	114	176	945
	East-West	143	73	1188
	North-South	142	482	1120
	South-North	219	192	341
Week Day, Peak Hours, Holiday	West-East	280	359	1830
	East-West	775	745	1691
	North-South	170	510	1664
	South-North	284	236	678

Table -2(c): Traffic Volume & Percentage of Relative Flow at Law College Intersection

Parameters	ROAD DETAILS	LEFT GOING	RIGHT TURNING	STRAIGHT GOING
Week Day, Peak Hours, Morning time	West-East	1068	1390	2651
	East-West	1945	1503	3719
	North-South	826	1842	3045
	South-North	559	2135	3543
Week Day, Non- Peak Hours, Afternoon time	West-East	1753	716	1425
	East-West	361	705	1452
	North-South	377	818	1573
	South-North	275	1146	1750
Weekend, Holiday	West-East	1233	349	724
	East-West	747	505	1527
	North-South	224	464	1242
	South-North	217	915	1454
Week Day, Peak Hours, Holiday	West-East	1177	781	1596
	East-West	775	745	1691
	North-South	365	737	1697
	South-North	216	1108	1780

Average Volume Count		
	Total PCU/hr	Relative Flow %
West - East		
Left	319	11.44
Right	406	14.56
Straight	2064	73.60
East - West		
Left	467	17.87
Right	301	11.52
Straight	1845	70.61
North - South		
Left	215	8.05
Right	658	24.63
Straight	1799	67.33
South - North		
Left	340	18.35
Right	543	29.30
Straight	970	52.35

Average Volume Count		
	Total PCU/hr	Relative Flow %
West - East		
Left	1307	35.20
Right	808	21.76
Straight	1598	43.04
East - West		
Left	956	24.41
Right	864	22.06
Straight	2097	53.54
North - South		
Left	448	13.57
Right	965	29.22
Straight	1889	57.21
South - North		
Left	316	8.37
Right	1326	35.14
Straight	2132	56.49



Fig -3(b): Bhole Petrol Pump Intersection



Fig -3(c): Law College Intersection

## 5. Need for Re-Design

The above traffic volume count gives information about the volume per hour in PCU's and it is clear from data collection is that the straight going traffic is more at all the intersections and as compared to that the right going traffic is very less. Because of less volume of right going traffic and that signal phases it causes delay for the straight going traffic. The delay is occurring for the every straight going traffic at every intersection. To avoid this delay it is necessary to redesign those signals as per current requirements. The change in the phases is also needed. The present signal system is causing the avoidable delay. For the fixed time signals we have to require careful settings.

## 6. Re-Design of Signal

As per the necessity the signal is required to be redesigned. Webster's model is used for that, in the redesign we make changes into phase. The design is four phase but the directions when signal is green must be changed as shown in the figure, it allows only the straight going traffic from both directions of opposite lanes, it causes less delay and proper coordination will results into time consume. It can provide for an orderly movement of traffic and can increase the traffic handling capacity of the intersection.

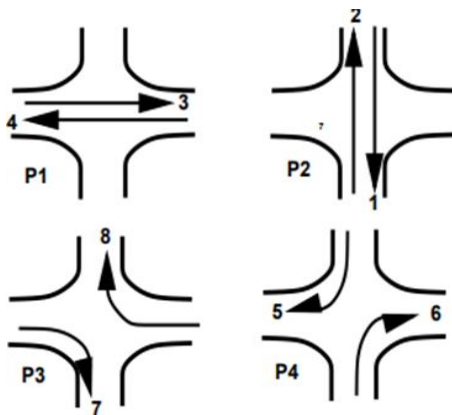


Fig -4: Proposed Signal Phases

## 7. Determination of Optimum Cycle Length

One of the important steps in designing a fixed time signal system is to determine the cycle time. If cycle

time is short, the ratio of the time lost will be greater resulting incompetent signal operation and longer delays. On the other hand if the cycle time is more, the proportion of time lost to cycle time will be less, and the signal operation will be more productive. Simultaneously, if the process duration is too large, there should be threat that a decent meeting of the green time will be utilized by unsaturated progression of traffic, which again prompts failure. For each traffic stream volume there is an ideal process duration which brings about the base deferral to the vehicle .It will be seen there in that for process duration inside the scope of 3/4 to one-and-a-half times they ideal worth. The deferral is never more than 10-20% over that given by the ideal process duration. By separating the condition for the all-out deferral of the convergence as for process duration, the accompanying condition for the ideal process duration has been acquired Cycle time calculation.

$$C = \frac{N \cdot Tl}{1 - (Vc/S)}$$

Where,

N- Number of lanes

Tl- the sum of start-up lost time and clearance lost time (considered as 3sec)

Vc- Critical volume count (PCU/Hr)

(Vehicle volume count, specifying Right turning and straight going vehicles)

$$S = 3600/h$$

Where,

S- The saturation flow rate in vehicles per hour.

h- The saturation headway in seconds (Range 1.5-2.5)

• Determination of Total Green Time

$$\text{Total Green time } Tg = C - N(Tl)$$

Where,

C- Calculated cycle time N- number of lanes

Tl- the sum of start-up lost time and clearance lost time (considered as 3sec)

• Green Time per Lane

Per lane green time is calculated by multiplying the ratio of total volume of that lane to the total volume with total green time calculated.

$$G1 = (Vc1/Vc) * Tg$$

By following the above steps the signals are redesigned, as shown in the table below for the particular intersections.

Table -3: Re-designed Signal Intervals in Seconds

Maharajbag Intersection				Bhole petrol pump Intersection				Law college Intersection			
Phases	Green Time	Red Time	Amber Time	Phases	Green Time	Red Time	Amber Time	Phases	Green Time	Red Time	Amber Time
I	31	91	3	I	46	90	3	I	33	81	3
II	37	85	3	II	53	82	3	II	36	78	3
III	20	102	3	III	11	125	3	III	15	99	3
IV	25	97	3	IV	17	119	3	IV	21	93	3
Cycle length= 125 sec				Cycle length=139 sec				Cycle length= 117 sec			

### 8. Modeling And Simulation

According to our study we have examined that PTV VISSIM is an ideal tool and we have used it for our work. The ‘Google Earth’ software is also used for the background image of the particular intersection. The following steps are followed for the modelling of the signals at these intersections for the present signal system and the proposed signal system.

#### 8.1 Background Image

Using “Google Earth” software from Google, the background image of the intersection and overall study area is presented in the image format. These images are used for the VISSIM simulations. The image below is showing the study with span 2 km.

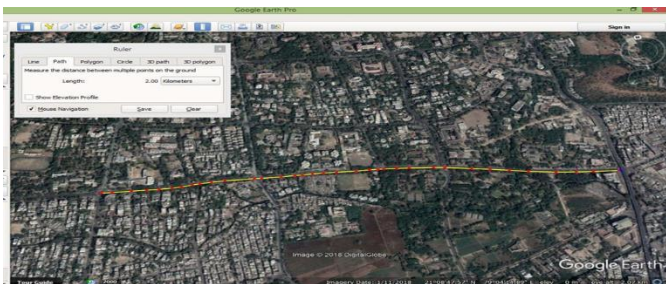


Fig -5(a): Study Area, ‘Google Earth’ Image

### 8.2 Link Formation

After inserting the background image on the VISSIM software, the links which are shown on that particular image are dragged by using the tool “link” on the tool bar option. The roads are dragged with the measured lane width and number of lanes. At intersection all the four lanes are connected by the connections and links are formed with all the details.

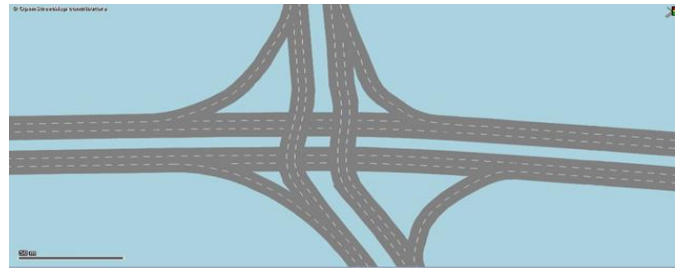


Fig -5(b): Links Formed on VISSIM Software

### 8.3 Vehicle Inputs and Routing

The vehicle input is given at the left side roads, according to the data collected in the format of Relative flow. The relative flow will differ from the vehicle routes and vehicle types. All the vehicle input is in PCUs/hr. After the vehicle input the routes are specified on the drawn links accordingly. Relative Flow for the vehicle routes is the ration of left going or straight going or right turning vehicles to the total vehicles in PCUs. In the same way the relative flow for the types of vehicle is also the ratio of type of vehicle to the total number of vehicles. The relative flow is the ratio, has no unit but also can be considered in percentage.

### 8.4 Signal Program

The signal is designed manually and implemented on VISSIM software, the phases are considered in the given format. The signal design is mainly depend upon the cycle time and the green intervals. The amber time is 3 sec for all the intersection. Following are the images showing the signal phase design.

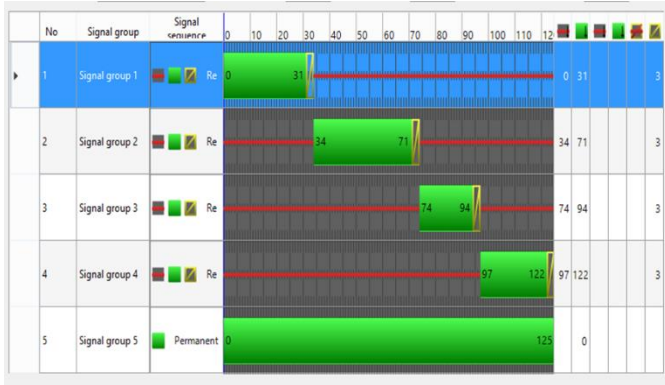


Fig -6(a): Image Showing Signal Timings at All Four Phases at Maharajbag Intersection.

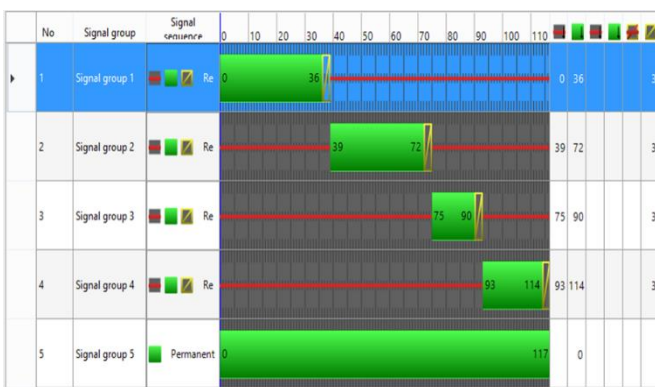


Fig -6(b): Image Showing Signal Timings at All Four Phases at Bhole Petrol Pump Intersection.

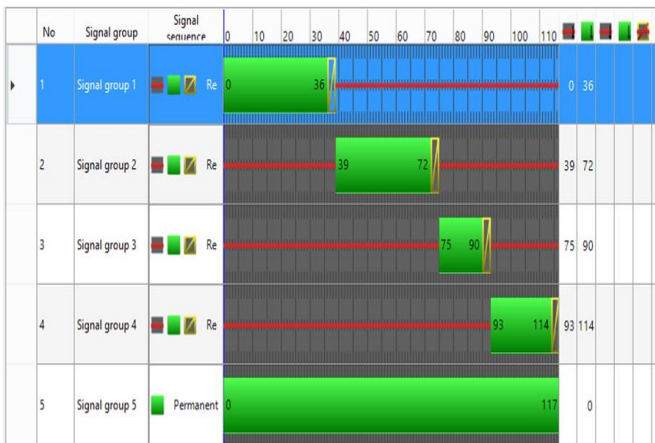


Fig -6(c): Image Showing Signal Timings at All Four Phases at Law College Intersection.

### 8.5 Node Evaluation

The intersection is ready for the evaluation of the result after placing the signal heads on the particular locations. That particular area is considered as a node

and taken for the study. After that node evaluation the results are obtained.

### III. DISCUSSION

According to survey done for the data collection it is observed that the straight going traffic is more at every intersection than the right turning traffic. To provide more comfort for those more number of straight going traffic the redesign is done. The queue length on the intersections is calculated using VISSIM software, the queue length differs from the current signal conditions and redesigned signal. The queue length is calculated using node analysis on VISSIM software. On each lane, length of vehicle in meters is shown in the table below, and the difference between existing signal system and redesigned signal system is shown in the graphical as well as in the tabular format of each intersection. The details of lane with their numbers are also shown in figure. The following are the graphs showing queue length difference between current situation of signal and the proposed signal system.

#### 1. Maharajbag Intersection

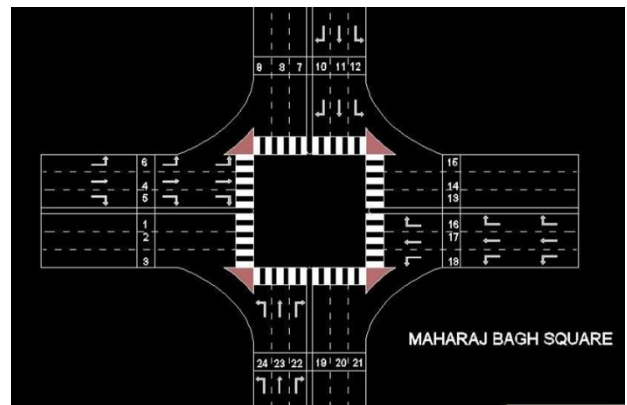


Fig -7: Lane Numbers at Maharajbag Intersection

Table-4 : Queue Length of Existing Signal System and Proposed Signal at Maharajbag Intersection

Movement	Q- Length (meters)	
	Existing signal	Proposed signal
4.-14	87.19	15.02
5.-19	87.19	72.59
6.- 9	87.19	0.00
10 - 1	56.94	52.07
11 - 20	56.94	3.50
12 - 15	56.94	0.00
16 - 7	116.52	108.87
17 - 2	116.52	10.44
18 - 21	116.52	0.00
22 - 13	48.71	25.69
23 - 8	48.71	35.90
24.- 3	48.71	0.00

The graph below showing the queue length difference between existing signal system and the proposed redesigned signal system. On X- axis vehicle routes are specified and on the Y- axis length in meters is shown.

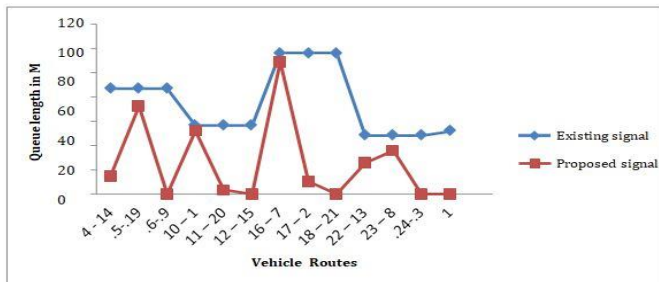


Chart -2: Difference in the Queue Length in Graphical Format at Maharajbag Intersection

2. Bhole Petrol Pump Intersection

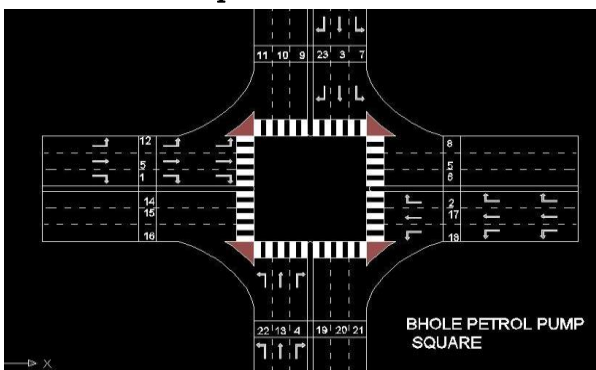


Fig -8: Lane Numbers at Bhole Petrol Pump Intersection

Table-5: Queue Length of Existing Signal System and Proposed Signal at Bhole Petrol Pump Intersection

Movement	Q- Length (meters)	
	Existing signal	Proposed signal
1 - 19	54.50	35.04
2 - 9	54.50	15.15
3 - 20	54.50	42.54
4 - 6	69.13	46.37
5 - 5	69.13	51.16
7 - 8	69.13	0.00
12 - 11	55.00	0.00
13 - 10	55.00	26.65
17 - 15	55.00	32.54
18- 21	16.10	0.00
22 - 16	16.10	0.00
23 - 14	16.10	11.26

The above table shows the difference between the queue lengths in meters. The difference is very large in number. The change in the signal design will give the positive results.

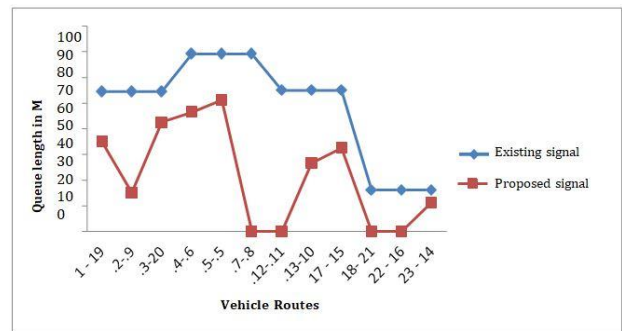


Chart -3: Difference in the Queue Length in Graphical Format at Bhole Petrol Pump Intersection

3. Law College Intersection

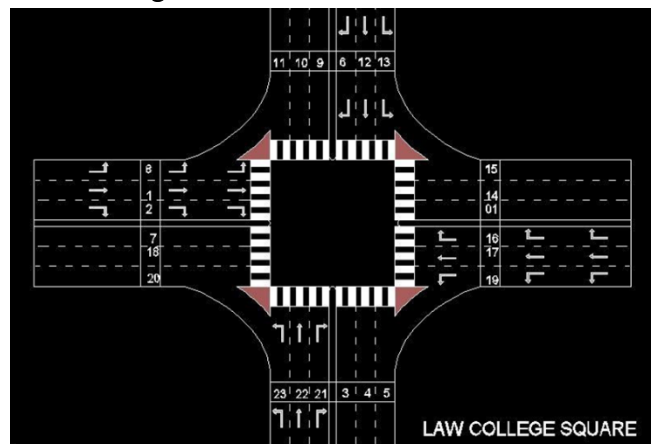


Fig -9: Lane Numbers at Law College Intersection

Table-6: Queue Length of Existing Signal System and Proposed Signal at Law College Intersection

Movement	Q- Length (meters)	
	Existing signal	Proposed signal
1 - 1	68.61	56.75
2 - 3	68.61	50.81
6 - 7	68.61	49.68
8 - 11	54.34	0.00
12 - 4	54.34	34.20
13 - 15	54.34	0.00
16 - 9	106.84	61.70
17 - 18	106.84	83.14
19 - 5	106.84	0.00
21 - 14	61.71	37.02
22 - 10	61.71	32.09
23 - 20	61.71	0.00

In the table above the difference in the queue lengths is shown, in the existing queue length there is a large value than the re-designed signal system. Somewhere there is value of queue length is zero in the left turning vehicles.

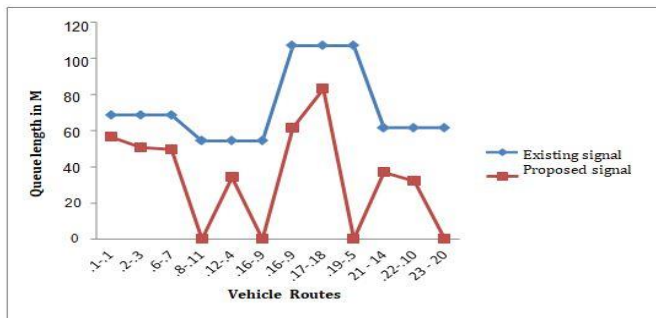


Chart -4: Difference in the Queue Length in Graphical Format at Law College Intersection

In India there is a heterogeneous traffic conditions, two key issues of heterogeneous traffic, namely, multiple vehicle types and non-lane based movement. As the traffic of existing road system in the cities grows, congestion becomes serious problem. Medium and long term solutions like widening of roads, providing elevated flyovers and constructing bypass and urban expressways are costly. As the use of traffic signals for control of conflicting streams of vehicular and pedestrian traffic is extensive in most of the towns and cities here in our case also it is used.

#### IV. RESULTS AND CONCLUSIONS

After redesign signal on those squares the following conclusions were obtained. For the application of the phases on site it is necessary to mark the directions on the road so that the vehicles will follow the route and the re-designed signal will succeed.

- The queue length difference between existing and redesigned signal system is considerable, it reduces 40-45%.
- The above redesigned model of signal able to predict delays reasonably well, the delay reduced to 45-50% from the existing scenario, indicating the efficiency of the modelling approach, even in the heterogeneous traffic.
- They can provide orderly movement of vehicles accordingly, left, straight or right turning.
- We can enhance the traffic-handling capacity of the intersection through appropriate geometric layouts.
- The redesigned signals are used to interrupt heavy straight going traffic from all the four lanes at intervals is permitted.

If it seems to be essential to coordinated to provide constant or nearly constant movement of traffic at a certain speed along a given path should also be done.

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# Synthesis of PbS Thin Film by Dip Coating Technique for Sensitization of Large band gap Semiconductor

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## ABSTRACT

Thin film of Lead sulfide (PbS) is synthesized via low cost dip coating technique using precursors  $\text{Pb}(\text{NO}_3)_2$  and thiourea for lead ions  $\text{Pb}^{+2}$  and sulfide ions  $\text{S}^{-2}$  respectively. The film is synthesized in alkaline medium. The as grown films onto glass slides were characterized by atomic force microscopy and UV-vis spectroscopy. The AFM image shows agglomeration of particles. The band gap value estimated from the UV-vis spectra as 1.49 eV. The photoelectrochemical (PEC) performance of cell was estimated in two electrode configuration. The thin film of PbS in PEC cell exhibited efficiency of 0.09% with fill-factor of 41% in polysulfide solution.

**Keywords :** PbS, dip coating technique, atomic force microscopy, UV-vis spectroscopy, photoelectrochemical cell

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## I. INTRODUCTION

Several oxide materials including  $\text{TiO}_2$ ,  $\text{ZnO}$  etc have been employed in dye sensitize solar cell. All these materials have band gap on the order of 3.0 eV. Calculations show that a band gap in the range of 1eV to 1.5 eV is highly desirable in optimized solar cells. Wide band gap materials can absorb only few percent of solar spectrum in UV region result in low efficiency. Sensitization of large band gap semiconductor by small band gap materials is key solution for solar cell application. The small band gap materials viz CdS [A, B, C], CdSe [D], CdTe [E], HgS [F] and PbS [G]. Among the materials Lead sulphide (PbS) is an excellent semiconductor which exhibits a

band gap of  $\sim 1-1.4$  eV by controlling the size of crystals.

For synthesise of PbS nanocrystals, different methods have been employed. PbS thin films can be prepared via different methods such as chemical bath deposition (CBD) [1,2], successive ionic layer adsorption reaction (SILAR) [3], electro-deposition, and vacuum evaporation [4]. Among the methods dip coating is a very comfortable and most convenient method for deposition nanocrystalline lead sulfide (PbS) thin films. The dip coating technique is relatively inexpensive and simple since it does not require sophisticated equipment.

## II. METHODS AND MATERIAL

All the chemicals were used without further purification. The chemicals were used as lead nitrate  $\text{Pb}(\text{NO}_3)_2$ , thiourea and sodium hydroxide  $[\text{NaOH}]$ . The lead nitrate was used for lead ions  $\text{Pb}^{+2}$ , thiourea for sulfide ions  $\text{S}^{-2}$ . Besides, sodium hydroxide was used for alkaline medium which also act as complexing agent to vary the pH of the reaction bath and to control the  $\text{Pb}^{+2}$  ions concentration. Substrate cleaning plays an important role in the deposition of thin films. Extreme cleanness of the substrate is required for the deposition as the contaminated substrate surface provides nucleation sites facilitating growth resulting non- uniform films. The commercial glass slides and Titanium (Ti) were used as substrates. The following procedure was adopted for cleaning of substrate.

1. The substrates were washed with double distilled (DD) water,
2. Then etched in dilute hydrochloric acid for a few second,
3. Again, the substrates were washed with detergent, rinsed in DD water,
4. Finally, the substrates were dried, degreased in AR grade acetone and were used for deposition.
5. To prepare PbS thin films the concentration of reagents were used as 0.1M of  $\text{Pb}(\text{NO}_3)_2$  and and 0.6M of  $\text{SC}(\text{NH}_2)_2$ . In a typical procedure, firstly in the solution of lead nitrate, the sodium hydroxide solution was added slowly. This solution was stirred for several minutes the solution becomes colorless. To this solution the solution of thiourea was added slowly and stirred till the color of the solution becomes dark gray which indicates the PbS compound formation. Then synthesis of PbS films were carried out by dipping the glass slides vertically in the prepared solution by withdrawal speed of 1 cm in 30 second. The as grown films were removed from the bath and rinsed with distilled

water. The resulting films were homogeneous, well adhered to the substrate with mirror-like gray aspect.

E. Pentia et al [5] have proposed the formation of thin film of by the reaction mechanism as follows:

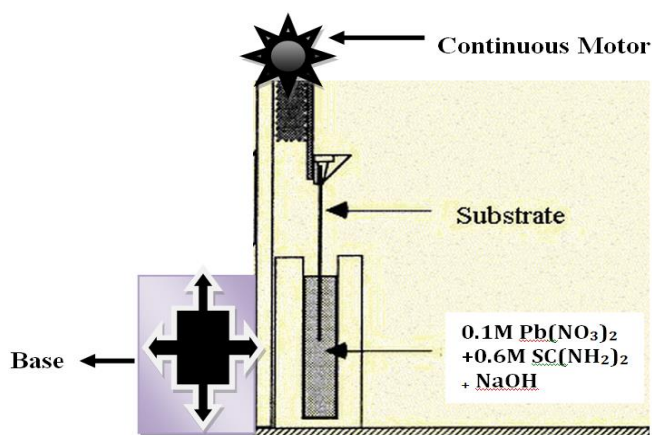
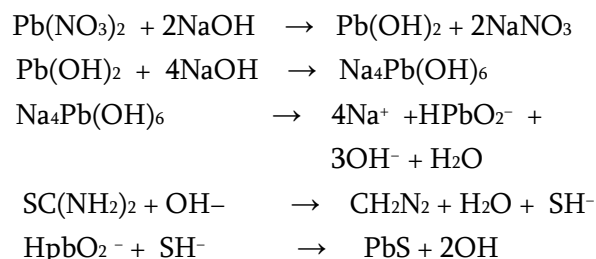


Figure 1 : Experimental layout diagram of Dip-Coating apparatus.

The surface morphology of the film was characterized by atomic force microscopy (AFM; DIAFM-4). The transmission data in the range 800-1100 nm were obtained with shimadzu uv-1800 spectrophotometer. The PEC cell was constructed using as grown films of PbS onto Ti as photoelectrode, and polysulfide as an electrolyte with graphite as the counter electrode. The polysulfide solution was used as an electrolyte in methanol/water (7:3 by volume). The polysulfide solution by means of it contains 1 Molar of each reagent of  $\text{Na}_2\text{S}$ ,  $\text{S}$  and  $\text{NaOH}$ . [H]. Photocurrent-voltage (I-V) performances of as-deposited PbS photoelectrodes were measured under  $100 \text{ mW/cm}^2$  light illumination intensity. The intensity of light was measured by Solar Power Meter (Tenmarsh Brand Model TM-207). The thickness of PbS film was measured by weight different gravimetric methods

employing sensitive electronic microbalance. Thickness of film was estimated around 800 nm.

### III. RESULTS AND DISCUSSION

#### A. Morphology of PbS film

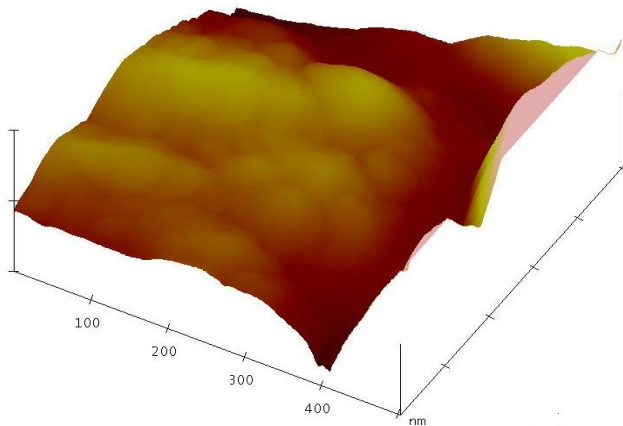


Figure 2: AFM image of PbS thin film

The surface morphology of films is studied by taking the AFM image. Figure 2 shows AFM 3-D image of PbS film. It is observed that the film covers the substrate very well. The morphology depicts that the grown film have large grains. The small particles group together and form as such large grain. It is clearly seen that the films are not uniform over the scan area of substrates.

#### B. OPTICAL STUDY

The absorption spectra of PbS thin film shown in Fig. 3. The absorption edge of the film can be seen around at 830 nm from which the band gap value has been estimated. The band gap value can be estimated as 1.49 eV.

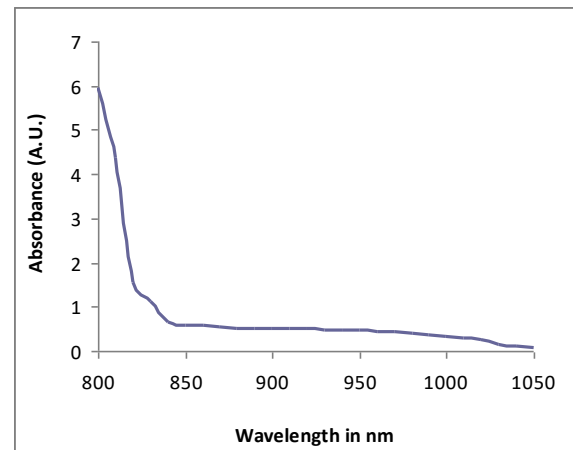


Figure 3: Absorption spectra of PbS film.

The photovoltaic power output characteristics of the PbS photoelectrode is obtained in two electrode configuration as depicted in the Fig. 4. For the PbS based PEC cell in polysulfide solution, a short-circuit photocurrent ( $I_{sc}$ ) of 706  $\mu\text{A}$ , open circuit photovoltage ( $V_{oc}$ ) of 250 mV, and a fill factor (ff) of 41% are obtained. For the obtained data the power conversion efficiency ( $\eta$ ) of 0.09%, is calculated.

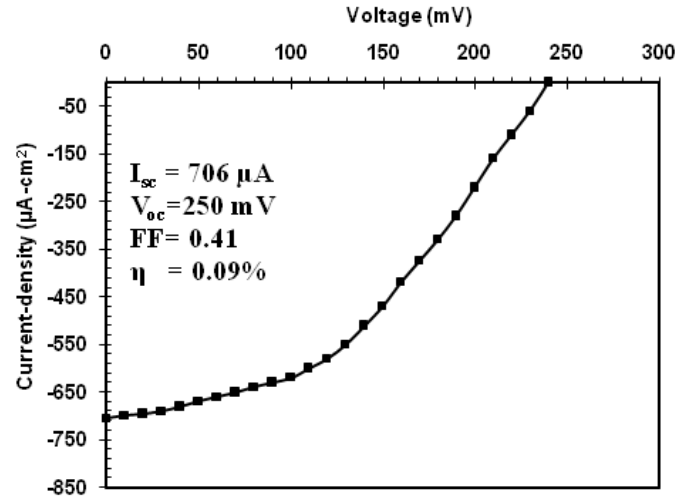


Figure 4: Photovoltaic power output characteristics of the PbS photoelectrode

### IV. CONCLUSION

This study presented deposition of PbS thin films by dip coating technique. UV-vis spectrophotometric studies showed that the direct band gap of PbS thin was estimated as 1.49 eV from the absorption edge.

The films have suitable band gaps to be used for solar cell applications. PbS thin film is a appropriate material for solar cells and can be used as an absorbing material in thin film solar cells due to its good optical properties.

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# Vegetation Assessment of Inland Wetland of Central Gujarat ( Pariej Irrigation Reservoirs )

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## ABSTRACT

Wetlands are one of the most productive and fertile ecosystems on earth. Those wetlands which are located in the transitional zone between permanently aquatic and terrestrial (upland) ecosystems have properties common to land and water both. Gujarat has a variety coastal and inland wetland systems. The inland wetlands include floodplains, freshwater ponds and lakes, rivers, irrigation reservoirs, marshes and waterlogged areas while the coastal wetlands include salt marshes and salt-pans, creeks, mudflats, estuaries, mangrove swamps and coral reefs. Many of these wetlands have potential to get designation of international significance due to their high diversity/population and/or other criteria. Pariej is one of the eight wetlands in Gujarat that has been declared by the Central Government as wetland of national importance. The purpose of the present study is to observe the flora of the pariej wetland and to determine the changes by each season. In a wetland ecosystem these biotic factors are mostly dependent on the season and hydrology. Thus wetland being an integrated system is affected by the changes in the physical as well as chemical parameters of hydrosphere at the catchment scale.

**Keywords :** Wetlands, productive, ecosystems, aquatic, terrestrial ecosystems, floodplains, freshwater ponds, lakes, rivers, irrigation reservoirs, marshes and waterlogged areas, diversity, biotic factors, hydrology, hydrosphere.

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## I. INTRODUCTION

Wetlands are eco-transitional regions which inhabit a transitional position between dry land and open water (Tatu *et. al.*, 2007). The penetration of wetland never exceeds six meters as defined in the text of convention report of wetlands which are globally important particularly as Water birds habitat known

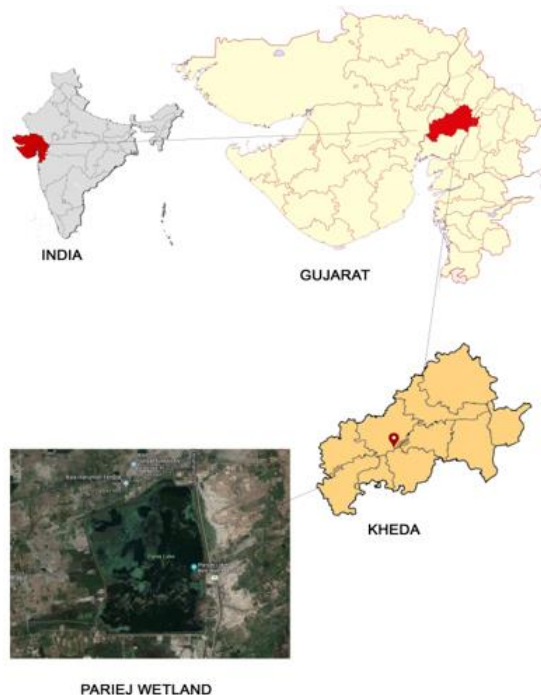
as the Ramsar site. Wetlands are extremely valuable pools of biodiversity and genetic resources, but unmaintainable development is intimidating the bio-wealth and even initiating species extinction (Burlakova *et al*, 2009). Wetlands are supportive to a varied range of flora and fauna and inhabit many ecological, climatic and biological roles. Wetlands provides food, shelter and breeding platforms for

aquatic birds and animals (Turner *et. al.*, 2000). It has a variety of aquatic habitats such as a long Arabian seacoast, rivers, streams, ponds, puddles, lakes, backwater creeks etc., which support characteristic types of vegetation of their own (Callaway *et. al.*, 2007). Pariej is one of the eight wetlands in Gujarat that has been declared by the Central Government as wetland of national importance. It offers a variety of habitats –from the ponds and marshes ,to patches of open grasslands and scrub and its proximity of the Gulf of Khambhat as given its wealth of birdlife.

## II. MATERIALS AND METHODS

### Study Area

Prioritized wetland site from Gujarat. One of the eight wetlands of National Importance identified in Gujarat state by the Ministry of Environment and Forests, Govt. of India. The wetland well known as ‘Mahi- Pariejyojna’ that stores and supply water to Saurashtra region. This is also an Important Bird Area (IBA) Site of India. Also, a proposed Ramsar Site by SACON (Source: SACON’s Atlas for Wetland Conservation). Commercial fishing is practiced.



**Figure 1 :** Satellite image of Pariej Wetland (Source: Google Map)

**Location:** Pariej Irrigation Reservoir is located in Limbasi taluka at 22°33'00" N latitudes and 72°38'00" E longitudes. It is situated at the distance of just 7 km north of Tarapur on Tarapur-Kheda State highway. The big lake of Pariej is approximately 2.5 kms. in area with depth varying between 4 ft to 10 ft.

### Field Survey

The field survey was started with reconnaissance survey of Pariej Wetlands located at Khambhat District of Gujarat state, India. Further, data collection was carried out in each of the season i.e., Summer, Monsoon and Winter. Types of vegetations like Submerged vegetation, Rooted Plants with Floating Leaves, Unrooted Submerged Plant, Free-floating Plants, Emergent vegetation have been covered during study. Belt- transects methods was employed for fulfilment of the objectives.

### Belt-Transect

Belt- Transect method for wetlands ringed with vegetation around large central deep water, a better strategy might be establishing a baseline around the perimeter of the wetland running transect toward the Centre. A length of the transect was 100 m. On each transect, quadrates were laid down at regular distance (i.e., 10m). Quadrates size was fixed as per habit of plants, 5m x 5m for the Shrub and 1m x 1m for the herbs. Each species occurring in the first three quadrate was counted for determination of species density, frequency, abundance, percentage composition and remaining quadrate only Percent cover and frequency percentage was taken because these aquatic species which could not be counted as individual number. Longitude and Latitude were also recorded for each transect & quadrates by using GPS (Global Positioning System).

### Quantitative Data Analysis

Enumeration of vegetation was carried out using quadrates method. The quantitative assessment was

carried out for all species. Various measurable attributes i.e., density, frequency, abundance, percentage composition, species richness and evenness were used for the assessment of plants in the all selected areas of wetland. Following formulas were being applied for calculation.

**Density**

Density is an expression number of the individual per unit area. Density is calculated by the equation.

$$\text{Density} = \frac{\text{Total number of individual of particular species}}{\text{Total number of quadrates studied} \times \text{Area of quadrat(ha)}}$$

**Frequency**

Frequency refers to the degree of dispersion of individual species in an area and usually expressed in term of percentage cover and it can be calculated by equation.

$$\text{Frequency} = \frac{\text{Number of quadrates in which species occurred}}{\text{Total number of quadrates studied}} \times 100$$

**Abundance**

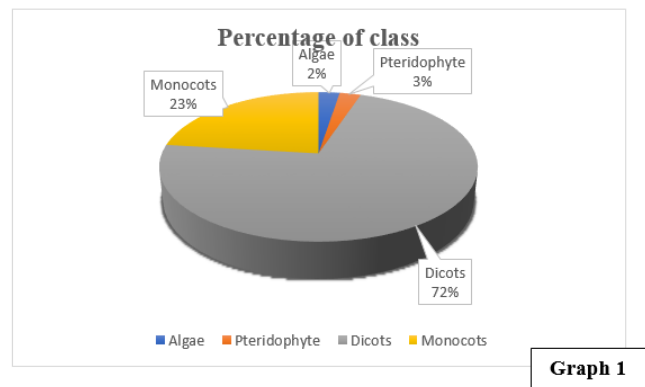
Abundance refers the number of individual of different species in community unit per area. By quadrates methods, sampling is made random at several places and the number of individual of each species was summed up for all quadrates divided by total number of quadrates in which the species occurred. It can be represented by an equation.

$$\text{Abundance} = \frac{\text{Total number of individual in all quadrates}}{\text{Total number of quadrates in which individual occurs} \times \text{Area of quadrat(ha)}}$$

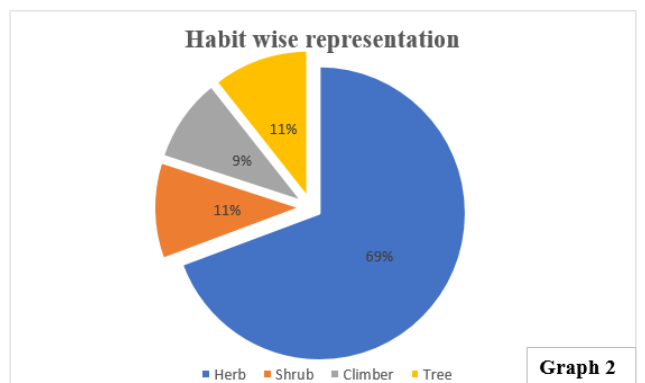
**III. RESULTS AND DISCUSSION**

**Qualitative analysis**

During the present study, a total of 74 species belonging to 39 families and 63 genera of flowering plants and 2 non-flowering i.e. *Chara* sp. (Algae) as well as *Marsilea quadrifolia* L. (pteridophyte) have been recorded from the in and around the Pariej wetland. Dicots represented by 48 species belongs to 41 genera and 29 families while Monocots represented by 26 species belongs to 20 genera and 9 families (Graph 1). Graph 2 showed habit wise analysis of plants i.e., tree, shrubs, climber, herbs, etc. Moreover, plant checklist was prepared based on the visual observation in the quadrats as well transects (Table 6). Graph 1 representing percentage of Dicot, Monocot, Algae, Pteridophyte and graph 2 representing habit percentage.



**Graph 1**



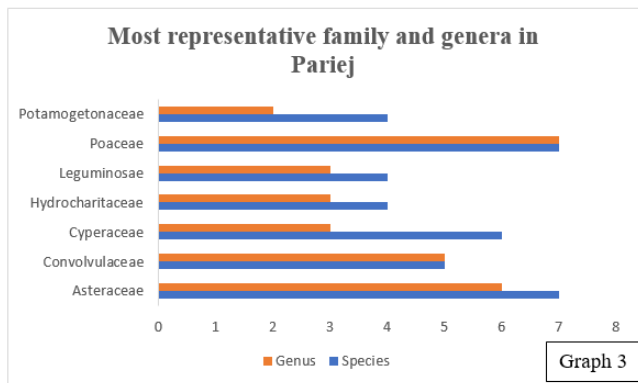
**Graph 2**

Out of 49 families, 48 genera are represented by single species of each genus. Convolvulaceae is largest families among the dicot while Poaceae and

Cyperaceae are largest among the monocots which are poorly represented. A total of 74 species of flowering plants, 51 species are herbs, 8 species are shrubs, 7 species are climbers and 8 species are trees and 1 non-flowering plant *Marsilea* (pteridophyte). This study show that herbaceous plants are dominating in the wetland and its surrounding areas.

**Most representative family and genera in Pariej Wetland**

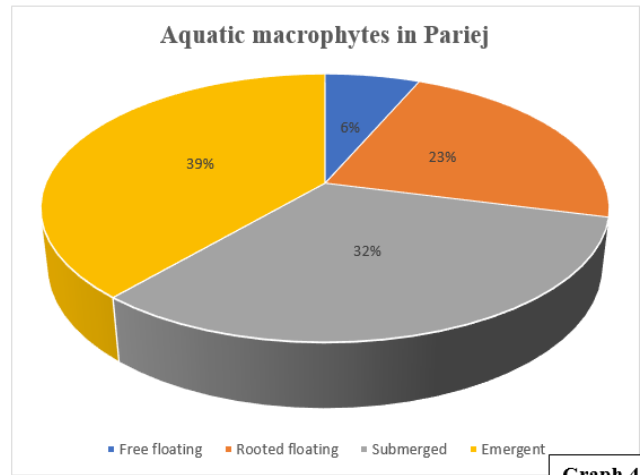
Most representative family, genera and species of Pariej are Asteraceae (7 species) followed by Poaceae (7 species), Cyperaceae (6 species), Convolvulaceae (5 species), Hydrocharitaceae (4 species) etc. as given in graph 3.



Graph 3

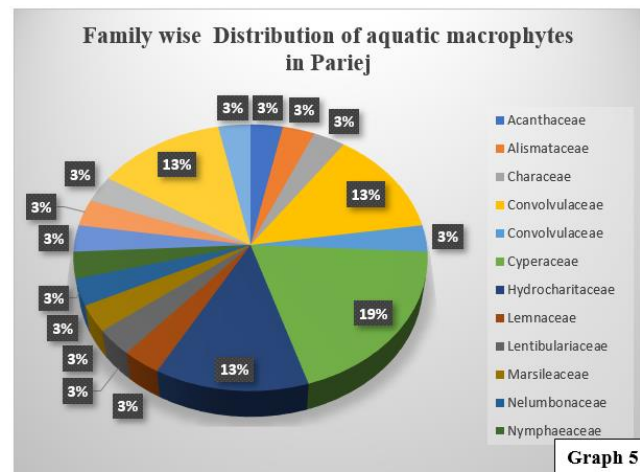
**Aquatic macrophytes**

The macrophytes are classified into submerged, free floating, rooted floating and emergent vegetation. Total 32 species recorded under this study belonged to 18 families. Majority of the species are recorded from emergent (13 species) vegetation followed by submerged (10 species), Rooted floating (7 species) and Free floating (2 species) Vegetation, etc. (graph 3)



Graph 4

Majority of the species are recorded from Cyperaceae family (6 species) followed by Convolvulaceae (4 species), Hydrocharitaceae (4 species), and Potamogetonaceae (4 species). Other Family wise Distribution of aquatic macrophytes in Pariej wetland. (graph 4)



Graph 5

During fieldwork at Pariej wetland 32 species of aquatic macrophytes were identified and listed based on the visual observation in the quadrats as well transects by using Cook (1996) and Shah (1978). The given table show list of aquatic macrophytes with their indicator statuses, habit, family, class etc.(table1)

**Table 1** : List of recorded aquatic macrophytes and their indicator status.

Sr. No.	Botanical Name	Family	Status	Habit	Indicator status	Class
1	<i>Ammannia baccifera</i> L.	Lythraceae	Emergent	Herb	FAC	Dicot
2	<i>Coix lacryma-jobi</i> L.	Poaceae	Emergent	Herb	FACW	Monocot



3	<i>Cyperus difformis</i> L.	Cyperaceae	Emergent	Herb	FACW	Monocot
4	<i>Cyperus iria</i> L.	Cyperaceae	Emergent	Herb	FACW	Monocot
5	<i>Cyperus rotundus</i> L.	Cyperaceae	Emergent	Herb	FACW	Monocot
6	<i>Cyperus bulbosus</i> Vahl	Cyperaceae	Emergent	Herb	FACW	Monocot
7	<i>Eichhornia crassipes</i> (Mart.) Solms	Pontederiaceae	Free Floating	Herb	OBL	Monocot
8	<i>Fimbristylis aestivalis</i> Vahl	Cyperaceae	Emergent	Herb	FACW	Monocot
9	<i>Hydrilla verticillata</i> (L.f.) Royle	Hydrocharitaceae	Submerged	Herb	OBL	Monocot
10	<i>Hygrophila auriculata</i> (Schum.) Heine	Acanthaceae	Emergent	Herb	FACW	Dicot
11	<i>Ipomoea aquatica</i> Forssk.	Convolvulaceae	Rooted Floating	Climber	FACW	Dicot
12	<i>Ipomoea carnea</i> Jacq.	Convolvulaceae	Emergent	Climber	FACW	Dicot
13	<i>Ipomoea marginata</i> (Desr.) Verdc.	Convolvulaceae	Rooted Floating	Climber	FACW	Dicot
14	<i>Ipomoea triloba</i> L.	Convolvulaceae	Rooted Floating	Climber	FACW	Dicot
15	<i>Lemna minor</i> L.	Lemnaceae	Free Floating	Herb	OBL	Monocot
16	<i>Limnophyton obtusifolium</i> (L.) Miq.	Alismataceae	Emergent	Herb	FACW	Monocot
17	<i>Ludwigia adscendens</i> (L.) Hara	Onagraceae	Emergent	Herb	FACW	Dicot
18	<i>Najas marina</i> L.	Hydrocharitaceae	Submerged	Herb	OBL	Monocot
19	<i>Najas minor</i> All.	Hydrocharitaceae	Submerged	Herb	OBL	Monocot
20	<i>Nelumbo nucifera</i> Gaertn.	Nelumbonaceae	Rooted Floating	Herb	OBL	Dicot
21	<i>Nymphaea nouchali</i> Burm.f.	Nymphaeaceae	Rooted Floating	Herb	OBL	Dicot
22	<i>Persicaria glabra</i> (Willd.) M.Gómez	Polygonaceae	Emergent	Herb	FACW	Dicot
23	<i>Potamogeton crispus</i> L.	Potamogetonaceae	Submerged	Herb	OBL	Monocot
24	<i>Potamogeton nodosus</i> Poir.	Potamogetonaceae	Submerged	Herb	OBL	Monocot
25	<i>Potamogeton perfoliatus</i> L.	Potamogetonaceae	Submerged	Herb	OBL	Monocot
26	<i>Scirpus littoralis</i> Schrad.	Cyperaceae	Emergent	Herb	FACW	Monocot
27	<i>Stuckenia pectinata</i> (L.) Börner	Potamogetonaceae	Submerged	Herb	OBL	Monocot
28	<i>Typha domingensis</i> Pers.	Typhaceae	Emergent	Herb	FACW	Monocot
29	<i>Utricularia inflexa</i> Forssk.	Lentibulariaceae	Submerged	Herb	OBL	Dicot
30	<i>Vallisneria spiralis</i> L.	Hydrocharitaceae	Submerged	Herb	OBL	Monocot

31	<i>Chara</i> sp.	Characeae	Submerged	-	OBL	Algae
32	<i>Marsilea quadrifolia</i> L.	Marsileaceae	Rooted Floating	Herb	OBL	Pteridophyte

\* Obligate Wetland Plants (OBL), Facultative Wetland Plants (FACW), Facultative Plants(FAC), Facultative Upland Plants (FACU), Obligate Upland Plants (UPL).

**Wetland indicator status**

The National List of Plant Species that Occur in Wetlands is a list of wetland plants and their assigned indicator statuses. The five indicator statuses are: Obligate Wetland Plants (OBL), Facultative Wetland Plants (FACW), Facultative Plants (FAC), Facultative Upland Plants (FACU), Obligate Upland Plants (UPL). Based on these indicator statuses total of 76 species of plants were categories and represented. Out of these, 38 species belong to Obligate Upland Plants, 16 Facultative Wetland Plants, 15 Obligate Wetland Plants, 6 Facultative Upland Plants and 1 naturalized, 1 Facultative Plants. (graph 5)

**Quantitative analysis**

**Percent Cover**

32 species of macrophytes were recorded in the Pariej wetland. Out of these, 11 species of macrophytes were recorded in the quadrats laid along with transects. The study reveals that the maximum Percent Cover was found of *Hydrilla verticillata* (L.f.) Royle (45.15%) follow by *Eichhornia crassipes* (Mart.) Solms (41.42%), *Stuckenia pectinata* (L.) Börner (38.33%), *Najas minor* All (33.75%) in winter season etc. (Table 2).

**Table 2 : Percent cover of macrophytes**

SN	Species Name	Common name	% Cover		
			Summer	Monsoon	Winter
1	<i>Chara</i> sp.	-	10	0	10
2	<i>Eichhornia crassipes</i> (Mart.) Solms	-	20	20	41.42
3	<i>Hydrilla verticillata</i> (L.f.) Royle	-	44.83	26	45.15
4	<i>Lemna minor</i> L.	-	23.33	10	25
5	<i>Marsilea quadrifolia</i> L.	-	15	10	10
6	<i>Najas marina</i> L.	-	21.81	23.63	26.66
7	<i>Najas minor</i> All.	-	30.43	26.92	33.75
8	<i>Nymphaea nouchali</i> Burm.f.	Poynu	22.85	20	28.57
9	<i>Potamogeton crispus</i> L.	-	26.47	24.7	25
10	<i>Stuckenia pectinata</i> (L.) Börner	-	23.33	10	38.33
11	<i>Vallisneria spiralis</i> L.	-	36.66	20	30

### Frequency

An analysis of the study showed that the maximum frequency was found of *Hydrilla verticillata* (L.f.) Royle (94.29%) in winter follow by *Najas minor* All (74.29%) in monsoon, *Potamogeton crispus* L. (51.43%) in winter, *Najas marina* L. (34.29%) in winter season etc. (Table 3).

**Table 3** : Frequency of macrophytes

SN	Species Name	Common name	Frequency %		
			Summer	Monsoon	Winter
1	<i>Chara</i> sp.	-	2.86	0.00	2.86
2	<i>Eichhornia crassipes</i> (Mart.) Solms	-	22.86	22.86	20.00
3	<i>Hydrilla verticillata</i> (L.f.) Royle	-	88.57	85.71	94.29
4	<i>Lemna minor</i> L.	-	8.57	2.86	5.71
5	<i>Marsilea quadrifolia</i> L.		5.71	2.86	2.86
6	<i>Najas marina</i> L.		31.43	31.43	34.29
7	<i>Najas minor</i> All.		65.71	74.29	68.57
8	<i>Nymphaea nouchali</i> Burm.f.	Poynu	20.00	17.14	20.00
9	<i>Potamogeton crispus</i> L.	-	48.57	48.57	51.43
10	<i>Stuckenia pectinata</i> (L.) Börner	-	8.57	2.86	17.14
11	<i>Vallisneria spiralis</i> L.	-	8.57	11.43	11.43

### Density

The study reveals that the maximum density was found of *Typha domingensis* Pers., (9.80 Indi/m) in winter follow by *Polygonum plebeium* R.Br. (3.27 indi/m) in winter, *Eclipta prostrata* (L.) L. (2.07indi/m) in summer, *Ipomoea carnea* Jace. (2.0 Indi/m) in summer season etc. (Table 4)

### Frequency

In pariej wetland, the maximum frequency was found of *Typha domingensis* Pers. (93.33%) in monsoon, *Polygonum plebeium* R.Br. (46.67 %) in monsoon, *Eclipta prostrata* (L.) L. (33.33%) in winter, *Ipomoea carnea* Jace. (33.33) in winter etc. (Table 4)

### Abundance

An abundance of different species in the present study were *Typha domingensis* Pers.(12.25indi/m) in winter followed by *Polygonum plebeium* R.Br. (8.16 indi/m) in winter, *Ammannia baccifera* L.(6.00 indi/m) in winter, *Ipomoea carnea* Jace. (5.2 indi/m) in winter season etc. (Table 4)

### Percentage composition

The percentage compositions of dominant species were *Typha domingensis* Pers. (53.26%) in winter followed by *Polygonum plebeium* R.Br. (17.75 %) in winter, *Ipomoea carnea* Jace. (9.42%) in winter, *Eclipta prostrata* (L.) L. (6.90%) in monsoon season etc. (Table 4)

**Table 4 :** Density, frequency, abundance and Percentage composition of Upland plant in Pariej wetland

Sr. No	Scientific Name	Local Name	Density per sq. meter			Abundance sq. meter			% of Frequency			% of Composition		
			Sum mer	Mon soon	Wint er	Summe r	Mons oon	Winte r	Sum mer	Mon soon	Win ter	Sum mer	Mons oon	Win ter
1	<i>Alternanthera sessilis</i> (L.) R.Br. ex DC.	-	0.47	0.27	0.27	2.33	2.00	2	20.00	13.33	13.33	2.80	1.72	1.45
2	<i>Cyperus iria</i> L.		0.47	0.40	0.47	3.50	2.00	2.33333	13.33	20.00	20.00	2.80	2.59	2.54
3	<i>Cyperus rotundus</i> L.	Dilo	0.60	0.47	0.47	3.00	2.33	2.33333	20.00	20.00	20.00	3.60	3.02	2.54
4	<i>Eclipta prostrata</i> (L.) L.	-	2.07	1.07	1.27	6.20	3.20	3.8	33.33	33.33	33.33	12.40	6.90	6.88
5	<i>Ipomoea aquatica</i> Forssk.	Vel	0.33	0.20	0.20	2.50	1.50	1.5	13.33	13.33	13.33	2.00	1.29	1.09
6	<i>Ipomoea carnea</i> Jace.	Bush Morning Glory	2.00	1.53	1.73	7.50	4.60	5.2	26.67	33.33	33.33	12.00	9.91	9.42
7	<i>Ammannia baccifera</i> L.	Jal agiyo	0.40	0.40	0.40	6.00	6.00	6	6.67	6.67	6.67	2.40	2.59	2.17
8	<i>Launaea procumbens</i> (Roxb.) Ramayya & Rajagopal	Gadjepi	0.13	0.13	0.13	2.00	2.00	2	6.67	6.67	6.67	0.80	0.86	0.72
9	<i>Ludwigia adscendens</i> (L.) Hara	-	0.27	0.27	0.27	4.00	4.00	4	6.67	6.67	6.67	1.60	1.72	1.45
10	<i>Polygonum plebeium</i> R.Br.		2.40	2.53	3.27	7.20	5.43	8.16667	33.33	46.67	40.00	14.40	16.38	17.75
11	<i>Typha domingensis</i> Pers.	Gha Bajariu	7.53	8.07	9.80	9.42	8.64	12.25	80.00	93.33	80.00	45.20	52.16	53.26
12	<i>Commelina benghalensis</i> L.		-	0.13	-	-	2.00	-	-	6.67	-	-	0.86	-
13	<i>Rungia repens</i> (L.) Nees		-	-	0.13	-	-	2	-	-	6.67	-	-	0.72

### IV. CONCLUSION

Wetlands are most productive ecosystem. Vegetation plays important role in wetland ecosystem. It acts as primary producer who makes food. Vegetation takes part vital chain like energy flow, food web, carbon cycle, Nitrogen cycle, phosphate cycle. It acts as basic trophic level for biomass production, which further passes to another trophic levels.

In the present study, a total of 74 species belonging to 39 families and 63 genera of flowering plants and 2 non-flowering i.e. *Chara* sp. (Algae) as well as

*Marsilea quadrifolia* L. (pteridophyte) have been recorded in and around the Pariej wetland. Dicots represented by 48 species belongs to 41 genera and 29 families while Monocots represented by 26 species belongs to 20 genera and 9 families.

The macrophytes are classified into submerged, free floating, rooted floating and emergent vegetation. A total 32 aquatic macrophytes species recorded under this study belonged to 18 families. Majority of the species are recorded from emergent (13 species) vegetation followed by submerged (10 species),

Rooted floating (7 species) and Free floating (2 species) Vegetation.

Based on the National List of wetland plants and their assigned indicator statuses a total of 76 species of plants were categorized. Out of these, 38 species belong to Obligate Upland Plants, 16 Facultative Wetland Plants, 15 Obligate Wetland Plants, 6 Facultative Upland Plants and 1 naturalized, 1 Facultative Plants. Thus wetlands require collaborated research involving natural, social and inter disciplinary study aimed at understanding the various components such as monitoring of water quality, socio economic dependency, bio diversity and other activities as an indispensable tool for formulating long term conservation strategies.

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## Smart Doorbell Security System Using IoT

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### ABSTRACT

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Security has always been an important issue in the home or office. A remote home security system offers many more benefits apart from keeping home owners, and their property, safe from intruders. The system is composed of the Doorbell interfaced with Raspberry pi, whoever press the doorbell, the camera gets triggered and capture their face and it checking for their face with its database which already has registered faces, if it is an authorized person door will open, otherwise it sends an OTP with their photograph of the intruder to server mail. Only when non authorized person entered that OTP, that face gets added to the authorized person's database to open the door. Smart doorbells allow home owners to receive alerts when a visitor is at the door, see who the guest is, and communicate with the visitor from a smart device. They greatly improve people's life quality and contribute to the evolution of smart homes.

Keywords : Terms-Face Detection, Home Security, Voice Recognition, Fingerprint.

### I. INTRODUCTION

A remote home security system is growing need of the hour to protect our home from intruders. The system is composed of a camera interfaced with Raspberry pi, whenever the doorbell is pressed, the camera gets triggered and capture their face and it verifies its database which already has registered faces. In this system, security that combines the functions of smart phone and home network system. It enables the users to monitor visitors in real-time, remotely via the IoT-based doorbell camera. These captured visuals are also processed for finding potentially harm causing objects. This system makes security as further

autonomous by capturing the image automatically and processing the image for facial matching and uses mail communication to the server to confirm the intruder is known or unknown.

### II. EXISTING SYSTEM

In an existing system, there is only facial recognition-based security system and the main drawback in this system is that whoever having the face data in the database it allows that person, whereas it doesn't look for any unknown faces.

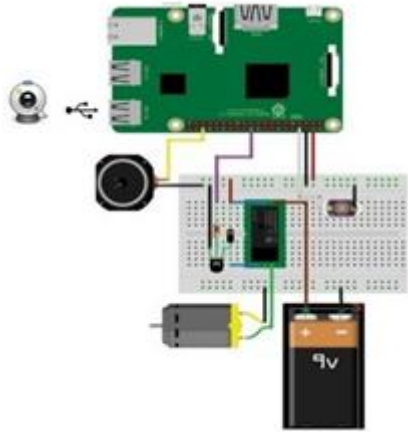


Fig. 1. Existing System.

### III. LITERATURE SURVEY

#### A. ENHANCED SMART DOORBELL SYSTEM BASED ON FACE RECOGNITION

In this paper [1], Face detection is also called as facial detection is an artificial intelligence (AI) based computer technology used to find and identify human faces in digital images. Facial recognition system uses biometrics to map facial features from a photograph or video. It compares the information with a database of known faces to find a match. Facial recognition can help verify personal identity, but it also raises privacy issues. This paper aims to replace costly image processing boards using Raspberry pi board with ARMv7 Cortex-A7 as the core within OpenCV library. This project is mainly based on image processing by porting the OpenCV library to the Raspberry Pi board. Algorithm for face. In this paper, face recognition is initiated by pressing the doorbell button. Indeed, an integrated camera will capture several pictures of the visitor. The face recently scanned will be verified in the present database. In case of unknown face, a template will be generated then stored. Otherwise, in case of known face, actual template is matched with templates stored in the database. Furthermore, the owner will be notified, through his mobile phone recognition, based on principal component analysis (PCA), is programmed and implemented on the platform. This paper reviews

the related work in the field of home automation systems and presents the system design, software algorithm, implementation and results. The main goal of this paper is to create an intelligent doorbell system mainly based on human face identification. To achieve the described functioning, we subdivide the face recognition process into three Extraction and Face Recognition. In this paper, face recognition system has been developed in order to study the potential application for home automation door security with real time response and better recognition rate. The data that is collected during the face detection is a personal data that may be misused. so, it must be secure with good securities practices.

#### B. RASPBERRY PI BASED SMART DOORBELL SYSTEM WITH ADVANCED ENCRYPTION SCHEME

This paper [2] aims as to discuss the IOT based doorbell with enhanced security features at a small cost with the help of Raspberry pi toolkit. This new concept includes the security concerned issue in an effective manner. Our paper aims as to connect any door system with internet and to make it more secure with help of MAC scheme. When you click the doorbell, the following form of notifications can be sent to the user's mobile appoint is a communication between outside and inside user when a phone call enables. The call will be activated using the GSM module connected to the Raspberry Pi. A speaker and microphone interfaced with the system enables the voice communication between the two persons at both ends. A snapshot of the person at the door. A script written in python is used to capture the image using the compatible webcam interfaced with the pi and to attach and send it to the user through mail. A text message with current time will be sent to the user using the GSM module. Proposed design in this paper is we are using concept of message authentication code. When you send a message from sender to receiver part then as we already discuss about firstly it takes snap from camera module and for



motion, we detect it part then it sends a message to receiver. But when we are sending message to receiver then it is not fully authenticated sometime intruder can crash it. So, to overcome this problem we do an encryption technique to make doorbell system more strong and powerful.

### C. AN IRIS AND VOICE RECOGNITION SYSTEM FOR A SMART DOORBELL

This paper [3] aims to discuss doorbell system is using both iris and voice recognition to verify the identity of the user who rings at the door. Since there is the involvement of biometric data, this information has to be properly handled. In particular, we designed our system in such a way that it can avoid to send or store any biometric data to the cloud. Iris Recognition is a biometric method of identifying people based on unique patterns within the ring-shaped region surrounding the pupil of the eye. Every iris is unique to an individual, making it an ideal form of biometric verification. Voice recognition is the ability of a machine or program to receive and interpret dictation or to understand and carry out spoken commands. The doorbell system is using both iris and voice recognition to verify the identity of the user who rings at the door. Since there is the involvement of biometric data, this information has to be properly handled. In particular, system is designed in such a way that it can avoid to send or store any biometric data to the cloud. The major two blocks focused in this paper are speaker identification block and iris recognition block. This paper focuses on the design process related to a Smart Home solution, which involves a system, like the AXIOM platform, capable of performing the extraction and analysis of biometric features of voice, face and iris using as input the recordings of the voice and iris capture. Previous work on smart doorbell has been performed on voice and iris recognition separately but in this paper combination of both voice and iris recognition is seen. In this paper smart doorbell system is thus experienced combining a novel Cyber-Physical Board

called the AXIOM board with a standard doorbell system, in order to provide a convenient acceleration of compute intensive recognition functions, such as voice-recognition and iris recognition via machine-learning techniques. We can gain a better performance and also energy reduction. Iris detection is very costly and requires too many datasets, also it is very complicated. the install of the iris detection modules is also not possible handy products. as it requires too much of high-end machines.

### D. SMART DOORBELL SYSTEM BASED ON FACE RECOGNITION

This paper [4] aims to discuss how to recognise a face is introduced face recognition system is an intelligent application which can recognise or confirm a man from advanced sources. This project uses the Eigen faces algorithm using OpenCV library to perform face recognition. The main goal of this work is to form an intelligent doorbell system based on human face identification. The primary half involves the face detection with the help of hair like filters then look for likeness within the database entries. A system with the ability to distinguish and recognize faces has numerous potential applications including crowd and airport surveillance, private security and enhanced human-computer interaction. In this paper, how to recognize a face is introduced; for evaluating the proposed system, the author has used two analysis algorithms which are Eigen face and Independent Component Analysis (ICA). Face recognition have various advantages like increase in security and airport surveillance, it also advances the human-computer interaction in a better way. A system proposed here will aid people having hearing impairment or are completely deaf, to intimate about someone on the door. People suffering from loss of hearing face difficulty in knowing the presence of any visitor at the door using conventional doorbells. This system uses facial recognition to intimate the owner about the person's identity and if the user is unknown to the user, it will ask to add the person to the

database or no. The system is based on the criteria of low power consumption, resources optimization, and enhanced operation speed. This paper reviews the related work in the field of home automation systems and presents the system design, software algorithm and implementation. This project is mainly based on image processing by porting the OpenCV library to the Raspberry Pi board. The proposed system mainly consists of two parts, which are pre-processing and image recognition. Face recognition approach offers are great advantage which is user-friendly, easy to build, cheap at cost and effective. Face detection can be further enhanced using voice recognition. We can also develop the same system in 3D using Hadoop we can inculcate call-handling by an IMS- HHNB based interface doorbell.

#### E. SMART SECURITY SURVEILLANCE USING IOT

This paper [5] aims to discuss system is proposed for development of security surveillance system using Raspberry Pi along with PIR motion sensor and camera module smart security surveillance using IOT with PIR sensor and camera module is an interesting idea to involve detection of sensing of the moving object and generate responses for better security. Experimenting with PIR sensor in association with camera module for detail understanding of the motion sensing and thereafter triggering of the camera module and detection of intruders on real time basis. The proposed system is based as PIR sensor and camera module connected to Raspberry Pi along with other system peripherals. In this paper, the work has been done using sensor and camera, the system detects motion in front of the door and capture image which is then sent to the user's cell phone along with the image in the email inbox and a detection message. A camera module is deployed to capture the picture of the visitor and stream a video on the basis of passive infra-red PIR sensor. In the future ,AI can be added to the system for identification and recognising the gesture of the visitor using CV.The proposed system using PIR sensor and camera module can be further

enhanced for face detection and recognition based on threshold of changes and using CV.The purposed system using PIR sensor and camera module can be further enhanced for face detection and recognition based on threshold of changes and using CV.

#### F. VOICE BASED HOME AUTOMATION SYSTEM USING RASPBERRY PI

This paper [6] aims to discuss, Voice Based Home Automation System is the idea which corresponds to new era of automation and technology. Voice Using Raspberry Pi, this project is very useful for old age people and disabled people, basically for one's who cannot perform basic activities efficiently. In this paper main aim is to control electrical home appliances by android voice commands using Wi-Fi as communication protocol between Raspberry Pi and An- droid device. In this paper, work has been done on android

application where a user will provide voice commands for controlling devices such as "Turn light on" which will be connected to Raspberry Pi and according to it the required process will work via Wi-Fi. Technologies used in this paper are Raspberry Pi and Android. Working of the system in the paper is that the voice command is given as input to android device which is connected to raspberry pi and the output from raspberry pi is given to relay switch. Relay switch is connected to electronic device which does the main function of switching on/off. Further this paper can be enhanced by giving voice authentication to provide security. The smart Doorbell can be made by implementing voice and video calls with the person standing right outside the door and the owner remotely. We can also add sensors, by using sensors we reduce the effort of declaring each and every device a particular name

### G. SMART BELL NOTIFICATION SYSTEM USING IOT

This paper [7] aims to discuss, Smart Bell Notification System uses microcomputer, Raspberry pi, camera, PIR sensor, Buzzer. This paper signifies the steps towards the smart home and living. In today's day to day life there is inconvenience in trends if delivery is faced by customer and delivery person if the concerned one is not present at his home. It gives the idea about the same doorbell which is helpful for the friends and relatives who visit our place unannounced. Using the microcomputer, 'Raspberry pi', the smart doorbell, it solves the problem of visitors remaining unattended in case the concerned person is not available. This smart doorbell alerts you when the bell is rung and lets you see and speak with visitors from your smartphone, anytime and anywhere. The medium of the course is INTERNET. The doorbell system also includes an inbuilt "Face Recognition" Module which distinguish between the known persons and unknown persons. It is also enable and disable the notifications based on the user's preference. Limitation of the system is that the medium of the course is Internet but sometimes if the internet is not stable in user's smartphone it will fails to alert about notification. So, we will include SMS system to give the notification. The user will notify when doorbell rings even though if the user's internet is not stable or user is not online.

### H. FINGERPRINT MODULE BASED DOOR UNLOCKING SYSTEM USING RASPBERRY PI

This paper [8] aims to discuss, Fingerprint Module based Door Unlocking System Using the Raspberry Pi microcontroller. Fingerprint recognition is one of the most popular method of biometric technology as compared to other biometrics such as face, voice, and retinal scan. fingerprint recognition can be considered more natural. The hardware components are described which is used for the doorbell system. Raspberry Pi 3 Board, Fingerprint Module, Relay, USB Web camera, Buzzer, Solenoid Lock. The

Raspberry Pi consider the input from the fingerprint module and when the details are match then the system automatically provides access to the owner by unlocking the door using a solenoid lock. The system also captures the image of the intruders and subsequently sends an email with intruder alerting message with the face image of the intruder to the owner using the IoT based Wi-Fi technology. Limitations The medium of sending the message with the picture of intruder is Internet. So, if Internet connection is not working well the doorbell system fails to alert So, we can implement the system by adding SMS system, so there is no need to depend on internet only.

### I. APPLICATION AND DESIGN OF AUTOMATION COMMUNICATION DEVICES

This paper [9] aims to discuss, Application and Design of Automation Communication Devices. Digital doorbell designed which includes the special features, they are as followed: The digital doorbell can provide some LCD text and voice prompts, which is very useful for the visitors. The digital doorbell can "remember" the information of visitor, then the owner will know when he is not at home. This doorbell plays different music when different visitors will come. Besides a doorbell, it can also be used as a ordinary clock by adding Real-time clock or calendar circuit which provides seconds, minutes, hours, day, week, month, year information. Limitations of the system is we may need to pay for monthly cloud subscriptions to enable you to have a continuous recording of videos recorded.

### J. ACCESS CONTROL OF DOOR AND HOME SECURITY BY RASPBERRY PI THROUGH INTERNET

This paper [10] aims to discuss, Access Control of Door and Home Security by Raspberry Pi Through Internet, A new system is design which would control the door through the internet. The raspberry pi micro controller is used to capture all the signals. The mini

raspberry pi has different input and output interfaces. The input section consists of calling bell, PI sensor and wireless camera. And the output section contains the led, magnetic lock, emailing and tweeting services. As soon the raspberry pi captures the signal the webcam gets activated and takes a snapshot of the visitor and also activates the alarm buzzer so that the user comes to know about the presence of the visitor. These data of the visitor are then sent to the user by email. If the user wants to give the access to visitor the doors open using the servo motor. The user can see from anywhere that who is visiting the door. The system also keeps the picture of the visitor. The limitations of the system is that it completely depends on the Internet connection to communication with the user and send the details. So, the system can be implemented the using SMS system.

#### K. DASH BELL: A LOW -COST SMART DOORBELL SYSTEM FOR HOME USE

This paper [11] aims to discuss, A low cost smart doorbell system for the home use. Doorbell are playing an important role in protecting the modern homes. When the user is not a home there is no any medium through which the user will get to know about the visitor visiting the door, or their no such a smart medium to keep the record. Due to these the smart doorbells came into picture. To solve these problems the doorbell can be simply connected to the user's smart device such as a computer, mobile or a tablet through which the user can communicate with the visitor and also can keep the record. However, such Doorbells are expensive due to technical and manufacturing difficulties. To solve these problem Dash bells was introduced. Dash bell is a low-cost bell which consists amazon dash button to serve the doorbells. It is connected through Internet through which the user can communicate easily with the visitor with any smart device and from anywhere. As Dash bell has several useful features, but it has few limitations there are many security and privacy issues with the Dash bell. Since the device is connected to

home Internet network the unauthorised user can still the data. So, there is need to keep the network secured with password. As the system is completely depend on Internet so many issues occur. So we are implementing message system so that the system will not depend on the Internet all time and the unauthorised cannot access it easily.

#### L. IOT SMART BELL NOTIFICATION SYSTEM: DESIGN AND IMPLEMENTATION

This paper [12] aims to discuss, IOT Smart Bell Notification System, implementing a security system that combines the functions of smartphone and home network systems. It enables the users to monitor visitors in real-time, remotely via the IoT- based doorbell installed near the entrance door to a house. When a visitor is on the door and pressing the doorbell, the device records and sends the CCTV of the visitor to the user. Our system provides a convenient user interface for the user to view the CCTV and take appropriate action accordingly. This is implemented by interlocking with the real-time SMS server that sends a warning message to the user when the doorbell is pressed. Or in case an outsider breaks into the house, the system can help identify the trespasser by acquiring CCTV evidence. Furthermore, this system can be used to report to the police or home security service provider immediately when a trespass occurs. Our smart bell system presented in this paper supports video, saving images, warning notice, GUI features. Existing products use the transmission protocol and use the internet standard protocol. There is an advantage that it is easy to access the system. More features can be implemented like voice recognition and face recognition functionalities can be augmented to strengthen the security system. The limitation of the system is delay in data transfer from the doorbell unit to your smartphone.

#### IV. PROPOSED SYSTEM

In this proposed system, we are having database of authorized person list by registering their faces by entering OTP, so that non authorized person can't able to enter the home until they entering the OTP. Whenever some person presses calling bell switch, the camera gets triggered and capture the image of the intruder and checks that the image to the database, if that face is not matching with the database, it sends an email containing that intruder image and OTP, when intruder type the OTP by the owners' knowledge then it allows to enter.

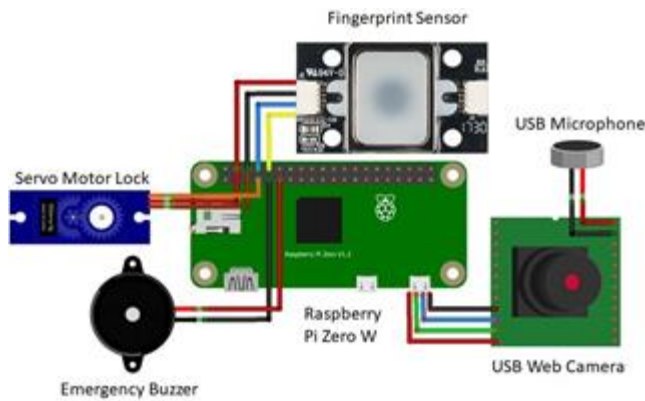


Fig. 2. Proposed System.

With face detection the system will be accompanied with voice recognition method which will add more updated face to the system. Voice recognition will be based on the detection of voice and speech. Also, the system will be equipped with motion detection system.

#### V. METHODS

##### 1) Image Processing

Image processing, set of computational techniques for analysing, enhancing, compressing, and reconstructing images. Its main components are importing, in which an image is captured through scanning or digital photography; analysis and manipulation of the image, accomplished using

various specialized software applications; and output (e.g., to a printer or monitor). Image processing has extensive applications in many areas, including astronomy, medicine, industrial robotics, and remote sensing by satellites.

##### 2) Digital Signal Processing

Digital signal processing (DSP) is the process of analysing and modifying a signal to optimize or improve its efficiency or performance. It involves applying various mathematical and computational algorithms to analog and digital signals to produce a signal that's of higher quality than the original signal.

##### 3) Speech to Text Processing

Speech-to-text technology is a type of technology that effectively takes audio content and transcribes it into written words in a word processor or other display destination. This type of speech recognition technology is extremely valuable to anyone who needs to generate a lot of written content without a lot of manual typing. It is also useful for people with disabilities that make it difficult for them to use a keyboard. Speech-to-text technology may also be known as voice recognition technology.

#### VI. EXPECTED THEORETICAL RESULTS

The expected theoretical results will be as follows:-

- The face detection would be carried out with at least 97% accuracy.
- The voice recognition module would be working with speech to text and would be working with at most 98% accuracy.
- The whole mechanism would be running on minimum power usage and maximum efficiency.
- The motion detection would be carried out for real time harmful objects.

#### VII. CONCLUSION

This system can also be reconfigured to detect the intruder who are not pressing the doorbell, whose

face get captured and follows the same authorization process to know the intruder who tries to open the door. Which can be very useful to monitor the home remotely. And also, for the owner the system will behave in another manner where it will not perform the same process for the owner i.e. processed for an unknown person it will just recognize the voice and face and the door will be opened.

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## A Study on Comparison of Efficiency of Low-Density Polythene (LDPE) Degradation Under Aerobic and Anaerobic Conditions by Microorganisms Isolated from Soil

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### ABSTRACT

Plastic has many desirable properties and thus, possesses several varied applications. This has led to a rise in its production and over the years, it has caused plastic pollution. Biodegradation is an affordable and more environment-friendly method compared to the other techniques currently available to eliminate plastic. The aim of this study was to isolate LDPE degrading microbes from soil samples that were collected from 4 different sources in Mumbai and compare their respective LDPE % degradation rates. Isolation of potential plastic degraders was carried out on Bushnell Haas agar that was overlaid with LDPE strips. The final biodegradation rate was calculated by the weight loss reduction method after an incubation period of one month under aerobic and anaerobic conditions. For identification of the bacteria, gram staining and Matrix Assisted Laser Desorption/Ionization- Time of Flight (MALDI-TOF) Mass Spectroscopy were performed and several colony characteristics were studied. For identification of fungi, Potato Dextrose agar containing chloramphenicol was used as the selective media, and Lacto Phenol Cotton Blue staining was performed. Two facultative anaerobic bacterial isolates, *Bacillus* sp. and *Staphylococcus cohnii* ssp. *urealyticus* with LDPE degradation rates of 9.8% and 5.57% respectively, and a highly aerobic fungus, *Aspergillus niger*, with a degradation rate of 12.13% were found. Fungi showed the maximum rate of biodegradation. *Bacillus* species exhibited an almost double degradation capacity as compared to that of *Staphylococcus* species. To improve the biodegradation capacity, the optimum conditions for microbial growth and enzyme production can be assessed and these findings can be applied commercially on a larger scale.

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## I. INTRODUCTION

Solid waste consists of unwanted materials generated due to human activities in housing, industrial, and commercial sectors. It has been found that solid waste comprises 10% of the total waste generated worldwide out of which 60-80% is plastic waste. These figures have skyrocketed over the years and reached an alarming rate of 230 million tonnes per year [1,2]. Central Pollution Control Board reports state that currently plastic usage in India stands at about 8 million tonnes per year out of which 5.7 million tonnes of waste is produced [3].

Plastic waste has escalated over the years due to a surge in its demand, sales, and consumption. This is mainly because it possesses many desirable properties such as it is quite strong, durable, lightweight, elastic, cheap to produce, resistant to corrosion, and has high thermal and electrical resistance, making it ideal for varied applications [4]. A major problem that arises due to plastic pollution is the ingestion of microplastics [5] by aquatic animals such as turtles, whales, seals that accidentally mistake them for food. This can cause blockage of their digestive systems and may lead to death, reduced levels of gastric enzymes and steroid hormones [6]. Marine creatures also get caught up in discarded plastic items like fishing nets [7]. Suspended plastic particles in the ocean may consist of highly toxic chemicals like PCBs, DDT, BPA, etc. [8] that undergo severe bio-amplification and can pose a direct risk to human health as well [9].

Since plastic is non-biodegradable or may potentially take several years to degrade [10], it continues to accumulate and harm the environment. Plastic pieces were found to interact with water and form hazardous chemicals which then seep underground and degrade the groundwater quality [11]. It also has a negative impact on the economy since it imposes additional costs of cleaning and disposal and affects tourism adversely [12].

Polyethylene (PE) is the most common type of solid waste produced. It is the result of addition or radical polymerization of ethylene molecules, in the presence of Ziegler Natta and Phillips catalysts [13].

The current methods used majorly to eliminate plastic include incineration and dumping in oceans or landfills. During incineration, toxins like dioxins, furans, heavy metals, and greenhouse gases are released into the atmosphere that contributes to severe air pollution [14]. Improper dumping of plastic wastes contaminates the environment and negatively affects the overall biodiversity [15]. These disposal methods have major limitations, making them highly ineffective. Thus, it is vital to switch to other alternatives.

One of them is oxidative degradation that occurs in the presence of oxygen free radicals. It is of 2 types: Photo-degradation and thermo-degradation [16]. Another method is biodegradation which is comparatively more affordable and an environment-friendly method that makes it very widely accepted. However, its efficiency is moderate and it takes a longer period of time. This is a natural process wherein different types of microorganisms degrade complex organic materials, either aerobically or anaerobically. Aerobic biodegradation results in the production of water and carbon dioxide as end-products whereas during anaerobic biodegradation, water, carbon dioxide, and methane are produced [17]. Some examples of microbes that exhibit biodegradation activity are bacteria (*Pseudomonas*, *Streptococcus*, *Micrococcus*, and *Moraxella*), fungi (*Aspergillus*), algae, and actinomycetes [18].

The primary objective of this study was to perform screening of soil samples that were collected from various locations in Mumbai city to isolate and identify certain microbes that exhibit significant LDPE biodegradation activity.



## II. METHODS AND MATERIALS

### A. Sample Collection:

20-30 grams of soil samples (4-5 cm from the soil surface) were collected from 4 different locations in Mumbai and stored in sterile, airtight containers.

Soil Sample	Location
Garden Soil	Lokhandwala
Forest	Versova
Dumping Ground	DN Nagar
Mangrove Soil	Lokhandwala

**TABLE 1: SOIL SAMPLE TYPE AND LOCATION**

### B. Enrichment and Isolation of Potential LDPE Degrading Microbes:

20 g of each soil sample type was added separately to flasks containing sterile 200 cm<sup>3</sup> Bushnell Haas broth [19] and 0.5 g of sterile 1cm<sup>2</sup> LDPE strips, in order to prepare 4 sets. After incubation for 30 days at room temperature, a loopful of inoculum from all 4 sets was streaked separately on sterile Bushnell Haas agar plates that were coated with sterile 0.5 g 1cm<sup>2</sup> LDPE strips (Fig 1) [20]. These four plates were then incubated at 37 °C for 5 days.



**FIGURE 1 : LDPE STRIPS (INDICATED IN BLACK ARROWS) OVERLAID ONTO SOLIDIFIED BUSHNELL HAAS AGAR IN PETRI PLATE**

### C. Obtaining Pure Culture and Checking Growth Under Aerobic and Anaerobic Conditions:

Pure colonies that exhibited rapid growth on the LDPE strips were selected. Each colony was separately streaked on a sterile Bushnell Haas agar plate that was overlaid with sterile 0.5 g 1cm<sup>2</sup> LDPE strips under aseptic conditions and incubated at 37°C for 5 days under aerobic conditions. The pure colonies were sub-cultured on sterile Nutrient agar slants and stored at 4°C for further studies.

The growth of these pure isolates was further checked under anaerobic conditions. Each isolate was streaked on a sterile Bushnell Haas agar plate that was overlaid with sterile 0.5 g 1cm<sup>2</sup> LDPE strips. A lit candle was placed in a glass jar and then it was tightly shut. Petroleum jelly was applied on all the edges in order to ensure that the jar was completely air-tight and no oxygen could enter inside. The above-prepared plates were then placed into this airtight, anaerobic glass jar which was saturated with carbon dioxide for a period of 5 days [21]. It was vital to leave this set-up undisturbed during the incubation time of 5 days.

### D. Bulk Growth of Pure Isolates:

A loopful of each pure isolate was inoculated in sterile 100 cm<sup>3</sup> nutrient broth [22]. This was incubated at 37°C for 10 days.

### E. Determination of LDPE Degradation Rates of Isolates:

The bulk growth of each pure isolate (approximately 0.25g) was added to a conical flask containing sterile 100 cm<sup>3</sup> Bushnell Haas broth and sterile 0.5 g 1cm<sup>2</sup> LDPE strips. The flasks containing aerobic cultures were incubated at 37°C for 30 days and the flasks containing facultative anaerobic/ anaerobic cultures were placed in an airtight anaerobic glass jar for 30 days. A control flask was simultaneously maintained in both cases. After 30 days, the LDPE strips were

extracted from the broth using forceps, washed thoroughly with tap water first and then distilled water, cleaned using 70% alcohol, and finally dried on filter papers. It was vital to ensure that culture was not stuck to the LDPE strips as this could add to the final weight.

The final weight of the strips was recorded and the LDPE degradation rates, i.e., % weight loss for the respective isolates was calculated by the given formula [19]:

$$\text{LDPE \% degradation rate} = \frac{\text{initial weight (in g)} - \text{final weight (in g)}}{\text{initial weight}} \times 100$$

#### F. Identification of the isolates:

The bacterial isolates were identified based on gram staining, their colony characteristics, and MALDI-TOF MS results [23]. Fungal isolates were identified by the colour and morphology of the aerial mycelia on 2% Potato dextrose agar (with chloramphenicol) as a selective media [24], followed by LPCB staining with reference from keys by Raper and Fennell [25].

### III. RESULTS AND DISCUSSION

#### A. Enrichment and Isolation of Potential LDPE Degrading Microbes:

The enrichment step was important for the microbes to recognize LDPE as the new carbon source. A period of 30 days was chosen for this as it gave the microbes adequate time to get acclimatized to the new environment by increasing the production of extra-cellular enzymes that help in cleaving the large, high molecular weight polymers into smaller fragments that are further biomineralized into end-products. In most cases, these end-products are carbon dioxide, water, and methane [18]. They are harmless and can easily be used up by the microbes as a form of energy source. Similar work was carried out by Asmita et al wherein Bushnell Haas broth was

selected as the enrichment medium and the enrichment process was carried out for 30 days [19]. Bushnell Haas media contains all the essential nutrients required for microbial growth; however, it does not contain any carbon source. LDPE in the form of strips was chosen as the sole hydrocarbon source for the microbes.

After incubation of all the plates, it was seen that only the plates belonging to sets 2, 3, and 4 showed the presence of distinct microbial colonies on the LDPE strips. This indicated that soil samples belonging to the forest, dumping ground, and mangrove, respectively, contained certain microbes that were able to utilize LDPE as the sole hydrocarbon source and so they were able to grow on the strips. These colonies were selected and studied further.

#### B. Checking Growth of Pure Isolates Under Aerobic and Anaerobic conditions:

3 pure colonies that were seen to be rapidly growing on the LDPE films on the Bushnell Haas media were selected. This kind of media preparation is similar to Das et al wherein 3% LDPE powder was added to the growth media [26]. In this study, instead of adding LDPE powder to the media, LDPE strips were overlaid onto the solidified growth media. The oxygen requirements of the colonies were further determined. To prepare the anaerobic gas chamber, the same method was followed as stated by Saha et al. A lit candle was placed in an air-tight glass chamber in order to completely saturate it with carbon dioxide. This method was chosen since it is more economical as compared to other commercially available equipment that require reagents like bicarbonate solution [21]. The 2 bacterial isolates were found to be facultative anaerobic while the only fungal isolate was highly aerobic.

C. Determination of LDPE degradation rates of isolates:

Sets 1 and 2 (Fig 2) contained bacterial isolates 1 and 2, respectively, and set 3 (Fig 3) contained isolate 3 which was a fungus. The initial and final weights of LDPE strips were recorded for all 3 isolates (Table 2) and the LDPE biodegradation rates were calculated by weight reduction method and compared with each other (Graph 1). This work can be compared to Das et al wherein weight-loss method was used as well. This was found to be the most convenient and simplest method compared to all the other possible methods such as SEM and FTIR analyses [26]. During the biodegradation process of 30 days, the flasks were left undisturbed which confirms the fact that the microbes were only able to grow by utilizing LDPE.

It was determined that the fungal isolate exhibited the greatest LDPE biodegradation rate of 12.13%. On the other hand, bacterial isolates 1 and 2 had degradation rates of 5.57% and 9.8%, respectively. This result is in accordance with existing literature that states fungi have a much higher biodegradation capacity as compared to bacteria. This is because fungi have the ability to attach to polymer surfaces with the help of extracellular polysaccharides and form biofilms. Biofilms aid in decreasing the hydrophobicity of LDPE so that the extracellular enzymes can conduct fragmentation more easily. Fungi also produce thin, long hyphae that allow them to penetrate further and reach longer distances in the search for nutrients. This helps them to survive longer than bacteria under harsh conditions, for example, nutrient starvation [26,27].



FIGURE 2: CONTROL, SET 1, SET 2 (FROM LEFT TO RIGHT)

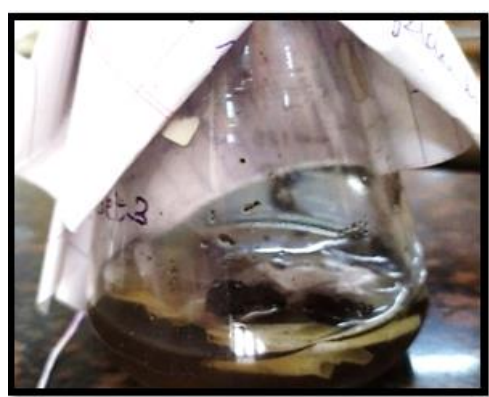
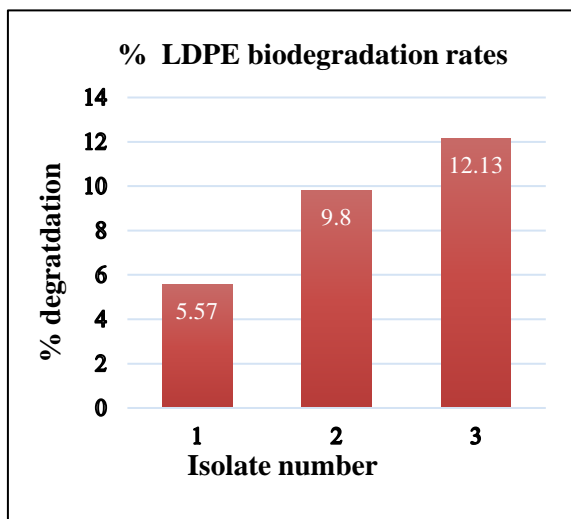


FIGURE 3: SET 3

Isolate	Initial wt (g)	Final wt (g)	LDPE % biodegradation rate
1	0.503	0.475	5.57
2	0.510	0.460	9.8
3	0.445	0.391	12.13
Control	0.520	0.520	0

TABLE 2: LDPE % BIODEGRADATION RATES



**GRAPH 1:** COMPARISON OF LDPE % BIODEGRADATION RATES OF ISOLATES

**D. Identification of Bacterial Isolates:**

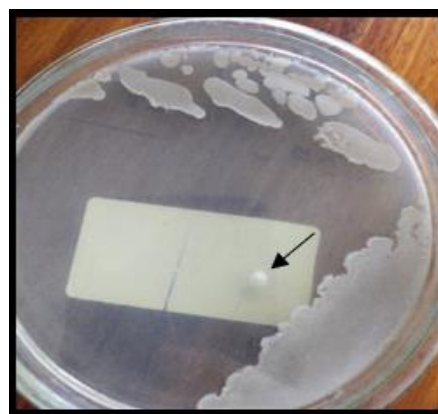
On performing gram staining and observing under the microscope, it was seen that isolate 1 had purple cocci, in singles or clusters. Isolate 2 had purple rods, in singles or pairs. Various colony characteristics of both isolates were studied (Table 3). MALDI-TOF MS was performed. This technique allows the identification of a wide spectrum of proteins which aids in classifying the isolates at a species level. This was found to be rapid, cost-effective and more sensitive towards the identification of anaerobes as compared to other techniques [28]. Since both the bacterial isolates in this study were determined to be facultative anaerobic, this technique was chosen.

Isolate 1 was *Staphylococcus cohnii* ssp. *urealyticus* (Fig 4) and isolate 2 was *Bacillus subtilis/ amyloliquefaciens/ vallismortis* (Fig 5). The final MALDI-TOF MS results obtained for isolate 1 (Fig 6) and isolate 2 (Fig 7) are shown below.

	Isolate 1	Isolate 2
Size	1 mm	3 mm
Shape	circular	circular
Colour	white	white
Margin	entire	entire

Surface	smooth and shiny	smooth
Elevation	raised	raised
Consistency	butyrous	butyrous
Opacity	translucent	opaque
Pigmentation	absent	absent
Gram nature	+	+
Morphology	cocci	bacilli
Arrangement	Singles or in pairs	Singles or in pairs
Motility	Non-motile	motile

**TABLE 3:** COLONY CHARACTERISTICS OF BACTERIAL ISOLATES



**FIGURE 4:** PURE *STAPHYLOCOCCUS* SPECIES COLONY (INDICATED BY BLACK ARROW) ON NUTRIENT AGAR SELECTED FOR MALDI-TOF MS ANALYSIS (ISOLATE 1)



**FIGURE 5:** PURE *BACILLUS* SPECIES COLONY (INDICATED BY BLACK ARROW) ON NUTRIENT

AGAR SELECTED FOR MALDI-TOF MS ANALYSIS  
(ISOLATE 2)



**FIGURE 6:** MALDI-TOF MS REPORT FOR ISOLATE-1 (*STAPHYLOCOCCUS COHNII* SSP. *UREALYTICUS*)

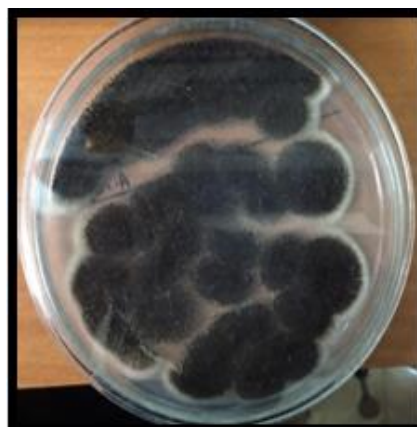


**FIGURE 7:** MALDI-TOF MS REPORT FOR ISOLATE-2 (*BACILLUS SUBTILLIS/ AMYLOAQUEFACIENS/ VALLISMORTIS*)

E. Identification of Fungal Isolates:

The fungal isolate was cultured and purified on selective media (2% potato dextrose agar that contained chloramphenicol) that was prepared in a way similar to Shafique et al [29]. It was seen that the colonies were initially colourless but after 2-3 days, they became brownish-black (Fig 6). Further, Lactophenol Cotton Blue (LPCB) staining was carried out. On observing the fungal isolate under 40X,

conidial heads, long conidiophores, and septate hyphae could clearly be seen (Fig 7). Metulae and phialides were seen to be covering the globular vesicles. Spores produced from conidial heads were seen as well which is a distinguishing feature of *Aspergillus niger*. These findings were in line with what was seen in previous studies [30]. To confirm the presence of *A. niger*, keys by Raper and Fennel were followed [25].



**FIGURE 8:** *ASPERGILLUS NIGER* ON POTATO DEXTROSE AGAR



**FIGURE 9:** LACTO PHENOL COTTON BLUE (LPCB) STAINING OF *ASPERGILLUS NIGER* SHOWING CONIDIAL HEADS AND SEPTATE HYPHAE (ENCIRCLED)

#### IV. CONCLUSION

Biodegradation of plastics is a more suitable and widely accepted alternative to the other methods currently used as it is relatively more cost-effective and eco-friendlier. In this study, many microbes isolated from soil were screened for their ability to utilize LDPE as the sole hydrocarbon source in the presence of Bushnell Haas media. Two facultative anaerobic bacterial isolates, *Staphylococcus cohnii* ssp. *urealyticus* and *Bacillus subtilis*/ *amyloliquefaciens*/ *vallismortis*, and one highly aerobic fungal isolate, *Aspergillus niger*, were found to exhibit significant LDPE percentage biodegradation activity of 5.57%, 9.8% and 12.13%, respectively. Fungi were seen to have the maximum biodegradation activity.

This study compared biodegradation rates of only LDPE. Toxicity testing for the end-products of biodegradation was not carried out. Since MALDI-TOF MS analysis was done, the bacterial isolates were determined accurately only up to species level. In the future, 16S rRNA sequencing can be done for more accurate determination. The biodegradation activity of these isolates on other types of plastics could be studied as well. Metagenomics studies could also be carried out to identify the primary genes responsible for the biodegradation activity.

#### V. ACKNOWLEDGEMENT

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# Structural Equation Modelling Approach to Determine the Mother and Child Health Care in Madurai District, Tamil Nadu

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## ABSTRACT

The present study attempt to describe the determinants of mother and child healthcare in Madurai District. To assess whether the exogenous constructs are highly correlated to each other and to identify the type of mediation exists in a model. The information was collected from the mother(s) lives in 13 blocks of Madurai district. The data collected for the year 2017-2018 and each block, 50 mothers were selected (13X50) and totally 650 samples were collected by random sampling method and they are the respondents of this study. The questions are related to their socio-economic status, attitude towards antenatal healthcare providers, healthcare utilization, child care, health problems, and psychological conditions. This information was transformed and confirmatory factor analysis was performed using SPSS software. Further, for the interpretation and findings, factor analysis, discriminant validity, path analysis with structural equation model (SEM) (direct relationship) and bootstrap approach (indirect relationship) was carried out by using AMOS software to validate the type of mediation found in this study. Hence, this study analyses the relationship of selected variables with mother and child care of women in the study area.

**Keywords** : SEM, AMOS, SPSS, Confirmatory Factor Analysis, Bootstrap Approach

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## I. INTRODUCTION

The healthy mother delivers a healthy baby and they are the future of a nation. Therefore, a nation should have healthy children to make a healthy nation. At this juncture, our country is making wonderful policies, planning and implementation through various healthcare programmes for the care of mother and child health. Structural equation modelling is a

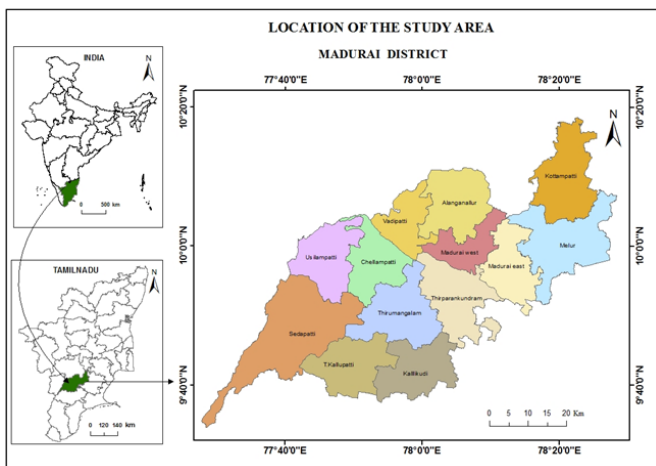
mediation model and to conduct a formal test on mediation effects. The effect of the independent variable on the dependent variable is triggered by the mediator variable. Such an effect was termed as an indirect effect (Shrout & Bolger, 2002). Aiken, West, Woodward, Reno, and Reynolds (1994) examined the mediating effects of four perceptions perceived susceptibility to breast cancer, perceived severity of consequences of breast cancer. Constantine (2007)



examined the mediating roles of general and multicultural counselling competence and client-counsellor therapeutic alliance in the relationship between subtle racist denigration and satisfaction with counselling.

The testing of multiple mediation hypotheses is somewhat arcane, relative to those for simple mediation and only a few authors (Bollen, 1987, 1989; Brown, 1997; Cheung, 2007; MacKinnon, 2000). Antenatal care is the care given to pregnant women so that they have a safe pregnancy and a healthy baby (Abose Z, Woldie M, Ololo S (2010)). Antenatal care visits to identify the complications like preterm delivery and manage these complications in a timely manner (Finlayson K, Downe S. (2013). The first visit is important because that is when a woman receives a complete assessment of gestational age and the risk factors (WHO Global Health Observatory, 2011).

### Study Area



**Fig. 1** Location of the Study Area

Madurai District is situated in the south of Tamil Nadu State with an area of 143.08 km<sup>2</sup>. According to 2017-2018, Statistical Handbook of Madurai District the density of population is 812 per sq.km. It is the ninth-largest populated district in Tamil Nadu. In the year 1984, Madurai District was bifurcated into two administrative division Madurai and Dindigul. Again in the year 1997, it was bifurcated as Madurai and

Theni Districts. Madurai is also known as Temple City. World Famous Sri Meenakshi Sundareshwarar Temple is in Madurai. Madurai District is influenced by various religions such as Christianity, Hinduism, Islam, Sikh, Buddhist and Jain which cause diverse entity. In the year 2011, Madurai Corporation was expanded from 72 wards to 100 wards and dividing into four regions (Fig.1). Madurai is known for its hot climate. The average annual rainfall for 2018 was 85.76 cm.

### II. Database and Methodology

This present study is based on a questionnaire survey. The information was collected from the mother(s) lives in 13 blocks of Madurai district. The data collected for the year 2017-2018 and each block, 50 mothers were selected (13X50) and totally 650 samples were collected by random sampling method and they are the respondents of this study. The questions are related to their socio-economic status, attitude towards antenatal healthcare providers, healthcare utilization, child care, health problems, and psychological conditions. This information was transformed and confirmatory factor analysis was performed using SPSS software. Further, for the interpretation and findings, factor analysis, discriminant validity, path analysis with structural equation model (direct relationship) and bootstrap approach (indirect relationship) was carried out by using AMOS software to validate the type of mediation found in this study. The three important techniques used in the present study SPSS, AMOS and GIS. The maps are prepared using GIS Software. ArcGIS is one of the important GIS software, which is used to prepare the maps. Hence, this study analyses the relationship of selected variables with mother and child care of women in the study area.

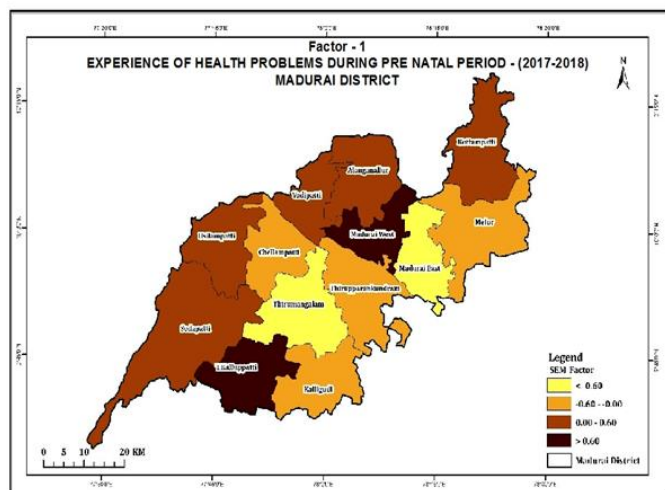
**III. Results and Discussion**

**Factor I : Experience of Health Problems during Pre-Natal Period**

Healthcare during prenatal period is more vital for mother, child and safe delivery. Thus, the first - factor healthcare during the prenatal period has emerged as a most important factor with the total variance of 19.033 per cent with an eigenvalue of 3.807 per cent (Table 1). Six out of twenty variables are positively loaded on this factor specifically, have you experienced any problems during the prenatal period (0.886), have you experienced any problem at the place of treatment during the prenatal period (0.847), did you get treated for any problems during the prenatal period (0.840), why are you not visiting any gynaecologist for treatment (0.707), did you take any special care during menstruation (0.687), and have you experienced any respiratory disease/asthma (0.618). As a result, the data set confirmed that the childbearing women in the study area are having experience of health problems during the prenatal period. The spatial pattern of experience of health problems during prenatal period in Madurai District of mean factor score is (Fig. 2) revealed that the high positive to low positive score observed in the blocks of T. Kallupatti (0.378), Madurai West (0.688), Sedapatti (0.475), Usilampatti (0.378), Vadipatti (0.378), Alanganalur (0.475), and Kottampatti (0.378) this clearly indicates that the health-seeking behaviours (post-natal healthcare) are highly satisfied in these blocks. Similarly, the low to high negative mean factor scores registered in the blocks of Chellampatti (-0.378), Kallikudi (-0.483), Thiruparankundram (-0.483), Melur (-0.391), Thirumangalam (-0.667), and Madurai East (-0.667). This is undoubtedly demonstrating that post-natal healthcare-seeking behaviours are dissatisfied for the above-mentioned blocks.

**Table 1.** Experience of Health Problems during Pre-Natal Period

Variable No.	Variable Name	Factor Loading	Communalities
Hc1	Have you experienced any problems during prenatal period	0.886	0.830
Hc2	Have you experienced any problem at the place of treatment during prenatal period	0.847	0.775
Hc3	Did you get treated for any problems during prenatal period	0.840	0.775
Hc4	Why are you not visiting an gynecologist for treatment	0.707	0.594
Hc5	Did you take any special care during menstruation	0.687	0.604
Hpp1	Have you experienced any respiratory Disease/Asthma	0.618	0.536
<b>Eigen value: 3.807</b>		<b>Total Variance: 19.033</b>	
Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization. Rotation converged in 6 iterations.			



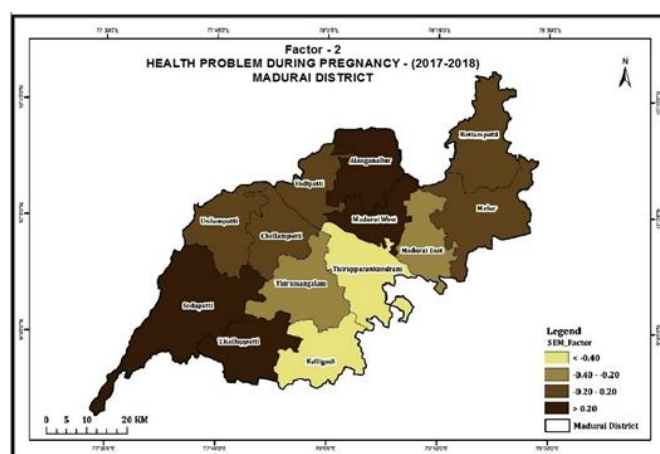
**Fig. 2.** Experience of Health Problems during Pre-Natal Period – (2017-2018)

**Factor II : Health Problem during Pregnancy**

All pregnant women are facing pregnancy complications, continuous monitoring of mother health condition and child growth is mandatory to reduce such problems. Therefore, the second most important factor health problem during pregnancy has emerged with a total variance of 17.918 per cent with an eigenvalue of 3.584 per cent (Table 2). According to the data set four and one out of twenty variables positively and negatively loaded on this factor respectively. Specifically, these variables are, do you get any kidney disease or urinary tract infections (0.881), do you have hepatitis liver disease/jaundice (0.853), did you get tuberculosis (0.844) and have you experienced abnormal Pap smear (0.771). However, the variable does you feel comfortable with sexual and reproductive health services in your area (-0.731) is negatively loaded on this factor, which reveals that the respondents are not satisfied with health service providers of this region. Therefore, maternal women in the study region are facing one or more pregnancy problems.

**Table 2.** Health Problem during Pregnancy

Variable No.	Variable Name	Factor Loading	Communalities
Hpp2	Did you get any kidney disease or urinary tract infections	0.881	0.779
Hpp3	Do you have hepatitis liver disease /Jaundice	0.853	0.735
Hpp4	Did you get tuberculosis	0.844	0.717
Hpp5	Have you experienced abnormal Pap smear	0.771	0.622
Psy1	Do you feel comfortable with sexual and reproductive health services in your area	-0.731	0.555
<b>Eigen value: 3.584</b>		<b>Total Variance: 17.918</b>	



**Fig. 3** Health Problem during Pregnancy – (2017-2018)

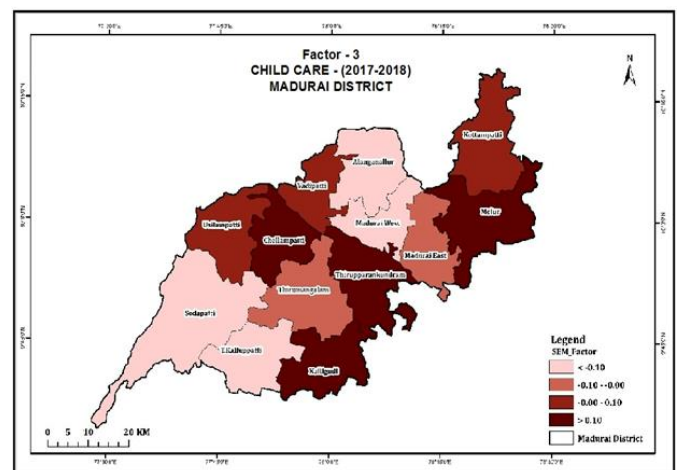
**Table 3.** Child Care

Variable No.	Variable Name	Factor Loading	Communalities
Cb1	What is the time duration of breastfeeding your children	.865	0.752
Cb2	What is the weight of the baby during delivery	.853	0.748
Cb3	Have you seen any abnormalities during birth	.816	0.715
Gp1	What are the types of labour and its complications	.811	0.694
<b>Eigen value: 2.955</b>		<b>Total Variance: 14.755</b>	

The fig. 3 illustrating the spatial pattern of mean factor score of Health problem during Pregnancy of Madurai District. The very high to high positive score are noticed in the blocks of Sedapatti (0.195), T. Kallupatti (0.177), Alanganalur (0.195), Madurai West (0.177), Usilampatti (0.127), Chellampatti (0.125), Vadipatti (0.127), Melur (0.125), and Kottampatti (0.127). The very low mean factor score perceived in the blocks of Thirumangalam (-0.157), Madurai east (-0.157), Thiruparankundram (-0.467), and (-0.467). This is evidently proved that the mean positive and negative factor scores exhibit satisfied and dissatisfied health problem during pregnancy in the blocks of Madurai district respectively.

**Factor III : Child Care**

The child is an important asset for a parent and nation. Healthy child’s nation is a wealthy nation. So, every parents and nation are looking healthy child. Thus, the third vital factor childbirth has emerged with a total variance of 14.755 per cent with an eigenvalue of 2.955 per cent (Table 3). Four out of twenty variables are positively loaded on this factor particularly what is the time duration of breastfeeding your children (0.865), what is the weight of the baby during delivery (0.853), have you seen any abnormalities during birth (0.816) and what are the types of labour and its complications (0.811). As a result, the reproductive mothers in this region are taking utmost care for their child. The areal differentiation of very high to high mean positive factor score for Childcare Madurai District established in the blocks (Fig. 4) of Chellampatti (0.111), Kallikudi (0.115), Thiruparankundram (0.115), Melur (0.111), Usilampatti (0.015), Vadipatti (0.015), and Kottampatti (0.015). The very low negative mean factor score recognized in the blocks of Thirumangalam (-0.060), Madurai East (-0.060), Sedapatti (-0.101), T. Kallupatti (-0.081), Alanganalur (-0.101), and Madurai West (-0.081) for the Childcare in Madurai District.



**Fig. 4** Child Care – (2017 – 2018)

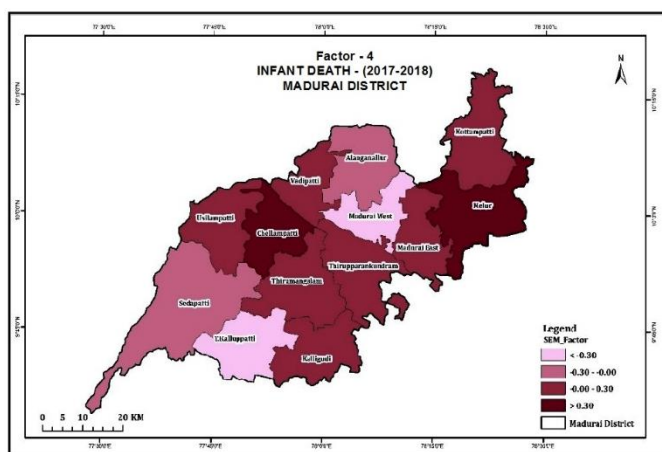
**Factor IV: Infant Death**

The occurrence of infant death is decreasing in India and its states particularly in Tamil Nadu because of the implementation of healthcare plan wisely. Thus, the fourth vital factor childbirth has emerged with a total variance of 9.365 per cent with an eigenvalue of

1.873 per cent (Table 4). Two out of twenty variables are positively loaded on this factor chiefly what is the number of infant deaths (0.770) and what is the health condition of educated pregnant women (0.675). In contrast, one variable was negatively loaded on this factor namely am I satisfied in my health condition (-0.671). Hence, the number of infant deaths related to the health condition of educated women and these variables are negatively loaded with the satisfaction level of mothers' health condition in this study area.

**Table 4.** Infant Death

Variable No.	Variable Name	Factor Loading	Communalities
Id1	What is the number of infant deaths	.770	0.731
Sec1	What is the health condition of educated pregnant women	.675	0.527
Psy2	Am I satisfied in my health condition	-.671	0.630
<b>Eigen value: 1.873</b>		<b>Total Variance: 9.365</b>	



**Fig. 5** Infant Death – (2017 – 2018)

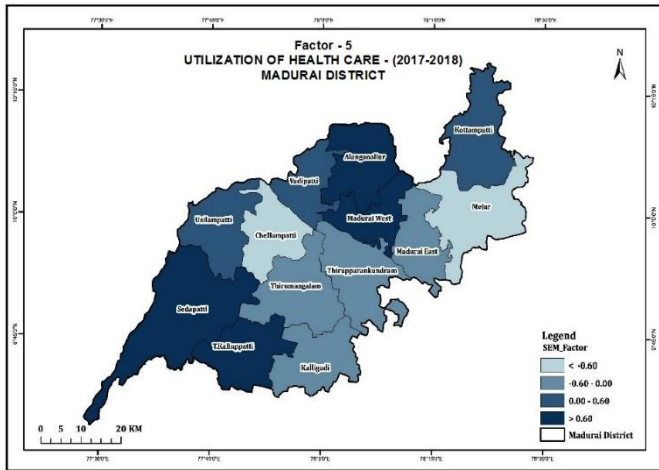
The very high to high mean factor score for infant death in Madurai District (Fig. 5) observed in the blocks Chellampatti (0.327), Melur (0.327), Usilampatti (0.083), Thirumangalam (0.103), Kallikudi (0.092), Thiruparankundram (0.092), Vadipatti (0.083), Madurai East (0.103), and Kottampatti (0.083). In contrast, the very low to low mean negative factor score for infant death found in the blocks of Sedapatti (-0.098), Alanganalur (-0.098), T. Kallupatti (-0.507), and Madurai West (-0.507).

**Factor V: Utilization of Healthcare**

The mother and child health condition mainly depends on the utilization of available healthcare centres in a region. Accordingly, this study area woman revealed that I received prenatal care during pregnancy (0.909) and I took medical check-ups during pregnancy (0.881). Thus, the fifth important factor utilization of healthcare has emerged with a total variance of 9.114 per cent with an eigenvalue of 1.823 per cent (Table 5). Therefore, these study area pregnant women receive proper healthcare services from the healthcare providers in time.

**Table 5.** Healthcare Utilization

Variable No.	Variable Name	Factor Loading	Communalities
Hu1	I received prenatal care during pregnancy	.909	0.845
Hu4	I took medical check-ups during pregnancy	.881	0.876
<b>Eigen value: 1.823</b>		<b>Total Variance: 9.114</b>	



**Fig. 6.** Utilization of Healthcare – (2017-2018)

The Spatial pattern of very high to high mean factor score of the utilization of health care in Madurai District (Fig. 6) in the blocks of Sedapatti (0.739), T. Kallupatti (0.604), Alanganalur (0.739), Madurai West (0.604), Usilampatti (0.075), Vadipatti (0.075), and Kottampatti (0.075). Likewise, the very low to low negative mean factor score observed the blocks of Thirumangalam (-0.508), Kallikudi (-0.217), Thirumangalam (-0.217), Madurai East (-0.508), Chellampatti (-0.693), and Melur (-0.693) in Madurai district.

**Regression Weights: Unstandardized and Standardized co-efficient**

The SPSS-AMOS data set outcome provides seven regression weights, unstandardized and standardized factor model (Fig. 7 and 8) structures for every path and its significance. Table 6 is representing the unstandardized coefficients and associated experiment statistics. The infant death goes up by 1 unit and child care goes down by 0.070 units. It has a standard error of about 0.075. Specifically, dividing the regression weight estimate by the estimate of its standard error gives  $z = -0.070/0.075 = -0.931$ . The regression weight for infant death in the prediction of child care is not significant because the p level is greater than 0.05. Therefore, the assumption (H<sub>1</sub>) infant death was not having significant impact on child care in this study

area. The child care increase by 1 unit and health problem during pregnancy increases by 0.017 units. The standard error is 0.006. Separating the regression weight estimate by the estimate of its standard error gives  $z = 0.017/0.006 = 2.637$ . Hence, the regression weight for child care in the prediction of health problem during pregnancy is significant (p=0.008) at the 0.001 level (two-tailed). As a result, the hypothesis (H<sub>2</sub>) child care has significant impact on health problem of women during pregnancy in this district.

The variable health problem during pregnancy ascends by 1 unit and experience of health problems during pre-natal period rises by 0.738 units. The standard error is about 0.256. Therefore, dividing the regression weight estimate by the estimate of its standard error gives  $z = .738/0.256 = 2.876$ . Consequently, the regression weight for health problem during pregnancy in the prediction of experience of health problems during pre-natal period is significant at the 0.001 level (two-tailed). Then, the assumption (H<sub>4</sub>) health problem during pregnancy has significant effect on experience of women’s health problems during pre-natal period.

The variable infant death increases by 1 unit and the health problem during pregnancy decreases by 0.042. It has a standard error of about 0.012. Dividing the regression weight estimate by the estimate of its standard error gives  $z = -0.042/0.012 = -3.584$ . The regression weight for infant death in the prediction of health problem during pregnancy is significant (p=0.001) at the 0.001 level (two-tailed). Hence, (H<sub>3</sub>) the infant death has significant impact on health problem of women during pregnancy in this study region.

When the infant death goes up by 1 unit and experience of health problems during pre-natal period goes up by 0.328 units and it has a standard error of about 0.075. Further, separating the regression weight

estimate by the estimate of its standard error gives  $z = .328/.075 = 4.366$ . Therefore, the regression weight for infant death in the prediction of experience of health problems during pre-natal period is significant at the 0.001 level (two-tailed). As a result, (H<sub>5</sub>) the infant death has significant effect on experience of health problems during pre-natal period in this study area.

The variable experience of health problems during pre-natal period increases by 1 unit and utilization of healthcare decreases by 0.097. It has a standard error of about 0.016. Dividing the regression weight estimate by the estimate of its standard error gives  $z = -.097/.016 = -6.019$ . The regression weight for experience of health problems during pre-natal period in the prediction of utilization of healthcare is significant at the 0.001 level (two-tailed). Therefore,

(H<sub>6</sub>) the experience of health problems during pre-natal period has significant effect on utilization of healthcare in the study area.

The attribute health problem during pregnancy rise up by 1 unit and utilization of healthcare goes down by 0.013 units and it has a standard error of about 0.102. Hence, separating the regression weight estimate by the estimate of its standard error gives  $z = -.013/.102 = -.130$ . Therefore, the regression weight for health problem during pregnancy in the prediction of utilization of healthcare is not significant ( $p=0.897$ ) at the 0.001 level (two-tailed). Consequently, (H<sub>7</sub>) the health problem during pregnancy was not having significant effect on utilization of healthcare.

**Table 6.** Regression Weights: Unstandardized and Standardized co-efficient

Sl. No.	Construct	Path	Construct	Unstandardized co-efficient	S. E	Standardized co-efficient	C.R.	P	Label
1	Child Care	<---	Infant Death	-0.070	0.075	-0.038	-0.931	0.352	Not Significant
2	Health Problem during Pregnancy	<---	Child Care	0.017	0.006	0.106	2.637	0.008*	Significant
3	Health Problem during Pregnancy	<---	Infant Death	-0.042	0.012	-0.144	-3.584	0.001*	Significant
4	Experience of Health Problems during Pre-Natal Period	<---	Health Problem during Pregnancy	0.738	0.256	0.116	2.876	0.004*	Significant
5	Experience of Health Problems during Pre-Natal Period	<---	Infant Death	0.328	0.075	0.177	4.366	0.001*	Significant
6	Utilization of Healthcare	<---	Experience of Health Problems during Pre-Natal Period	-0.097	0.016	-0.240	-6.019	0.001*	Significant
7	Utilization of Healthcare	<---	Health Problem during Pregnancy	-0.013	0.102	-0.005	-0.130	0.897	Not Significant

AMOS Graphic output compiled by Author

\*\* Denotes significant at 1% level

\* Denotes significant at 5% level

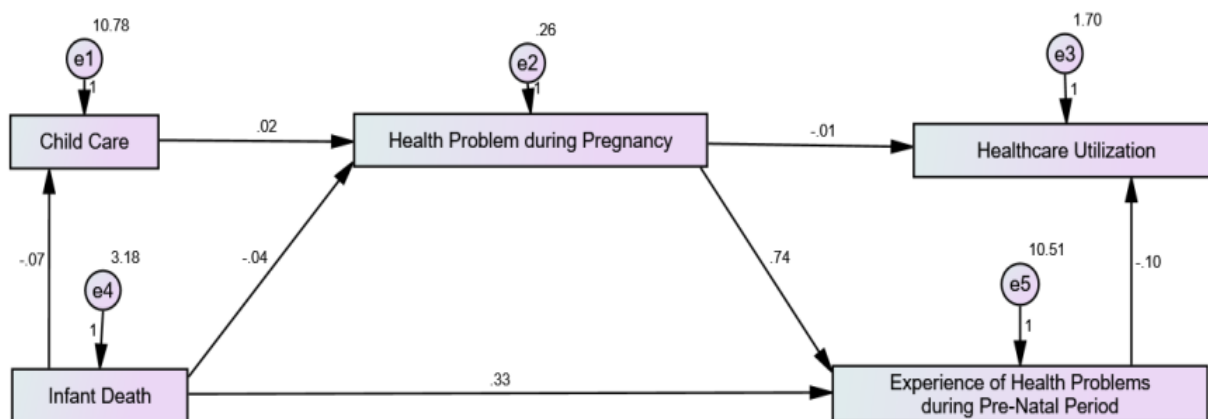


Fig. 7 : Unstandardized model of mediator construct AMOS Graphic Output

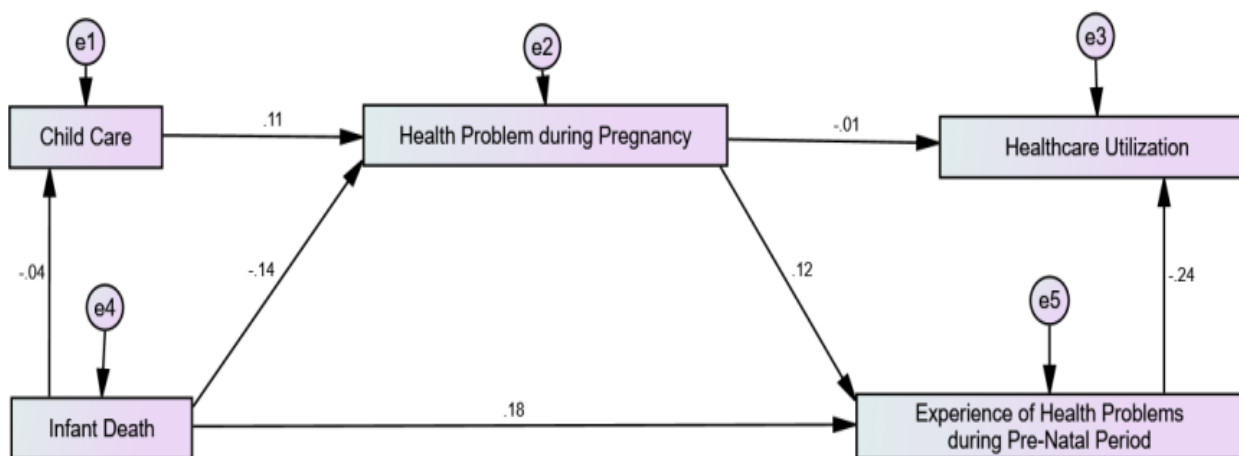


Fig. 8 : Standardized model of mediator construct AMOS Graphic Output

#### IV. CONCLUSION

This present study has proven that the factors specifically the experience of health problems during the prenatal period, health problem during pregnancy, child care, infant death and utilization of healthcare are influenced the mother and childcare of Madurai district. The scale used in this study adequately fits into the data gathered in the study area. Further, it concludes that the hypothesized thirteen assumptions models fit the collected sample data. Therefore, the likelihood and statistical association of essential elements estimates, the good fit of the structural model and represents an adequate description of

mother and child healthcare indicator support the model fit. In the discriminant validity test, it has been investigated that the correlation of all constructs are below 0.85. In other words, there are no constructs measuring the same thing. The structural equation model with path analysis has been conducted in the existence of direct and indirect mediator construct; all exogenous constructs show significant direct and indirect effects toward endogenous latent construct through mediator latent construct. In the bootstrap approach, the exogenous constructs except for child care and utilization of healthcare through the mediator construct health problem during pregnancy; and infant death and health problem during



pregnancy through the mediator child care have partial mediation effects. The above cited mediator constructs have indirect significant contributions or partial mediation toward mother and child healthcare in Madurai district. This finding concludes that the direct and indirect positive effects obtained in the path analysis have been confirmed.

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# Minimum Quantity Lubrication-Alternative to Flood Cutting and Dry Cutting

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## ABSTRACT

For any machining process cutting tool temperature, surface roughness value of work piece, cutting forces are the performance deciding parameters. These parameters directly, indirectly affect the tool life and thus affect machine cycle time, product cost and productivity. Cutting fluids are used to improve the machining performance however its cost and environment unfriendliness raise several questions. Researchers have documented several adverse health and environment effects of cutting fluids through their work. Plenty are efforts are going on to reduce the cutting fluid costs and to minimize its harmful effect to the environment. There is urgent need to provide sustainable, low cost and productive alternative to conventional machining processes. Minimum quantity lubrication is emerging as a tool to minimize the quantity exposure to the cutting fluids. In present work, low cost minimum quantity lubrication is used to verify its performance in terms of temperature, cutting forces and surface roughness. Results are compared for dry, flood and MQL cutting. Performance of MQL is better as compared to dry and flood cutting.

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## I. INTRODUCTION

Cutting tool, cutting fluid, cutting environment, machine input parameter and output performance parameter are the most important factors to decide failure or success of any manufacturing system. Cutting tool, cutting fluid involves replacement and maintenance cost. For cutting fluid, disposal is severe problem. Now a day', Operator's health, global

warming, diminishing petroleum products, harsh government policies demands for green manufacturing. Near dry machining or use of very minute amount of cutting fluid is the alternative suggested by most of the researchers. It is also called as Minimum quantity lubrication. Minimum Quantity Lubrication is considered as potential method to reduce the quantity of cutting fluid and to improve

the performance of the manufacturing system [1] [2] [3].

MQL is gaining attention of the manufacturer due to its benefits over traditional cooling and lubricating methods, yet most of the manufacturers are unaware of it. The cost of the MQL unit available in the market is not affordable to small scale manufacturer. They are reluctant to use it. There are several cases of skin cancer, respiratory diseases due to over exposure to toxic metal working fluid[4].It is needed to create awareness among the industry particularly small industrial units of developing, undeveloped countries. This paper concentrates on simple, low cost MQL system design and comparative study of dry, flood and MQL, in terms of cutting forces, surface roughness and temperature

## II. MINIMUM QUANTITY LUBRICATION

Cutting fluids are used to reduce the temperature. Mineral-based cutting fluids are costly as well as unsafe to the human being. According to the different researcher, the hazardous effect of the cutting fluid is a threat to the society [5]. Marksberry et al. [6] revealed that contaminants, like nitrosamines, microbial agents, bacteria, fungi, shigella, E.Coli, salmonella, and pseudomonas occurred within the manufacturing system. These contaminants react with cutting fluid and affect occupational health and safety. According to Bennett et al. [7] exposure to cutting fluid results in increased risk of chronic bronchitis, asthma and even laryngeal cancer. A. T. Simpson [8] conducted survey of occupational exposure to metalworking fluids in the engineering industry Survey results proved that grinding and drilling operations produced higher exposures than turning and milling. Exposure to the chemical content of the cutting fluid leads to life-threatening diseases, hence different regulatory bodies decided to limit the exposure level of the cutting fluid.

Dry cutting can be treated as a substitute to flood cutting. In dry cutting, no cutting fluid is used. Anselmo Eduardo Diniz et al. [9] determined that feed; tool nose radius and cutting speed had a major impact on tool life and surface roughness. They specified that without using any cutting fluid performance could be increased by proper selection of parameters. A. Bordin, S. Brachial et al. [10] investigated the surface integrity of a CoCrMo alloy during dry turning. Their work resulted in interesting outcomes for difficult-to-cut metal in dry conditions, without affecting its surface integrity.



Figure 1 Cases of skin diseases [13]

Dry cutting was considered as an alternative to get rid of the poisonous cutting fluid; however it has number of limitations like higher temperature, tool wear and worsened product quality. Therefore, minimum quantity lubrication (MQL) is developed as a compromise between flood cutting and dry cutting. The financial and ecological qualms on the use of cutting fluids lead to the research in minimum quantity lubrication (MQL) [11]

MQL uses minute quantity of cutting fluid i.e.50 ml to 500 ml per hour, which is very low as compared to flood lubrication system (1liter to 10 liter per min). MQL consist of mixture of high pressure air and cutting fluid applied directly into the interface of cutting tool and work piece. [12] Due to high-pressure air, oil particles are transformed into small

droplets. This increases the contact area. The increase in contact area results in more heat dissipation. Studies showed that oxygen enhanced the adsorption ability of the lubricant. The lubricant particles are surrounded by a large amount of air containing oxygen, leading to the formation of a robust and tribologically effective lubricating film. The difference between the lubricating film formed around the tool and work surface is shown in figure 2

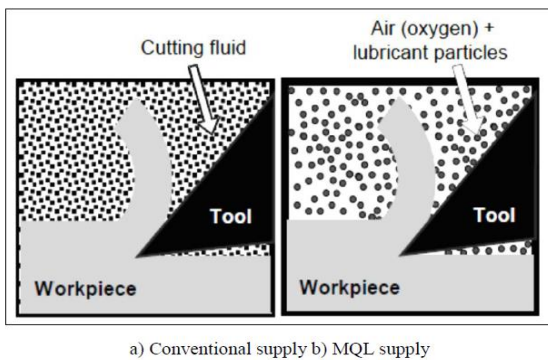


Figure 2 Schematic differences between conventional supply and MQL supply [14]

### III. METHODOLOGY

MQL system consists of medium capacity air compressor, oil tank, air filter regulator, Solenoid valve, Spray lube unit, different valves. Siphon tube with Suction strainer, Coolant Pipe, PU tube and Nozzle etc. The set up of MQL working on siphonage principle is as shown in figure 3.

Uncoated Carbide insert single point cutting tool is used for the experimentation. AISI 4130 MS bar of 60 mm diameter is used as work piece. Speed, depth of cut and feed are selected on the basis of capacity and restriction of the lathe machine used. Dry cutting, flood cutting and MQL cutting are the three working environments used for experimentation. Cutting forces are measured with the help of lathe tool dynamometer.



Figure 3: Experimental Set up with MQL System

Temperature is measured with the help of infra-red Thermometer (IRL-550). Following working parameters are selected for experimentation.

Cutting speed  $V$  (m/min) = 34.27, 53, 79.73

Feed Rate,  $f$  (mm/rev) = 0.35, 0.40, 0.45

Depth of cut,  $d$  (mm) = 0.5, 1, 1.5

MQL Parameter Pressure = 2bar,

Lubricant-BlassoCut-400Strong, Viscosity-58mm<sup>2</sup>/s

AISI4130C0.-30, Mn-0.52, Si-0.24, P-0.017, s-0.011,

Cr-1.06, Ni-0.017, N=0.22

### IV. RESULTS AND DISCUSSION

Cutting speed varied from 34.27 m/min to 79.73 m/min while depth of cut is taken as 0.5, 1, and 1.5 mm respectively. Feed is increased from 0.35 to 0.45 mm/rev. With proper combinations of speed, depth of cut and feed, 27 trials are performed for each working environment. Temperature, cutting force and surface roughness values are noted. Cutting fluid used is Blasso-cut 400 strong.

#### Cutting Forces

Cutting forces increase with increasing feed rate and decreases with increase in speed. As cutting velocity increases, frictional forces are decreased, which results in decrease in cutting forces. This is in agreement with the literature findings. Figure 4(a,b,c)

shows variations of cutting forces at various speed, feed and depth of cut.

Increase in depth of cut results into increased tool work contact length, hence frictional force will be more. There is adhesion between cutting tool and work piece, hence cutting forces seems to be at higher level.

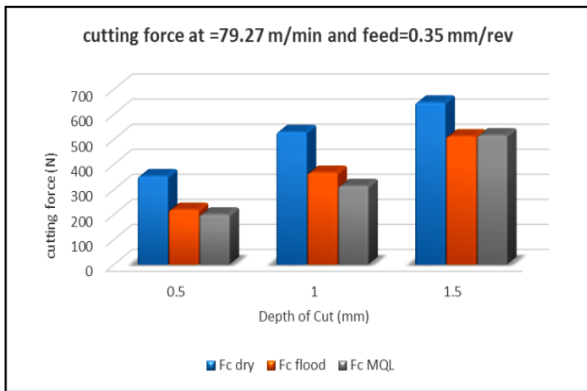


Figure.4 (a) Variation of cutting forces at V=79.27m/min, f-0.3,0.4 and 0.45mm/rev respectively

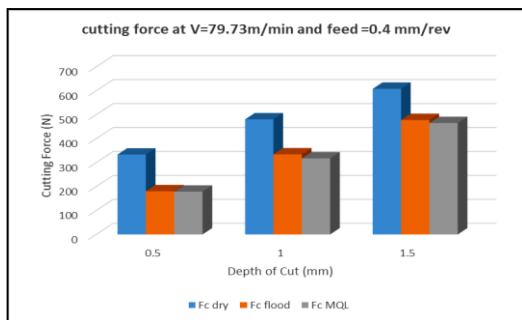


Figure.4 (b) Variation of cutting forces at V=79.27m/min, f- 0.3,0.4 and 0.45mm/rev respectively

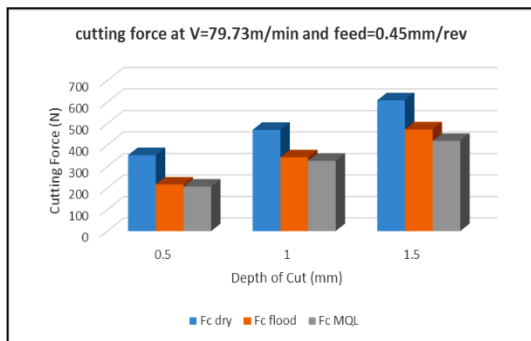


Figure. 4 (c) Variation of cutting forces at V=79.27m/min, f- 0.3,0.4 and 0.45mm/rev respectively

Increase in depth of cut represent better compression in tool work piece interface, increases the energy conversion into heat. This is the reason cutting forces are increased at higher depth of cut.

Cutting forces are highest at dry cutting as there is no cooling media. Cutting forces are higher at 79.73 m/min and depth of cut 1.5 mm. For flood cutting adhesion between tool and work piece is less hence there is decrease in cutting forces, while in case of MQL, due to high velocity coolant jet, adhesion is lowest. The use of MQL reduces cutting forces approximately by 10% to 30% as compared to dry cutting and 5% to 10% as compared to flood cutting

### Cutting Tool Temperature

As depth of cut and feed rate increases, friction is between tool and work piece is also increases, more energy required for material removal, which results into increase in temperature.

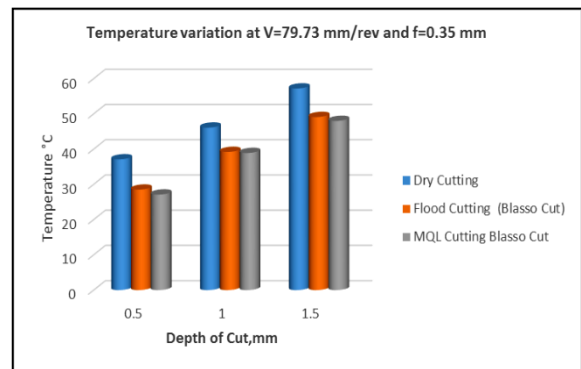


Figure.5 (a) Variation of cutting forces at V=79.27m/min,f-0.3,0.4 and 0.45mm/rev respectively

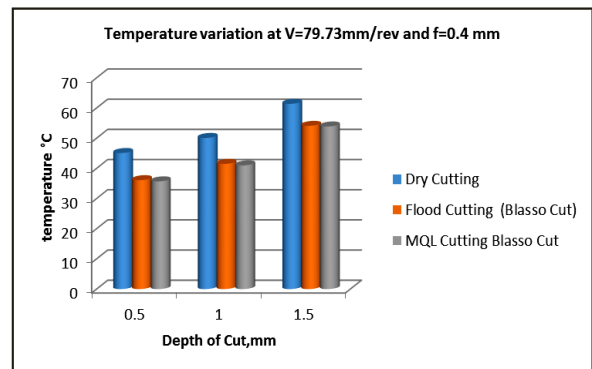


Figure.5 (b) Variation of cutting forces at V=79.27m/min,F-0.3,0.4 and 0.45mm/rev respectively

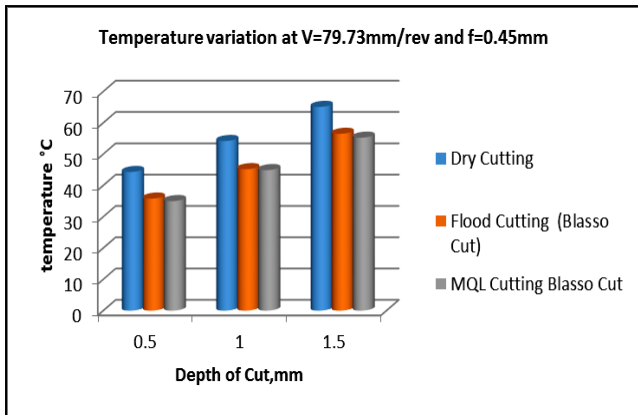


Figure.5(c) Variation of cutting forces at V=79.27m/min, f=0.3, 0.4 and 0.45mm/rev respectively

Figure 5(a,b,c) shows variation of the temperature obtained at various speed, feed and depth of cut. Speed has less significant effect on temperature. There is significant decrease in temperature for MQL cutting as compared to dry and flood cutting. In MQL high pressure air jet mixes with coolant and this mixture is sprayed on the work piece-tool interface. Heat is removed by mixture of compressed air and coolant. Due to high velocity, particle of coolant penetrates easily which results into less temperature for MQL. The use of MQL reduces the temperature approximately 10%-25% as compared to dry condition and is reduced by 1%-5% as compared to the flood cutting.

**Surface Roughness**

The surface roughness is improved by the application of coolant. It is apparent from the observations that the coolant quantity is not a deciding feature for surface roughness. For flood and MQL, the amount of cutting fluid applied is different but comparably results are almost same.

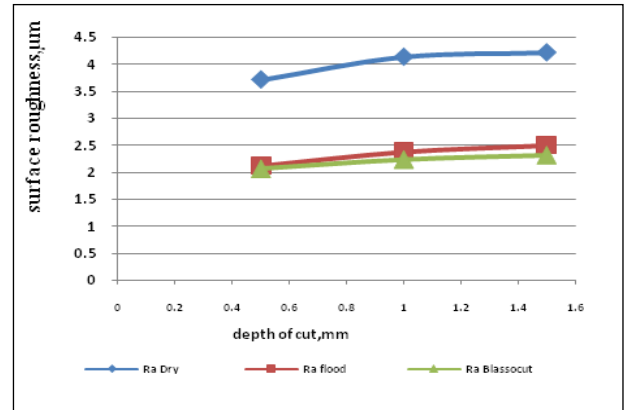


Figure. 5(a) Variation of surface roughness at V=79.27m/min, F=0.3, 0.4 and 0.45mm/rev respectively

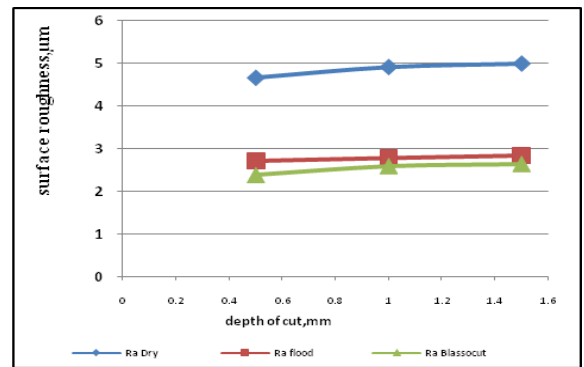


Figure.5(b) Variation of surface roughness at V=79.27m/min, f=0.3, 0.4 and 0.45mm/rev respectively

Figure 5(a,b,c) shows variation of surface roughness with respective speed, depth of cut and feed for dry, flood and MQL conditions. Surface roughness is more for dry cutting as compared to flood and MQL cutting. More temperature and more stress at tool results into rougher surface.

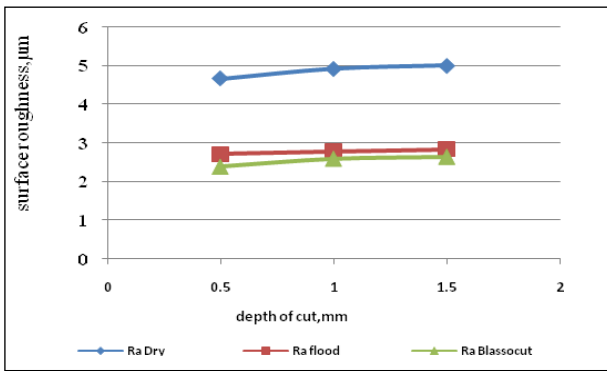


Figure.5(c) Variation of surface roughness at  $V=79.27\text{m/min}$ ,  $f=0.3, 0.4$  and  $0.45\text{mm/rev}$  respectively

Surface finish is improved due to reduction of wear and damage of tool. There is approximately 20-40% decrease in surface roughness in flood cutting as compared to dry cutting. Surface roughness is greatly reduced in MQL, average 47% when compared with dry cutting. Roughness values are notably reduced by 1% to 5% for MQL when compared with flood cutting, along with advantage of cutting fluid quantity and cost is saving

## V. CONCLUSIONS

For various combinations of speed, depth of cut and feed, surface roughness, temperature and cutting forces are measured. No coolant, flood cooling and MQL are the three environment used for comparison. BLASSO CUT - 400 is used as cutting fluid for flood and MQL cutting conditions. The concluding remarks are as follows.

1. The cutting temperature was considerably reduced by average 16 % for the MQL cutting as compared to dry cutting while it is reduced up to average 5% when MQL results are compared with flood cutting. The decrease in cutting temperature improves cutting tool life.
2. There is remarkable decrease in cutting forces approximately 25% to 45 % in case of MQL as compared to Dry cutting. At least 5% reduction in cutting forces is observed for MQL when compared with flood cutting. Cutting forces are

reduced due to decrease in friction in case of MQL cutting.

3. There is extensive difference in surface roughness produced by dry, flood and MQL cutting conditions. There is an average 1-5 % reduction in roughness values for MQL as compared to flood cutting.
4. MQL technique is at the present emerged as substitute for dry and cutting not only in terms of performance but also it is cost effectiveness and environment friendliness.
5. In India, multinational industry have developed and applied environmental friendly concepts but most of the medium and small scale industries are not aware of it. Developed MQL system is low cost, simple and hence will be helpful for small units.

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## CORONA/COVID-19- Vaccines Current Scenario

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### ABSTRACT

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The pandemic COVID -19 caused by novel coronavirus, SARSCoV-2, has infected more than 125 million individuals and resulted in over 2,756,768 deaths globally spread over 219 countries and territories. There has been an intensive search for an effective drug against the virus and the resultant disease. However, till now no single effective drug could be found against SARS-CoV-2. Hence, all research efforts to contain the epidemic are being focussed on effective vaccine development. Here, we review the current scenario of vaccines being developed all over the world and also India to restrict the COVID-19. Advances in genetic sequencing and other technological developments have speeded up the establishment of a variety of vaccine platforms. Most of the platforms mainly based upon the viral spike protein due to its vital role in viral infectivity. Accordingly, numerous vaccines are under various stages of development. Some vaccines like Astra-Geneca, Moderna, Covaxine, and Pfizer are already released for vaccination to general public. Principles, advantages and disadvantages of different vaccine platforms are discussed. Notwithstanding the tall claims made by manufacturers, concerns are expressed especially over the rush, at which the vaccines are developed, and their efficacy and safety. In India, two vaccines viz, covaxin and covishield are released even before finishing the mandatory phase III trials on conditional trial basis. Salient features and differences between these two vaccines are discussed.

**Keywords :** Corona virus, SARSCoV-2, COID-19, Vaccines, Vaccine platforms, Covaxin, Covishield

## I. INTRODUCTION

Measures such as surveillance, quarantine and social distancing taken work efficiently to prevent and control a pandemic, and thus to flatten the curve, albeit at a major cost to the economy. However, the development and deployment of effective tests, drugs, and vaccines to protect lives and limit disease spread are still urgent need. Emergency Use Authorizations (EUA) speeded up the availability of drugs to prevent serious or life-threatening conditions when adequate, approved alternatives are not available. For many drugs that are already marketed for other disease conditions, off-label use can increase access for patients who need them. Currently, thousands of clinical trials are ongoing to test clinical efficiency of drugs. Some candidate drugs targeting different such as cell membrane fusion, RNA-dependent RNA polymerase, viral protease inhibitor, interleukin 6 blocker, and convalescent plasma may improve the clinical outcomes of critical COVID-19 patients. Still, other supportive care measures for critical patients are necessary. Non availability of drugs that can specifically cure the COVID-19 is a major drawback for tackling the pandemic and there is no hope of getting an efficient drug in near future. Intensive clinical trials are necessary to confirm or refute the usefulness of several candidate drugs. Similar to several other viral pandemics of the past, vaccines hold promise to this pandemic also. Numerous research laboratories around the world supported by government and private organisations are competing to produce an effective vaccine against SARS-CoV-2 at the earliest possible, in order to be able to stop the spread of the new coronavirus.

### Vaccines

The conventional medicines are oriented towards the treatment of a disease whose symptoms have manifested. But vaccines are primarily intended for use in persons not yet exhibiting disease symptoms, in order to prevent the occurrence and spread of diseases. Vaccines alert the immune system

with the necessary instructions for recognizing and mobilizing lines of defense against the pathogenic microorganisms, such as bacteria or viruses. Traditional vaccines although proved to be extremely effective in combating highly contagious diseases such as measles, require large amounts of viruses or bacteria, which can last for months. Those microorganisms then become the key element in a vaccine, the so-called antigen that alerts and warns the human immune system. In classical vaccines, antigens are introduced into the body, originating from inactivated or half active bacteria or attenuated viruses. These antigens are capable of causing a mild disease, but are still capable of activating the immune system. If a vaccinated person comes in contact with the native pathogen, the immune system with existing antibodies effectively fight the pathogen.

### Outlines of vaccine development

The development of a vaccine is a complex and time-consuming process. In several respects, it differs from the development of conventional medicines. The stipulated guidelines for vaccine development are much more stringent than those meant for drug development. The reasons are obvious: the vaccines are for global use, administered to different sections of vulnerable healthy populations such as children, elderly, and pregnant mothers, and thus have enormous potential for production and marketing. The process of vaccine development follows a unique stepwise pattern and is broadly divided into: Exploratory, Preclinical, Clinical, and Post-marketing stages. The clinical stage in turn is divided into 3 phases, viz, phases I, II and III. Further, two regulatory permissions are needed namely "Clinical Trial Authorization" before the clinical stage to allow "First-in-human" testing and "Biologic License Application/Approval" for the marketing of the vaccine after successful clinical trials. Under normal situations, the period of development of a vaccine is 12-15 years (Han, 2015)

The safety and efficacy of the vaccine is initially assessed in laboratory studies with experimental animals like mice or rabbits. If the animals do not show signs of disease after receiving the vaccine, then the tests begin in humans (DeStefano *et al.*, 2015). The procedure of the clinical trial for a classical vaccine (after preclinical stage -.in vitro and in vivo tests) is as follows (Pronker *et al.*, 2013; Guerra Mendoza *et al.*, 2019): In phase I, also called the first human test, the vaccine is given to a small group of healthy volunteers (10 to 100). Here, the objective is not to test whether the vaccine protects against the disease, but to assess whether it is safe or whether it induces any severe side effects. In phase II, the candidate vaccine is administered to a larger group of subjects (100-1,000), and in phase III, to an even larger group (1,000-100,000). To assess whether a vaccine prevents the disease among those likely to be exposed to the infection, it should be tested in phase III studies, in a setting where the infection is actively prevalent. During a pandemic, because of demand urgency, these sequential studies may be shortened and partially overlapped; nevertheless, it is mandatory that thousands of vaccinated people are followed for several months before the release for mass vaccination programs.

In order to meet the pandemic demand, tens or hundreds of millions of doses of vaccine are needed. This production process takes at least six months, if the production line already available. Any novel vaccine involves a new production process that involves several quality control steps. The manufacturer must ensure that each vaccine produced is of consistent quality and requires quality control at every step. Before initiating each stage of the human testing process, the developer must provide evidence that the vaccine has early indications of protection and is safe among those who have been tested. Research ethics committees review clinical trial plans, and authorities such as the European Medicines Agency (EMA) and Food and Drug Administration (FDA) oversee the entire vaccine development process before approving it for general use. These assessments usually take several weeks or months. Although such approvals could be shortened in the event of a pandemic, many potential COVID- 19 vaccines use new technologies, so regulators will not be able to rely on the experience of similar vaccines to speed up the process. Developers of the COVID- 19 vaccine were given a target to produce a vaccine in 12-18 months, while historically; vaccines took 15-20 years to develop. For efficient application of SARS-CoV-2 vaccines, not only the production procedure needs to be developed, but also requires a large-scale production followed by vaccination program targeting multimillion population of different regions. The manufacturer must ensure that each vaccine produced is of consistent high quality. Given the fact that vaccine manufacturing is a biological process, inevitably, some batches of vaccines will fail in quality control tests, the reasons are not always clear, which can further delay production. There are quite a few manufacturers in the world that can produce vaccines on a large enough scale to meet the demand of a pandemic (Calina *et al.*, 2020)

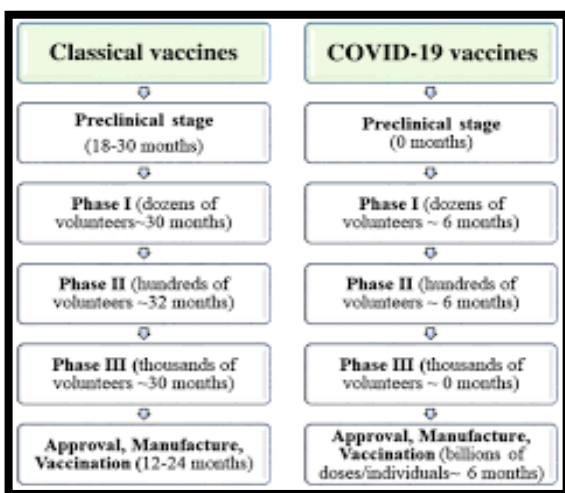


Fig. 1. Stages of clinical trial for classical vaccine compared with COVID- 19 vaccines.

Current pandemic of COVID-19, caused by SARS-CoV-2, is an unprecedented global

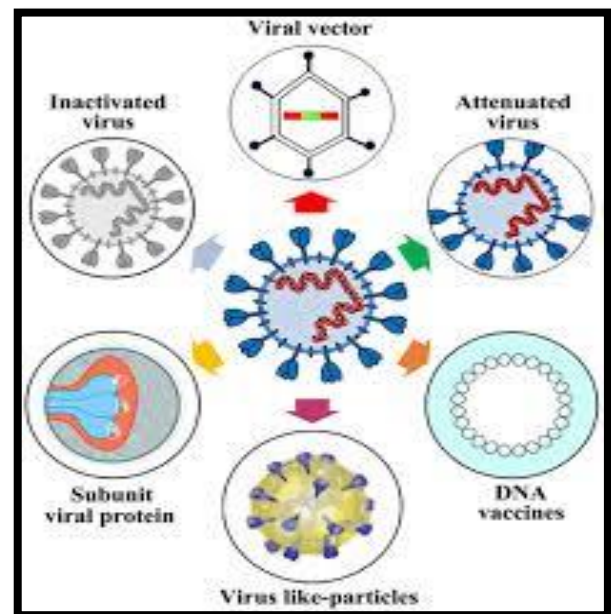
epidemiological problem, the solution of which will require establishment of large-scale production of the vaccine. Given the experience of previous coronavirus outbreaks, showing a high variability of the virus, it is necessary to develop a vaccine production platform that provides the scalability, technological flexibility, and versatility. These vaccines must provide high efficacy, safety, and tolerability. Many 'candidate' vaccines, which initially look promising, are likely to fail during the subsequent testing processes.

### Vaccine production platforms

The technology underlying the development of vaccines in R&D has been witnessing a tremendous transformation in the recent past. Over the years, the so called candidate vaccines were reduced through traditional methods. As a result, making of a prototype vaccine took 2 - 5 years and was confined to a few types of vaccines. It needed the availability of sophisticated research facilities in order to work with the infectious agent and such type of facilities were available only in few laboratories over the globe. Recently, platform technologies have been employed in developing candidate vaccines (Wadman, 2020; US FDA, 2020). Platform technologies are systems build upon a platform architecture that distributes the system out into different levels of abstraction. Platform technologies offer several advantages in the development of vaccines which include automation, speed, cost-effectiveness and ability to develop several prototype vaccines from the single system.

As of December 2020, just eleven months after the working out the details of the SARS-CoV-2 genome, there are over 150 official vaccine projects in the field (WHO, 2020; Akst, 2020). About fifty of them have already reached human experimentation and a few of these are currently administered to some sections of the general population. Making use of different technologies, these anti-SARS-CoV-2 candidate vaccines are targeting the whole SARS-CoV-2, molecules or fragments of molecules expressed on virus surface. These different candidate vaccines can be grouped based on the technological

platform exploited to induce a protective immune response. However, almost every vaccine project has its peculiarities that make it unique and different from others. A large amount of available basic research data on the mechanisms of SARS-CoV-2 infection has convinced most developers of innovative vaccine to concentrate their efforts on inducing an immune response against the spike protein (Fig. 2). The new data emerging from Phase III studies show that vaccines based on nucleic acids (DNA, RNA) coding for the Spike protein, carried by vectors like liposomes or adenoviruses, can elicit an effective protective response.



**Fig. 2: Strategies of different vaccine producing platforms to produce COVID-19 vaccine**

The various platforms being considered for the development of COVID-19 vaccines include

1. Vaccines based on attenuated SARS-CoV-2 viruses
2. Vaccines based on the inactivated SARS-CoV-2 viruses
3. Vaccines based on SARS-CoV-2 proteins
4. Naked DNA-based vaccines
5. mRNA-based vaccines
6. Vaccines based on viral vectors
7. A few other technological platforms

#### 1. Vaccines based on attenuated SARS-CoV-2 viruses

The history of vaccination begins with vaccines based on a live microbe that has been

weakened so that it cannot cause disease. Since attenuated microbes retain the ability to replicate *in vivo* inciting a limited disease, they are very effective in stimulating the immune system and inducing a strong and persistent immune memory that is effective in preventing infection. Hundreds of millions of people all over the world have been protected from disabling and fatal diseases by using attenuated vaccines (Forni *et al.*, 2020).

**Principle:** This is the most traditional technology exploited in the development of vaccines. Live attenuated vaccines are obtained by growing the virus in unfavourable conditions or by generating a genetically weakened version of the virus. However, the attenuation of large quantities of viruses is complex, laborious and delicate and often associated with major biosafety risks. Once produced, their storage and handling require careful monitoring procedures.

**Mechanism:** Live attenuated vaccines induce the production of CD8+ cytotoxic T lymphocytes and T-dependent antibody responses. A vaccine is only effective for as long as the body maintains a population of these cells. Live attenuated vaccines can induce long-term, possibly lifelong, immunity without requiring multiple vaccine doses. Live attenuated vaccines can also induce cellular immune responses, which do not rely solely on antibodies but also involve immune cells such as cytotoxic T cells or macrophages (Cohen, 2020)

**Safety:** Live-attenuated vaccines stimulate a strong and effective immune response that is long-lasting. Given pathogens are attenuated, it is extremely rare for pathogens to revert to their pathogenic form and subsequently cause disease. (Pollard, 2020) Additionally, within the five WHO-recommended live attenuated vaccines (tuberculosis, oral polio, measles, rotavirus, and yellow fever) severe adverse reactions are rarely reported. However, similar to any medication or procedure, no vaccine can be 100% safe or effective. Individuals with compromised immune systems (e.g., HIV-

infection, chemotherapy, combined immunodeficiencies) typically should not receive live-attenuated vaccines as they may not induce an adequate and safe immune response.

#### Advantages

- Accurately imitate natural infections.
- Are effective at evoking both strong antibody and cell-mediated immune reactions.
- Can elicit long-lasting or life-long immunity. Often only one or two doses are sufficient.
- Quick immunity onset.
- Cost-effective (compared to some other health interventions).

#### Disadvantages

- In rare cases, particularly when there is inadequate vaccination of the population, natural mutations can cause an attenuated virus to revert to its wild-type form or mutate to a new strain, potentially resulting in the new virus of infectious or pathogenic nature.
- Often not recommended for immunocompromised patients due to the risk of potentially severe complications.
- Live strains typically require advanced maintenance, such as refrigeration and fresh media, transport to remote areas is difficult and costly.
- Attenuated viral vaccines that are currently in use are: Live attenuated influenza vaccine (LAIV), Japanese encephalitis vaccine, Measles vaccine, MR vaccine, MMR vaccine, MMRV vaccine, Polio vaccine, Rotavirus vaccine, Rubella vaccine, Yellow fever vaccine, Zoster/Shingles vaccine  
Manufacturers
- Only three projects of attenuated SARS-CoV-2 vaccines are in active preclinical development at the following institutions:
  - The Serum Institute of India, India, in collaboration with Codagenix, a New York private biotech

- Indian Immunologicals Ltd, India, in collaboration with the Griffith University, Australia
- Mehmet al., i Aydunar Univ, Turkey
- None of these vaccine projects have yet reached the stage of clinical trials.

## 2. Vaccines based on the inactivated SARS-CoV-2 viruses

Vaccines based on killed microorganisms (inactivated vaccines) belong to a very traditional technological platform that has led to development of numerous successful vaccines. The vaccines produced using this method are more stable than live attenuated vaccines but their limit is mainly related to the short duration of immune memory which demands inoculation of higher amounts of vaccine or supplementing the inactivated microorganism with an adjuvant. The immune response elicited is directed not only against the Spike protein but also against many other SARS-CoV-2 antigens. The induced response is generally weaker but the vaccine is more easily handled, less expensive, and much safer.

**Principle:** The SARS-CoV-2 virus is inactivated through different physical chemical techniques. The virus is killed using a method such as heat or formaldehyde. All these candidate vaccines are injected intramuscularly.

**Mechanism:** The pathogen particles are destroyed and cannot divide, but the pathogens still maintain some of their integrity to be recognized by the immune system and evoke an adaptive immune response. When manufactured correctly, the vaccine is not infectious, but improper inactivation can result in intact and infectious particles. Because the killed pathogens in a properly produced vaccine do not reproduce, booster shots are required periodically to reinforce the immune response.

**Advantages:** More stable, can be lyophilized for easy transport, cheaper, and can be used in immune-compromised people

**Disadvantages:** Often requires booster shots, must ensure proper inactivation, not all viruses are immunogenic after inactivation.

Attenuated viral vaccines that are currently in use are: Poliovirus, hepatitis A virus, rabies (human), Japanese encephalitis virus, seasonal influenza (purified subunit).

### Manufacturers

Seven vaccine candidates based on variously inactivated SARS-CoV-2 virions are in clinical trials, four of which in Phase III trials and already approved for limited use. Results of phase II trials suggest that the vaccine is safe and induces a high titer of antibodies.

- Sinovac Biotech, China, this vaccine called CoronaVac, has already been approved for limited use among the general population
- Sinopharm, China, two of its distinct projects are approved for limited use in the general population
- Wuhan Inst Biol Products, China, this vaccine has been approved for limited use in the general population
- Chinese Acad Med Sci, China
- Bharat Biotech, India, this vaccine, called Covaxin, has been approved for limited use in the general population
- RIBSP, Kazakhstan.

## 3. Vaccines based on SARS-CoV-2 proteins

As on today, there are several human vaccines based on proteins present on the surface of microbes. In the past, these proteins were purified from the microbes but today, in most of the cases, they are produced *in vitro* employing the recombinant DNA technology.

**Principle:** The large trimeric aggregates of the Spike protein that protrude from virion surface play a crucial role in the attachment of the SARS-CoV-2 to human cells. Hence, the Spike protein or its fragments are the targets of all these vaccines. However, in few cases other SARS-CoV-2 proteins -

mostly the nucleoproteins (NP) are also targeted. To activate a robust immune response, often these vaccines supplemented with adjuvants, either of bacterial or synthetic origin.

**Mechanism:** The subunit vaccine, however, exhibits low immunogenicity and requires auxiliary support of an adjuvant to potentiate the vaccine-induced immune responses. An adjuvant may enhance the biological half-life of the antigenic material, or it may ameliorate the immune-modulatory cytokine response. The addition of an adjuvant, therefore, helps in overcoming the shortcomings of the protein subunit vaccines. More recently, it has been observed that SARS-CoV S elicited polyclonal antibody responses, and vigorously neutralized SARS-CoV-2 S-mediated entry into cells.

**Advantages:** Spike protein based vaccines do not have any live component of the viral particle. Thus, they are safe with fewer side-effects. These vaccines can be created for viruses that do not propagate well in the laboratory. There is no chance of live virus reversion. Induce an immune response.

**Disadvantages:** Requires specialized expertise to create; they are not as immunogenic as whole virus preparations, expensive, more difficult to produce. Memory for future responses is doubtful.

Subunit or protein based viral vaccines that are in currently use are: Human papilloma virus and Hepatitis B virus

#### Manufacturers

There are very numerous vaccine projects based on SARS CoV- 2 proteins, their fragments, or their fragments combination. At least sixteen candidate vaccines are already in human trials and two in Phase II trial

a. Spike protein or its fragments plus adjuvant: Adimmune, Taiwan; Bektop, Russia; biotechnology Vector, Russia; Clover Biopharmarm plus GSK adjuvant, China-Italy; CoVaxx, US; Inst Finlay de Vacuna Vaccine, Cuba plus adjuvant; Medigen, Taiwan-US, plus CpG adjuvant; Sanofi plus GSK adjuvant, France - Italy; The Univ of Queensland,

Australia; Univ Tubingen, Germany; Vaxine, Australia, plus adjuvant; West China Hosp Sichuan Univ., China; ZFSW Anhui Zhifei Longcom, China, plus adjuvant.

b. Proteins carried by nanoparticles : Novavax, US, US, Australia, and South Africa, plus adjuvant .

c. Oral tablet containing Spike protein fragments: Vaxart, US.

d. Microneedle skin patch delivering Spike proteins: Univ Queensland, Australia

e. Spike protein or its fragments inserted in virus-like particles (VLP): SpyBiotech/Serum Institute of India, India.

f. Tobacco plant-produced proteins: Kentucky Bio Processing, US.

#### 4. mRNA-based vaccines

mRNA vaccines were reported to be effective for direct gene transfer for the first time by Woff *et al.*,1998. Currently, two forms of mRNA vaccines have been developed: conventional mRNA vaccines and self-amplifying mRNA vaccines, which are derived from positive strand RNA viruses. Although mRNA vaccines were first tested in the early 1990s, these vaccines were not initially extensively utilized due to concerns about their loss of integrity caused by ribonucleases and small-scale production.

**Principle:** Several vaccine projects are trying to exploit this technology for the creation of SARS-CoV-2 vaccines. Unlike DNA, RNA must be delivered in various ways to enter the human cell. The mRNA coding the full-length spike protein is delivered by some vectors like encapsulated in microliposomes. Upon successful entry, the mRNA vaccine temporarily induces the cell to produce the antigen protein coded by the mRNA.

**Mechanism:** mRNA-based vaccines comprise mRNA that encodes a protein antigen. mRNA employed in vaccines encode the antigen of interest that contains 50 and 30 untranslated regions, whereas the virally derived, self-amplifying RNAs encode not only the antigen but also the viral replication machinery that enables intracellular RNA amplification and abundant

protein expression. Recent mRNA vaccine designs have improved the stability and protein translation efficiency for enhanced innate and adaptive immunogenicity. Delivery of the mRNA vaccine has been optimized by use of lipid nanoparticles (liposomes) for intramuscular or intradermal administration. These vaccine preparations need to be stored at  $-30$  to  $-80$  °C.

**Advantages:** mRNA vaccines are non infectious and non-integrating; egg and cell culture free, rapid and scalable production, stimulation of innate immune response, induction of T and B cell immune response

**Disadvantages:** Two major concerns are instability and low immunogenicity

#### Manufacturers

There are many vaccine projects based on mRNA and its variants coding the Spike protein. Two of those have already finished the Phase III trials. The mRNA vaccine may be carried by:

a. Lipid vesicles (Liposomes)

Abogn, China; CureVac, Germany; Moderna, US ; Pfizer, US - BioNTech, Univ Oxford, UK

b. Nanoparticles

Arcturus Ther, Singapore

#### 5. Naked DNA-based vaccines

The DNA platforms offer great flexibility in terms of manipulation of the coded antigen and great potential for speed. Currently, there are no DNA vaccines registered for human use; however, DNA vaccines are commonly used in veterinary medicine. These vaccines are stable and can easily be produced in large amounts in host bacteria.

**Principle:** DNA vaccines consist of plasmid-DNA encoding one or several antigens that will be expressed in host cells. DNA vaccines can be produced rapidly and at low cost. DNA vaccines encoding the S protein of the SARS-CoV and MERS-CoV have been shown to elicit T cell and neutralizing antibody responses, as well as protective immunity in mouse model and human studies. However, the need for specific delivery systems to achieve good immunogenicity and possible genomic integration

and persistence in host cells is still a problem that needs to be resolved.

**Mechanism:** Once injected into the muscle or skin, DNA plasmids enter human cells, and their ability to enter may be enhanced by a very short local electrical pulse (electroporation). Once entered, plasmid DNA induces the cell to produce temporarily the target protein. In this way, DNA vaccination stimulates the production of antibodies and the activation of killer T cells.

**Advantages:** Non-infectious, stimulation of innate immune response; egg and cell culture free, stable, rapid and scalable production; induction of T and B cell immune response.

**Disadvantages:** Potential integration into human genome, poor immunogenicity

#### Manufacturers

Six DNA vaccine projects are entering human trials. All of them code the Spike protein or its fragments.

a. Naked DNA plasmids :Zyudus Cadila, India; AnGes, Japan; Takis, Italy.

b. Naked DNA plasmids plus electroporation: Inovio, US; Genexine, Korea; Karolinska Inst, Sweden + Inovio, Italy.

At present, human trials are underway with several different DNA vaccines, including those for malaria, AIDS, influenza, and herpesvirus.

#### 6. Vaccines based on viral vectors

Virus-based vectors are powerful tools for vaccination. Their effectiveness stems from the fact that their ability to infect cells. It allows them to be highly efficient, specific, and able to trigger strong immune responses. Viral vector vaccines use a modified version of a different virus (the vector) to deliver important instructions to our cells. For COVID-19 viral vector vaccines, the vector (not the virus that causes COVID-19, but a different, harmless virus) will enter a cell in our body and then use the cell's machinery to produce a harmless piece of the virus that causes COVID-19. This piece is often a spike protein and it is only found on the surface of the virus that causes COVID-19.



**Principle:** The virus inside which the DNA is inserted may lose its ability to replicate. Since a pre-existing immunity against the virus vector may affect vaccine efficacy, primate viruses (from chimpanzee, gorilla monkeys etc) are often exploited as vectors. In other cases, the DNA is inserted into replication active virus vectors: as these viruses can propagate to some extent, they may induce a more robust immune response (Krammer, 2020). Also in these vaccine projects, the target antigen coded by the DNA is mostly, if not only, the Spike protein, its variants, or its fragments. Commonly, these virus-based vaccines are injected intramuscularly.

**Mechanism:** Since the vector viruses carry the genetic material that code for spike protein. The immune-response is similar to viral sub unit protein.

**Advantages:** High-efficiency gene transduction; Specific delivery of genes to target cells; Induction of robust immune responses; Increased cellular immunity

**Disadvantages:** Low titre production; May induce antivector immunity; Generation of replication competent virus, which can induce tumorigenesis.

At present there are numerous vaccine projects based on viral vectors that are already in advanced clinical trials. Four of those are currently in Phase III trial or approved for limited use. The DNA vaccines differ with respect to DNA inserted inside:

**A. Engineered non-replicating virus vectors**

1. Chimpanzee adenovirus: AstraZeneca, Univ. Oxford, Sweden-UK-Italy, that is also testing a vaccine inhaled form not yet in Phase III trial
2. Gorilla adenovirus: v ReiThera, Italy.
3. Human adenoviruses: CanSino, China; Johnson & Johnson, US; Acad Mil Med Sci, China, Gamaleya Res Inst, Russia: this vaccine based on two human adenoviruses injected one after the other has been approved for limited use.
4. Adenoviruses specifically modified for nasal spray: Beijing Wantai Biol Pharm Enterprise, China; Acad Mil Sci, China, two projects; Bharat Biotech-

Washington Univ, India-US; AstraZeneca, Sweden-UK; Altimmune, US.

**5. Other viruses**

**B. Engineered replicating virus vectors**

1. Injected intramuscularly: Measles virus, Merck, US; Vesicular Stomatitis Virus.
2. Influenza virus administered by nasal spray: Influenza virus: Univ Hong Kong; Valavax-Abogn, China; Beijin Vantal Biol Pharm, China.

In addition to above discussed platforms, some other technological platforms are also are trying to develop new type of vaccines and they are at various stages of clinical trials.

1. Immunomonitor, Canada: Phase I/II human trial are underway with heat-inactivated plasma from donors with COVID-19.
2. Synvivo, Canada: Phase I human trial is underway with orally administered Bifidobacterium probiotic, engineered to carry the DNA encoding the Spike protein.
3. Shenzhen Geno-Immune Medical, China: Phase I human trial is underway with dendritic cells engineered to express SARS-CoV-2 proteins.
4. Aivita Biomedical, US: Phase I/II human trial are underway with the patient's dendritic cells modified to express SARS-CoV-2 antigens.

**Corona - COVID Vaccines- Challenges and Concerns**

During the past few months, several companies all over the world have been expediting their vaccine production programs. Traditionally, vaccine development takes 10–15 years. However, to circumvent this, a period to only 15 months targeted has its own drawbacks and challenges, and some concerns have been ventilated (Sharma *et al.*, 2020)

Accelerating vaccine development by overlapping some phases involves trials being done on smaller groups. This is a significant concern because when the vaccine is released for public use globally, unknown side-effects may appear in the larger population which were not previously observed within targeted smaller groups. In addition, if all sections of people (elderly and young) and those with co-morbidities are

not included in the design of the clinical trials, there is a chance that unwarranted side-effects may be observed in those groups (Span *et al.*, 2020).

- Platforms based on nucleic acids such as DNA and RNA is new technological innovations. So far, they have not resulted in a successful vaccine for human diseases and hence it is yet to be seen how mRNA vaccines will be successful for the reason the vectors lipid nanoparticles are temperature-sensitive and this may be a major road block for scaling up production (Corey *et al.*, 2020). Furthermore, for DNA vaccines, its dependence on electroporation or an injector delivery device for vaccine administration is a challenge.

- Pre-existing immunity to vector viruses such as adenoviruses is a concern, particularly for those vaccine candidates utilizing human adenoviruses which may result in a reduced immune response to the vaccine (Zhu *et al.*, 2020; Sumner, 2020). To overcome this, AstraZeneca/Oxford's AZD1222 is using a genetically modified chimpanzee derived adenovirus (Folegatti *et al.*, 2020).

- Rapid large-scale manufacturing of vaccines still remains a challenge with lots of uncertainty to meet the demand of a pandemic.

- Political/governmental pressure is another concern which demands to rush the development and approval processes for a vaccine. It may result in an ineffective vaccine being released for public use. Public becomes hesitant to accept such type of vaccines.

- With regard to pandemics, Global Vaccine Summit has called for an equal allocation of vaccines whenever a vaccine is released, but there is still an apprehension that some countries reserve the vaccine for their citizens. A recent example is stockpiling of the drug, remdesivir by USA for the treatment of patients with COVID-19 (Global Vaccine Summit, 2020).

- Phase 3 trials require over a large number of volunteers (30,000) and mostly these trials are performed during the later stages of development.

Hence, there is a high chance that at that stage there will be fewer cases of COVID-19 and hence, HCTs may be required. Although HCTs have been done in the past, they may pose more risk for COVID-19 given how there is very little known about the pathogenesis and the availability of an effective treatment for COVID-19 (Deming *et al.*, 2020).

- Mutations are very frequent in viruses. Mutations of the virus can result in vaccines having limited effectiveness against it (Makhoul, 2020 Morris, 2020). There is also risk of vaccine-enhanced disease for inactivated vaccine candidates; this should be kept in mind when developing vaccines against COVID-19 (Morris, 2020).

However, given the crucial need for the availability of a COVID-19 vaccine globally, being concerned and assessing such risks should not prevent the release of otherwise safe and effective vaccines to the public (Garber, 2020).

### **Corona - COVID Vaccines – Indian scenario**

India is expected to become the world's second largest covid vaccine maker, and the country has the capacity to produce for both its domestic use and to other developing countries. Most of the world's vaccines have historically come from India. Even before Covid-19, it produced up to about 60% of the world's vaccines, and that too at a relatively low cost. Given the track record it should therefore be a strategic partner in the global inoculation against COVID-19.

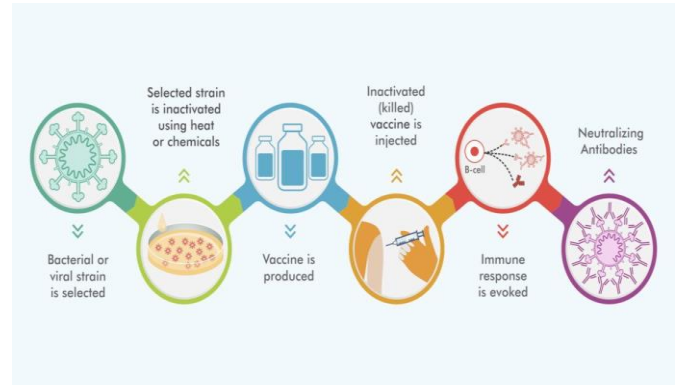
On 5 January, 2021 Sunday, India approved the emergency authorisation of two vaccines against novel coronavirus: Covaxin by Bharat Biotech, Hyderabad and Covishield by Serum Institute of India, Pune. Mass vaccination campaign was initiated on 16th January 2021 and both the manufacturers released the fact sheets about their products before the release of their vaccines.

### **Covaxin**

Covaxin has been developed by Hyderabad-based Bharat Biotech in collaboration with the

Indian Council for Medical Research (ICMR) and the National Institute of Virology. Bharat Biotech is an Indian Biotechnology company, headquartered in Hyderabad, India. The company was founded by Indian scientist, Krishna Ella in 1996. Bharat Biotech has one of the largest pharmaceutical manufacturing plants of its kind in Asia-Pacific. The company has the reputation for developing an eco-friendly recombinant and a naturally attenuated strain derived Rotavirus vaccine called ROTAVAC. They were one of the first to develop vaccines for viral diseases like Chikungunya and Zika. The company also produces vaccines for Japanese Encephalitis.

In May 2020, Indian Council of Medical Research's (ICMR's) National Institute of Virology approved and provided the virus strains for developing a fully indigenous COVID-19 vaccine. On June 29, 2020, the company got permission to conduct Phase 1 and Phase 2 clinical trials in India for a developmental COVID-19 vaccine named Covaxin, from the DCGI, Government of India. The Drugs Controller General of India (DCGI) has clearly mentioned that its approval is Emergency Use Approval (EUA) only. Covaxin is a whole-virion inactivated SARS-CoV-2 (Strain: NIV-2020-770), and the other inactive ingredients such as aluminium hydroxide gel (250 µg), TLR 7/8 agonist (imidazoquinolinone) 15 µg, 2-phenoxyethanol 2.5 mg, and phosphate buffer saline up to 0.5 ml. The vaccine (COVAXIN™) thus has been developed by using inactivated/killed virus along with the aforementioned chemicals. The vaccine is developed using Vero Cell derived platform technology. Inactivated vaccines do not replicate and are therefore unlikely to revert and cause pathological effects. They contain dead virus, incapable of infecting people but still be able to instruct the immune system to mount a defensive reaction against an infection. This indigenous, inactivated vaccine is developed and manufactured in Bharat Biotech's BSL-3 (Bio-Safety Level 3) high containment facility.



**Fig. 3 :** Outlines of protocol adapted by Bharat Biotech to produce COVAXIN™

### Why it has selected Inactivated Vaccine?

Conventionally, inactivated vaccines have been used for decades. Numerous vaccines for diseases such as Seasonal Influenza, Polio, Pertussis, Rabies, and Japanese Encephalitis use the same technology to develop inactivated vaccines with a safe track record of more than 300 million doses of supplies to date. It is the well-established and time-tested platform in the world of vaccine technology.

### Salient features of Covaxin

- COVAXIN™ has been granted approval for emergency restricted use in India by Drugs Controller General of India (DCGI) on Jan 03, 2021.
- COVAXIN® is included along with immune-potentiators, also known as vaccine adjuvants, which are added to the vaccine to increase and boost its immunogenicity.
- It is a 2-dose vaccination regimen given 28 days apart.
- It is a vaccine with no sub-zero storage, no reconstitution requirement, and ready to use liquid presentation in multi-dose vials, stable at 2-8°C.
- Pre-clinical studies demonstrated strong immunogenicity and protective efficacy in animal challenge studies conducted in hamsters & non-human primates.

- A total of 375 subjects have been enrolled in the Phase 1 study and generated excellent safety data without any reactogenicity. Vaccine-induced neutralizing antibody titers were observed with two divergent SARS-CoV-2 strains. Percentage of all the side-effects combined was only 15% in vaccine recipients.
- Phase 2 studies led to tolerable safety outcomes and enhanced humoral and cell-mediated immune responses.
- Efficacy is estimated by the incidence of COVID-19 cases accrual between the vaccine and the placebo group, which will commence two weeks after the second dose.
- The interim efficacy estimated to be 81% as declared on 5<sup>th</sup> March 2021

All India Institute of Medical Sciences (AIIMS) said that Bharat Biotech's Covid-19 vaccine, Covaxin, may provide immunity against the disease for nine to 12 months, as per the mathematical calculations. Data from Phase I and Phase II trials, and the ongoing Phase III trials, suggest that it is safe and effective, and by March-end tentatively, the data from Phase III trials will be available to establish its efficacy. In between, in phase III the vaccine is being administered to lakhs of people, and there are hardly any serious side-effects. No death has been reported so far. Covaxin satisfies the guidelines of drug regulator that for approval the efficacy of the drug should be more than 50%.

At present, Covaxin is being used by India in its vaccination campaign, which has already covered over 9 million health workers, and aims to cover 300 million people by August. Bharat Biotech has supplied 5.5 million doses to the government and will sell an additional 4.5 million doses.

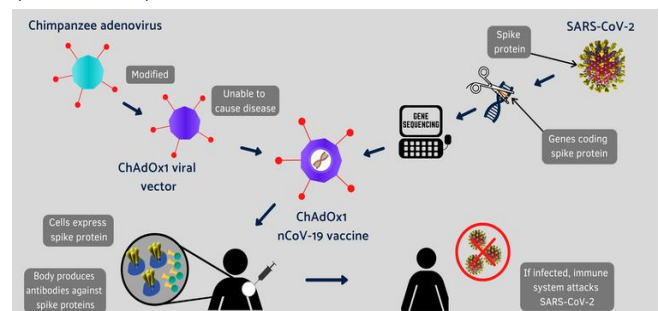
#### Global Acceptance of COVAXIN™

Bharat biotech has been approached by several countries across the world for the procurement of COVAXIN. Clinical trials in other countries will commence soon. Supplies from

government to government in the following countries would take place: Mongolia, Myanmar, Sri Lanka, Philippines, Bahrain, Oman, Maldives and Mauritius.

#### Covishield

Covishield is manufactured by Pune based Serum Institute of India, the world's largest vaccine manufacturer by volume. Originally, it was developed by British-Swedish pharma giant AstraZeneca and Oxford University. Earlier, Britain and Argentina had approved the emergency marker use of coronavirus vaccine developed by the University of Oxford and AstraZeneca. Serum Institute of India has joined hands with British-Swedish drugmaker to produce 1 billion doses of its COVID-19 vaccine. In June last year, AstraZeneca had reached a licensing agreement with Serum to supply one billion doses for low-and-middle-income countries, with a commitment to provide 400 million before the end of 2020. The local version of Oxford-AstraZeneca COVID-19 vaccine (ChAdOx1) will be known as Covishield.



**Fig. 4: Outlines of protocol adapted by Serum Institute of India to produce COVISHIELD™**

Covishield is made from a weakened version of a common cold virus (known as an adenovirus) from chimpanzees. This Oxford vaccine packs the DNA that code for the spike protein in the shell of a genetically altered chimpanzee virus. The original adenovirus causes common cold in chimpanzees and it rarely, if ever, infects humans. The virus is further modified to ensure that this chimp virus cannot grow in people. The AstraZeneca vaccine uses the modified replication-deficient virus as a vehicle to deliver the COVID-19-causing spike or S-protein of the SARS-CoV-2 virus. It is produced in genetically modified human embryonic kidney (HEK) 293 cells.

On the whole, it has been modified to look more like coronavirus - although it can't cause illness. When the vaccine is injected into a patient, it prompts the immune system to start making antibodies and primes it to attack any coronavirus infection. The jab is administered in two doses given between four and 12 weeks apart. It can be safely stored at temperatures of 2°C to 8°C, about the same as a domestic refrigerator, and can be delivered in existing health care settings such as doctors' surgeries.

It has received emergency approval by WHO and DCGI to be used in India's mass inoculation campaign which aims to vaccinate some 300 million people in the first phase, most of them frontline workers and those above 50 or in high-risk groups.

Covishield is less expensive compared to some of the other vaccines being used — such as the ones from Pfizer-BioNTech and Moderna. It also doesn't need to be stored in ultra-low temperatures, which makes it suitable for use in many developing countries that lack necessary storage infrastructure. In view of its efficiency, affordability and storage, the demand for Covishield is also growing among many countries.

### How effective is Covishield?

International clinical trials of the Oxford-AstraZeneca vaccine showed that when people were given a half dose and then a full dose, effectiveness hit 90%. But there was not enough clear data to approve the half-dose, full-dose idea. However, unpublished data suggests that leaving a longer gap between the first and second doses increases the overall effectiveness of the jab. In a sub-group given the vaccine this way it was found to be 70% effective after the first dose.

### A comparison between Covishield and Covaxin

India has approved two vaccines — Covishield and Covaxin — for emergency use to fight Covid-19 pandemic in the country. The mass vaccination drive has begun on 16 January 2021. Covishield is the same vaccine that is being used in

other countries including the UK. India's approval for Covaxin is conditional as it is still “in the clinical trial mode”. Here is a comparison between the two Covid-19 vaccines approved in India:

### Makers

- Covishield has been developed by the Oxford University scientists in collaboration with the pharmaceutical company AstraZeneca. In India, its trial was undertaken by the Serum Institute of India (SII), which is also manufacturing the Covishield vaccine for the mass vaccination drive.
- Covaxin has been developed by the indigenous vaccine developer Bharat Biotech in collaboration with the Indian Council for Medical Research (ICMR). Its phase III trial is in the final stage. The ICMR director, Dr Balram Bhargava said the full trial will be over in a week and by the time mass vaccination begins, the final set of data will be available.

### How they were made

- Covishield vaccine has been developed by using the virus — adenovirus — that causes common cold infections among chimpanzees. Its genetic material is same as that of the spike protein of SARS-CoV-2 coronavirus. Spike protein is the part of SARS-CoV-2 using which the virus enters a human body cell. Covishield vaccine has been developed by using a weakened version of the adenovirus.
- Covaxin vaccine has been developed using dead coronavirus-called “inactivated” vaccine in medical parlance. Under inactivated state, the virus is not capable of infecting people or replicating on its own inside the body of a person after being injected. But a shot of the vaccine prepares the immunity system to recognise the actual virus and fight it if and when infection happens.

### **Efficacy**

- While Covaxin is still in the final stage of clinical trial and no efficacy rate has been made public for this Covid-19 vaccine. However, the interim efficacy estimated to be 81% as declared on 5<sup>th</sup> March 2021. The efficiency of Covishield has been pegged at over 70 per cent. This efficacy rate is far below than the vaccines developed by Pfizer-NBiotech and Moderna, but it is above the qualifying efficacy benchmark of 50 per cent set by several countries.

### **Dosage**

- Both Covishield and Covaxin are two-dose Covid-19 vaccines. But in an interesting development that was considered as inadvertent error, the Covishield vaccine was found to show over 90 per cent efficacy if one and a half doses are given to the recipient. However, in India, the SII conducted trials using full two-shot doses during testing.
- The two shots of the Covishield vaccine need to be spaced by six weeks. In the case of Covaxin, the interval between the two shots has not been yet prescribed by the Drug Controller General of India (DCGI) but its developer Bharat Biotech had earlier said the second shot would be given after 14 days.

### **Storage**

- Both Covishield and Covaxin vaccines are easy to store as they require to be kept at 2-8 degree Celsius. Most vaccines commonly used in India are kept at this temperature range. This makes transport and local storage of both Covid-19 vaccines safe and easy for all parts of the country.

### **Pricing**

- Though currently the government is controlling the vaccination drive against Covid-19, and it is free. Different reports have cited different prices for both the vaccines. The Covishield vaccine is reported to cost the

government around Rs. 400-450 or Rs. 200-225 per dose.

- The pricing of indigenously developed Covaxin is not clear yet. However, some reports say the Bharat Biotech has priced its Covid-19 vaccine at Rs. 350.

### **Safety**

- In the backdrop of reports questioning safety of the vaccines, the DCGI has said both Covishield and Covaxin are safe Covid-19 vaccines. DCGI VG Somani categorically said, “[Both] vaccines are 110 per cent safe. Some side effects like mild fever, pain and allergy are common for every vaccine.” “We will never approve anything if there is slightest of safety concerns,” Somani said.

### **The vaccination plan**

- The government aims to vaccinate 30 crore people by July defining them as “priority population”. They include frontline health workers, essential duty personnel and vulnerable sections of population. The first batch of 3 crore people will be given the shots of Covid-19 vaccines by March. Vaccination will be done through registration on Co-WIN, the digital platform developed by the government agencies to facilitate and monitor the drive against Covid-19 pandemic.

### **The other candidate vaccines which are in different stages of trials in India to test safety and efficacy include:**

- **ZyGov-Di**, being developed by Ahmedabad-based Zydus-Cadila. Drugs Controller General of India (DCGI) has approved conducting phase III trials of the country's first DNA vaccine candidate against Covid-19 being developed by Zydus Cadila, the Department of Biotechnology said. The vaccine candidate has been supported by the National Biopharma Mission (NBM) under the aegis of

Biotechnology Industry Research Assistance Council (BIRAC), a PSU under the DBT.

- A vaccine being developed by Hyderabad-based Biological E, the first Indian private vaccine-making company, in collaboration with US-based Dynavax and Baylor College of Medicine.
- HGC019, India's first mRNA vaccine made by Pune-based Genova in collaboration with Seattle-based HDT Biotech Corporation, using bits of genetic code to cause an immune response
- A nasal vaccine by Bharat BioTech
- The Sputnik V vaccine candidate developed by Dr Reddy's Lab and Gamaleya National Centre in Russia
- A second vaccine being developed by Serum Institute of India and American vaccine development company Novavax.

### Conclusions

Scientists began working on coronavirus vaccines ever since the outbreaks of SARS and MERS, however, they could not succeed because of a myriad of difficulties. The current coronavirus pandemic, COVID- 19, appears much broader than SARS and MERS. Emergence of new variants intensifies the problem. Many research groups and companies are undertaking R & D programs to develop an effective vaccine against SARS-C oV-2 all over the world. A recent trend of vaccine research and development for SARS-C OV-2 is availability of varied range of evaluated technological platforms.

A close scrutiny of coronavirus vaccines revealed several safety concerns associated with the use of coronavirus S-based vaccines, including inflammatory and immunopathological effects. Assuming that the vaccine will generate an effective immune response the time frame of vaccine protection in vaccinated individuals is questionable. It is necessary to check the post-vaccination persistence of anti-COVID antibodies. Both safety and efficacy are significantly dependent on the type of vaccine, i.e.

the technology or platform used. Some technologies are very new and therefore require more careful testing. Another aspect is not only the ability of a company to develop the technology, but also its large-scale production capacity so that it is quickly accessible globally. New production lines, capable of generating billions of doses in a few months, must be considered (Calina *et al.*, 2020). Applying short cuts in the development of vaccines can lead to errors with disastrous consequences. Relaxation of regulatory principles based on political pressure and goodwill needs to be resisted. Finally, vaccine development is a risky process, and one critical issue in the COVID-19 vaccine would be the occurrence of ADE which may be disastrous for those receiving the vaccine.

Vaccines are based on the principle of DNA and RNA requires insertion of these nucleic acids in to cells of people to be vaccinated. Although some recent data seem encouraging, these concepts have questionable efficiency in humans. The attenuated viruses would be variants of SARS-C oV-2 made less or not at all pathogenic by genetic engineering. They are by far the most immunogenic, but there is a risk that they will become pathogenic after mutations. Inactivated viruses, viral fragments, and synthetic peptides are all relatively weakly immunogenic. Considering all these, it is doubtful whether there ever will be a successful SARS-CoV-2 vaccine.

In India, two vaccines, covaxin and covishield are released for mass immunization on conditional basis. Many scientific organizations criticize that a vaccine released on such conditions cannot be released for vaccination of general public. Vaccination is taken up phase-wise. Frontline workers are targeted first. The manufacturers and government assure their effectiveness. But both of them did not indicate the time frame for immunoprotection. It is interesting to note that a number of countries halted use of the AstraZeneca vaccine (basis for covishield) because a small number of people developed blood clots. In light of onset of

second wave of pandemic, it needs to be seen the effectiveness of these vaccines.

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# Analysis of Physico Chemical Parameters of Medchal Lake in Telangana State

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## ABSTRACT

In the present work an attempt was made to assess the Physico Chemical Parameters of a water body in Telangana state for a period of one year during January 2019 to December 2019. Water samples were collected from four different sampling stations of Medchal Lake labeled as S1, S2, S3, and S4. Samples were collected at monthly interval in order to assess physico chemical parameters such as temperature, pH, turbidity, total dissolved solids, total hardness, chlorides, phosphate, nitrates, sodium, potassium, dissolved oxygen and biological oxygen demand, following the standard methods of APHA (2005)[1]. The results revealed that there was significant variation in some physicochemical parameters and most of the parameters were found to be in normal range of permissible limit and thus indicated better quality of lake water. It has been found that the water was suitable for drinking purpose

**Keywords :** Physicochemical parameters, Medchal Lake, Telangana state

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## I. INTRODUCTION

Lakes are an important element of natural environment that defines both landscape and its ecological functioning. During the last few decades lakes all over the World have become the focus of environmental investigation as they exhibit enormous diversity based on the genesis, geographical location hydrological regimes and substrate factors.

Water quality constitutes various biotic and abiotic factors associated with the ecosystem. The maintenance of healthy ecosystem is dependent on

the physico chemical properties of water and biological diversity. The quality of ecosystem is dependent on the physico-chemical and biological characteristics (Medudhula Thirupathaiah., 2012)[2].

Water quality indicates the relation of all Hydrobiological properties; it reflects the biotic and abiotic status of ecosystem. (Smitha AD, 2013)[3].

Abiotic and biotic factors of an eco-system are interdependent and the fluctuation of abiotic ones frequently affects the biotic factors changing their quantity and biodiversity physical characteristics like

temperature, light intensity, transparency, pressure, conductivity and water current whereas chemical properties like levels of dissolved oxygen, free carbon dioxide alkalinity, hardness, phosphate and nitrate levels of the lake water highly govern the aquatic life and determine the trophic status of the water body. Abiotic factors are usually the governing forces of the environment and influence the well being, distribution of organisms and functioning of the ecosystem. The productivity of the freshwater community that determines the fish growth is regulated by the dynamics of its physico-chemical and biotic environment (Wetzel, 1983)[4]. The present investigation involves the analysis of water quality in relation to physicochemical parameters.

## II. MATERIALS AND METHODS

a. Study area: Pedda Cheruvu, located in Medchal, is listed with the Hyderabad Metropolitan Development Authority's (HMDA) Lake Protection Committee. The lake was surveyed in 2013 and according to that report, the water spread area is about one and a half acre full tank level area is 356 acres and its bund length is 1,200 meters. Lake Latitude 17°0.251 17.0004" N, Longitude 78°0.331 16.3800" E. It is 30 km away from Secunderabad Railway Station and 45 km from the Rajiv Gandhi International Airport. The lake was once used to provide water for agriculture and allied activities and was a source of drinking water. The lake attracted migratory birds in the winter. According to locals, this is the largest lake in the mandal consisting of 18 villages including Medchal village. Hence it is popularly known as Pedda Cheruvu. It is said that it has been in existence since the Nizam's Era.

b. Analysis of water: The surface water samples were collected from four sampling stations namely, S1, S2, S3, and S4 between 8 and 10 am from January 2019 to December 2019. To collect water samples, cleaned and rinsed plastic containers of two-liter capacity

were used. Water samples were tested for different physico-chemical parameters. The chemical parameters as pH and temperature were measured in the field using a pH meter and digital thermometer. Further analysis was carried out as per APHA method (APHA 2005)[5], and standard literature, Trivedi and Goel (1986)[6].

## III. RESULTS AND DISCUSSION

The results obtained for various Physico-chemical parameters assessed such as Temperature, pH, Carbonates, Bicarbonates, Dissolved oxygen, biological oxygen demand, Chemical oxygen demand, Organic matter, Total hardness, Calcium, Magnesium, Chlorides, Phosphates, Sulphates, Nitrates, Nitrites, Silicates, Total dissolved solids, are depicted as shown in the form of Tables and Figures

a. Temperature: The measurement of temperature is one of the most primary factors, which plays an important role in the metabolic activities of the organism. The temperature showed a range ranged from 21.7° C to 31.14° C during the study period, January 2019 to December 2019 (Table-1, Figure-1).

The maximum temperature was recorded in the month of May and lowest was in December month. Water temperature influenced aquatic weeds and algal blooms (Zafer, 1968)[7].

b. pH: pH of water is an important environmental factor which effects the biology and the life cycle of the biotic life. It is recorded in the range of 7.2 (Sep) to 8.5 (May) at all stations. pH was estimated by using pocket pH meter at the spot in lake. pH value is very important for plankton growth (Chisty, 2002)[8]. According to (Umavathi *et.al.* 2007)[9]. pH range between 5 to 8.5 is best for plankton growth. (Table-1, Figure-2).

c. Carbonates: Carbonate is the prime contributor for maintaining pH of a water body and ends its role is of vital importance (Hegde *et.al.* 2005)[10]. The highest amount of carbonates was found to be 52.94 mg/l in May and the lowest value was recorded as 26.64 mg/l in June. (Table-1, Figure-3).

d. Bicarbonates: Bicarbonate play an important role in water biota. Higher value of bicarbonate leads to alkaline pH. The greater amount of bicarbonate was identified as 250.64 mg/l in August and lowest value is 140.56 mg/l in October. (Table-1, Figure-4)

e. Dissolved Oxygen: Dissolve oxygen is an important parameter in water quality assessment as it regulates many metabolic and physiological processes of biotic components. It indicates the pollution in water bodies. The DO values varied from 8.2 to 11.4 mg/l. Highest DO observed in the month of November and lowest was observed in month of March. (Table-1, Figure-5). Lower DO indicate organic pollution in lake as DO levels in water drop below 5.0 mg/l, many life forms are put under pressure (Bowman *et. al.*, 2008)[11].

f. Biological Oxygen Demand: The highest concentration of BOD 10 mg/L recorded in April whereas lowest value 2.62 mg/L was recorded in August (Table-1, Figure-6). High amount of waste along with rain water from the surrounding and addition of organic waste in lake by certain human activities which also be responsible for the increase in BOD (Solanki HA 2007)[12]. High biological oxygen in summer was several microbes in water accelerated their metabolic activities.

g. Chemical Oxygen Demand: The highest value 31.00 mg/L lowest values 10.00 mg /L were recorded (Table-1, Figure-7). Highest values observed in summer and lowest values were recorded during rainy season. The values of COD in conjugation with BOD are useful in knowing the toxic condition and presence of biologically resist organic substances. (Sharma et al., 2010)[13]. The estimation of COD along with BOD is helpful in indicating toxic conditions and the presence of non biodegradable substances in the water (Sawyer, McCarty and Parkin, 2003)[14]. The high COD values indicates that some degree of non-biodegradable oxygen demanding pollutants were present in the water. The estimated greater amount of COD 30 mg/l was recorded in April and lowest of 11 mg/l I in August (Table-1, Figure-7).

h. Total hardness: The maximum values 260.00 mg/L is recorded during the month of March (Table-1, Figure-8). Lowes values 120.00mg/L were recorded in the month of August. High range organic components, detergents, chlorides, high temperature are influence to decrease in water volume and they increase the hardness. The lowest amount of total hardness was recorded during winter season due to low concentration of calcium and magnesium. (Salve BS 2006)[15].

i. Calcium: Calcium is an important nutrient for aquatic organism. Sewage waste might also be responsible for the increase in amount of calcium (Table-1, Figure-9), (Udhya Kumar et al., 2006)[16]. The lowest amount of calcium in water was recorded during winter season due to calcium absorbed by the large number of organisms for shell construction, bone building and plant precipitation of lime. (Solanki, HA 2012)[17]. The maximum value of calcium 60.49 mg/l were noticed in August and minimum 35.26 mg/l January.

j. Magnesium: The maximum value 40.24 was in the month of April and the lowest value was 24.78 mg /l in December (Table-1, Figure-10). Lowering of magnesium level reduces the phytoplankton population (Govindan, 1991)[18]. The high values observed in summer could be due to evaporation, increasing the concentration of magnesium (Sharma R, 2010)[19].

k. Total Dissolved Solids(TDS): Dissolved solids are present in water in natural condition. The Dissolved solids are composed mainly of carbonates, bicarbonates, chlorides, sulphates, calcium, phosphate and iron (Trivedy, 1986)[20]. High TDS value for Medchal lake was estimated to be 495 mg/l in the month of April and lower was 310 mg/l in the month of August (Table-1, Figure-11). The contamination of domestic waste water, garbage and other related wastes in the surface water body can be one among the reasons for increasing in TDS measure (Reasoner,2004)[21].

l. Chlorides: It is an inorganic anion in water. The higher concentration of chloride 198.96 mg/l estimated in April and lower concentration 126.25mg/l recorded in July (Table-1, Figure-12). The higher concentration of chloride is considered to be an indicator of higher pollution due to higher organic waste of animal origin(.Mishra et al 2007 ) [22].The concentration of chloride is directly correlated to the pollution level (Munnavar,1970)[23].The lowest value of chloride recorded during monsoon season due to the dilution of lake water by rain ( Shastry 1970)[24].

m. Sulphates: The maximum value 36 mg/l was recorded in the month of February and Minimum of 24 mg/l in September during the period of investigation .Sulphur deficiency can inhibit algal growth indirectly by hindering chlorophyll synthesis (Cole, 1979)[25]. (Table-1, Figure-13).

n. Phosphates: Phosphates were recorded very low concentration in Medchal Lake and the concentrations are influenced by domestic sewage, agricultural drainage, and the release of laundry detergents into the aquatic system. The phosphate – phosphorus was recorded in range of 0.37 to 0.98 mg/l in April of observation noticed. (Table-1, Figure-14).

o. Nitrates: The estimated maximum amount of nitrates 1.15 mg/l in June and minimum amount 0.64 mg/l were recorded in March. (Table-1, Figure-15).

Nitrogen is component in nitrate, nitrite, ammonia, urea, and dissolved organic compounds in an aquatic environment. The highest amount of nitrate concentration was known to support the formation of blooms. (Udama, AU 2014)[26].

p. Silicates: This is an important parameter in fresh water ecosystem which regulates the diatoms population. Silicates are play an important role in the production of algal growth is well recognized. In the present investigation value ranged 1.92 mg/l in april to 2.99 mg/l. in june were recorded. (Table-1, Figure-16).

q. Organic matter: The highest value 2.5 mg/l was recorded in September and lowest value was recorded of 0.4 mg/l in August (Table-1, Figure-17). Organic matter infusion into the lake as outside the basin water inflowing.

r. Nitrites: Nitrites are increase with nitrogen rich flood water into the Lake .The maximum value 0.08 mg/l in july and the lowest value was 0.02 mg/l in march were recorded (Table-1, Figure-18). The lowest amount nitrite was recorded during the summer and monsoon may due to the utilization by eutrophication.(Abdar.,2013[27], Srinivas,M., 2018)[28].

Table 1. Monthly variation of Physico-chemical parameters

Parameters	JAN 2019	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC 2019	AVG.
Temp(°C)	22.4	27.1	30.1	31.14	31.13	29.2	24.2	23.2	22.9	22.4	21.6	21.7	25.58
pH	7.8	8.0	8.0	8.2	8.5	8.3	8.4	8.1	7.2	7.4	7.4	7.9	7.91
Carbonates (mg/l)	51.62	34.25	46.31	36.28	52.94	26.64	39.34	48.40	42.68	41.56	47.26	27.44	41.22
Bicarbonates(mg/l)	234.24	241.26	229.76	239.56	249.24	248.65	249.79	250.64	232.68	140.56	226.34	248.61	232.58
DO(mg/l)	8.2	6.9	4.3	4.4	4.5	5.2	5.6	5.8	6.4	7.2	8.4	8.3	6.26
BOD	8	6	8	10	8	8	4	4	5	10	8	10	7.41
COD(mg/l)	19	28	24	31	29	27	10	10	12	14	16	16	19.66
TH(mg/l)	222	245	260	188	196	178	182	120	194	180	194	218	198.08

Calcium(mg/l)	35.26	38.28	44.29	46.96	49.92	41.34	44.66	60.49	46.74	42.12	51.39	54.58	46.33
Magnesium(mg/l)	35.79	28.84	34.68	40.24	38.66	28.24	30.66	26.78	34.42	29.94	26.64	24.78	31.63
TDS(mg/l)	320	360	410	495	395	330	340	310	360	340	330	320	359.16
Chlorides(mg/l)	127.26	165.28	122.6	198.96	145.56	126.25	158.56	148.64	140.67	160.54	140.68	190.58	152.13
Sulphates(mg/l)	32	36	30	34	30	34	32	36	24	28	26	36	28.75
Phosphates(mg/l)	0.88	0.66	0.53	0.98	0.44	0.56	0.42	0.77	0.76	0.64	0.89	0.67	0.68
Nitrates(mg/l)	0.87	0.85	0.64	0.66	0.98	1.15	1.08	0.98	0.97	0.67	0.74	0.95	0.87
Silicates(mg/l)	2.24	2.44	2.16	1.92	2.75	2.99	1.93	1.94	2.18	1.96	2.56	1.96	2.25
Organic matter(mg/l)	1.8	0.9	1.4	1.8	1.8	0.6	0.5	0.4	2	1.9	1.6	1.8	1.37
Nitrite(mg/l)	0.04	0.06	0.02	0.06	0.03	0.04	0.08	0.02	0.04	0.04	0.02	0.05	0.04

Figure-1:- Showing variation in temperature.

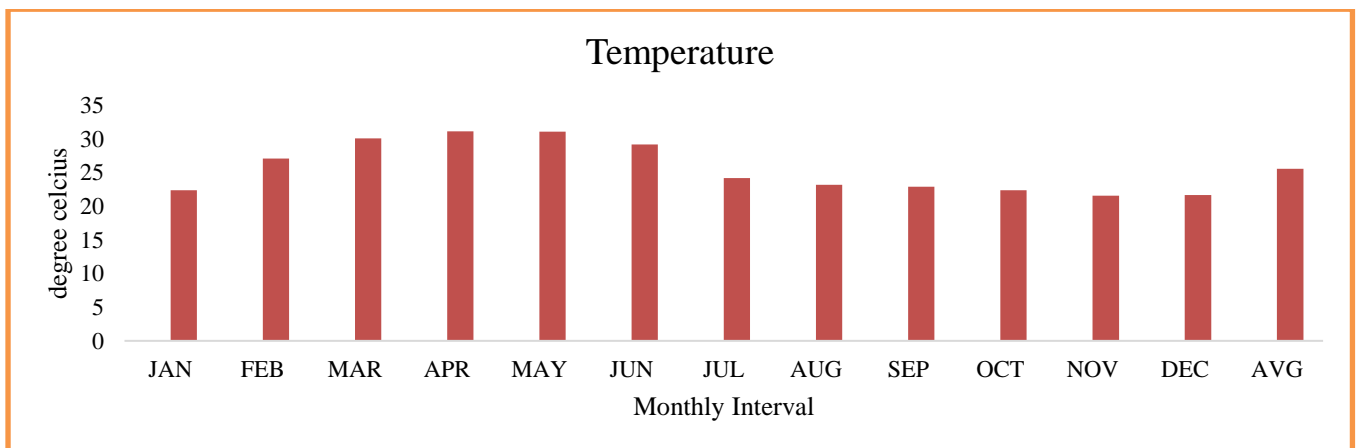


Figure-2:- Showing variation of pH

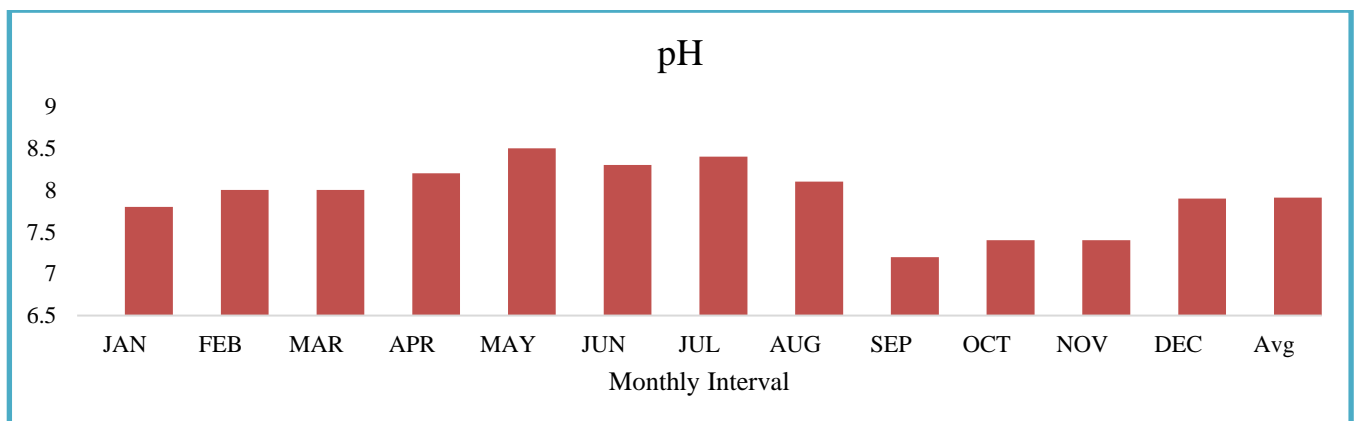


Figure-3:- Showing Amount of Carbonates

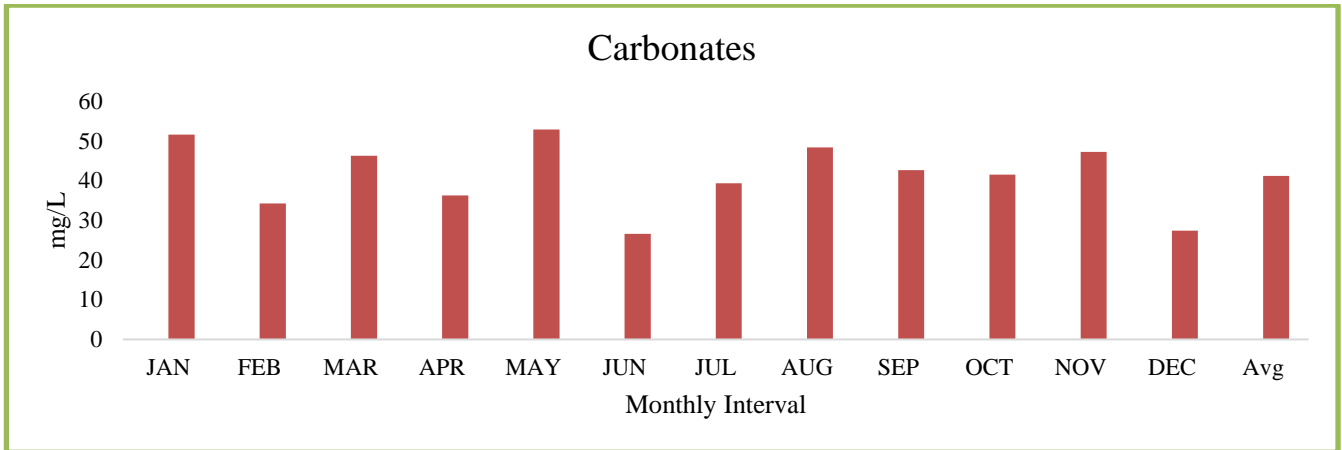


Figure-4:- Showing Amount of Bicarbonates

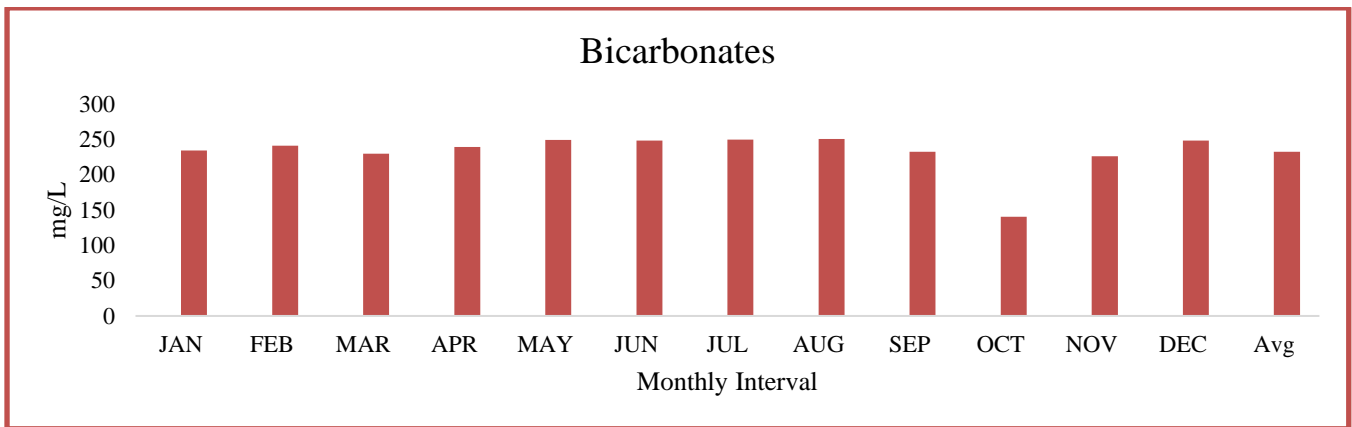


Figure-5:- Showing variations in Dissolved Oxygen

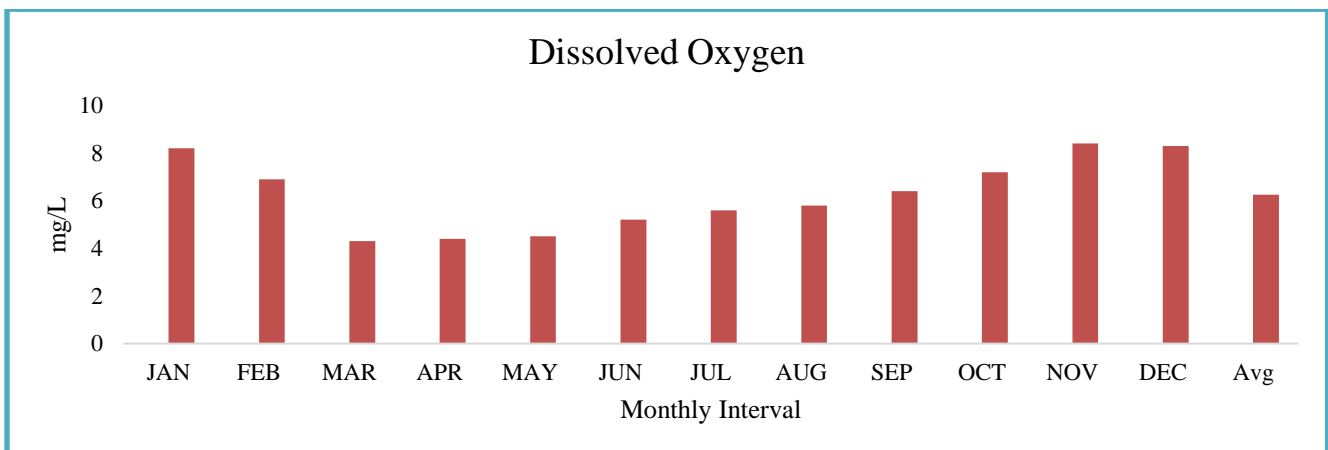


Figure-6:- Showing variation of Biological Oxygen Demand

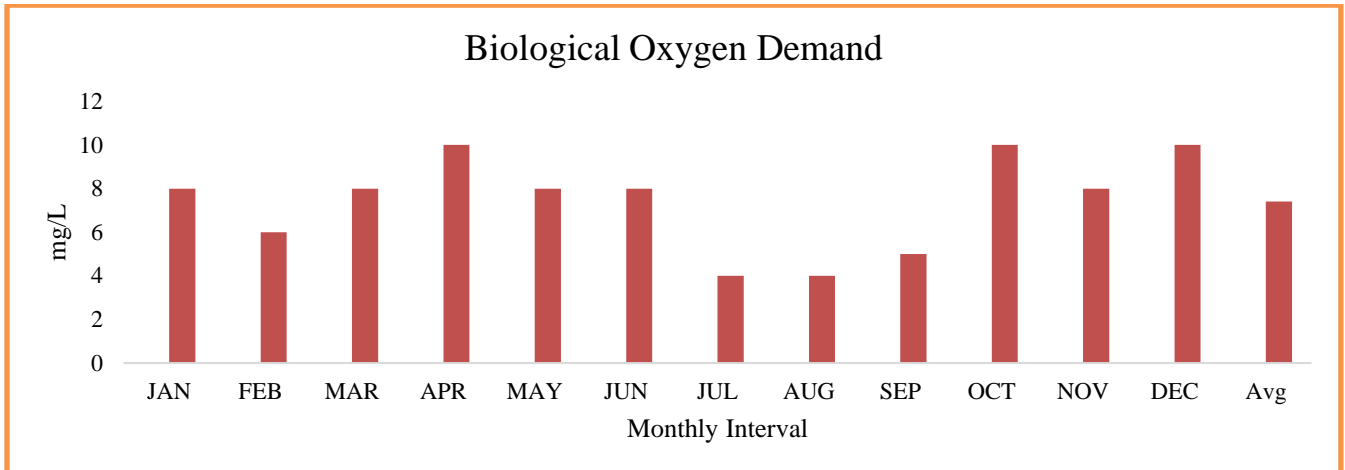


Figure-7:- Showing variation of Chemical Oxygen Demand

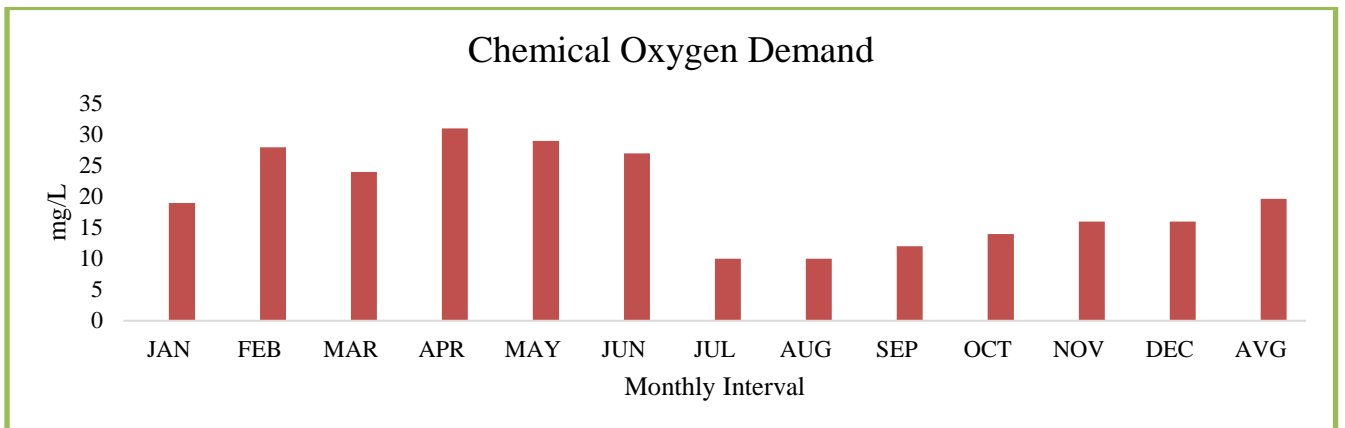


Figure-8:- Showing variation in Total Hardness

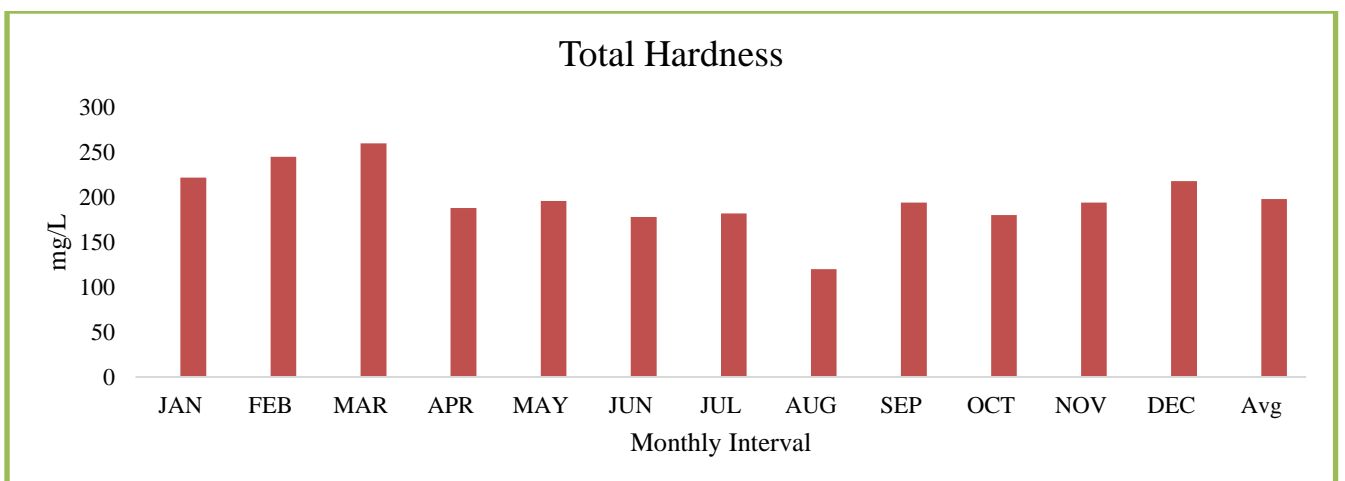




Figure-9:- Showing Amount of Calcium

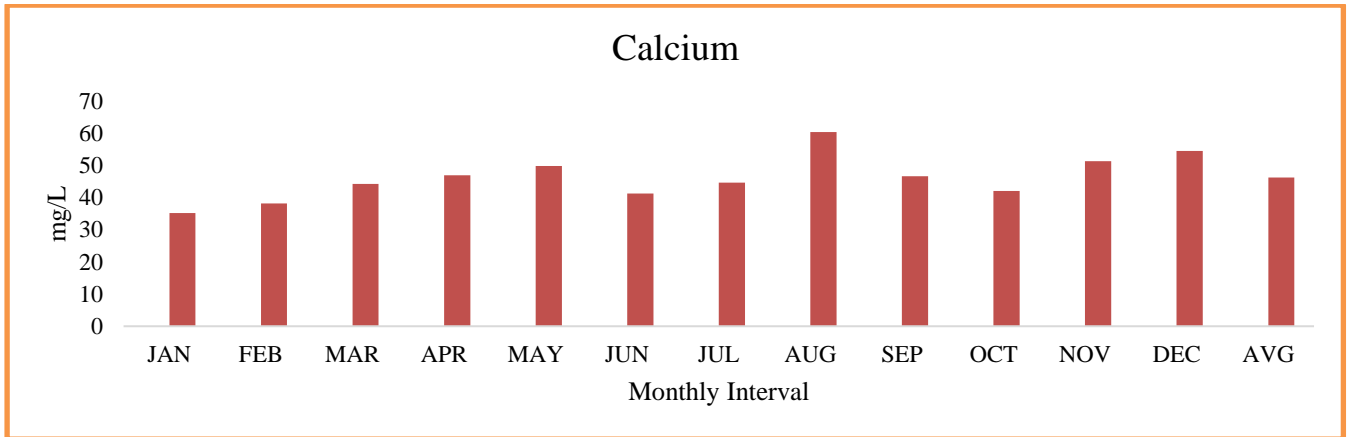


Figure-10:- Showing Amount of Magnesium

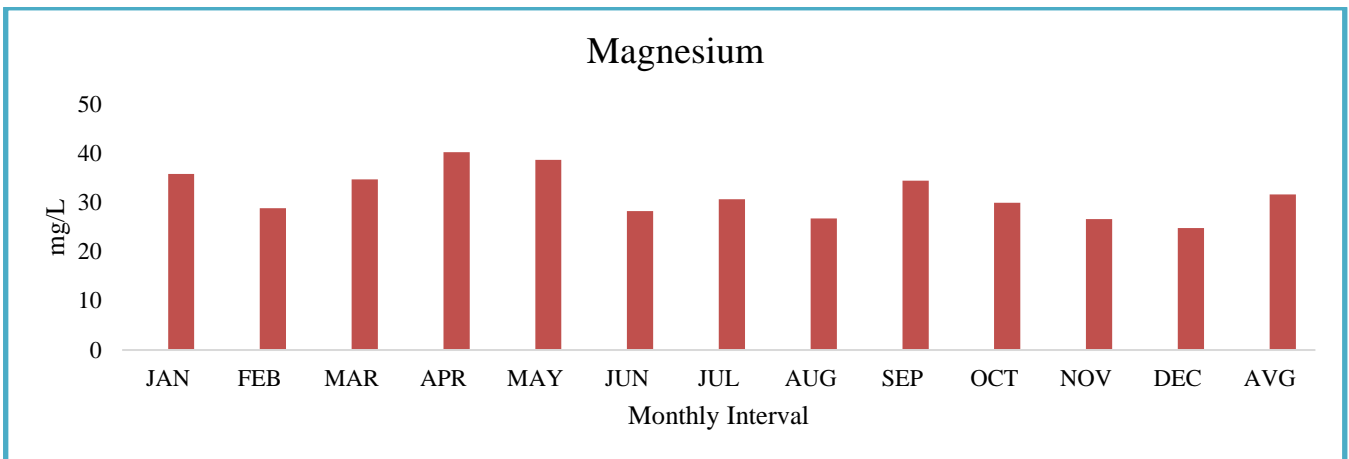


Figure-11:- Showing variation of Total Dissolved Solids

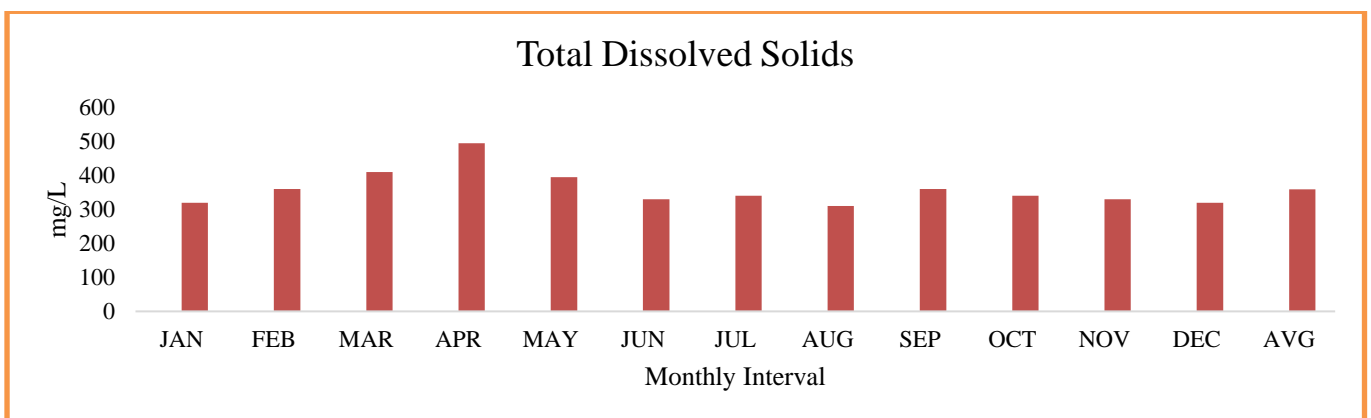


Figure-12:- Showing Amount of Chlorides

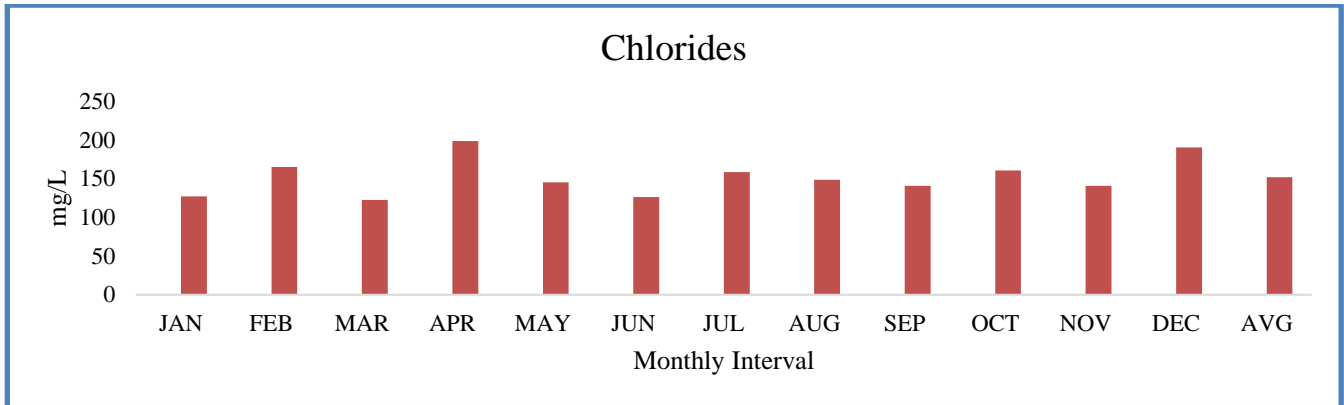


Figure-13:- Showing Amount of Sulphates

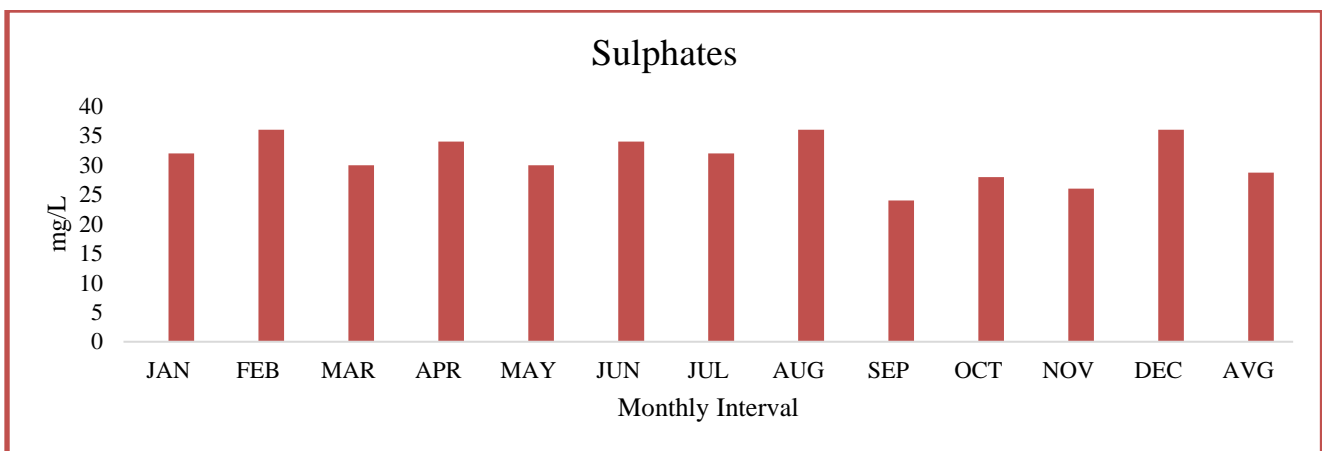


Figure-14:- Showing Amount of Phosphates.

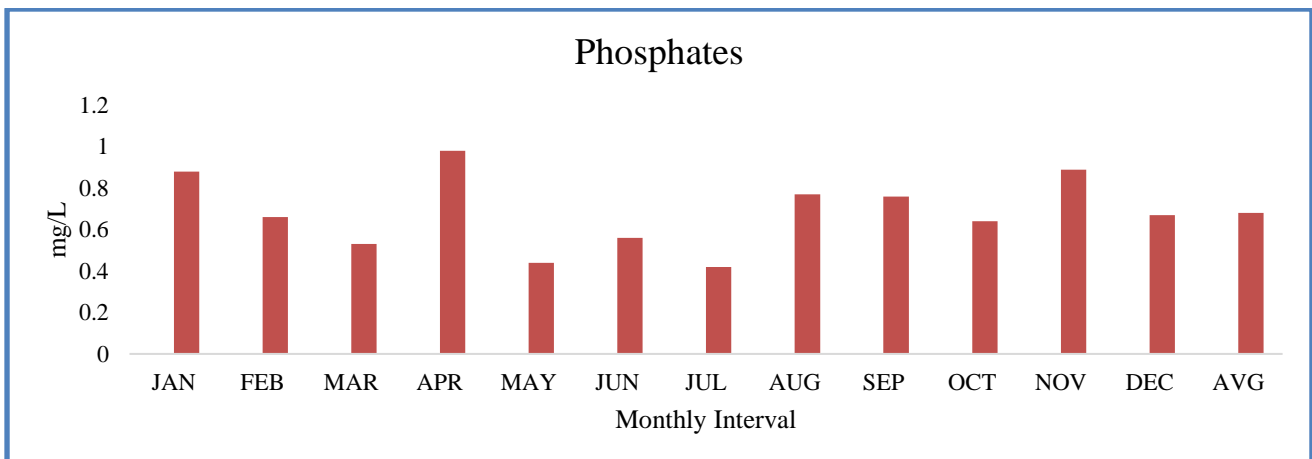


Figure-15:- Showing Amount of Nitrates

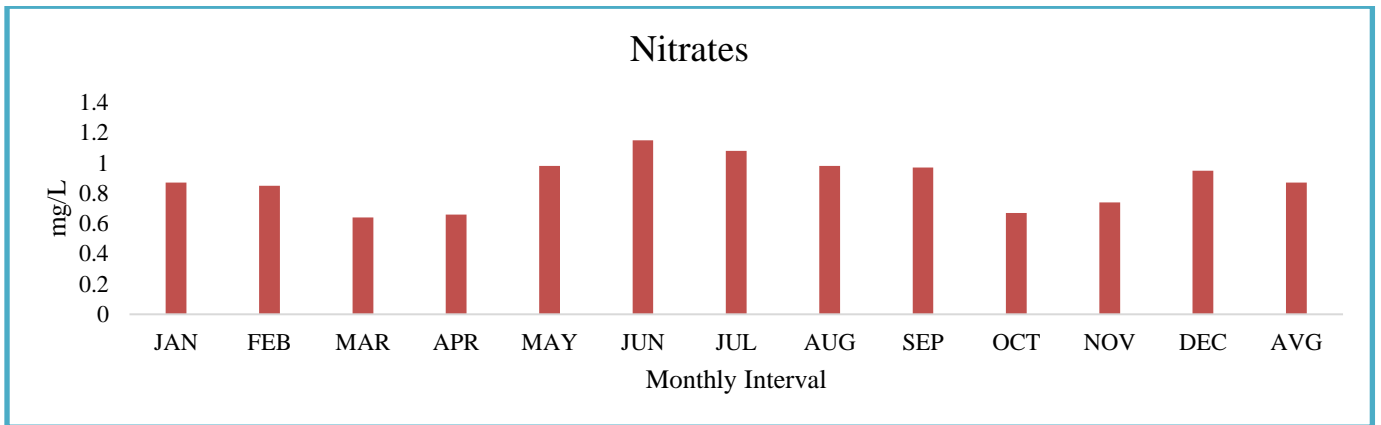


Figure-16:- Showing variation of Silicates

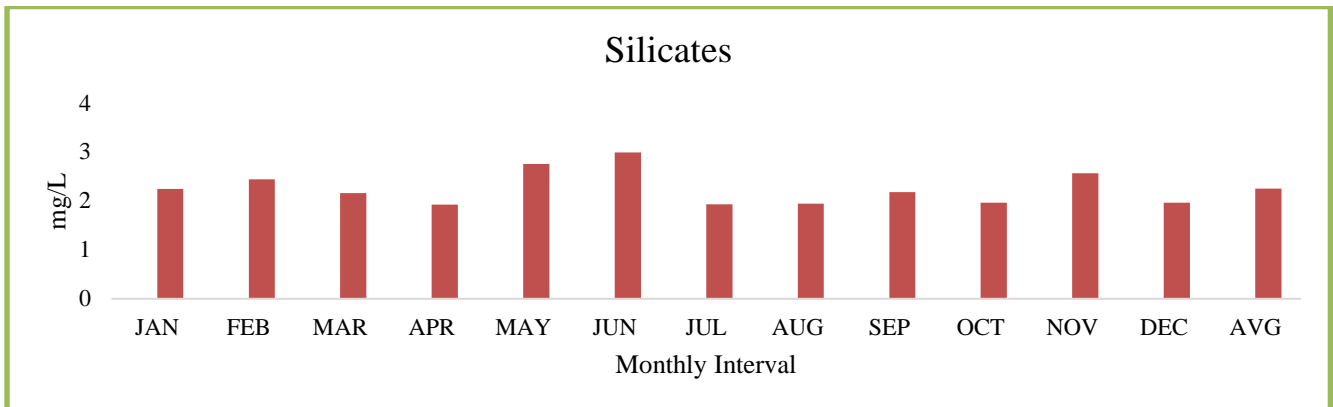


Figure-17:- Showing Content of Organic Matter

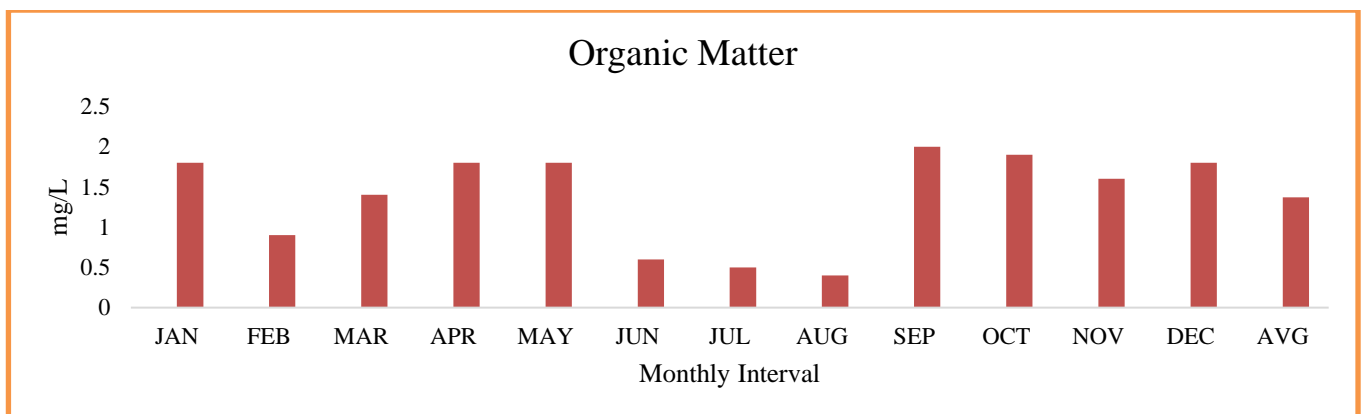
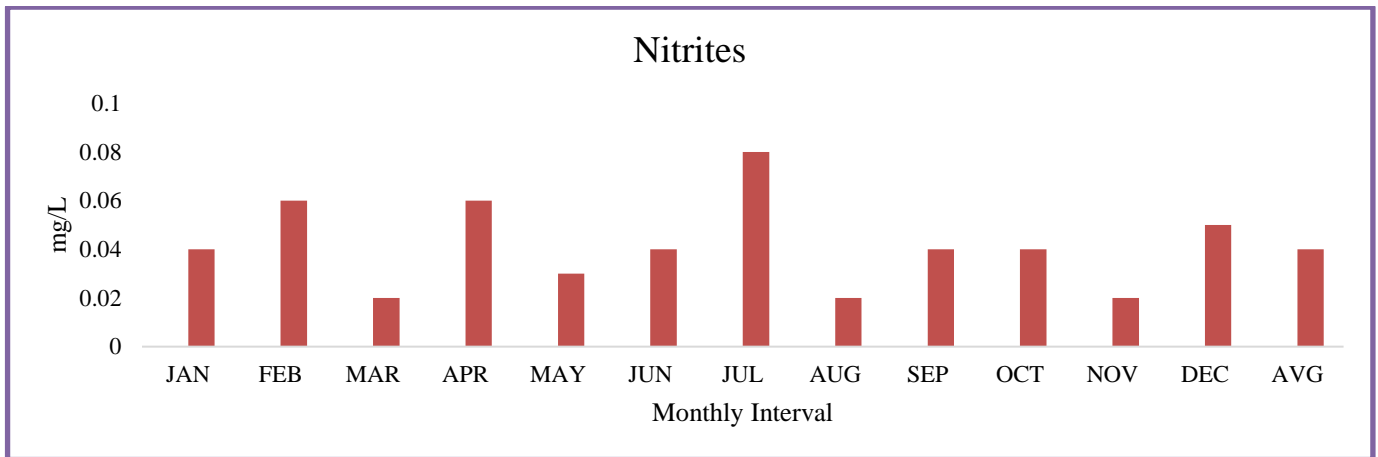


Figure-18:- Showing Amount of Nitrites



#### IV. CONCLUSION

In the present investigation the resultant of analysis of Physico –chemical parameters had indicated that human activity and influx of domestic waste into the lake led to eutrophication. The values of physico –chemical parameters assessed were found to be within or slightly above the permissible limit prescribed by WHO. Physico chemical analysis of water of Lake has indicated a continuous change in its trophic state, which correlates temporally with an increase in anthropogenic activities.

#### V. ACKNOWLEDGEMENT

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# An Automated Covid-19 Face Mask Detection and Warning System with Deep Learning

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## ABSTRACT

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The corona virus COVID-19 pandemic is causing a global health crisis so the effective protection methods are wearing a face mask in public areas according to the World Health Organization (WHO). The COVID-19 pandemic forced governments across the world to impose lockdowns to prevent virus transmissions. Reports indicate that wearing face masks while at work clearly reduces the risk of transmission. As the result, to create an efficient and economic approach of using Artificial Intelligence (AI) for safe environment in a manufacturing setup. A hybrid model using deep and classical machine learning for face mask detection will be presented. A face mask detection dataset consists of with mask and without mask images, by using OpenCV to do real-time face detection from a live stream via our webcam. The use of dataset is to build a COVID-19 face mask detector with computer vision using Python, OpenCV, and Tensor Flow and Keras. The goal is to identify whether the person on video stream is wearing a face mask or not with the help of computer vision and (RCNN) deep learning.

**Keywords :** Facial Mask Detection, COVID-19, Deep Learning, Convolutional Neural Network(CNN), Regional based Convolutional Neural Network(RCNN), Smart City

## I. INTRODUCTION

Deep learning methods aim at learning feature hierarchies with features from higher levels of the hierarchy formed by the composition of lower level features. Automatically learning features at multiple levels of abstraction allow a system to learn complex functions mapping the input to the output directly from data, without depending completely on human-

crafted features. Deep learning algorithms seek to exploit the unknown structure in the input distribution in order to discover good representations, often at multiple levels, with higher-level learned features defined in terms of lower-level features. The hierarchy of concepts allows the computer to learn complicated concepts by building them out of simpler ones. Deep learning allows computational models that are composed of multiple processing layers to learn

representations of data with multiple levels of abstraction.

## II. PROPOSED SYSTEM

To protect ourselves from the COVID-19 Pandemic, almost every one of us tend to wear a face mask. It becomes increasingly necessary to check if the people in the crowd wear face masks in most public gatherings such as Malls, Theatres, Parks. The development of an AI solution to detect if the person is wearing a face mask and allow their entry would be of great help to the society. A simple Face Mask detection system is built using the Deep Learning technique called as Regional based Convolutional Neural Networks (RCNN). This RCNN Model is built using the TensorFlow framework and the OpenCV library which is highly used for real-time applications. This model can also be used to develop a full-fledged software to scan every person before they can enter the public gathering. Using this model, an accuracy of over 99% is obtained. This can also be used further to achieve even higher levels of accuracy.

## III. ALGORITHM

Regional based Convolutional Neural Network (RCNN) RCNN takes image as input, using selective search, region proposals are extracted from that image. Each region proposals are warped(reshaped) to a fixed size, that is passed as a input to the CNN. CNN extracts a fixed-length feature matrix for each region proposals. These features are used to classify region proposals using category specific linear SVM. The bounding boxes are refined using bounding box regression so the object is properly captured by the box.

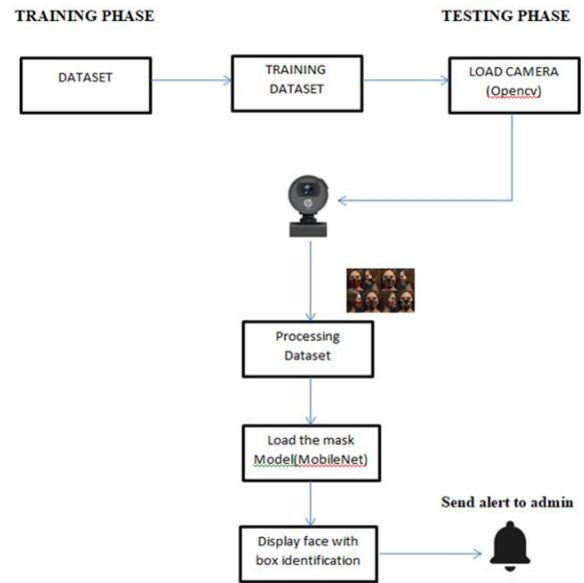


Fig. 1 System Architecture

## IV. MODULES DESCRIPTION

### A. Training Dataset

The datasets are collected from the various sources for the model. Then, the datasets is separated with the criteria of with mask and without wearing mask. After, the model is trained using Tensorflow&Keras with the dataset (with and without mask).

### B. Open camera and OpenCV

For the real time application, the camera is opened and the OpenCV package is loaded to detect the faces of the people who are in the frame. The OpenCV package used to recognize the faces in the live video stream.

### C. Load the Model

After the face recognition process, the pre-trained model is loaded. Here, the purpose of the pre-trained model is to detect the person wearing or not wearing mask.

### D. Identify the wearing of mask or not

Applying the pre-trained model to identify the person wearing mask or not over live video stream with the help of camera. Through the model, the people are identified according to the criteria.



**E. Sent Alert**

At the end, alert is send to the corresponding authority, if the person did not wear mask is identified.

**V. IMPEMETATION**

System implementation is the important stage of project when the theoretical design is tuned into practical system. The main stages in the implementation are as follows: Planning, Training, System testing and Changeover Planning. Planning is the first task in the system implementation. Planning means deciding on the method and the time scale to be adopted. At the time of implementation of any system people from different departments and system analysis involve. They are confirmed to practical problem of controlling various activities of people outside their own data processing departments.

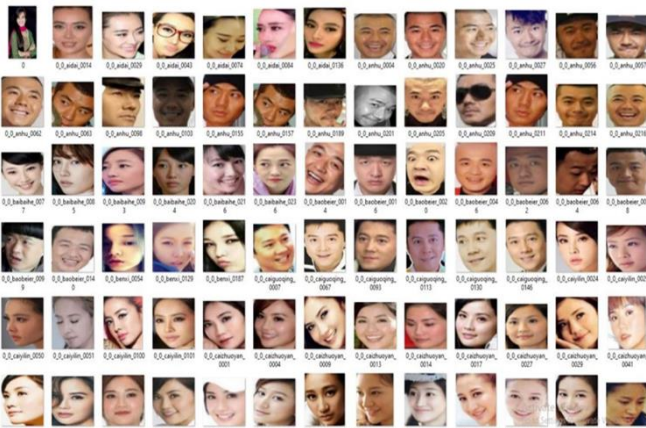


Fig.2 Dataset Without Mask



Fig.3 Dataset with Mask

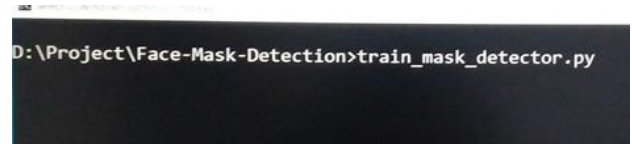


Fig.4 Initiation of Training Dataset

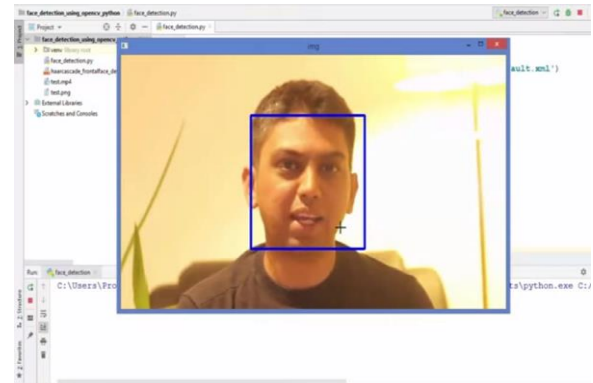


Fig.5 Face Detection with OpenCV

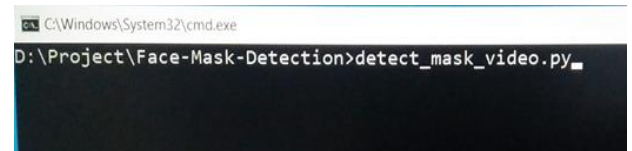


Fig. 6 Initiation of Mask Detector Code

**VI. RESULTS AND DISCUSSION**

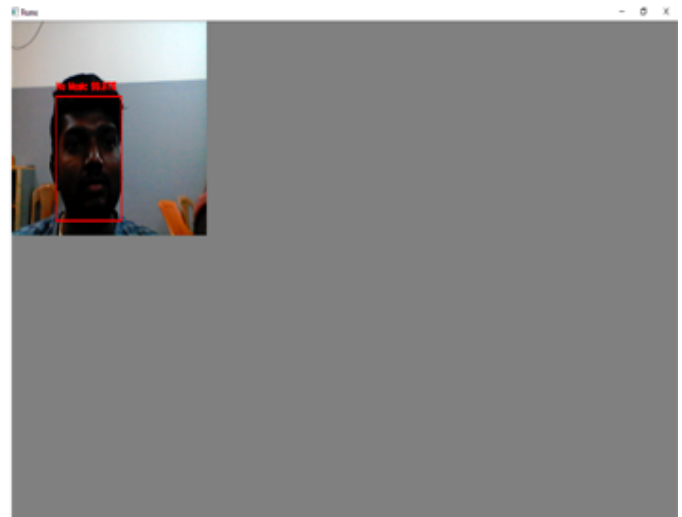


Fig.7 Person Without Mask Is Identified

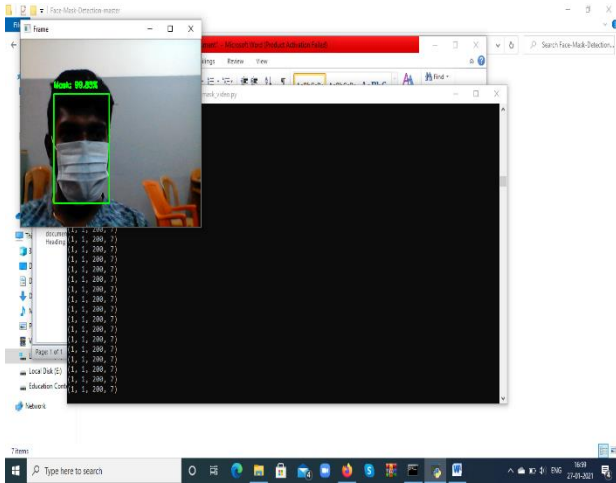


Fig.8 Person with Mask Is Identified

## VII. CONCLUSION

A system is to reduce the spread of corona virus by informing the authority about the person who is not wearing a facial mask that is a precautionary measure of COVID-19. The motive of the work comes from the people disobeying the rules that are mandatory to stop the spread of corona virus. The system contains a face mask detection architecture where a deep learning algorithm is used to detect the mask on the face. To train the model, labeled image data are used where the images were facial images with masks and without a mask. The proposed system detects a face mask with an accuracy of maximum 99%. The decision of the classification network is transferred to the corresponding authority. The system proposed in this study will act as a valuable tool to strictly impose the use of a facial mask in public places for all people.

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# A Privacy-Preserved & Encrypted Multi-Keyword Ranked Search in Cloud Storage

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## ABSTRACT

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Recently, the growth of private and semi-private data has accelerated on the data network, and instruments to track such data have exploded in security safeguarding. In the field of data systems, security saving seeking is becoming increasingly important in order to conduct various information mining operations on encoded data stored in various stockpiling frameworks. It is also a critical and difficult task to maintain the confidentiality of private information exchanged among specialist co-ops and data owners. One possible structure provided by the existing system is defense safeguarding ordering (PPI). In this framework, archives are stored on a private server in plain content format in exchange for secrecy. To make this framework more safe and reliable, we first store the records on the server in scrambled form, and then use the Key Distribution Center (KDC) to allow decoding of information obtained from the private server at the customer's end. To improve the client's look engagement, we also use TF-IDF, which provides efficient results positioning. Finally, we run a series of large tests on the dataset to evaluate how well our proposed system works. The proposed system would be shown to be superior to any current one in terms of security safeguarding, proficient and stable inquiry on scrambled appropriated archives based on exploratory findings.

**Keywords** : Cloud computing, Encryption, Inner product similarity, Single Keyword Search, Multi-keyword search, ranking.

## I. INTRODUCTION

In today's world, a large number of people are using the internet. Constantly new data is outsourced as a result of development away from consumer needs, and is then effectively semi-placed in servers. Cloud enlisting is a Web-based model, where cloud clients can supply their data into the cloud [1]. Through storing data in the cloud, data owners are able to

remain unconstrained once the cap has been reached. As a result, ensuring the authenticity of confidential data is an important task. When all is said and done, when it comes to data protection in the cloud, the data owner must be outsourced in an encoded structure to individuals, and the data process must be based on plaintext keyword look. The capable measure of "orchestrate organizing" is chosen. To measure the parallel whole, sort out organizing is

used. Encourage the centrality of data records to the request address keywords by encouraging them to be organized. The request office, as well as the security guarding mixed cloud data, are critical. If we concentrate a large number of data reports and data customers in the cloud, it will be difficult to meet the demands of execution, convenience, and adaptability. The enormous amount of data files in the cloud server fulfills to come about imperative rank instead of returning indistinguishable outcomes, stressing to experience the genuine data recovery. To recover the request correctness, the locating arrangement considers a large number of keyword interests. In today's Google organize look for gadgets, data customers give a game plan of keywords rather than a noteworthy keyword look centrality to recover the most outrageous fundamental data. Compose preparation is the synchronized coordination of query keywords that are essential for the response to the request. It remains the captivating work for how to relate the mixed cloud looks for as a result of inherence prosperity and stability. The difficult problem of multi-keyword located search over encoded cloud data is solved by using strict security requirements followed by various multi-keyword semantics. We choose promote preparation from a variety of multi-keyword based semantics. Our roles are as follows: 1) For the first case, we examine the issue of multi keyword located mixed cloud data and create a game plan of stringent security requirements for such a secure cloud data utilization system. 2) In two specific hazard models, we suggest two MRSE arrangements based on the similarity measure of "organize preparation" while also following various assurance requirements. 3) A thorough analysis into the proposed arrangements' protection and profitability confirmations is provided; a review of this current reality dataset also reveals that the proposed plots in fact introduce low overhead on count and correspondence.

## II. LITERATURE SURVEY

Secure and confirmation saving keyword search was proposed by Qin Liu et al. in [1]. By using open key encryption, it provides keyword authentication, information confirmation, and semantic security. The rule problem with this pursuit is that encryption and

unscrambling have a higher correspondence and computational cost.

Authorized Private Keyword Search (APKS) is a concept proposed by Ming Li et al. in [2.] Keyword protection, index and query privacy, fine-grained search authorization and revocation, multi-dimensional keyword search, scalability, and efficiency are all provided. This intrigue scheme increases the efficacy of the pursuit by using a consistency chain of noteworthiness, but after a short period of time, each of the characteristics has been leveled.

Cong Wang et al. proposed Secure and Efficient Ranked Keyword Search in [3], which highlights prepare overhead, information and keyword security, and the least communication and figuring overhead. It isn't useful for various keyword missions, and it comes with a small amount of overhead in the record-keeping process.

Secured padded keyword search for with symmetric searchable encryption was proposed by Kui Ren et al. [4]. (SSE). It can't play out different keywords semantic pursue with open key based searchable encryption, and it can't strengthen delicate excitement with open key based searchable encryption. Upgrades to the padded searchable report are not completed competently.

Ming Li et al. [5] proposed a searchable disseminated stockpiling framework with privacy guarantees. SSE (Scalar-Product-Preserving Encryption) and Order-Preserving Symmetric Encryption are used to perform the encryption. It strengthens the fundamentals of security and utilitarianism. The open key based searchable encryption is not strengthened by this strategy.

K-gram-based fluffy keyword Ranked Search was suggested by Wei Zhou et al. [6]. In this case, the proprietor creates a k-gram delicate keyword appeal for record D, and the tuple  $I, D \rangle$  is traded to the demand server (SS), which is embedded in the development channel for size power. To the point of confinement server, the blended record D is exchanged. Regardless, the problem is that the padded

keyword set is determined by the k-measure gram's in relation to the jacquard coefficient.

The Secure Channel Free Public Key Encryption with Keyword Search (SCF-PEKS) system was proposed by J. Baek et al. in [7]. In these device package servers, each server creates its own unique open and private key pair, but KGA attacks this approach from the outside.

Trapdoor in recognisability Public-Key Encryption with Keyword Search was introduced by H. S. Rhee et al. [8]. (IND-PEKS). This outsourcing is done in the form of SCF-PEKS. It encounters an external aggressor who uses KGA to isolate the rehash of the keyword trapdoor case.

Peng Xu et al. [9] suggested PEFKS with Fuzzy Keyword Search, in which the client creates padded keyword trapdoor  $T_w$  for  $W$  and right keyword trapdoor  $K_w$  for  $W$ .  $T_w$  is requested by the client for CS. After that, CS tests  $T_w$  with a delicate keyword record and sends a superset of sorting out figure messages using CS's Fuzz Test estimation. Exact Test is a client process that involves verifying that the figure works with  $K_w$  and recovering the encoded data. For large databases, the process of creating padded keyword archives and performing a keyword check is difficult.

Ning et al. [10] suggested Privacy Preserving Multi Keyword Ranked Search as a solution to this issue (MRSE). It's useful for content models with established figures and foundations that display blended data. It has a low overhead in terms of computations and correspondence. For multi-keyword searches, the workplace arrangement is selected. The disadvantage is that MRSE has a very low standard deviation, which reduces keyword security.

### III. PROBLEM STATEMENT

The expansive number of information clients and archives in cloud, it is essential for the hunt administration to permit multi-keyword question and give result likeness positioning to meet the compelling information recovery require. The searchable encryption concentrates on single

keyword inquiry or Boolean keyword look, and once in a while separates the list items.

- a) Single-keyword search without Ranking
- b) Boolean-keyword look without Ranking
- c) Single-keyword hunt with Ranking

We define and address the testing problem of security saving multi-keyword positioned look over scrambled cloud data (MRSE), as well as provide a set of stringent security requirements for such a secure cloud data use system to become a reality. We choose the proficient rule of "facilitate organizing" from among the various multi-keyword semantics. Over scrambled cloud data, a multi-keyword search is performed (MRSE). Internal object comparability is used to "coordinate coordinating."

### IV. PROPOSED SOLUTION

We propose a framework under which any endorsed customer may conduct an interest search on mixed data using various keywords without disclosing the keywords he is looking for or the data of the records that fit the query. Confirmed customers may use the cloud to search for structures using unmistakable keywords in order to recover the correlated reports. Our recommendation system enables a group of customers to request the database if they have specified trapdoors for the hunt words that enable customers to consolidate them in their request. Our proposed system will perform several keyword searches in a single query and place the results such that the customer only receives the most important matches. Similarly, we devise a set of strict security requirements. We choose the feasible control of "sort out preparation" from among various multi-keyword semantics.

### V. SYSTEM OVERVIEW

The system architecture is stressed by making a direct assistant structure for a structure. It portrays the general edge of the wander which rapidly delineates the working of the structure and the inspiration driving the wander stage is to mastermind an answer of the issue recognized by the need archive. The

underneath Figure 1 exhibit the system of the structure. We consider three segments in our structure designing: Data Owner, Data customer and Cloud Server.

- Data Owner is in charge of the making of the database.
- Data Users are the devotees in a gathering who can utilize the documents of the database.
- Cloud Server bargains information offices to confirmed clients. It is fundamental that server be torpid to substance of the database it keeps.

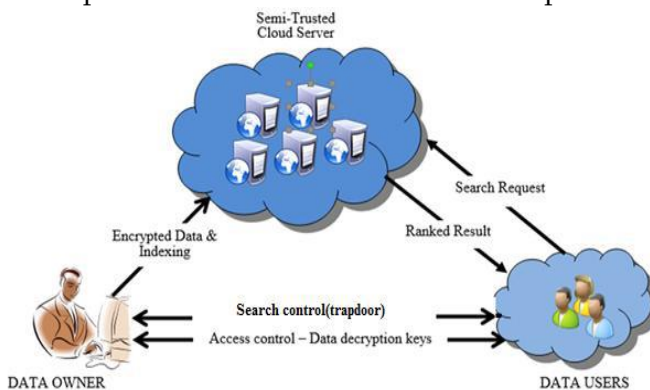


Figure 1: Search over Encrypted Cloud

The data owner has a large number of data records that he wants to outsource to a cloud server in a hybrid environment. Prior to outsourcing, the data owner would first create a secured searchable record using a series of keywords omitted from the report creation process, and then store both the list and the encoded archive on a cloud server. We make every effort to complete the underwriting between the data owner and the customers. A guaranteed customer makes and shows a request in a hidden casing a trapdoor of the keyword to the cloud server to search the record gathering for a given keyword. Following the receipt of a chase order, the server is responsible for searching for the record and returning the customer's report preparing course of action. We believe that the ensured situated keyword is dangerous because it requires the following: the query yield must be retrieved in accordance with simple situated noteworthiness rules, ensuring that customers' records are recovered precisely. In any case, cloud servers must inspect any information that is dark or irrelevant about the fundamental rules, as they expose vital sensitive data against keyword insurance. To slow down the exchange, the customer

can send as many as  $k$  possible considerations near the trapdoor, and the cloud server will only send back the top- $k$  most relevant archives to the customer's concerned keyword. Plot Objectives: To allow for localized performance for professional use of outsourced cloud data under the already defined display, our device setup can quickly complete security and execution attestations as follows.

**Multi-keyword Ranked Search:** To design look for arrangements which allow multi-keyword question and give result closeness situating to fruitful data recuperation, instead of returning undifferentiated results.

**Insurance Preserving:** To shield the cloud server from taking in additional data from the dataset and the record, and to meet security.

**Viability:** Expert with low correspondence and estimation overhead should be used to achieve the above goals on helpfulness and protection. **Mastermind Matching:** "Compose preparation" [2] is a common likeness measure that assesses the importance of a chronicle to the request by counting the number of query keywords that appear in the response. When customers identify the correct subset of the dataset to be retrieved, Boolean requests are completed successfully with the customer's defined chase requirement. Customers are more adaptable to interpret a list of keywords displaying their tension and recoup the most critical reports with a rank query.

## VI. METHODOLOGY

### A. Stemming:

Stemming is a method for reducing twisted (or sometimes determined) words to their pledge stem, base, or root shape—for the most part, a composed word frame—in phonetic morphology and data recovery. The stem may not have to be indistinguishable from the word's morphological foundation; it is usually sufficient that related words lead to a common stem, even though this stem is not a significant root in and of itself. Since the 1960s, stemming calculations have been considered in software engineering. Many web indexes treat terms that have indistinguishable origins from equivalent

words as a query extension, a process known as conflation. The terms stemming calculations and stemmers are often used to describe stemming projects.

A stemmer for English, for example, should identify the string "cats" (and possibly "catlike", "catty" etc.) as based on the root "cat", and "stems", "stemmer", "stemming", "stemmed" as based on "stem". A stemming algorithm reduces the words "fishing", "fished", and "fisher" to the root word, "fish". On the other hand, "argue", "argued", "argues", "arguing", and "argus" reduce to the stem "argu" (illustrating the case where the stem is not itself a word or root) but "argument" and "arguments" reduce to the stem "argument".

### B. Suffix-stripping algorithms:

Suffix-stripping algorithms don't depend on a query table that comprises of curved structures and root frame relations. Rather, a commonly littler rundown of "tenets" is put away which gives a way to the calculation, given an information word shape, to discover its root frame. A few cases of the principles include:

- if the word ends in 'ed', remove the 'ed'
- if the word ends in 'ing', remove the 'ing'
- if the word ends in 'ly', remove the 'ly'

When the maintainer is sufficiently trained in the difficulties of etymology and morphology, as well as encoding postfix stripping laws, addition stripping approaches have the advantage of being significantly easier to keep up with than savage constrain calculations. Because of the poor execution when handling remarkable ties (like "ran" and "run"), addition stripping calculations are sometimes regarded as crude. With a few exceptions, the arrangements provided by postfix stripping calculations are limited to those lexical groups that have clearly understood additions. Nonetheless, this is a problem since not all aspects of debate have such a well-thought-out set of criteria. The aim of lemmatization is to improve this test.

### C. Stop-Words:

Stop words may be words that are sifted through before or after usual dialect information is handled in

the registration process (text). Despite the fact that stop words often refer to the most commonly known words in a dialect, there is no single all-inclusive list of stop words used by all common dialect preparation apparatuses, and in fact, not all devices even use such a list. To support state seek, a few apparatuses specifically avoid evaporating these stop terms.

For any purpose, any grouping of terms can be chosen as the stop words. These are the most popular, short ability terms for some web crawlers, such as the, is, at, which, and on. Stop words, particularly in names like "The Who," "The," and "Take That," can cause problems when scanning for phrases that contain them in this situation. Other web crawlers remove the most common terms from a query, including lexical words like "need," in order to improve execution.

One of the pioneers of data recovery, Hans Peter Luhn, is credited with coining the phrase and putting it into practice. The words "stop word," "stop rundown," and "stoplist," which do not appear in Luhn's 1959 introduction, appear in the writing in the blink of an eye a short time later.

A forerunner concept was used in the development of a few concordances. For example, the main Hebrew concordance, Meir local, had a one-page list of unindexed terms, with no meaningful relational words and conjunctions that are similar to stop words today.

### D. TF-IDF

TF-IDF stands for term recurrence in contrast to archive recurrence, and the TF-IDF weight is a common weight used in data recovery and content mining. This weight is a factual metric for determining how important a word is to a record in a collection or corpus. The meaning of a word grows in proportion to the number of times it appears in the archive, but is balanced by the word's recurrence in the corpus. Online search tools often use variations of the TF-IDF weighting plan as a focal apparatus in scoring and positioning an archive's value in response to a client inquiry.

Summing the TF-IDF for each query term yields one of the simplest positioning capacities; various more



complex positioning capacities are variants of this simple model.

In a variety of subject areas, such as material outline and characterization, TF-IDF may be used to effectively separate stop-words.

The tf-idf weight is usually made up of two terms: the primary processes and the standardized Word Frequency (TF), also known as. The number of times a word appears in a text, divided by the total number of words in that archive; the second term is the Inverse Document Frequency (IDF), calculated as the logarithm of the number of documents in the corpus divided by the number of records where the term appears.

TF: Term Frequency is a metric that calculates how much a term appears in a study. Since each document is unique in length, it's possible that a word will appear in much more circumstances in longer records than in shorter ones. In this vein, as a form of standardization, the term recurrence is periodically divided by the report duration (also known as the total number of terms in the record):

$$\text{TF}(t) = (\text{Number of times term } t \text{ appears in a document}) / (\text{Total number of terms in the document}).$$

IDF: Inverse Document Frequency, which measures how important a term is. While computing TF, all terms are considered equally important. However it is known that certain terms, such as "is", "of", and "that", may appear a lot of times but have little importance. Thus we need to weigh down the frequent terms while scale up the rare ones, by computing the following:

$$\text{IDF}(t) = \log_e (\text{Total number of documents} / \text{Number of documents with term } t \text{ in it})$$

### E. Build Index Tree

Input: the document collection  $F = \{f_1, f_2, \dots, f_n\}$  with the identifiers  $F_{ID} = \{F_{ID} = 1, 2, \dots, n\}$ .

Output: the index tree T

1. for each document  $\{F_i\}$  in F do
2. Construct a leaf node u for  $f_{ID}$ ,
3. Insert u to CurrentNodeSet;
4. end for
5. while the number of nodes in CurrentNodeSet is larger than 1 do
6. if the number of nodes in CurrentNodeSet is even, i.e.  $2h$  then
7. for each pair of nodes  $u_0$  and  $u_{00}$  in CurrentNodeSet do
8. Generate a parent node u for  $u_0$  and  $u_{00}$ ,
9. Insert u to TempNodeSet;
10. end for
11. else
12. for each pair of nodes  $u_0$  and  $u_{00}$  of the former  $(2 \times 2)$  nodes in CurrentNodeSet do
13. Generate a parent node u for  $u_0$  and  $u_{00}$ ;
14. Insert u to TempNodeSet;
15. end for
16. Create a parent node  $u_1$  for the  $(2h - 1)$ -th and  $2h$ -th node, and then create a parent node u for  $u_1$  and the  $(2h + 1)$ -th node;
17. Insert u to TempNodeSet;
18. end if
19. Replace CurrentNodeSet with TempNodeSet and then clear TempNodeSet;
20. end while
21. return the only node left in CurrentNodeSet, namely, the root of index tree T ;

### F. BDMRS

$SK \leftarrow$  Setup () initially, the data owner generates the secret key set SK, including 1) A randomly generated m-bit vector S where m is equal to the cardinality of dictionary, and 2) two  $(m \times m)$  invertible matrices M1 and M2. Namely,  $SK = \{S, M1, M2\}$ .

$I \leftarrow$  GenIndex (F, SK) First, the unencrypted index tree T is built on F by using

$T \leftarrow \text{BuildIndexTree}(F)$  Secondly, the data owner generates two random vectors ( $D'u, D''u$ ) for index vector  $Du$  in each node  $u$ , according to the secret vector  $S$ . Specifically, if  $S[i] = 0$ ,  $D'u[i]$  and  $D''u[i]$  will be set equal to  $Du[i]$ ; if  $S[i] = 1$ ,  $D'u[i]$  and  $D''u[i]$  will be  $\{M_1^T D'_u, M_2^T D''u\}$  set as two random values whose sum equals to  $Du[i]$ . Finally, the encrypted index tree  $I$  is built where the node  $u$  stores two encrypted index vectors  $Iu =$

$TD \leftarrow \text{GenTrapdoor}(Wq, SK)$  with keyword set  $Wq$ , the unencrypted query vector

$Q$  with length of  $m$  is generated. If  $w_i \in Wq$ ,  $Q[i]$  stores the normalized IDF value of  $w_i$ ; else  $Q[i]$  is set to 0. Similarly, the query vector  $Q$  is split into two random vectors  $Q'$  and  $Q''$ . The difference is that if  $S[i] = 0$ ,  $Q'[i]$  and  $Q''[i]$  are set to two random values whose sum equals to  $Q[i]$ ; else  $Q'[i]$  and  $Q''[i]$  are set as the  $\{M_1^{-1} D'_u, M_2^{-1} D''u\}$  same as  $Q[i]$ . Finally, the algorithm returns the trapdoor  $TD =$

Relevance Score  $\leftarrow \text{SRScore}(Iu, TD)$  With the trapdoor  $TD$ , the cloud server computes the relevance score of node  $u$  in the index tree  $I$  to the query.

### G. EDMRS Scheme

The enhanced EDMRS scheme is almost the same as BDMRS scheme except that:

$SK \leftarrow \text{Setup}()$ : In this algorithm, we set the secret vector  $S$  as a  $m$ -bit vector, and set  $M1$  and  $M2$  are  $(m + m')$   $(m + m')$  invertible matrices, where  $m'$  is the number of phantom terms.

$I \leftarrow \text{GenIndex}(F; SK)$ : Before encrypting the index vector  $Du$ , we extend the vector  $Du$  to be a  $(m+m')$ -dimensional vector. Each extended element  $Du[m+j]$ ,  $j = 1 \dots m'$ , is set as a random number<sup>[7]</sup>.

$TD \leftarrow \text{GenTrapdoor}(Wq, SK)$  The query vector  $Q$  is extended to be a  $(m + m')$ -dimensional vector. Among the extended elements, a number of  $m'$  elements are randomly chosen to set as 1, and the rest are set as 0.

Relevance Score  $\leftarrow \text{SRScore}(Iu, TD)$  After the execution of relevance evaluation by cloud server, the final relevance score for index vector  $Iu$  equals to  $Du^A \sum_{v \in \{j | Q[m+j] = 1\}} \epsilon v$ , where  $v \in \{j | Q[m+j] = 1\}$

## I. IMPLEMENTATION

### A. Data User Module:

Clients of this framework are information clients, who have their identities set up to retrieve documents from the cloud that are exchanged by information proprietors. Since the number of documents stored on the cloud server could be large, the client is accommodated in an intrigue office. On the cloud server, the client should be able to perform a multi-keyword search. Once the result for a specific interest is available, clients should be able to use the system to send a request to the individual details owners of the document (also known as a trap-section request) for the documents to be downloaded. Clients of information will be given a demand support screen that will show whether the information proprietor has perceived or rejected the demand. Clients should be able to download the decoded record if the request has been approved.

### B. Information Owner Module:

The owners of the data should be able to share records in this module. Before transferring the documents to the cloud, the reports are encrypted. The data owners are also given the option of entering keywords for the records that are sent to the server. These keywords are used for the requesting purpose, which aids in the interest return values being returned quickly. When these documents have been uploaded to the cloud, consumers should be able to search for them using keywords. The data owners will also be provided with a request approval screen, allowing them to approve or deny the requests received by the data customers.

### C. Document Upload and Encryption Module:

The owners of the data should be able to share archives in this module. Before sending the files to the cloud, the documents are combined. The data owners are given a different choice when it comes to entering the keywords for the records that are sent to the server. These keywords are used for the requesting purpose, which aids the chase's ability to quickly return values. When these documents are opened in the cloud, consumers should be able to search for them using keywords. The data proprietors will also be outfitted with a request underwriting screen, allowing them to approve or deny requests received from data customers. Before being

exchanged, the record should be encrypted with a key, so that data customers cannot simply download it without it. The data customers will request this key via the trap-portal. Unapproved consumers would not be able to download these archives since they are encrypted using RSA figuring.

**D. Document Download and Decryption Module:**

Data clients are clients on this framework that will have their identities ready to retrieve documents from the cloud that the information proprietors have transferred. Since the amount of records stored on the cloud server may be enormous, the client is given a pursuit office. On the cloud server, the client should be able to perform a multi-keyword search. When the result for a specific search appears, clients should be able to submit a request to the individual information owners of the document via the process (also known as a trap-entryway request) to download these documents. The information clients will also be presented with a demand endorsement screen, which will indicate whether the information owner has accepted or rejected the request. Clients should be able to download the unscrambled document if the request has been approved. The record should be unscrambled with a key before being downloaded. The details clients will inquire about this key through the trap-entryway request. The information clients will be able to download and use the record once the key is provided during the download.

**E. Rank-Search Module:**

This module enables the information clients to search for the reports with multi-keyword rank looking. This model uses the on occasion utilized rank pursuing figuring down present the yield for multi-keywords. "Energize Matching" administer will be gotten a handle on for the multi-keyword pursuing. This module in like way oversees making an archive for speedier pursue.

**VII. EXPERIMENTAL RESULT**

Fig. 2 shows look time correlation diagram; in roar chart X-hub demonstrates the calculation by which records are sought while Y-pivot indicate time required for seeking question related in ms.

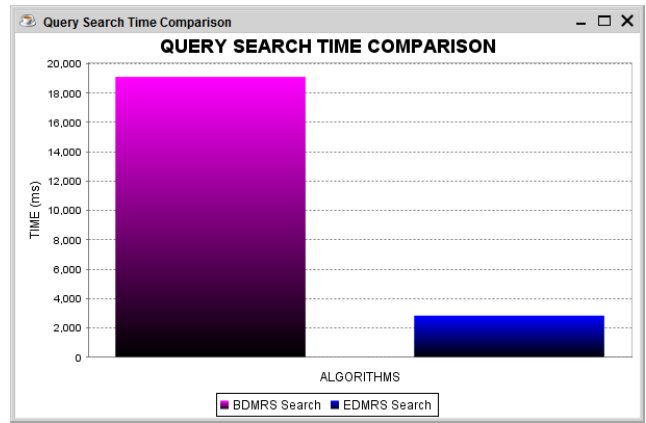


Figure 2: Query Search Time Comparison

Fig. 3 shows time diagram; in above chart X-pivot indicates number of records in gathering while Y-hub demonstrate time required for producing file tree in ms, with increment in number of archives the time required to create list tree is additionally increment.

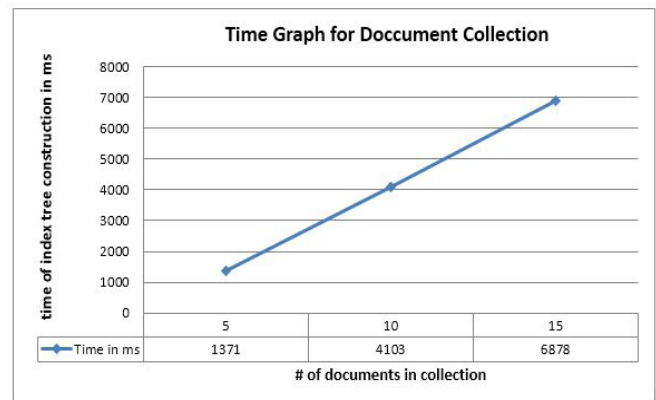


Figure 3: Time Graph for Document Collection

Fig. 4 shows time diagram; in above chart X-hub indicates number of keywords in word reference while Y-pivot demonstrate time required for producing file tree in ms, with increment in number of keywords the time required to create list tree is additionally increment.

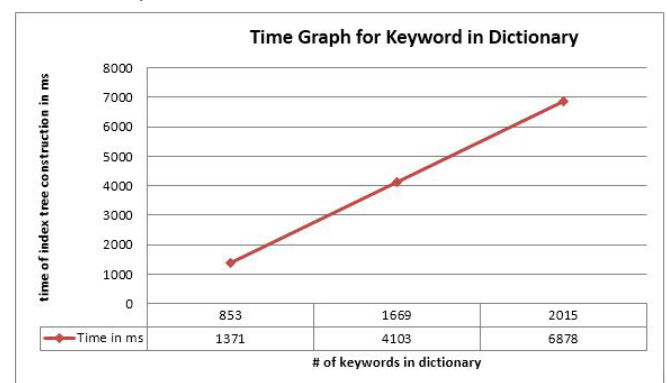


Figure 4: Time Graph for Keyword in Dictionary

## VIII. CONCLUSION

First, we illustrate and resolve the challenging of multi-keyword positioned look over scrambled cloud data, as well as create a set of security requirements in this job. We choose the persuasive resemblance measure of "facilitate coordinating," i.e., as many different matches as possible, from among various multi-keyword semantics to accurately capture the relevance of outsourced archives to the query correspondence. In the future, we'll focus on promoting other multi-keyword semantics over encoded data and verifying the rank request's honesty in the item keywords. We suggest an important thought of MRSE for the traditional test of consistent multi-keyword semantics without security breaks. After that, we present two improved MRSE diagrams to account for a variety of stringent security requirements in two different risk models. A detailed review of the proposed plans' security and effectiveness guarantees is given, and tests on this current reality data set show that our future frameworks have low overhead on both measurement and correspondence.

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## Heart Disease Prognosis Using Artificial Intelligence

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### ABSTRACT

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Machine learning tools are providing successful results in disease diagnosis. In the diagnosis of heart disease, the Machine Learning Techniques has been used to show the acceptable levels of accuracy. Human heartbeat has been asserted to provide promising markers of CHF. For diagnosing heart disease, it can provide solution to complex queries and thus assist healthcare practitioners to make intelligent clinical decisions which traditional decision support systems cannot. By providing this treatment, it also helps to reduce the treatment costs. To predict the heart disease of a person, the CNN is used, which is one of the classification technique of deep learning. In the existing system, they have used random forest algorithm which is one the technique of machine learning. It could provide the accuracy up-to 80%. But by using this conventional neural network, the accuracy level could be more than 90% (i.e.) the efficiency level is increased. Each person has different level of Cholesterol, Blood pressure, FBS, Resting Electrocardiogram, Pulse rate in their body. we can predict the heart disease, by using the medical terms such as blood pressure, type of chest pain, blood sugar, cholesterol. Rather than using machine learning, Deep learning algorithm will provide the result accurately.

**Keywords** : Artificial Intelligence, Machine Learning, Neural Network, Random Forest, Convolutional Neural Network.

### I. INTRODUCTION

The artificial intelligence techniques are useful for predicting various diseases [1] in medical field. Cardiovascular diseases are one of the highest- flying disease. According to world health organization about more than 12 million deaths occurs worldwide, every year due to heart problems. It is also one of the fatal diseases in India, it causes maximum casualties. The

diagnosis of this disease is intricate process. It should be diagnosed accurately. Due to limitation in potential of the medical experts and their unavailability at certain places, put their patients at high risk. Normally, it is diagnosed using intuition by the medical specialist. It would be highly advantageous if the techniques are integrated with the medical information system.

Disease diagnosis plays an important role in deep learning. Healthcare organizations [2] can reduce costs by accomplishment of computer based data and decision support systems. Healthcare service data are very huge as it incorporates patient records, resource management information and updated information. Human services associations must have capacity to break down information. Treatment records of many patients can be stored up in computerized. There are various reasons for the occurrence of Heart Diseases, it can be frequently investigated through the Attribute Set related to different test results of Patients. The different sources of medical.

Data are Medical Analysis, Diagnostic Centers, Past Case Sheets, Doctor Prescriptions. Heart diseases can be predicted through the analysis made on fasting blood sugar, Maximum heart rate achieved. Based on the values of the attributes, it makes indexes for all associated frequent item sets. The presence of these item sets depends on the threshold value specified. Deep learning techniques like convolutional neural network algorithm is used for validating the accuracy of medicinal data. These algorithms can be used to optimize the data storage for practical and legal purposes.

Heart Disease Prediction helps in preventing patient's life from risks. To make this possible there will be different modules handled by the application and it will be collecting all the data required to predict the Heart Disease of a respective Patient. The main objective is to develop a system that will help to contribute our Society. This become easy for us to compute our health status and make the people healthier. All the collected data from the patient's report will be presented in the Graph format. It will be helpful in analyzing.

To predict the disease, it uses the Naive Bayes, K-nearest neighbor, Random forest and Decision tree. These algorithms have been used for analyzing the

heart disease [3-6]. Convolutional neural network is the deep learning algorithm used for classifying these medical data and these data are calculated using delta rule. Convolutional Neural Network algorithm performs well than other algorithms. It is used in the application to make it more effective.

## II. RELATED WORK

The current review contributes with an extensive overview of decision support systems [1] in diagnosing heart diseases in clinical settings. The investigators independently screened and abstracted studies related to heart diseases-based clinical decision support system (DSS) published until 8-June-2015 in PubMed, CINAHL and Cochrane Library. The data extracted from the twenty full-text articles that met the inclusion criteria was classified under the following fields; heart diseases, methods for data sets formation, machine learning algorithms, machine learning- based DSS, comparator types, outcome evaluation and clinical implications of the reported DSS. Out of total of 331 studies 20 met the inclusion criteria. Most of the studies relate to ischemic heart diseases with neural network being the most common machine learning (ML) technique. The study categorizes the ML techniques according to their performance in diagnosing various heart diseases. It categorizes, compares and evaluates the comparator based on physician's performance, gold standards, other ML techniques, different models of same ML technique and studies with no comparison. It also investigates the current, future and no clinical implications.

One of the most important applications of machine learning systems [2,8,10] is the diagnosis of heart disease which affect the lives of millions of people. Patients suffering from heart disease have lot of independent factors such as age, sex, serum cholesterol, blood sugar, etc. in common which can be used very effectively for diagnosis. In this paper an

Extreme Learning Machine (ELM) algorithm is used to model these factors. The proposed system can replace a costly medical checkups with a warning system for patients of the probable presence of heart disease. The system is implemented on real data collected by the Cleveland Clinic Foundation where around 300 patients information has been collected. Simulation results show this architecture has about 80% accuracy in determining heart disease.

Recent advances in wearable and/or biomedical sensing technologies [4,9] have made it possible to record very long-term, continuous biomedical signals, referred to as biomedical intensive longitudinal data (ILD). To link ILD to clinical applications, such as personalized healthcare and disease prevention, the development of robust and reliable data analysis techniques is considered important. In this review, we introduce multiscale analysis methods for and the applications to two types of intensive longitudinal biomedical signals, heart rate variability (HRV) and spontaneous physical activity (SPA) time series. It has been shown that these ILD have robust characteristics unique to various multiscale complex systems, and some parameters characterizing the multiscale complexity are in fact altered in pathological states, showing potential usability as a new type of ambient diagnostic and/or prognostic tools. For example, parameters characterizing increased intermittency of HRV are found to be potentially useful in detecting abnormality in the state of the autonomic nervous system, in particular the sympathetic hyperactivity, and intermittency parameters of SPA might also be useful in evaluating symptoms of psychiatric patients with depressive as well as manic episodes, all in the daily settings.

### III. SYSTEM MODEL

In the system, first it process the data from the data set for good predicting capability. It handles all missing values and investigates each possibility. If an

attribute has more than 5% of missing values, then the records should be deleted. While Random Forest is a good option (fast, robust and easier to understand) for local search ability but it didn't work well with global clusters. Even its performance is un-consistent at different initial partitions, it produces different results at different initial partitions.

Initially, it will collect all the required data from the patient to make the analyze using the relevant algorithms of the application. Once, all the data has been gathered the report will be generated. The drawbacks of the existing system have been overcome by implementing CNN to make the analysis. Existing systems had used only one algorithm each. In this system CNN algorithm has been used and that makes the system more effective than the previous one. The system is less cost product with highest accurate output results. It can predict and give accurate results it helps in saving the life of the patient.

By using Machine learning techniques, we propose a system for heart disease prediction. To generate strong association rules, we have applied frequent pattern growth association mining on patient's dataset. The method will help doctor to explore their data and predict heart disease. There is no previous research that identify heart disease, which Machine learning technique can provide more reliable accuracy in identifying suitable treatment for heart disease patients. Practical use of healthcare database systems and knowledge discovery is difficult in heart disease diagnosis. The heart beat parameter in ECG signal is noticed and mean heart rate, standard deviation and frequency domains (e.g., LF and HF powers) are derived. Finally, these and further features are fed into a standard Support Vector Machines (SVM) to predict mortality in CHF patients at a single-subject level. But it has some accuracy reduction because of some arrhythmia signals are come to interrupted the ECG.



In Proposed System, we are applying machine learning techniques in identifying suitable treatments for heart disease patients. Apply single techniques to heart disease diagnosis Dagggle dataset to apply convolution neural network establish baseline accuracy in the diagnosis of heart disease patients.

The convolution neural network is mainly applicable when the dimensionality of the inputs is high. Convolution neural network model recognizes the characteristics of patients with heart disease. It shows the probability of each input attribute for the predictable state.

Neural network has the most recent technology taken to evaluate the training data. It is the one of supervised neural network multi-layer perceptron for prediction. Multi-layer perceptron contains three part input, hidden layer and output layer. The trained data taken as input data, this input each is multiplied with each weight and go to hidden layer and then output. Output layer is depending on the weight's and previous data.

Multi-layer Perception is just that, a network that is comprised of many neurons, divided in layers. These layers are divided as follows:

The input layer, where the input of the network goes. The number of neurons here depends on the number of inputs we want our network to get. One or more hidden layers. These layers come between the input and the output and their number can vary. The function that the hidden layer serves is to encode the input and map it to the output. It has been proven that a multi-layer perceptron with only one hidden layer can approximate any function that connects its input with its outputs if such a function exists.

The output layer, where the outcome of the network can be seen. The number of neurons here depends on the problem we want the neural net to learn. The Multi-layer perceptron differs from the simple perceptron in many ways. The same part is that of

weight randomization. All weights are given random values between a certain range, usually  $[-0.5, 0.5]$ . Having that aside though, for each pattern that is fed to the network three passes over the net are made.

#### IV. PROPOED SYSTEM IMPLEMENTATION

Implementation is the stage in the project and the theoretical design is turned the program into a working system. The most crucial stage is achieving a successful new system and giving a user confidence in that the new system will work efficiently and effectively in the implementation stage. The program will be tested by giving the sample data set of the user to ensure that it predicts correctly. The data will be collected from the patient first and it will be entered in the system for the Medical Analysis. The medical records of the patient can be viewed and it will be used to predict the heart disease.

The analysis report should get generated by taking the right values and the result should be generated based on the algorithm it is used in the system. During the testing, the errors will be found initially and it should get corrected to bring the right prediction. In the system, false prediction of a heart disease is an issue and it shouldn't happen in the system. The data has to be reviewed and the errors should get corrected to bring the right prediction of the heart disease. The produced report has to be tested with the algorithm and it has to detect the errors if it has any in the produced result. Errors in the report have to be corrected, once if it is verified with the algorithm manually.

a. Creating a user requirement system

The developed system should meet the requirement of the patients that is it has to predict the heart disease based on their recorded health information.

b. Training Data Set

The system can be used efficiently only if the data set is trained. A system with dummy records and value, the analysis has to be done based on that. Doctor's has to be trained to use the system in an efficient manner.

c. Tested data and preprocessing

The system uses 15 medical parameters such as age, sex, blood pressure, cholesterol, and obesity for prediction. The EHDPS predicts the likelihood of patients getting heart disease. The obtained results have illustrated that the designed diagnostic system can effectively predict the risk level of heart diseases.

It is the alignment of the data. Data Preprocessing plays a significant role in Data Mining. The training phase in the Data Mining during Knowledge Discovery will be very difficult if the data contains irrelevant or redundant information or more noisy and unreliable data. The medical data contain many missing values. So preprocess is an obligatory step before training the medical data. A total of 303 instances are trained before preprocessing.

d. Feature Extraction

It is worth noticing that most of the real-life data contains more information than it is needed to build a model, or the wrong kind of information. Noisy or redundant information makes it more challenging to extract the most meaningful information. Feature selection which refers to the process of reducing the inputs for processing and analysis, or finding the most meaningful subset of information, is effective for the prediction performance. Feature selection does not only improve the quality of the model but also makes the process.

e. Multilayer Perceptron

With one or more layers between input and output layer, MLP is a feed forward neural network. It is called as feed forward because the data flows in

one direction from input to output layer (forward). Nodes that are no target of any connection is called input neurons, while nodes that are no source of any connection is called output neurons. A MLP can have more than one output neuron. The way the target values (desired values) of the training patterns are described will determine the number of output.

f. CNN

Finally we predict that the person have an heart disease or not using Conventional neural network by using the features of cholesterol, resting blood pressure, fasting blood sugar, thalassemia, chest pain type etc., This model could answer complex queries, each with its own strength with ease of model interpretation and an easy access to detailed information and accuracy

## V. CONCLUSION

Decision Support in Heart Disease Prediction System is developed using multi-layer perceptron Classification. The system extracts hidden knowledge from a historical heart disease database. This model could answer complex queries, each with its own strength with ease of model interpretation and an easy access to detailed information and accuracy. The system is expandable in the sense that more number of records or attributes can be incorporated and new significant rules can be generated using underlying Deep learning technique. In Proposed System, we are applying deep learning techniques in identifying suitable treatments for heart disease patients. Apply the techniques like conventional neural networks to establish the heart disease diagnosis kaggle dataset to achieve baseline accuracy in the diagnosis of heart disease patients. The conventional neural network is mainly applicable when the dimensionality of the inputs is high. Conventional neural network model recognizes the characteristics of patients with heart disease. It shows the probability of each input attribute for the predictable state. Here the datasets

are trained manually through code, but in future there is a possibility to train the datasets automatically with the new features.

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# Impact of Global Value Chain on Economic Growth: Evidence from Belt and Road Initiatives

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## ABSTRACT

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The Belt and Road Initiative is massive with a lot of potential, and number of positives. The disintegration of the mode of production of most countries across the globe has allowed the global dispersal of value-added activities in the production value chain networks. We examined the impact of global value chain on economic growth of Asian countries within the Belt and Road over the period of 2005 to 2017. We find robust evidence for a positive productivity effect from stronger GVC integration. Moreover, we find that relatively less productive countries can benefit more from GVC participation in terms of growth rate. Several policy recommendations support the findings.

**Keywords :** Global Value Chain, Economic growth, Belt and Road, Asian.

## I. INTRODUCTION

Globalization has been characterized by the regional fragmentation and splintering of the processes that underpin development for decades (Mettler & Williams, 2011; Taglioni & Winkler, 2016). The global dispersion of value-added activities in manufacturing value chain networks has been enabled by the disintegration of most countries' modes of production (Orlic, 2017; Taglioni & Winkler, 2016). This indication has culminated into significant rise in the global trade across these networks of which Asian countries are no exception (Ghiassy & Zhou, 2017; Solmecke, 2016).

The GVC framework shows how a sector or a country and its sectors participate in the sequence of operational activities required to bring a product or a service from its stage of conception to production as well as sales (Kersan-Škabić, 2019). Cross-border linkages have been emphasized in the literature as paramount and vital determinants of global output and device delivery (Kersan-kabi, 2019; Orlic, 2017; Taglioni & Winkler, 2016) thanks to GVC. As a result, global reorganization and transformation of manufacturing and distribution, as well as sales into various value chain segments, has critical and profound consequences for Asian countries. (Kowalski, Lopez-Gonzales, Ragoussis, & Ugarte, 2015; OECD, 2013)

Each dimension of the value chain employs various combinations of production factors, resulting in a broad range of opportunities for value addition as well as relevant global linkages that include different opportunities, technical advantages, and capabilities (Leitner & Stehrer, 2014; Liu, Li, Long, Li, & Le, 2018; Orlic, 2017). GVCs have the potential to drive positive results, but there are winners and losers in GVCs, according to Stollinger (2016). Clearly, participation in the GVC does not necessarily lead to positive outcomes for all participants. The initiative is a massive international trade network that cuts across three continents; Asia, Europe and Africa (Kohl, 2019; Solmecke, 2016). This initiative also cuts across several corridors in different countries (Solmecke, 2016). The BRI has received a lot of positive feedback from a variety of stakeholders, but there are still a lot of questions about why China is championing it, and whether there is some link to a desire to promote its political dynamics wrapped around economic power in the many vulnerable and developing countries through which it passes (Ghiasi & Zhou, 2017).

In fact, the BRI is still evolving as a long-term Chinese vision for infrastructural development, connectivity and economic cooperation (Ghiasi and Zhou (2017). With BRI still in its early stages, it becomes imperative to extent literature on it, especially with its effectiveness in improving GVC participation. Also the assertion by Brückner and Lederman (2012) with regards to a lack of consensus on if trade increases growth, also forms a bases to evaluate how the GVC influences economic growth in a period of increasing global production fragmentation, within the implementation era of BRI. Our paper examined the impacts of global value chain on economic growth of Asian countries within the Belt and Road initiative. We employed aggregate panel data selected Asian 20 countries within the Belt and Road region over the period of 2005 to 2017. We find robust evidence for a positive productivity effect from stronger GVC integration. Moreover, and in line

with Rodrik (2013), we find that relatively less productive countries can benefit more from GVC participation in terms of growth rate. However, our findings establish negative prediction of global value chain participation on economic growth rate. This speak global value chain participation of sampled countries contribution in the world via GDP growth rate is negative

Our paper contributes to the literature in diverse ways. First, the paper projected to extent the literature on the Belt and Road initiative. The findings of the impacts in promoting global value chain will add to the extant literature on the effectiveness the policy to China and all countries within the initiative. Second, the paper can be a basis for critical policy evaluations by governments. Belt and Road initiative is massive with a lot of potential, and number of positives. Therefore, we believed that, scholars and other stakeholders alike can also rely on the findings for critical evidence on the initiative, consequently assisting in promoting proper economic discourse and discussions.

## II. LITERATURE REVIEW

According to Jingzi, Haitao, and Hua (2013) global value chain is a phenomenon that cannot be taken for granted. It was indicated that in recent time, GVC discussion has been in the fabric of almost all country, from developed to less developed countries. GVC is recognized to comprise of activities that cut across raw material and components procurements, manufacturing, and distribution across countries. GVC which promotes trade freedom and reduces cost of doing business also improves technological advancement, and improves the timely of product delivery and efficiency (ESCAP, 2015). The fragmented nature of production associated with GVC is positively shaping trade and production methods in current times (Pomfret & Sourdin, 2014).

The importance of GVCs in current times cannot be over emphasized, it is on the back of this that the United Nations Economic and Social Commission for Asia and the Pacific (ESCAP) (2015) projected that GVC plays an instrumental role in establishing future trade and Foreign Direct Investment (FDI) trends and economic growth avenues. GVCs includes a lot of sectors that have driven trade drastically high as shown in some trade figures like when trade grew from \$300 billion in 1990 to \$2,300 billion and a substantial number of this was service exports from East, South, and Southeast Asia (Pomfret & Sourdin, 2014).

The benefit of GVC is obviously enormous, with the capacity to improve efficiency and also save times, since with GVCs in current times, there is no need to design, and produce a product alone, as it is more advantageous to identify a specialty and focus on it (Baldwin, 2011). However, for this to happen smoothly, there is need to reduce the obstruction to the flow of products, information and capital (Jingzi, Haitao, & Hua, 2013), which has to be driven by specific policies (ESCAP, 2015).

It needs to be emphasized that there are certain factors that motivate players to participate in GVCs. One important condition for the participation in GVCs is the price of cost of production. The cost needs to be reduced in the sense that it allows for the use of location advantages of countries and economies-of-scale (Anukoonwattaka, 2011). Also in the case where a firm is already participating in GVCs, there is also the likelihood to increase their flow if there is a reduction in the cost of trade (ESCAP, 2015). Also the availability of natural resources in a particular country can be the reason why a firm move certain part of their production process to the country. For example, the availability of cheap labour. But it should however be stress that the availability of resources is not the only potent reason for firms to move their production process to another country. In

instances where there is the ability of enjoy economies of scales, tax incentives, preferential trade arrangements and existing regulatory frameworks, these can very well influence a firm or a country to participate in GVCs (Bhattacharya & Moazzem, 2013). Asia plays a key role in GVCs, this is evidence in the “Factory Asia phenomenon, which the electrical and electronics industry plays an important part in (Pomfret & Sourdin, 2014). It should however, be emphasized that Asia also actively participates in other GVCs such as those related to the textiles, clothing, and footwear industries (Pomfret & Sourdin, 2014).

The importance of Asia in the GVC is also reflected in the Asia-Pacific region which has been established to be a major player in GVCs with regards to exporting of GVC products (ESCAP, 2015). For example, in 2013, approximately 45% of global GVC-related exports of final products were from the Asia-Pacific region, with China’s export being half of the region’s final exports (ESCAP, 2015). The gap between their export and import is however large. In the same year, the region’s imports of GVC final products were about 26% of global imports, as it was dominated by the United States and a number of countries in the European Union (ESCAP, 2015)

Data from the Asia-Pacific region indicates that participation in GVC comes with enormous benefits that cover a number of stakeholders and levels, such as for firms and country. It comes with advantages such as creation of better employment opportunities (ESCAP, 2015). The fragmentation nature of GVCs which promotes the participation of different firms at different circle of production, has given the opportunity of certain small and medium firms to collaborate with multinational firms, giving them the opportunity to gain access to a global market, one that might not have been possible under the traditional mode of production (Mettler & Williams, 2011; Orlic, 2017; Taglioni & Winkler, 2016). This however does

not mean that it is an easy ride for those in the GCVs as competition is usually fierce for various spots in the GVCs (Taglioni & Winkler, 2016). This is also coupled with complex trade-off policies, which exposes firms to uncertainties that are associated with coordinating production across several locations (Taglioni & Winkler, 2016).

It must be emphasized that GVC participation sometimes increases volatility and inequality (Pomfret & Sourdin, 2014). This however does not mean not participating places the country in a better position as not participating in the GVC can result in reduced economic growth compared to those that participate in the GVC (Pomfret & Sourdin, 2014). This however does not change the fact that countries in Asia do not participate in the GVCs equally. This is indicted to be largely driven by the economic development level of the country. Low-income economies usually focus on tasks that involves low-wage or unskilled labour. They are usually not fully exposed to the benefit presented with technology distribution and skills upgrading. And the high-income economies hold the power to manipulate the knowledge-intensive activities of GVC (ESCAP, 2015). Pomfret and Sourdin (2014) agree, stating that the high cost of conducting business transactions in some Asian economies, such as those in Western and Central Asia, is the reason why some Asian countries have not participated in the GVC.

### III. Data and Methods

The methodological strategy adopted for this quantitative approach. For the quantitative phase of the study, we used data from the World Bank, ILO, International Monetary Fund, and UIBE websites. We examined the impact of Global Value Chain on economic growth using panels from Belt and Road countries. For robust empirical analysis, we integrated into our model other explanatory variables, especially trade balance, and foreign exchange research

following the works of (Pomfret & Sourdin, 2014). Therefore, we employed a panel data of aggregate values of the adopted variables over the period of 13 years thus from 2005 through to 2017.

### Empirical Models

We first estimate to predict the impacts of Global Value Chain on Economic Growth by integrating specific indicator variables. The regression specifications are shown as:

$$ECG = \alpha + \beta_1 GVCPTt + \beta_2 GVCPS + \beta_3 FREX + \beta_4 TRDB + \varepsilon_t \dots\dots\dots (1)$$

The extent of a country's involvement in global value chains can be defined as the sum of GVC-related components divided by gross exports ( $E_{ijt}$ ), as provided in our study as:

$$GVC\_Participation_{ijt} = FV_{ijt}/E_{ijt} + IV_{ijt}/E_{ijt} \dots\dots\dots (2)$$

$$GVC\_Position_{ijt} = \ln(1 + IV_{ijt}/E_{ijt}) - \ln(1 + FV_{ijt}/E_{ijt}) \dots\dots\dots (3)$$

We derived the panel dataset from Asian 20 countries within the Belt and Road region from World Bank, ILO, International Monetary Fund, and UIBE websites. The yearly data covered the period from 2005 to 2017. The countries included in the study are: Vietnam, Thailand, Singapore, New Zealand, Mongolia, Malaysia, Korea, Rep, Indonesia, China, Cambodia, Brunei Darussalam, Tajikistan, Kyrgyz Republic, Kazakhstan, Azerbaijan, Sri Lanka, Pakistan, Nepal, India, and Bangladesh.

### IV. Findings and Analysis

A summary of the descriptive statistics for the baseline series in their natural logarithmic form are reported in Table 1 for the selected 20 countries within the Belt and Road region over the period 2005 to 2017. The outcome shows, for all selected economic growth recorded the highest mean value of (0.4468), with a standard deviation of 0.2277, successive by global value chain position with an average value of 0.1955, and standard deviation of

0.0494, global value chain participation (0.1350, standard deviation 0.389). The outcome shows that, global value positively and significant impact economic growth as skewed.

	Mean	Std. deviation	Min	Max
ECG	0.4468	0.2277	0.2067	0.8700
GVCPTT	0.1350	0.3899	-	0.7880
GVCPTST	0.1955	0.0494	0.1069	0.2590
TRADEB	0.1436	0.0372	0.0873	0.1925
FREXE	0.1567	3.5423	3.6000	14.4000

### Regression Result

The table (3) establish statistical difference between GVC participation and position and their relationship with economic growth as proxy by GDP growth rate. The significance level was pegged at (0.05) with 95% confidence level. The results further show statistically significant difference of both GVC position and participation of all the selected countries as evident by (df=2, F=3.454, significant value=0.047 and p<0.05). The results imply that, global value chain envisage gross domestic product growth rate inversely. In fact, the mean differences exist as results of the effect of global value chain on economic growth of selected Asian countries.

**Table 3.** ANOVA Result from Regression

Model	Sum of Squares	Df	Mean Square	F	Sig.
1 Regression	4194.596	2	2097.298	3.454	.047 <sup>b</sup>
Residual	9714.878	16	607.180		
Total	13909.473	18			

### Note: Dependent Variable: GDP Growth Rate, and Predictors: (Constant), GVC Position, GVC Participation

However, the results in table (4) shows a statistically significant prediction of GVC participation on GDP growth. The results indicate negative prediction as evident ( $[\beta = -.644, t = -2.627, \text{sign} = .018, p < 0.05]$ , and 64.4% of differences elucidated. The prediction explains Global value chain participation of sampled countries contribution in the world via GDP growth rate is negative. We established that, most of the GVC trading are been carried out locally. Our finding is obvious that participation index is moderately correlated with the size of countries and the import content of exports of countries. The findings are consistent with Gereffi and Fernandez-Stark (2011). GVC participation sometimes increases volatility and inequality (Pomfret & Sourdin, 2014). This however does not mean not participating places the country in a better position compared to participating in the GVC and being exposed to inequalities, as not participation can result in a higher reduced economic growth compared to participating in the GVC (Pomfret & Sourdin, 2014). In addition, the findings show that, GVC position of selected countries failed to predict economic growth as proxy by GDP growth rate ( $\beta = -.322, t = -1.313, \text{sign} = .208, p < 0.05$ ). This implies that position index, is not correlated with the size of countries and the import content of exports of countries in Asia.

**Table 4.** Regression Coefficient Result

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	92.657	9.291		9.973	.000
1 GVC Participation	-16.444	6.259	-.644	2.627	.018*



GVC				-	.2
Position	-.254	.193	-.322	1.3	08
n				13	

## V. Conclusion and Policy Recommendation

Being a project that is arguably in its early stages, the full effect of the BRI cannot be stated with all certainty. There is no doubt that the project is a massive one with a lot of potential, and to some extent a number of positives, but there is need to properly evaluate the long term effect of the project. We first estimate to predict the impacts of Global Value Chain on Economic Growth by integrating specific indicator variables. We employed panel unit root test of selected Asian 20 countries within the Belt and Road region over the period of 2005 to 2017. Our findings show that, countries' GVCs position and participation were not steady throughout, before and after the adoption of the BRI.

The key contribution of our study is to provide econometric evidence on the impact of GVC participation and position on economic growth rate using data since 2005 on 20 Asian countries. We find robust evidence for a positive productivity effect from stronger GVC integration. Moreover, and in line with Rodrik (2013), we find that relatively less productive countries can benefit more from GVC participation in terms of growth rate.

Our finding on participation is moderately correlated with the size of countries and the exports of countries. Finally, our findings establish negative prediction of global value chain participation on economic growth rate. This speak global value chain participation of sampled countries contribution in the world via GDP growth rate is negative. We established that, most of the GVC trading are been carried out locally. Our finding is obvious that participation index is moderately correlated with the size of countries and the import content of exports of countries. The

findings are consistent with Gereffi and Fernandez-Stark (2011). This can be assumed at this point; the program is attaining its aspirations to some extent. Our paper encounter certain caveats where our paper did not evaluate the BRI within the long run, so future studies could look at roping in other economies from different regions that have adopted.

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## Smart Basket : The Modern era IoT application

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### ABSTRACT

Smart basket is a technology that uses Arduino and RFID. During pandemic times like Covid-19 there gets the crowd in the grocery marts, and the customer must wait in queue for final billing. But there may be high risk during these times of spreading the disease, so Smart basket brings an ideal solution for getting the final billing done. Using Arduino and RFID tag customer gets a final bill through the web app which gives a list of products scanned by the smart basket. The customer can remove the products which he further wishes to eliminate from his basket and delete the item from the final bill in the web app which can result in savings too. This smart basket also reduces manpower as the traditional method of buying the products involves a long time, with RFID tag the same thing is performed in a modern way.

**Keywords** : Arduino, RFID tag, RFID reader, Shopping cart, Wireless Communication.

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## I. INTRODUCTION

Smart basket is a technology used inside small grocery shops to big malls. With the use of an RFID tag and RFID reader, shopping is made easy. During times like pandemic or festive, there is a lot of crowds in malls. Overcrowding is the biggest issue in continents like Asia and Africa. But with evolving, IoT technology new solution devices are made each month. With Arduino, the technologies had a huge impact on human lives. With the use of Arduino and RFID technology, we had made a Smart basket that will use a Wi-Fi module. The customer must scan a

product on an RFID reader, the products in near future will come with In-built RFID tag chips on the product. The product details will be read by the RFID reader and a web application will be there where these scanned product details will be present. The customer must pay the final bill in any mode of payment and generate E-receipt. This way the Smart basket is avoiding overcrowding in the malls while customers must scan a product on the go. In past this technology had evolved a lot and yet must bring some new changes. We had discussed and used RFID technology and Node MCU(ESP2866). In this following paper, we had presented a survey on

different techniques used in Smart Basket over the years. Methodology and conclusions had been explained. Section 2 explores the literature review of the following paper. Section 3 demonstrates the proposed model and in the last section we had discussed the conclusion and future scope of Smart Basket using IoT technology.

## II. LITERATURE SURVEY

### 1. Smart Shopping Cart using RFID & Zigbee.

The smart basket technology had evolved a lot in the recent years, one such technique used was Zigbee device. This device is based on IEEE 802.15 standard. Zigbee is a device which transmit data covering longer distances. It passes data through intermediate devices to reach more longer ones i.e., devices, resulting in a mesh network. The RFID and Zigbee technology brought an automated billing system. The proposed system was as follows: Inside a shopping mall, each shopping cart was designed in such a way that each shopping basket would contain a RFID device i.e., to identify product. This was the product identification device which contained the microcontroller. As the customer would proceed to buy products the customer has to scan the product through RFID reader, the RFID reader reads the product details through the RFID chip. The basket containing product identification device also contains microcontroller, LCD, an RFID reader, EEPROM, and ZigBee module. The information read by the RFID reader is stored inside the EEPROM and this data is sent to billing system by Zigbee module.

RFID is the radio frequency identification which is the on-going technology and progressing each day. It has been helping the IoT industry grow more and more towards sustaining environment and automation. The technology is old but with latest trends in technology world RFID chips are made for ease of use of the humans. This technology is

bringing and will change the supply-chain industry and logistics.

Zigbee is a network device which is built on top the IEEE 802.15.4 standard. Creating a mesh network and transmitting the data to distant device is done by Zigbee module. It provides wireless networking protocol at low cost with low data rate and power consumption which helps toward automation of remote-control applications.

### 2. Smart Trolley using RFID.

In this product the RFID technology was used with IR technology. The infra-red technology is another technology which was used in past years to get the Smart trolley work inside the mall. The system also contains ARM processor like in past microcontroller for processing of the desired data. The concept of smart shopping cart there was a use of IR sensor and ARM processor which made alert for the customer whether a product has been removed. This was introduced due to theft and fraud or any disputes between customer and shop owner. , and smart shopping trolley but depending upon growing technology, need of the market and hardware cost each year the products must bring some changes. In this product.

This product used a RS232 protocol which helps in the processing for billing purpose along with ARM processor. The working was simple and like past products but with ease of use. The customer must scan the RFID tag i.e., a chip on RFID reader the details of the product will be sent to system memory. As the customer scans the product there will be a option to check whether the product is available or not on LCD display. If the product is found the basic details such as name and price on LCD display. The product details are processed in a way where ARM processor and the protocol i.e., RS232 will work to calculate and process the data. The IR sensor

mentioned before is used for counting purpose i.e., to count the number of products. The sensor will emit the rays in continuous fashion and help in storing the products in ARM processor. After completion of the shopping, there is a button which when pressed indicates the final billing of the products on a web-based interface.

### III. PROPOSED WORK

The goal of the system is to deliver a system that is easy to work and generate automated invoices. Making this system easily accessible and deliver the shopping system with low-cost hardware, which will bring an ideal solution both for consumers and retailers. The basket will contain the sensor module with a circuit such that when an item is placed it will be scanned with an RFID reader, the product should include an RFID tag. When the item is scanned, and RFID has completed its work, the microcontroller will store the data using SPI protocol with and Node MCU [4] will help this data to store in the system. In this way, the sensor module will have Arduino embedded in the circuit with all necessary hardware components.

When the customer enters the shopping mall, he/she will take the basket. [3] The basket has the sensor module which contains an RFID reader per customer taking that basket, with customer inspecting the products they must scan the product through RFID tag and the RFID tag will send this detail to the RFID reader, which relates to Arduino (Arduino contains inbuilt microcontroller) now the Node MCU Wi-Fi module (ESP2866) will communicate with the database using SPI protocol and the products will be stored on the webpage of the shopper's website. The scaling and automation help in regulating the process easy and the bill is generated fast.

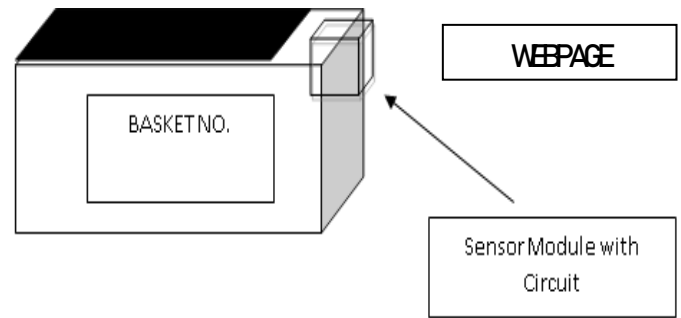


Figure 1: Design of setup.

### IV. CONCLUSION

Considering the latest changes in IoT technology there are number of trends which are helping the world to grow a better place, so the Smart Basket IoT application will bring a change and make a new trend in retail shopping. This will become a necessity in the upcoming future for shopping and retail marketing industry, as it performs the fast billing. Further the cost of the Hardware module will decrease with new evolving technology, resulting in making more IoT embedded hardware. Smart Basket will help the marketing industry to build more hardware with less cost. The automation industry will upgrade the IoT products so this product will work seamlessly resulting less manpower.

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## Minimal Cost Notice Board Using IoT

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### ABSTRACT

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As we know the purpose of noticeboards in schools and colleges had become unappealing among students. Also, the traditional way of sticking up the charts and paperwork was found to be dreary which is also why students are not actively involving in doing that. In this paper, we are proposing a model of online digital noticeboard using IOT which plays a vital role in reducing paper work, time and man power.

Here we use Node Miro-Controller Unit ESP8266 which has an in-built Wi-Fi module capable of sending/receiving data to/from internet. This micro-controller is connected with a LED dot matrix display which displays the data sent by the micro-controller.

We have also introduced some new concepts like collecting and displaying current time, date and day along with displaying the notice sent to the micro-controller through internet.

**Keywords** : Node MCU ESP8266, LED dot matrix MAX7219, smart noticeboard, Flutter, Firebase

### I. INTRODUCTION

The problems with putting up paper notices on noticeboards are many in number: heavy wastage of paper, limitation in number of notices that can be put up at a time, recording and reuse of notices is rendered impossible, etc. Our study visualizes a smart screen hung outside every class—a smart system that regularly updates itself from a server, and effectively displays class-specific notices. The project is an IoT project in its true essence.

Node MCU plays a vital role in transmitting the information from mobile application to the smart display.

We have interfaced LED dot matrix display for long range and attractive visibility of the content. This smart display is cost effective and also looks attractive enough to get people's attention. Knowing time, date and current day is a vital part of every day. Most of the classes in schools and colleges lacks a clock. This



system displays time, date, and day continuously in between displaying notices. The network time protocol helps us to feed current time and date in this instance. We use Google Cloud Realtime database to store and retrieve notices.

#### **Internet Of Things – Services and Components used**

**Node MCU ESP8266:** The micro controller unit that connects to the internet and fetches and displays data from the databases.

**Network Time Protocol API:** Current accurate time and date are provided by Network Time Protocol. After connecting to the internet, time and date are obtained from NTP servers using its API by the micro-controller.

**Firestore Real-Time Database:** It provides a database and a secure connection to access the data. The changes given by the user through mobile phone is instantly reflected on the notice board because of this Firestore Real-Time Database.

**Firestore Authentication:** This service verifies the user's credentials and gives appropriate access to the user to access the database.

## **II. EXISTING SYSTEMS**

Ethernet module is used as a source for internet connectivity [1][6]. Here ethernet cables are laid along till the notice board and connected to the ethernet module. Raspberry Pi is used as a primary micro-controller [5][7][2] and large LCD monitors are used as display. Here images can be sent as a notice.

Some existing systems use a GSM modem, and combine it effectively with a basic LCD display. GSM modem with a SIM card is interfaced to the ports of the microcontroller with the help of AT commands. These systems make use of simpler micro-controllers like 8051, Atmel AT89C52, ATMEGA32 etc. A mobile phone is usually made use of in the client side to upload notices.[4]

Web applications are made in some papers using HTML CSS. This web application is used to change the contents of the noticeboard [5].

## **III. SCOPE AND MOTIVATION**

In traditional method the notifications are displayed on the wooden noticeboard by writing the content on the paper which consumes space, prone to tampering and require manual labour to put and remove on time. Some important notices need to be displayed without any delay. So, there is a need for having smart digital notice board.

Government school students or students from rural schools tend to find schools boring or not interesting. A wireless display which shows time and notices will make them more interested to go to schools. If we speak about installing a device across all schools, then cost would be a major issue.

Our motive is to make schools very much interesting by introducing a smart device which is capable of making the class look futuristic within a minimal budget. Cost is our main objective.

The cost of this system would be,

Total Cost = Cost of Micro-Controller + Cost of Display + Cost of power source

Total Cost = 150 + 200 + 50 = ₹400/-

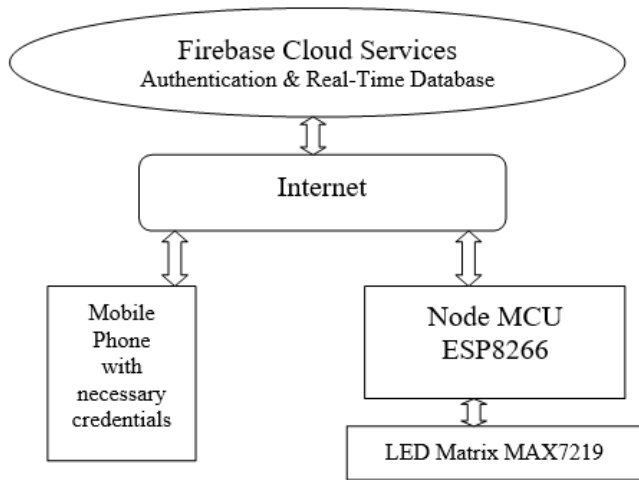
This system provides less functionality than others but it is also much cost efficient than other available systems.

## **IV. METHODOLOGY**

### **General Architecture**

We have used Firestore as a backend for the project. The Node MCU will constantly listen to the changes in the firestore real-time database and updates the LED Matrix display. Node MCU also fetches time, date and day from NTP servers and updates the LED

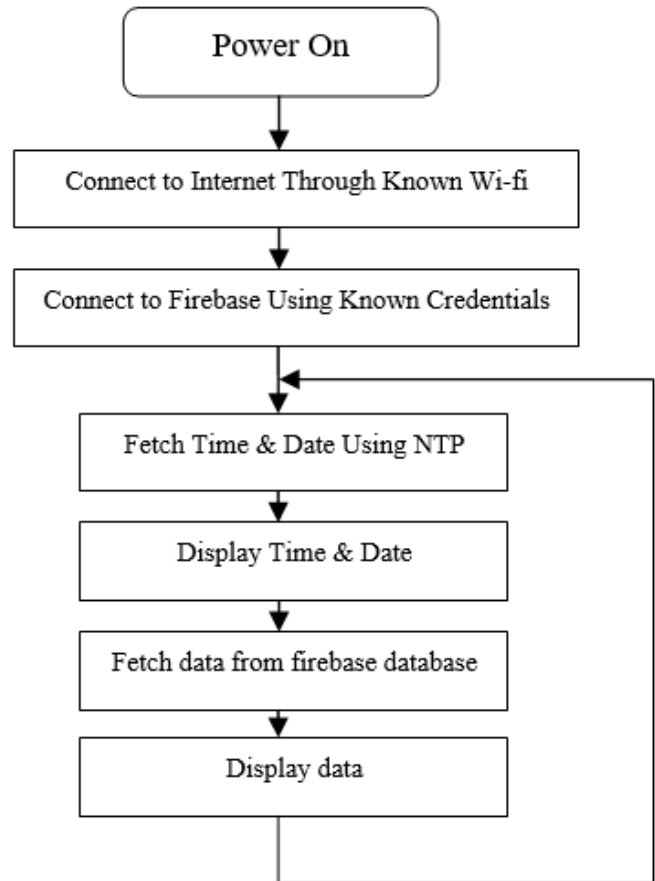
Matrix display. The user's mobile phone will be authenticated using firebase authentication and listens to the changes in database. User's device has provision to change the contents of the database.



**Fig 1.0** Architecture of the Minimal Cost Notice board system

**Notice Board Architecture**

We now explain the logic of working of our Node MCU system. For this we need Node MCU ESP8266 connected with LED Matrix MAX7219. We also need a known wi-fi connection nearby so that the device will connect to it. First the device connects to the known wi-fi connection thereby it connects to the internet. Once connected to the internet, it fetches time and date from the NTP server using APIs and displays it one by one on the LED matrix display. Using the predefined credentials present in the device, an access is given to the device to access the database. Now it gets the data from the firebase real-time database and displays it on the display in a scrolling manner. Now it again fetches time and date. This process is repeated.



**Fig 1.1** Flow chart for the notice board

**Mobile Application Architecture**

The mobile application starts with a login screen where user's credentials are entered. When login button is clicked the credentials are sent to firebase and firebase authentication verifies the credentials and provides access to the user to access the real-time database. (This process requires the mobile phone to be connected to the internet) Now the edit screen appears and we can edit the content to be displayed on the notice board. Once the edit button is clicked the new text is sent to the database which replaces the old one. This is also reflected on the device.

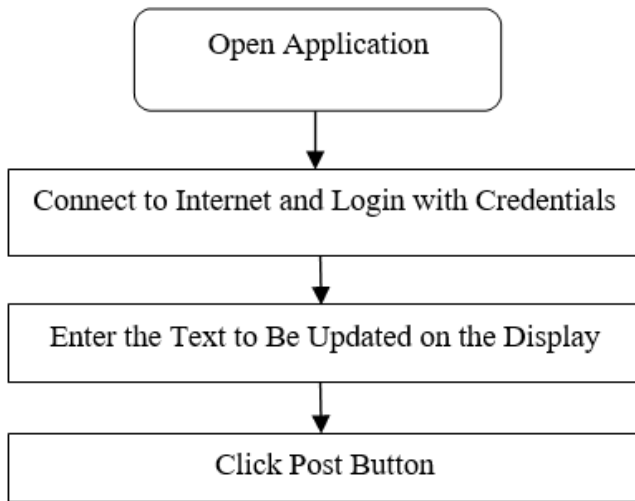


Fig 1.2 Flow chart for the mobile application

**Justification for Opted Methodology**

Firestore provides universal access to the notice board (although it requires internet on both mobile and noticeboard). Using Node MCU with LED Dot Matrix would be the most cost-effective way of implementing it. Mobile application made using flutter frame-work is more efficient than other app development ways as this app can be migrated to IOS or Windows with minimal changes. Even web version can be created from the mobile app within few steps.

**V. IMPLEMENTATION**

**Technology Stack**

This system uses efficient technology stack which provides results with minimal delay and high reliability. It also provides high number of functionalities at a low cost.

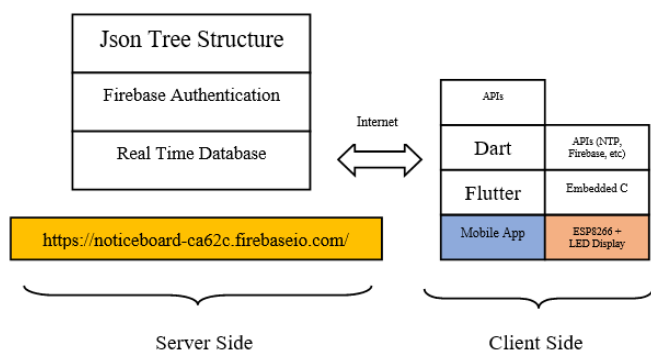


Fig 2.0 Technology Stack for the noticeboard system

The server side is hosted on firebase. The whole backend process is handled by firebase. On the client side, flutter is used to make the mobile application and embedded c language is used to make the microcontroller program. Flutter is a framework which is written and used by the language dart. The various services used in this system has their own APIs which allows us to fetch data from them (Example: NTP, Firebase, etc).

**Dot Matrix Type Display**

Dot Matrix LED MAX7219 Array is used in this system. The two main advantages of using this type of display are,

1. High Visibility
2. Low Cost and Power Efficient

The colour scheme (black and red) and its intensity (of LEDs) makes sure that the display is visible from a long distance. Comparing to other display methods (like using LCD monitors), this method is highly power saving and cost saving.



Fig 2.1 Image of our noticeboard displaying time

**Wifi Micro-controller**

This project uses Node MCU ESP8266 as its microcontroller. This kind of microcontrollers provide functionality to connect to the internet or a Local Area Network (LAN) and send/receive data accordingly. It is built such a way that its processing powers are limited thus reducing the cost of the device. Since it has networking capabilities it can be used in IoT related applications.

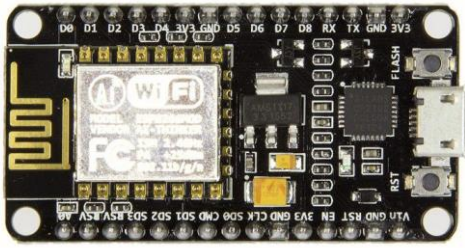


Fig 2.2 Image of Node-MCU ESP8266

### Flutter App

The mobile application that is used in this project is made using flutter. Flutter is a framework that can be used to make applications. It is written in Dart language. The code for the app is also written in dart language. While making the app, important API keys and credentials related to firebase are saved into the application. This app consists of 2 screens, the login screen and the edit screen. The login screen insists users to enter the credentials (email ID and password). It then uses the saved keys to contact firebase authentication service and verifies the credentials. If the credentials are right, then the app shows its second screen which is the edit screen. Here you can see the text that is currently present on the noticeboard. You also have provision to edit the text. When you edit the text, the app uses the firebase keys and credentials to change the data present in the database. This whole process will not work if there is no internet connection available.

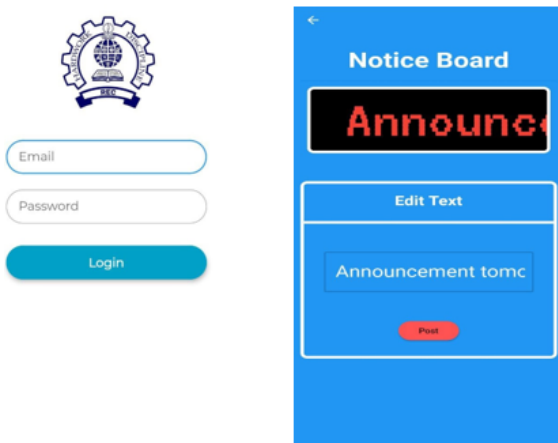


Fig 2.3 Screenshots from the mobile application

### Firestore Backend

Firestore is used as a backend for the project. Firestore is a platform developed by google that provides cloud services at a minimal cost. This project uses firestore for 2 purposes,

1. User Authentication
2. Real Time Database

Firestore authentication prevents any unauthorized person to access and change the contents of the noticeboard. It uses high level encryption and provides better security than any other backend services. Firestore Real-time database acts as a cloud storage of data where we can access it anytime and anywhere. Google is one of the biggest cloud service providers in the world. So, firestore can be used as backend service with high reliability.

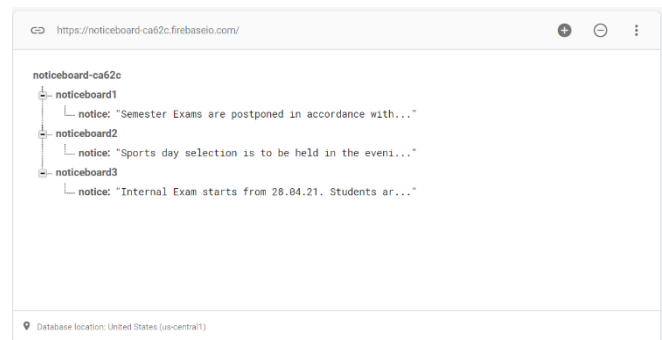


Fig 2.4 Image of firestore real-time database

The above image shows the structure of the firestore real time database that is used in this project. We can have any number of noticeboards connected to any number of users.

### APPLICATION OF LOW COST NOTICE BOARDS

Cloud-based smart noticeboards will be a big part of smart homes and smart cities as it implies the concepts of IoT similar to smart homes and smart cities. Apart from that, these noticeboards can be placed anywhere like schools, colleges, shops, malls, etc. For example, when a shop is closed unexpectedly and he has to give a notice, he can type out his notice in the app and it will be displayed on the shop's notice board. It can be integrated with smart home

and used at the door to give notice to people coming to our house.

## VI. CONCLUSION

The prototype of this cost-effective wireless noticeboard was efficiently designed. This prototype has facilities to be integrated with a display board thus making it truly mobile.

### Unit Testing

This device is tested to last for more than 12 hours without any heating issues. The mobile application holds good without any crashes. Firebase backend works all time without any server issues.

### Future Work / Add-On Possibilities

This is just a prototype of a wireless display board whose content can be changed using mobile phones. There is always room for changes. For instance, we can use buzzers to notify incoming notifications. We can also use speakers to speak out the notification text. Different sized dot matrix displays can be used based on locations and necessity.

## VII. ACKNOWLEDGMENT

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# Investigating the Energy Efficient Routing Protocol for Wireless Sensor Networks

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## ABSTRACT

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A Wireless Sensor Network(WSN) consists of chain of sensors with capabilities of consuming energy for sensing, computing, and wireless communication to track physical device and relay their data to a base station cooperatively via the network. Efficient path for the processing of data in WSN and also to identify the active devices in the path. The ad-hoc networks which are active in WSN due to protocol, they facilitate versatility that often alters the topology. The Energy Efficient Zone based Routing Protocol (ZBEEP) which is the latest protocols in this direction, and the most common is On Demand Distance Vector Ad-hoc routing protocols. In ABODV and ZBEEP protocols using Network Simulator, I simulated this Black Hole Attack and tried that in the case of ZBEEP protocol the effect of energy due to Black Hole Attack is ineffective and better as compared to ABODV. I used two service quality metrics, such as Packet Transmission Ratio and Through-put, to help my opinions.

**Keywords :** Black Hole Attack, MSN, Protocol, Energy, and ZBEEP.

## I. INTRODUCTION

The appearance of mobile computing has revolutionized our info society. The proliferation of new, powerful, and compact act devices, having extraordinary process power sealed the means for advance mobile connectivity. We have a tendency to be moving from the private pc age to the ever present Computing age within which a user utilizes, at a similar time, several electronic platforms through which he will access all the specified information

whenever and where needed. The character of ubiquitous devices makes wireless networks the best resolution for his or her interconnection and, as a consequence, the wireless arena has been experiencing exponential growth within the past decade. There are, several things wherever user needed networking connections aren't obtainable in an exceedingly given geographic area, providing the required property and network services in all conditions becomes a true challenge [1]. A Wireless Sensor Network (WSN) is a group of pretty less

expensive computational nodes that degree neighbourhood environmental situations like temperature, sound, strain and many others and ahead such data to a base station for appropriate processing [2]. WSN is by some means much like advert hoc cellular community in the experience that each are useful resource constrained, just like the battery power, capacity, conversation variety and memory. WSNs nodes can experience the environment, can speak with neighbouring nodes, and can, in lots of cases, carry out primary computations at the facts being collected, means Sensor nodes are deployed randomly within the software area, because of that, the WSN has various tiers of node density alongside its area. The likely difference of node density amongst a few areas of the community has the energy constraint of the wireless sensor nodes due to which some nodes degrade making the particular bunch much less dense. Overall it's appealing not unusual to set up WSNs in the Detroit environment, so the many wireless sensors have fault [3]. For which, networks should be fault-tolerant and protection is minimized. Typically conversion is dynamic in topology. The resultant for this trouble is to deploy protocols that carry out efficiently making use of less quantity of energy as viable for the conversation amongst nodes. The Wireless sensor network may be described as a wi-fi sensor network that follow specific path in the network. These sensor nodes may associate to specific moving nodes. Sometimes those nodes need to flow because of the surroundings in which they're associated.

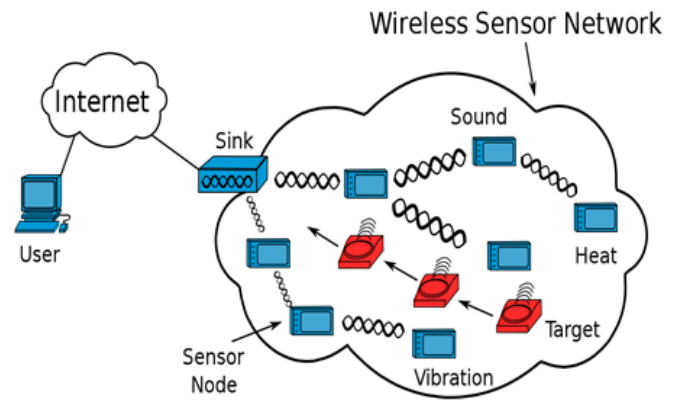


Figure 2: Wireless Sensor Network architecture [14]

## II. PROBLEM STATEMENT

Here in paper we try to investigate green power protocol ZBEEP and scrutinize the effects and consequences how black-hole on ZBEEP primarily based on a few arguments. Here in paper different segment specified which can gift to speak approximate running ideas of ZBEEP and approximately the black-hole assault, the way it works. The other segment will complex our proposed protocol ZBEEP approximately how black-hole reasons hassle for ZBEEP. Next segment analyses the overall performance of current and the use of extraordinary graphs. Last segment describes the belief and destiny paintings observed via way of means of references.

## III. RELATED WORK

There are numerous methods supplied via way of means of exceptional authors relating each stable and non-stable routing protocols. Initially, there's numerous literature research targeted on reviewing seek issues on stable routing in WSNs. Subsequently, present research taken into consideration numerous troubles like as electricity efficiency [4], location-primarily based totally [5], Network topology, community scalability and maintainability, powerful records transmission, routing and stable multi-direction routing and security etc. The



importance of the proposed routing protocol is to reap statistics securely and shield the overall performance of the community from degradation and different resources. From this method can shield statistics exchange, stable records transport in addition to replace the rout via way of means of isolation of malicious nodes.

All the ones investigational research offer an in depth look at of various routing schemes. However, this segment is specially specializing in a complete survey look at of stable routing protocols in WSNs. Other proposed a trust-primarily based totally mechanism with stable routing approach for WSNs and explored the contemporary studies look at and become aware of the open studies demanding situations via way of means of surveying proposed mechanisms [6]. Later, they categorized the earlier routing protocols primarily based totally at the form of routing assaults and supplied complete studies on a trust-primarily based totally mechanism to stable the routing in WSNs. They supplied a trust-primarily based totally stable routing mechanism that establishes a honest stable routing among every sensor nodes to the vacation spot node.

Energy green routing protocols sensor nodes store their electricity stage via way of means of the usage of extraordinary strategies to growth node and community lifetime. Introduction of quarter growth the electricity performance as handiest quarter head have the authority to ship and get hold of data. For this facility different member nodes might not energetic all of the time, it saves nodes electricity and growth community lifetime [7]. Energy performance is an essential problem in MSN. The present electricity-green routing protocols often use final electricity, transmission power, c programming language among nodes as metrics to pick out a most advantageous path. Obviously the node with maximum electricity decided on as a quarter head. The intention of ZEEP protocol is to lessen the wide

variety of manipulate packets while attempting to find a route [8].

#### IV. SECURITY ISSUES

- A. Active and Passive Attacks: In passive assaults the attacker does now no longer ship any message, however simply listens to the channel. Passive assaults are non disruptive however are records seeking, which can be essential within the operation of a protocol [9]. Adversaries want now no longer be bodily gift to keep surveillance; they are able to accumulate records at low-chance in nameless manner. In a wi-fi surroundings it's miles typically not possible to locate this type of attack, because it does now no longer produce any new trace within the network. Active assaults may also both be directed to disrupt the everyday operation of a specific node or goal the operation of the entire network. The motion of an lively attacker consists of injecting packets to invalid locations into the network, deleting packets, enhancing the contents of packets.
- B. Impersonation Attack: With the loss of authentication in ad-hoc networks, IP addresses uniquely discover hosts[10]. Therefore non repudiation is not supplied for ad-hoc community protocols. MAC and IP spoofing are the most effective strategies to faux as some other node or disguise within side the community. Malicious nodes attain impersonation most effective with the aid of using converting the supply IP cope with within side the manipulate message. Another purpose for impersonation is to steer nodes to alternate their routing tables pretending to be a pleasant node, including assaults towards routing table. An example of impersonations, Man-in-the-center assault [11]. Malicious node plays this assault with the aid of using combining spoofing and losing assaults. Physically, it need to be

positioned because the most effective node in the variety for vacation spot, within side the center of the course or sufferer node need to be averted from receiving every other course statistics to the vacation spot. The affected node routing tables can be used to redirect packets, the use of assaults towards the routing table.

- C. Gray Hole Attack: Gray hollow assaults is an energetic assault type, which result in losing of messages. Attacking node rest consents to ahead packets after which fails to do so. Initially the node behaves successfully and replays real RREP messages to nodes that provoke RREQ message. This way, it takes over the sending packets. Afterwards, the node simply drops the packets to release a (DoS) denial of carrier assault. If neighboring nodes that try and ship packets over attacking nodes lose the relationship to vacation spot then they'll need to find out a path again, broad-casting RREQ messages.
- D. Selective Forwarding Attack: Multi hop networks are primarily based totally at the concept that collaborating nodes will faithfully ahead acquire messages. Malicious nodes may also refuse to ahead positive messages and actually drop them, making sure that they're now no longer propagated any similarly within the network. Selective forwarding assaults are usually maximum effective while the attacker is explicitly blanketed at the route of a statistics [12].

## V. BLACK HOLE ATTACK

Black hollow is one sort of protection assault in which a malicious node sends faux routing information, it has a top-quality course in the direction of vacation spot and reasons different proper nodes to course statistics packets via the malicious one. This is a well-known ad-hoc routing assault in which nodes are dropped.

In this assault a malicious node makes use of the ad-hoc routing protocol (right here we use ABODV) to put it up for sale itself as having the shortest course to the node whose packets requires to detain. As ABODV is published primarily based overall protocol, right here if malicious respond reaches to supplicate the node earlier than the response from the actual node, a cast course has been created. This malicious node then can pick whether or not to drop the packets to carry out a denial-of-carrier assault or to apply its region at the course because the rest assault in between[13]. As the example follow, in ABODV, the attacker can ship a faux RREP(together with a faux series quantity which is fabricated to be identical or better than the only contained with inside the RREQ) and reducing hop-matter fee to the supply node, claiming that it has a sufficiently clean course to the vacation spot node. This reasons the supply node to pick out the course that passes through the attacker.

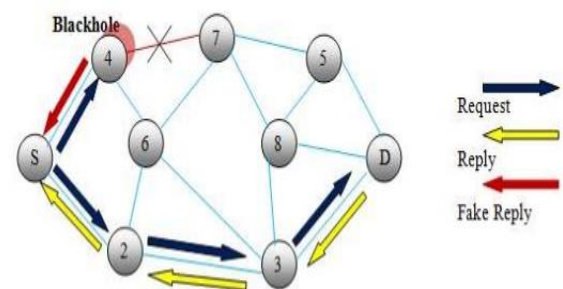


Figure 2: Black hole Attack in protocol [15]

This trouble of complexity made sensor networks extra at risk of the various safety attacks, where in packet drop assault that's pretty not unusual place and dangerous assault that influences the community tier. In dangerous assault the adversary biases the wireless sensor node to drops the whole packets which might be forwarded to it. Here in research, the method to know-how primarily based to gain knowledge of used by detection and easing of these dangerous nodes from the community liable for activating the assault.

## VI. ANALYSIS AND RESULTS

The traffic reasserts are CBR (non-stop bit rate). The source-vacation spot pairs are unfold randomly over the community. The mobility version makes use of random waypoint version in a square led of 900m x 900m with 50 nodes. During the simulation, every node begins off evolved its adventure from a random spot to a random selected vacation spot. Once the vacation spot is reached, the node takes a relaxation time period in 2nd and any other random vacation spot is selected after that pause time. This system repeats during the simulation, causing continuous modifications within the topology of the underlying community. Different community state of affairs for different quantity of nodes and pause instances are generated.

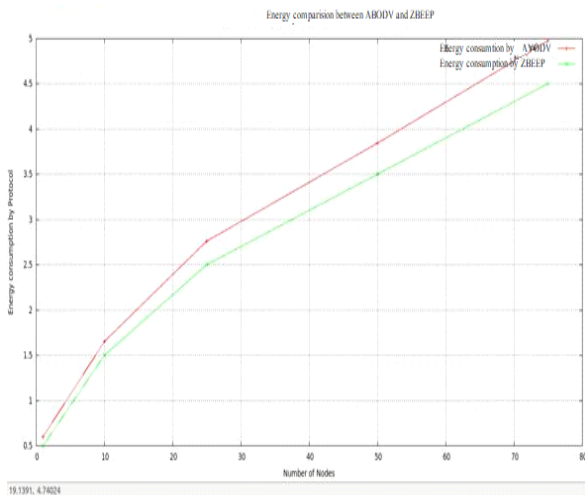


Figure 3: Energy difference of ABODV and ZBEEP

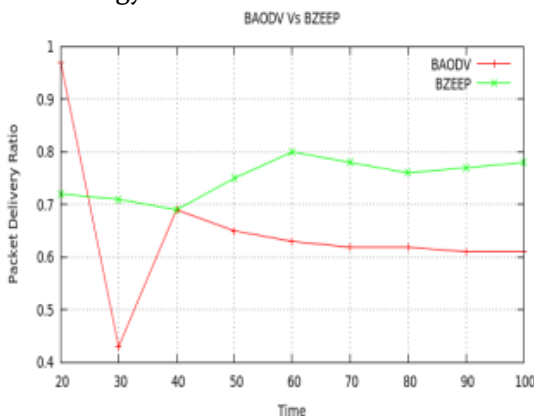


Figure 4: Comparison of BAODV and BZEEP using Packet Delivery Ratio performance

## VII. CONCLUSION

These simulation effects have proven that ZBEEP has a higher overall performance in comparison to BAODV protocol consumes less energy of the network. Black hole(dangerous assault) ZBEEP offer higher packet transport ratio along with throughput than black hole(dangerous assault) BAODV. Thus in manner the effect of dangerous assault is extra intense in case of BAODV the energy efficient routing protocols for wireless sensor.

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## Accident Analysis and Blackspot Identification at Chandrapur City

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### ABSTRACT

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Increased economic activity raised the consumption levels of the people across the India. This created scope for increase in the travel and transportation demanding a greater number of vehicles. The increase in the vehicles since last ten years has put a lot of pressure on the existing roads and ultimately resulting in increased rate of accidents. Blackspots are occurred at urban areas due to increased rate of vehicles, shorter width of roads and defective geometry of intersections. Blackspots are the locations in the city where the accident rate observed to be high. Therefore, there is need identify such locations of the urban area. For the present research, Chandrapur city in Maharashtra, India was selected. Accident data of last four year (2015- 2018) was obtained from police station. Weighted severity index (WSI) method and statistical analysis is used for identifying the accident blackspots. After field observations and interaction with the public, some improvements are suggested for improving the accident blackspot.

**Keywords :** Severity Index, Accident Blackspot, Chi-Square Test

### I. INTRODUCTION

Increased economic activity raised the consumption levels of the people across the country. This created scope for increase in the travel and transportation. The increased in the vehicles since last 10 years has put a lot of pressure on the existing roads and ultimately resulting in road accidents. A major social problem- the loss of lives through road accidents has created due to the spectacular increase in the number of motor vehicles on the road. The appealing human

misery and the serious economic loss caused by road accidents demand the attention of the society and call for the solution for the problem. Understanding the problem and providing the solution shall be provided by the multi- disciplinary approach.

Chandrapur city is located in the south-central region of India in Maharashtra state. Chandrapur has approx. population of 3.75 lakhs. Also, the city having super thermal power station, the largest one in India. Also, the city is enriched with different minerals. The

population of Chandrapur city has increased so far in this year and with that has increased the vehicles causing high traffic volume & rise in pollution. But the transportation system in Chandrapur city is still the same. Blackspots are occurred at urban areas due to increased rate of vehicles, shorter width of roads and defective geometry of intersections. Blackspots are the locations in the city where the accident rate observed to be high. There is a need to carry out some work in the Chandrapur city to improve black spots for reducing the accident. Therefore, Chandrapur city is selected as a study area. The objective of the research is,

- A. Statistical analysis of the accident data using Chi-square test.
- B. To identify the accident black spot using weighted severity index (WSI) method.
- C. Suggesting the improvements for the accident black spots.

Last four years (2015-2018) of accident data collected from Ram Nagar Police Stations. Weighted Severity Index (WSI), a scientific method is used for identifying the accident black spots. Statistical analysis has carried out for the collected data using Chi-Square Test to determine the independence of accidents with other attributes. Chi-Square Goodness of fit test conducted for test whether the accidents are occurring by chance or following any pattern. WSI values are determined for the 143 locations. The Locations with high WSI are treated as accident black spots. 10 black spots are taken for field study. After field observations and interaction with the public, some improvements are suggested for improving the accident black spots.

There is no relationship between the severity of accidents and the other attributes like month, season, day, hours in day and the age group except type of vehicle. Road accidents are distributed throughout

the Year, Month and Season. Road accidents are not distributed throughout the day.

## II. DATA COLLECTION

Accident data of last four years, from 2015 to 2018 was collected from Ram Nagar police station in Chandrapur city. The study area includes total 14 intersections namely Junona square, Bangali Camp square, Bagla Chowk, GEC square, Priyadarshani square, Bus Stop square, Anchaleshwar Gate, Chota Bazar square, Traffic Office square, Jayant Talkies square, Ram Nagar Police Station square, Jatpura Gate, Girnar square, Gandhi square. The data is summarized as follows

TABLE I. ACCIDENT DATA (2015 TO 2018)

Year	Type of Accident				Number of Accidents
	Fatal (K)	Grievous Injury (GI)	Minor Injury (MI)	Damage to Property	
2015	0	0	50	1	51
2016	12	45	45	11	113
2017	24	01	49	07	81
2018	06	13	35	01	55

## III. METHODOLOGY

### A. Statistical Analysis of Accident Data

The causes for accidents being interplay of a variety of factors, the analysis of accident presents formidable problems. Qualitative methods of analysis of accidents can provide insight into the causes that contributed to the accident and can often help to identify the black

spots on the street system. More recently, the emphasis has shifted to the application of statistical techniques in planning and analyzing experiments into the effectiveness of accident prevention measures. The data gathered on accidents can be purposefully interpreted and used only if modern statistical methods are employed. A number of statistical methods are currently being applied in accident research. These include

- i. Regression Method
- ii. Poisson Distribution
- iii. Use of Chi-Squared test
- iv. Quality Control Method

**B. Use of Chi-Square Method**

One of the situations a traffic engineer has to assess frequently is whether the safety measures adopted at a particular location or stretch of road have been really effective in reducing the number of accidents. Before and after data can be evaluated on statistical principles, and one of the handy tools in this direction is the Chi-Squared test. Let  $b$  be the no. of accidents before the improvements at a particular location and the number after the improvements. Assuming that the improvements have no effect and the accident number is expected to increase due to the changes in traffic and weather than let  $b$ .  $C$  be the number of accidents expected if no improvement had been carried out, the factor  $C$  being called the control ratio. Then the value of Chi-Squared is,

$$X^2 = (a - b C)^2 / (a + b) C$$

The null hypothesis  $H_0$  stipulates that there is no real change due to the improvements.

Assuming a 5% level of significance, from Table. We find the value of  $x^2$  to be 3.841 with one degree of freedom. If  $x^2 > 3.841$ , we observe that the null hypothesis is unlikely to be true and that there is a real change. On the other hand, if  $x^2 < 3.841$ , we

conclude that the null hypothesis is true and that there is no real change due to the improvements.

The chi-squared ( $x^2$ ) test is a very useful statistical tool and has many applications. Of particular importance to the traffic engineer are the following:

- i. Testing of proportions with contingency tables.
- ii. Goodness-of-fit-test

The probability density function for chi-squared distribution is shown in a graphical form. It will be seen that corresponding to each “degree of freedom” there is a definite curve.

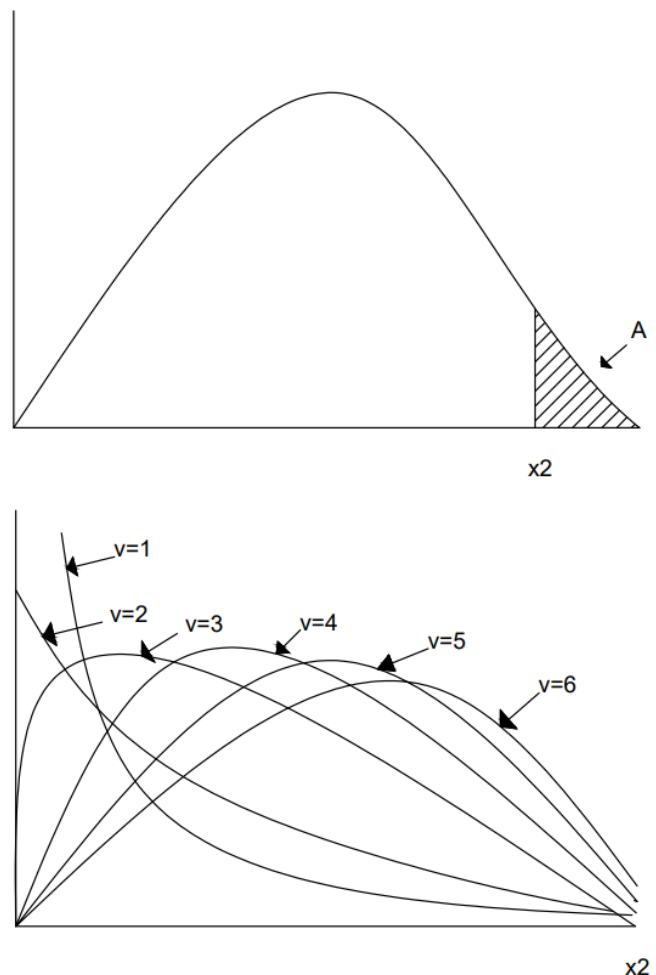


Fig.1. Distribution of  $X^2$  for various degree of freedom

**A. Chi-square test for independence of attribute**

**i. Test of independence between the accident severity and the months in a year**

TABLE II  
TEST OF INDEPENDENCE BETWEEN THE ACCIDENT SEVERITY AND THE MONTHS IN A YEAR

Month	Fatal		Grievous Injury		Minor Injury		Damage to Property		Total	Calculated X <sup>2</sup>	Critical X <sup>2</sup>
	Observed	Expected	Observed	Expected	Observed	Expected	Observed	Expected			
Jan	13	10.16	16	17.14	26	29.31	5	3.39	60	35.76	47.4
Feb	12	10.16	14	17.14	32	29.31	2	3.39	60		
Mar	14	11.17	24	18.86	24	32.24	4	3.72	66		
April	10	9.31	18	15.71	24	26.87	3	3.1	55		
May	6	7.11	7	12	26	20.52	3	2.37	42		
Jun	9	8.63	13	14.57	27	24.92	2	2.88	51		
July	11	8.47	17	14.29	21	24.43	1	2.82	50		
Aug	6	7.11	12	12	22	20.52	2	2.37	42		
Sept	5	5.42	9	9.14	14	15.63	4	1.81	32		
Oct	3	5.93	13	10	14	17.1	5	1.98	35		
Nov	3	5.76	10	9.71	21	16.61	0	1.92	34		
Dec	4	6.77	9	11.43	26	19.54	1	2.26	40		
<b>Total</b>	<b>96</b>	<b>96</b>	<b>162</b>	<b>162</b>	<b>277</b>	<b>277</b>	<b>32</b>	<b>32</b>	<b>567</b>		

**Null Hypothesis (H<sub>0</sub>):** The accident severity and months in a year are independent.

**Result:** The above table shows a calculated x<sup>2</sup>-value of 35.76 and a critical x<sup>2</sup>-value of 47.40 at 0.05 alpha Level for 33 Degree of Freedom. Since the calculated x<sup>2</sup>-value is less than critical x<sup>2</sup>. The null hypothesis, “The Accident severity and the months in a year are independent” is accepted. Thus, it indicates there is no relationship between the accident severity and the months in a year.

**ii. Test of independence between the accident severity and season in a year**

TABLE III  
TEST OF INDEPENDENCE BETWEEN THE ACCIDENT SEVERITY AND THE SEASON IN A YEAR

Season	Fatal		Grievous Injury		Minor Injury		Damage to Property		Total	Calculated X <sup>2</sup>	Critical X <sup>2</sup>
	Observed	Expected	Observed	Expected	Observed	Expected	Observed	Expected			
Summer	49	40.8	72	68.86	106	117.74	14	13.6	241	8.56	12.59
Rainy	32	31.32	49	52.86	96	90.38	8	10.44	185		
Winter	15	23.87	41	40.29	75	68.88	10	7.96	141		
<b>Total</b>	<b>96</b>	<b>96</b>	<b>162</b>	<b>162.01</b>	<b>277</b>	<b>277</b>	<b>32</b>	<b>32</b>	<b>567</b>		

**Null hypothesis (H<sub>0</sub>):** The accident severity and the seasons in a year are independent.

**Result:** The above table shows a calculated x<sup>2</sup>-value of 8.56 and a critical x<sup>2</sup>-value of 12.59 at 0.05 alpha level for 6 degree of freedom. Since the calculated x<sup>2</sup>-value is less than critical x<sup>2</sup>. The null hypothesis, “the accident severity and the season in a year are independent” is accepted. It indicates that there is no relationship between accident severity and session in a year.

**iii. Test of independence between accident severity and days in a week**

TABLE IV  
TEST OF INDEPENDENCE BETWEEN THE ACCIDENT SEVERITY AND THE DAYS IN A WEEK

Day	Fatal		grievous Injury		Minor Injury		Damage to Property		Total	Calculated X <sup>2</sup>	Critical X <sup>2</sup>
	Observed	Expected	Observed	Expected	Observed	Expected	Observed	Expected			
Mon	21	15.7	24	25.43	40	43.48	4	5.02	89	17.07	28.87
Tue	15	13.4	21	22	38	37.62	3	4.35	77		
Wed	9	11.17	21	18.86	33	32.24	3	3.72	66		
Thu	18	15.92	29	26.86	45	45.92	2	5.31	94		
Fri	12	12.19	18	20.57	37	35.17	5	4.06	72		



Sat	11	13.54	18	22.86	45	39.08	6	4.51	80
Sun	10	15.07	31	25.43	39	43.48	9	5.02	89
<b>Total</b>	96	96	162	162	277	277	32	32	567

**Null hypothesis (H<sub>0</sub>):** The accident severity and the days in a week are independent.

**Result:** The above table shows a calculated  $\chi^2$ -value of 17.07 and critical  $\chi^2$ -value of 28.87 at 0.05 alpha level for 18 degree of freedom. Since the calculated  $\chi^2$ -value is less than critical  $\chi^2$ . The null hypothesis, “The accident severity and the days in a week are independent” is accepted. It shows that there is no relationship between the accident severity and the days in a week.

iv. Test of independence between accident severity and hours in a day

TABLE V  
TEST OF INDEPENDENCE BETWEEN THE ACCIDENT SEVERITY AND THE HOURS IN A DAY

Hour	Fatal		grievous Injury		Minor Injury		Damage to Property		Total	Calculated X <sup>2</sup>	Critical X <sup>2</sup>
	Observed	Expected	Observed	Expected	Observed	Expected	Observed	Expected			
12-01 Am	1	1.69	2	2.86	7	4.89	0	0.56	10	63.95	89.39
01-02 Am	0	1.35	5	2.29	1	3.91	2	0.45	8		
02-03 Am	0	0.34	1	0.57	1	0.98	0	0.11	2		
03-04 Am	1	0.68	1	1.14	2	1.95	0	0.23	4		
04-05 Am	1	1.19	2	2	3	3.42	1	0.4	7		
05-06 Am	2	1.02	2	1.71	1	2.93	1	0.34	6		
06-07 Am	2	2.03	4	3.43	6	5.86	0	0.68	12		
07-08 Am	4	4.06	8	6.86	11	11.72	1	1.35	24		
08-09 Am	1	4.74	10	8	14	13.68	3	1.58	28		
09-10 Am	5	3.72	10	6.29	7	10.75	0	1.24	22		
10-11 Am	5	3.72	5	6.29	10	10.75	2	1.24	22		
11-12 Am	4	4.4	8	7.43	13	12.7	1	1.47	26		
12-01 Pm	2	3.05	5	5.14	10	8.79	1	1.02	18		
01-02 Pm	5	4.23	5	7.14	14	12.21	1	1.41	25		
02-03 Pm	3	3.56	6	6	11	10.26	1	1.19	21		
03-04 Pm	7	4.74	6	8	14	13.68	1	1.58	28		
04-05 Pm	6	7.28	9	1.29	26	21.01	2	2.43	43		
05-06 Pm	5	5.76	6	9.71	19	16.61	4	1.92	34		
06-07 Pm	1	6.1	13	10.29	19	17.59	3	2.03	36		
07-08 Pm	11	10.33	19	17.43	30	29.8	1	3.44	61		

08-09 Pm	14	11.01	17	18.57	31	31.75	3	3.67	65
09-10 Pm	2	3.01	8	6	8	10.26	3	1.19	21
10-11 Pm	7	4.06	6	6.86	11	11.72	0	1.35	24
11-12 Pm	7	3.39	4	5.71	8	9.77	1	1.13	20
<b>Total</b>	96	96	162	162	277	277	32	32	567

**Null hypothesis (H<sub>0</sub>):** The accident severity and the hour in a day are independent

**Result:** The above table shows a calculated  $\chi^2$ -value of 63.950 And a critical  $\chi^2$ -value of 89.391 at 0.05 alpha level for 69 degree of freedom. Since the calculated  $\chi^2$ -value is less than critical  $\chi^2$ . The null hypothesis, “The accident severity and the hour in a day are independent” is accepted. It shows that there is no relationship between the accident severity and the hours in a day.

v. Test of independence between accident severity and age group of drivers

TABLE VI  
TEST OF INDEPENDENCE BETWEEN THE ACCIDENT SEVERITY AND AGE GROUP OF DRIVERS

Age group		Fatal		Grievous injury		Minor Injury		Damage to Property		Total	Calculated X <sup>2</sup>	Critical X <sup>2</sup>
From	To	Observed	Expected	Observed	Expected	Observed	Expected	Observed	Expected			
10	14	0	0.17	0	0.29	1	0.49	0	0.06	60	42.2	50.99
15	19	0	1.69	5	2.86	5	4.89	0	0.56	60		
20	24	9	9.31	15	15.71	26	26.87	5	3.1	66		
25	29	20	19.64	37	33.14	53	56.67	6	6.55	55		
30	34	20	19.81	26	33.43	64	57.16	7	6.6	42		
35	39	24	18.62	27	31.43	54	53.74	5	6.21	51		
40	44	11	10.33	16	17.43	30	29.8	4	3.44	50		
45	49	6	8.63	16	14.57	27	24.92	2	2.88	42		
50	54	3	3.05	8	5.14	6	8.79	1	1.02	32		
55	59	2	2.2	10	3.71	1	6.35	0	0.73	35		
60	64	1	1.35	0	2.29	6	3.91	1	0.45	34		
65	69	0	0.68	1	1.14	3	1.95	0	0.23	40		
70	74	0	0.51	1	0.86	1	1.47	1	0.17	41		
<b>TOTAL</b>		96	96	162	162	277	277	32	32	567		

**Null hypothesis (H<sub>0</sub>):** The accident severity and the age group of drivers are independent.

**Result:** The above table shows a calculated  $\chi^2$ -value of 42.20 and a critical  $\chi^2$ -value of 50.99 at 0.05 alpha Level for 39 Degree of Freedom. Since the calculated  $\chi^2$ -value is less than critical  $\chi^2$ . The null hypothesis, “The Accident severity and the age group of drivers are independent” is accepted. It shows that there is no relationship between the accident severity and the age group of drivers.

vi. Test of independence between accident severity and types of vehicles

TABLE VI  
TEST OF INDEPENDENCE BETWEEN THE ACCIDENT SEVERITY AND TYPE OF VEHICLES

Type of Vehicle	Fatal		Grievous Injury		Minor Injury		Damage to Property		Total	Calculated X <sup>2</sup>	Critical X <sup>2</sup>
	Observed	Expected	Observed	Expected	Observed	Expected	Observed	Expected			
Motorised Two-Wheeler	34	23.87	44	40.29	60	68.88	3	7.96	60	79.07	36.41
Auto Rikshaw	22	32.85	60	55.43	109	94.78	3	10.95	60		
Car/Jeep/	9	14.39	24	24.29	45	41.53	7	4.8	66		

Van/Taxi									
Bus	4	3.89	3	6.57	10	11.24	6	1.3	55
Light Truck	7	7.62	16	12.86	12	21.98	10	2.54	42
Heavy Articulated Truck	10	6.26	6	10.57	20	18.08	1	2.09	51
Tempo/Tractor	9	6.43	8	10.86	19	18.56	2	2.14	50
Bicycle	1	0.51	1	0.86	1	1.47	0	0.17	42
Cycle Rikshaw	0	0.17	0	0.29	1	0.49	0	0.06	32
<b>Total</b>	<b>96</b>	<b>96</b>	<b>162</b>	<b>162</b>	<b>277</b>	<b>277</b>	<b>32</b>	<b>32</b>	<b>567</b>

**Null hypothesis (H<sub>0</sub>):** The accident severity and type of vehicles are dependent.

**Result:** The above tables shows a calculated  $\chi^2$ -value of 79.078 and a critical  $\chi^2$ -value of 36.415 at 0.05 alpha Level for freedom. Since the calculated  $\chi^2$ -value is more than critical  $\chi^2$ . The null hypothesis, “The accident severity and the type of vehicles are dependent” is rejected. It shows that there is some relationship between the accident severity and the type of vehicles.

**B. Chi-square test for goodness of fit: Chandrapur city**

- i. Chi-square test for goodness of fit: monthly variation

TABLE VII  
CHI-SQUARE TEST FOR GOODNESS OF FIT: MONTHLY VARIATION

Month	Observed	Expected	DOF	Calculated X <sup>2</sup>	Critical X <sup>2</sup>
Jan	60	47.25	11	3.44	19.68
Feb	60	47.25		3.44	
Mar	66	47.25		7.44	
April	55	47.25		1.271	
May	42	47.25		0.583	
Jun	51	47.25		0.298	
July	50	47.25		0.16	
Aug	42	47.25		0.583	
Sep	32	47.25		4.922	
Oct	35	47.25		3.176	
Nov	34	47.25		3.716	
Dec	40	47.25		1.112	
<b>Total</b>	<b>567</b>	<b>567</b>		<b>30.141</b>	<b>Ho Rejected</b>

**Null hypothesis (H<sub>0</sub>):** “Occurrence of accident is uniform throughout the year”

**Result:** The above table shows a calculated  $\chi^2$ -value of 30.143 and a critical  $\chi^2$ -value of 19.680 at 0.05 alpha level for 11 degree of freedom. Since the calculated  $\chi^2$ -value is greater than critical  $\chi^2$ . The null hypothesis, “occurrence of Accidents is uniform throughout the year” is rejected. Thus, it indicates that the accidents are not uniformly distributed throughout the year. Moreover, there is a lack of enough evidence to indicate such a monthly pattern.

- ii. Chi-square test for goodness of fit: seasonal variation

TABLE VIII  
CHI-SQUARE TEST FOR GOODNESS OF FIT: SEASONAL VARIATION

Season	Observed	Expected	DOF	Calculation X <sup>2</sup>	Critical X <sup>2</sup>
Summer	241	189	2	14.307	5.99
Rainy	185	189		0.085	
Winter	141	189		12.19	
<b>Total</b>	<b>567</b>	<b>567</b>		<b>26.582</b>	<b>Ho rejected</b>

**Null hypothesis (H<sub>0</sub>):** “Occurrences of accidents is uniform throughout the seasons”

**Result:** The above table shows a calculated  $\chi^2$ -value of 26.582 and a critical  $\chi^2$ -value of 5.99 at 0.05 alpha level for 2 degree of freedom. Since the calculated  $\chi^2$ -value is greater than critical  $\chi^2$ . The null hypothesis, “occurrence of Accident is uniform throughout the season” is rejected. Thus, it indicates that the accidents are not uniformly distributed throughout the season. Moreover, there is a lack of enough evidence to indicate such a seasonal pattern.

iii. Chi-square test for goodness of fit: daily variation

TABLE IX  
CHI-SQUARE TEST FOR GOODNESS OF FIT: DAILY VARIATION

Day	Observed	Expected	DOF	Calculated $\chi^2$	Critical $\chi^2$
Mon	89	81	6	0.79	12.59
Tue	77	81		0.198	
Wed	66	81		2.778	
Thu	94	81		2.086	
Fri	72	81		1	
Sat	80	81		0.012	
Sun	89	81		0.79	
<b>Total</b>	567	567		7.654	<b>Ho accepted</b>

**Null hypothesis (Ho):** “Occurrence of accidents is uniform throughout the week”

**Result:** The above table shows a calculated  $\chi^2$ -value of 7.654 and a critical  $\chi^2$ -value of 12.590 at 0.05 alpha level for 6 degree of freedom. Since the calculated  $\chi^2$ -value is less than critical  $\chi^2$ . The null hypothesis, “Occurrence of accident is uniform throughout the week” is accepted. Thus, it indicates that the accident is uniformly distributed throughout the week.

iv. Chi-square test for goodness of fit: hourly variation

TABLE X  
CHI-SQUARE TEST FOR GOODNESS OF FIT: HOURLY VARIATION

Time Duration	Observed	Expected	DOF	Calculated $\chi^2$	Critical $\chi^2$
12.00 am to 06.00 am	37	141.75	3	77.408	7.81
06.00 am to 12.00 pm	134	141.75		0.424	
12.00 pm to 06.00 pm	169	141.75		5.239	
06.00 pm to 12.00 am	227	141.75		51.27	
<b>Total</b>	567	567		134.34	<b>Ho rejected</b>

**Null hypothesis (Ho):** “Occurrence of accident is uniform throughout the day”

**Result:** The above table shows a calculated  $\chi^2$ -value of 134.430 and a critical  $\chi^2$ -value of 7.810 at 0.05 Alpha level for 3 degree of freedom. Since the calculated  $\chi^2$ -value is greater than critical  $\chi^2$ . The null hypothesis, “Occurrence of accidents is uniform throughout the day” is rejected. Thus, it indicates that the accidents are not uniformly distributed throughout the time.

C. Identification of accident black spot

- i. Method uses for identification of accident black spot: Accident severity index, Accident density method and Weighted severity index (WSI)
- ii. Weighted severity index (WSI): WSI follows a system of assigning scores based on the number and severity of accidents at that particular location. Severity of an accident is classified as Fatal (K), Grievous Injuries (GI) and Minor Injuries (MI).

WSI is calculated by formula,

$$WSI = (41 \times K) + (4 \times GI) + (1 \times MI)$$

Where K = Number of persons killed

GI = Number of grievous injuries

MI = Number of minor injuries.

In the WSI formula a fatal accident has been given 10.02 times more weighted than grievous accident ( $4 \ll 41$ ). Also, minor accidents have been given a unit coefficient ( $1 \ll 41$ ). For Grievous and Minor accidents to be comparable with fatal accidents.

TABLE XI  
IDENTIFICATION, CAUSES AND PREVENTION OF BLACKSPOT

Sr	Name of intersection	Fatal	Grievous Injuries	Minor Injuries	WSI	Causes of accidents and damages		Improvements		Remark
1	Junona Square	7	3	5	304	1	Over speeding	1	Provide Rumble strip	Blackspot
						2	Pedestrian damages	2	Provide zebra crossing	
						3	Drunk and drive	3	Checking of Alcohol consumption level	
2	Bangali Camp	6	8	16	294	1	Uncontrol of vehicle	1	Marking should be provide for parking area	Blackspot
						2	Crashes of vehicles	2	Remove the illegal construction at turning of road	
						3	Rush of pedestrians	3	Taking necessary enforcement action	
						4	Presence of potholes			
3	Bagla Chowk	3	4	6	145	1	Unsignalized area	1	Provide signals	Blackspot
						2	Presence of pot holes	2	Remove pot holes	
						3	No road markings	3	Provide road marking	
4	G.E.C. Square	2	3	7	101	1	Absence of signal	1	Provide signal	Blackspot
						2	Improper distribution of traffic	2	Some sign boards are hidden due to trees, make it visible.	
						3	Due to hidden sign board			
5	Priyadarshani Square	1	6	3	68	1	Due to pot holes	1	Remove pot holes	Blackspot
						2	Improper divider system	2	Provide proper dividing system	
						3	Due to crossing of animals	3	Provide restriction to unwanted animals on road	
6	Bus Stop Square	1	4	7	64	1	Absence of road marking	1	Provide proper road marking	Blackspot
						2	No speed breakers	2	Proper checking of signal should be there	
						3	Signal are situated but it is off condition	3	Provide rumble strip	
						4	Road side traffic due to auto	4	Clearance of road traffic should provide.	
7	Anchaleshwar Gate	1	3	2	55	1	Presence of pot holes	1	Provide rumble strip	Blackspot
						2	Fast movement of traffic	2	Remove pot holes	
8	Chota Bazar Square	1	3	2	55	1	Opposite moving of vehicle	1	Provide road marking	Blackspot
						2	Obstruction due to auto stand	2	Provide proper parking area for auto stand	

Sr	Name of intersection	Fatal	Grievous Injuries	Minor Injuries	WSI	Causes of accidents and damages		Improvements		Remark
9	Traffic Office Square	1	2	3	52	1	Presence of pot holes	1	Median should be provided for safe turning of vehicles	Blackspot
						2	Median is not there	2	Remove pot holes	
						3	No traffic signals	3	Proper signal should be provided	
10	Jayant	1	0	2	43	1	No proper road	1	Proper road marking should	Blackspot

	talkies Square					marking		be provided	
						2	Signals are in off condition	2	Rumble strip to be provided to control the speed of vehicles
						3	Rumble strip are not provided	3	Maintenance of traffic signal should be there
						4	Number of pot holes	4	Remove pot holes
11	Ram Nager police station Square	0	2	7	15				
12	Jatpura gate	0	1	8	12				
13	Girnar Square	0	1	1	5				
14	Gandhi Square	0	0	3	3				

*iii. Causes of accidents and damages:*

1. Absence of road marking like center line, pavement edge lines.
2. Absence of traffic sign like, "major road ahead" in the minor road.
3. Condition of the pavement is not good.
4. Improper location of bus stops and auto stands.
5. Roadside parking of Lorries.
6. Violation of the traffic rules.

*iv. Recommendation and preventive measures:*

1. Need to provide road marking like center line, pavement edge lines.
2. Installation of "major road ahead" in the minor road.
3. Need of resurfacing of the pavement.
4. Re-location of bus stop and auto stands.
5. Prohibiting the roadside parking of Lorries.
6. Forcing the road users to follow the traffic rules.

#### IV. RESULT

WSI value are determined for the all 14 intersections. The locations with WSI value more than 40 are treated as accident black spots. 10 such locations are identified as a blackspot of Chandrapur city out of 14 intersections. After field observations and interaction with the public, some remedial measures are suggested for improvement of accident blackspots. There is no relationship between the severity of accidents and the other attributes like month, season, day, hours in day and the age group except type of vehicle. Road accidents are distributed throughout the year, month and season. Road accidents are not distributed throughout the day.

#### V. CONCLUSION

The study and analysis of accident at different intersection help in identifying the stretches where the accident are more and this spot reduce the road safety. The Weighted Severity Index (WSI) Method was used to rank the accident location. The black spot where selected as per the WSI having value more than 40 from the collected data and we had suggested suitable alternatives measures to reduce accident at such black spot. The overall methodology was found to be effective for identification, evaluation and treatment of accident black spot if sufficient data is available. Also found other factors such as non-availability of parking lane, lack of zebra crossing, lack of guard rails

and also improper signal etc. It is also observed that most of the two wheelers users are not using the helmets and also over speeding their vehicles.

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## Surrogate Safety Measures : A Review on Time Proximity and Evasive Action Based Indicators

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### ABSTRACT

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Surrogate safety measures are gaining more interest in the field of traffic safety analysis due to the limitations of traditional methods. Traffic conflict techniques (TCTs) is one of the surrogate safety measure. The most appealing aspect of conflict indicators is their ability to capture severity of collision data objectively within shorter period of time. This paper comparatively reviews the methodology and application of proximal surrogate safety indicators. In this paper, the surrogate safety measures are grouped in two categories namely time proximity indicators and evasive action based indicators. For each of indicators, the paper provides the guidelines as well as prominent features, including critical and threshold values. The paper also discusses the advantages and disadvantages of the reviewed indicators.

**Keywords** : Surrogate safety measures, Traffic conflict techniques, Time proximity indicators, Evasive action based indicators

### I. INTRODUCTION

Surrogate safety measures such as traffic conflict techniques (TCTs) are gaining more interest to study the traffic safety from a broader perspective than relying only on collision data. The application of traffic conflict techniques (TCTs) for analysis of traffic safety problems has seen considerable research interest, having acquired acceptance as a proactive

surrogate approach [30]. Research on TCT basically started in the late 1960s. The approach is previously used to identify the safety problems related to vehicle construction [31]. Traffic conflict techniques can improve our understanding into the failure mechanism and chain of events which leads to road traffic collision and resulting consequences [48]. A widely accepted definition of traffic conflict is 'an observable situation in which two or more road- users

approach each other in space and time to such an extent that there is risk of collision if their movements' remains unchanged' [7]. The traffic conflict can occur more frequently and in similar manner as that of collision. Several research have concluded that the failure mechanism of collision and traffic conflict is similar. Hence, the reducing traffic conflicts can lead to reduce the road collisions [37]-[39], [42]. The most appealing aspect of conflict indicator is their ability to capture the severity of collision data objectively within a shorter time period to the use of accident data; and have much less if any, societal cost compared with collision. More ever, the ethical problems associated with the need for the collision of long accident history data will also be avoided.

The traffic characteristics plays an important role in the risk behavior road users [33]. In developing countries like India or China, variety of vehicles, conventional as well as unconventional traffic models such as mopeds and tricycles share the same space with each other following less traffic rules and regulations as compared to North American or European cities. Such traffic behavior leads to more occurrence of traffic conflicts. Traditionally, time proximity measures have been largely validated as a measure of traffic conflict in organized traffic environments such as a Sweden [29], Canada [23], [39], Japan [5] and in United States [42]; but in less organized traffic environments like India or China, it was observed that the road user tends to keep greater proximity to one another and have more frequent interactions that affect the conflict occurrence [4], [12]. The study conducted in Delhi India, validating traffic conflict technique (TCT) using time proximity conflict indicators showed a little correlation between conflicts and collision collected from different intersections throughout the city [45]. The result showed that the traffic behavior differences from other countries. In such traffic environments, the driver adjusts his or her own speed to be in greater proximity to other road user and dynamically decides

as whether a more pronounced evasive action is needed.

The traffic conflict is a chain of events in which road user may take evasive action to avoid the collision with each other [34]. The involved user eventually collide if strength of evasive action is not sufficient to avoid the physical contact. The evident has increasing the time proximity conflict indicators lack several aspects to the basic definition of an evasive action [8]. It is observed that the tie proximity conflict indicators may not be valid in less organized traffic conditions like in developing countries like India where the road user tend to keep greater proximity to one another and have more interactions with each other . The literature showed that the time proximity indicators have some limitations. It may not capture the accurate data in less organized traffic condition [27], [39]. The evasive action based indicator may cover the missing aspects of the other indicators.

The objective of this paper is to review the various traffic conflict indicators. These are divided into two major groups, namely time- proximity conflict indicators and evasive action based indicators. For each of indicators, the paper provides the identifying methodology, prominent features, including critical and threshold values.

## II. BACKGROUND

In developing economies like India or China, the rapid development of cities has generated corresponding rapid growth in travel demand. The expansion of cities into suburbs and non- availability of adequate, efficient and economical public transportation services have made people to use their own vehicles for transportation. At the same time, increased earnings of people have made them vehicle ownership more affordable. Due to this, rapid growth of traffic has observed on roads of developing countries in past few years. The traffic risk has also increased as the adequate infrastructure is not present to cope up with increased traffic demands. Therefore,

the traffic safety and management is important concern in developing world because it affects the economy and peoples welfare of the country. The safety evaluation is difficult task in such a countries due to highly heterogeneous traffic mix, traffic indiscipline, as well as the absence of standard guidelines for assessing the safety of traffic facilities.

In order to reduce crashes, safety evaluation has traditionally done based on the police reported crash data. But the method is obsolete to various shortcomings and limitations like long observational period, reactive nature, unavailability of crash data and improper information related to crash pattern as well as locations are quite common. In direction to improve the traffic safety evaluation, it is necessary to use 'predictive' methods, where the impact of various safety measures on the traffic system can be estimated. Several research has been carried out to use the indirect, short term traffic safety measure which are 'proactive' in nature and being used as an alternative to crash data. The traffic conflict techniques (TCTs) are gaining more popularity among various such a surrogate road safety measure as those events as characteristically similar but more frequent than crashes. The traffic conflict is 'an observable situation in which two or more road- users approach each other in space and time to such an extent that there is risk of collision if their movements' remains unchanged.' The research on TCT has started in late 1960s. Over the period of time several time proximity conflict indicators are identifies. Time to collision (TTC) and post encroachment time (PET) are popular time proximity indicators. These indicators are based on space and time. The time proximity indicators could not predict the severity of the conflict. Also, the approach is difficult to apply in mixed traffic scenario. Therefore, the researcher have come up with evasive action based indicators such as yaw rate, jerk, etc. The evasive action based indicators can predict the accurate data as compared to various time proximity indicators. The approach is gaining more interest in research field.

### III. TIME PROXIMITY CONFLICT INDICATORS

The time proximity conflict indicators are defined as a measure of crash proximity, based on temporal and spatial measures that reflects the closeness of road users, in relation to projected point of collision [44]. These indicators are developed under the assumption that the closer the vehicles to each other, the nearer they are to collision [41]. The quantitative measure is more objective and provides results in terms of closeness to collision. On the basis of temporal and spatial measures, these indicators represent the nearness of the road users (or their vehicles) in relation to projected point of collision. Also, the time and space proximity definition is easily understood and it is widely acceptable by both conflicting driver and observer. The time- proximity conflict measures are widely accepted due to its high percentage of correlation with accident data.

In order to apply the concept in actual practice, many proximal indicators are developed and studied. The traffic conflict is recorded when the traffic movement parameters in specified equation is less than a predetermined threshold [11], [19], [46]. Time- to- collision (TTC) and post encroachment time (PET) are most widely used time- proximity indicators. A brief description about methodology, prominent features, including critical and threshold values for each indicator are discussed in below sub- headings. The paper also discusses the advantages and disadvantages of the reviewed indicators.

#### A. *Time to Collision (TTC)*

Time- to- collision (TTC) is most frequently used conflict indicator. The TTC is defined as the time that remains until a collision between two vehicles would have occurred if the collision course and speed difference were maintained [21]. The expected path of road user's trajectory is used to determine the TTC. Reference [4], assumes that the road user will maintain the same speed with the linear extrapolation of their position at every frame. The calculation of

TTC is done by testing whether any pair of these expected position will be on a collision curve under the hypothesis [4]. Therefore, the TTC is calculated according to the two road users to reach their collision point. The TTC is the continuous time between the conflicting road users, and thus a set of value is returned for each interaction [4]. The maximum severity of each interaction is the minimum TTC value extracted [39]. Typically, the most sever value is used to represent the overall severity of traffic event [4]. Fig. 1 shows the example of TTC profile of the pedestrian [2].

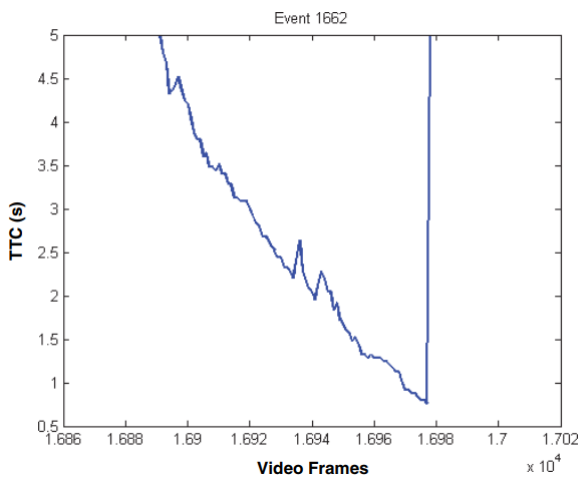


Fig.1. Pedestrian- vehicle conflict TTC profile

The TTC on the onset of braking ( $TTC_{br}$ ), represents the available manoeuvring space at the moment of evasive action starts [41]. The severity of an encounter is calculated by the minimum TTC has reached during the approach of two vehicles on a collision course. In principle, the lower the  $TTC_{min}$  is, the higher the level of a collision will be [13]. Table I shows some desirable TTC threshold values.

TABLE I  
TTC THRESHOLD VALUES

Sr.	Reference	TTC Threshold (s)	Condition
1	Van der Horst [13]	1.5	Approaches at intersections

2	Sayed et al. [47]	2.0	Low level conflict
		0.9	High level conflict
3	Hogema and Janssen [26]	3.5	Non- supported drivers
		2.6	Supported drivers
4	Vogel [28]	2	Approaches at intersections
5	Meng and Qu [36]	4	Urban road tunnel
6	Huang et al. [19]	1.6	Signalized intersection
7	Sayed et al. [46]	3	Signalized intersections
8	AASHTO [1]; Farah et al. [22] & Hegeman [20]	3	For 2-lane rural roads

There are two widely used approaches have been found in earlier studies to determine TTC. The first is calculated by the vehicle passing a cross section of a roadway. The method is commonly used in the traffic flow studies. The second approach deals with the drivers driving either during a certain time period or over a specific route in real- life traffic conditions; or on a driving simulator in a controlled environment. Recently, microscopic traffic simulation modelling approach has gain interest in safety evaluation. In this approach, TTC is calculated by determining the trajectories of vehicles [18], [25], [32].

The TTC has limitation like the approach ignore many potential conflicts due to acceleration or deceleration discrepancies. The TTC approach can provide the magnitude of crash but not their severity. The collision course must exist for calculating TTC; the TTC index cannot be estimated in a finite number where leading vehicle is faster than following

The TTC is easy approach and more informative than PET. The approach is more effective for rear end, turning/ weaving, hit objects/ parked vehicles, crossing and hit pedestrian, etc.

#### **B. Post Encroachment Time (PET)**

The post encroachment time (PET) as first introduced by Allen et al [17]. It was defined as 'the time difference between the moment of 'offending' vehicle passes out of the area of potential collision and the moment of arrival at the potential collision point by the 'conflicted' vehicle possessing the right-of-way. [35] PET only considers the time difference between two cross traffic in the area of conflict [9].

The encroachment time is a derivative of PET, has also used by some researchers which considers the time interval during which the offending road vehicle occupy the conflict area and it is applicable when oncoming major road vehicle travel at constant speed [31].

The PET is most suitable proximal safety indicator for determining crossing conflicts [44]. The conflicts with low PET value are more prone to accidents as their might not be enough time available to the driver of conflicting vehicle to respond and take evasive action such as breaking or changing lanes to avoid the collision with offending vehicle. The critical conflicts are defined on the basis of certain minimum value known as threshold value. However, it is difficult to define threshold value due to certain factors such as varying driver's behaviour, reaction time, driving environment, traffic condition, etc.

The research has been done to define the threshold PET value. PET threshold value used by researcher as 1s [10] and 5s [18]. Reference [31] shows, the highest correlation between crossing conflicts and related crash data was observed for PET threshold at or below 1s. For two- wheeler, the threshold of 1s and for LMV & HV, the threshold of 1.5s was calculated [31].

The advantages of this approach is PET can be easily extracted, it can be easily estimated using photometric

analysis in video or simulated environment. PET represents driver's behaviour.

The PET is only useful in case of transversal crossing trajectories (right angle collision); it cannot reflect the changes with the dynamics of safety- critical events over a larger area. The levels of severity as well as impact of a conflict are not taken into account.

#### **IV. EVASIVE ACTION BASED CONFLICT INDICATORS**

There is increasing evident that the time proximity conflicts indicators have several limitations related to basic definition of evasive action [6]. They might not be suitable for mixed traffic conditions and less-organized traffic situations where evasive actions are common collision avoidance mechanism. Also, it is found that the time proximity- based conflict indicators does not capture the severity of conflicts [8]. Therefore, evasive action based indicators are introduced by the researchers as a useful approach to assess the missing cues in time proximity measures.

A traffic conflict consists of chain of events in which a conflicting driver may take some evasive action to avoid the collision. An evasive action generally involves powerful breaking or speeding or sudden swerving. A travel path (spatial) alteration through steering action, or a headway change through breaking or speeding (temporal) is defined as evasive action [24]. The analysis of evasive action can provide appropriate information about traffic safety. In simple words, the evasive action is a significant change either in the speed or in the direction of the road user to avoid the collision. The spatial and temporal information of road user can be obtained from the tracking trajectories, is further analysed to extract these driver's dynamic behaviour and thus relate such behaviour to traffic conflict. The literature shows that the usefulness of evasive action based indicators in measuring the severity of traffic conflicts [49]. The authors concluded that the indicators such as yaw rate, jerk and deceleration rate are more suitable for

measuring the severity of motorcycle conflicts in highly- mix and less organized traffic condition. The literature also shows that the analysis of motorcycle swerving [50] and driver’s jerk [16], [51] are useful in measuring the severity of the evasive action taken by driver during conflict.

The evasive action indicators are also used for measuring the severity of pedestrian- involved traffic conflicts. Tegeldin and Sayed (2016) [2] have studied the pedestrian evasive action parameters such as step length, step frequency and walk ratio to detect pedestrian conflicts by using an automated technique. It was concluded the pedestrian evasive actions are more useful to determine the severity of conflict than time- proximity indicators.

The indicators such as yaw rate, jerk profile and deceleration rate are the evasive action indicators which are discussed in subsequent paragraphs. A brief description about methodology, prominent features are discussed in below sub- headings. The paper also discusses the advantages and disadvantages of the reviewed indicators.

**A. Yaw Rate**

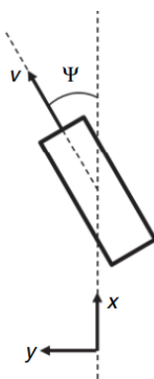


Fig.2. Heading angle illustration for a rigid body

The rate of change of the heading angle, or angular velocity of rotation of the rigid body around its z-axis is called as yaw rate. Yaw rate describes the movement around the yaw axis of the body that changes the direction to its motion. The yaw rate

signal profile can quantifies the swerving behaviour of the road user. The gyroscope fixed in the vehicle is used to measure the yaw rate. Ayres et al [15], suggested the simplified method for calculation of yaw rate. The equation 1 shows the yaw rate calculation as the change of heading angle  $\Psi$  of the rigid body, as shown in Fig. 2. The typical graph of yaw rate of conflicting vehicle shown in Fig. 3.

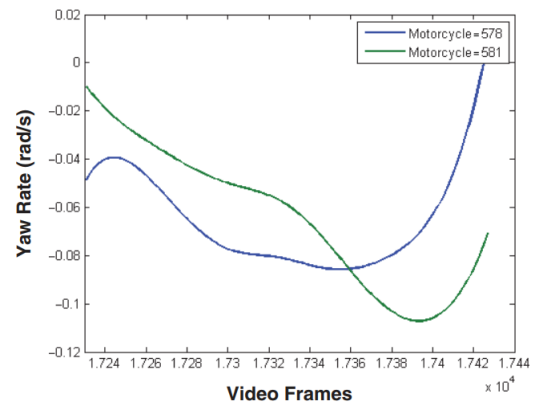


Fig.3. Typical graph of yaw rate

$$r(t) = d\Psi / dt \quad \dots (1)$$

Where t is time.

Yaw rate helps to identify several parameters related to swerving manoeuvre of the motorcycle. Yaw rate ratio, equation 2, is useful to see the high swerving, which shows the peak in yaw rate in a short time.

$$\text{Yaw rate ratio} = [(\max(r(t)) - (\min(r(t))) / [t_{\text{start}} - t_{\text{end}}] \quad \dots (2)$$

The high value of ratio indicates the peak. The most effective measure in identification of conflicting swerving maneuver by motorcycle is showed by the higher ratio of the two conflicting vehicles. Ahmed Tageldin, Tarak Sayad and Xuesong Wang (2015) [4] has done yaw rate calculation by tracking the vehicle trajectories by using automated software technique. Also, Yanyong Guo, Tarak Sayad and Mohamed H. Zaki (2018) [49] compared the TTC with yaw rate and

concluded that the yaw rate ratio was efficient in measuring conflict severity for electric e- scooter, motorcycles and bicycles.

**B. Jerk Profile**

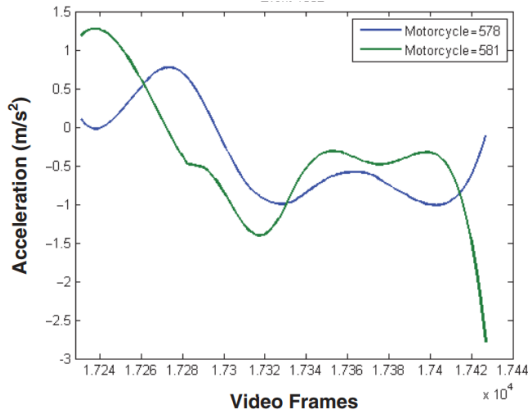


Fig.4. Typical graph of jerk profile

Jerk is the derivative of acceleration. It is used for powered two wheeler (PTW) breaking behaviour that varies as a reaction time to the environment. For example, decelerating to stop behind another vehicle at a signal is different from stopping suddenly due to the crossing pedestrian. The evasive action involving powerful breaking or sudden acceleration by strong negative value can be reflected in the jerk profile. The maximum negative value for the jerk of PTW before conflicting point was used as evasive action indicator. The acceleration is the derivative of speed which is calculated by equation (3). Fig. 3 shows the typical graph for jerk profile. The jerk is calculated by using equation (4), as follows

$$A(t) = \frac{dV}{dt} \dots (3)$$

Where, A (t) is the acceleration at time t.

$$\text{Jerk}(t) = \frac{dA}{dt} \dots (4)$$

Where, jerk (t) is the jerk at time t.

**C. Deceleration Rate**

The magnitude of deceleration action of the road user can be quantified as deceleration rate. Higher the deceleration rate, lesser will the time for deceleration to avoid the collision. The acceleration graph is obtained from road user’s trajectory path by calculating derivative of speed with respect to time. The maximum value of deceleration of road user is considered to define the critical conflict. Fig. 5 shows the typical example of graph obtained for acceleration rate of conflicting vehicle.

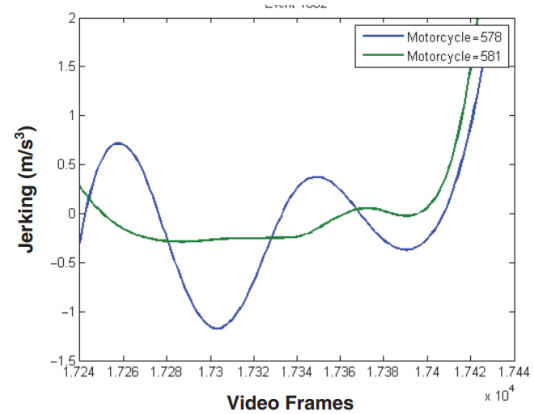


Fig.5. Typical graph of acceleration rate

Ahmed Tageldin, Tarak Sayad and Wuesong Wang (2015) have done research on effectiveness of deceleration rate and concluded that the deceleration behaviour of the conflicting motor cycles showed a higher correlation with severity of conflicts than yaw rate.

**V. DISCUSSION**

Surrogate safety measures address several issues associated with the traditional crash data technique. The traffic conflict indicators can capture the severity of accident data within in a shorter period of time. The data of various traffic parameters can be extracted by using specific equations of the conflict indicators from which the critical conflicts can be recorded. The conflicts having output obtained is less than specified threshold value is indicated as critical conflict. The time proximity indicators are based on space and time of the conflict. They are easy to estimate, hence

popular than other measures. Time-to-collision (TTC) is most frequently used time proximity indicator. TTC is developed using the concept of point conflict. Hence it is more suitable for lane changing conflicts. TTC is more informative than PET. The Post encroachment time is more appropriate for intersecting conflicts. It is suitable indicator used for right- angle or crossing conflicts. PET can be estimated from photometric analysis from videography.

Although, there have been number of time proximity indicators available but none of them could measure the severity of the conflict. Evasive action based indicators uses evasive parameters of the road users. Therefore, the output obtained is more reliable than time- proximity measures. It also predicts the severity of conflict.

Yaw rate is more suitable indicator for swerving action while deceleration rate and jerk rate are used when there is abrupt change in speed over a smaller period of time. The trajectories obtained from videography can be used for photometric analysis of the approach. Also, the approach can give more realistic data in mixed traffic conditions and less organized traffic situations. Mostly, the research in these indicators is done in developed countries like United States or European countries where the traffic is more organized. There is more need of research in developing countries like India or China where traffic is less organized. The threshold values for different traffic conditions need more research. Also, the analysis methodology for the various indicators need to be defined. There is a research gap in conflicts where more than two vehicles are involved.

## VI. CONCLUSION

The traffic conflict measures are used for traffic safety evaluation since long time. Various traffic conflict indicators are suitable for various conditions. Each indicator has its own advantages and disadvantages. The paper presents a broad review on surrogate safety

indicators. In this paper, the surrogate safety measures are grouped in two categories namely time proximity indicators and evasive action based indicators. The guidelines as well as prominent features, including critical and threshold values are discussed. The advantages and disadvantages of the reviewed indicators are also discussed. There are still significant opportunities for research to improve the approaches. There more research required the approach in mixed traffic condition, less organized traffic, threshold values for different traffic conditions, analysis guidelines and principles, etc.

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# A Design on Recognition of Sentiment Analysis of Marathi Tweets using Natural Language Processing

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## ABSTRACT

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Sentiment Analysis of Marathi Tweet using Machine learning Concept is done in this paper. The tweets are classified into Positive, Negative and Neutral by using different concepts. It is difficult to predict Marathi tweet results from tweets in Marathi language. So, we used different tool to get tweets in Marathi tweet. Sentiment Analysis also shows the higher accuracy of Marathi Tweet data. The proposed work explain Sentimental Analysis of Marathi tweets, which have been classified into positive, negative and neutral using machine learning algorithms like NLP. and shows the higher accuracy of text data.

**Keywords** :- Machine Learning Algorithm, Sentiment Analysis, Marathi Tweets.

## I. INTRODUCTION

Sentimental Analysis is the process of decide whether a piece of writing is positive, negative or neutral. Sentimental analysis is the technique to analyzes the text that imperfection polarity within text, whether a entire documents, passage, sentence or clause. Nowadays, due to the huge number of daily posts on social network people opinion is very critical for decision making millions of people gives their opinion in their other tongue through social media like Twitter, Blogs, Facebook, Instagram, etc. Sentimental Analysis plays essential role in the field of business, politics and Public Action. Text limitation of tweet messages with 280 characters per each. So, Sentiment

level analysis is one of the main directions in sentiment analysis.

Maharashtra's mother tongue is Marathi is most commonly used language to express their opinion through twitter. The Sentimental Analysis of Marathi twitter message is unavoidable since there exists on automatic sentiment analysis in this language. Marathi language is very expressive language and the language is write in the form of text. Text contain word as well as hyperlink, special character, punctuation, number, symbols, etc. to removing such type of expression is the major task. The proposed work explain Sentimental Analysis of Marathi tweets, which have been classified into positive, negative and

neutral using machine learning algorithms such as NLP. and shows the higher accuracy of text data.

Bag-of-words (BOW) is the most popular technique to model text in statistical machine learning approaches in sentiment analysis. However, the performance of BOW sometimes stand short due to some fundamental deficit in handling the polarity shift issue. For that we collect the Positive words, Negative words and stopwords in Marathi language. And make a dictionary of that words.

### Objectives

Sentiment Analysis for the Marathi language is the new trending work research field as number of system is available for many other languages but for Marathi language not much research work has been done. Classifying and identifying sentiment in the form of text. Nowadays, social media a huge form of sentiment oriented rich data in the form of blog post, Facebook, twitter, etc. This user generated web oriented data may contain very useful information that helps for finding the sentiments of the crowd data or gating useful information from unstructured data. Sentiment Analysis is to predict the emotion. Emotions are the representation of different facial expression. For analyzing this expression we use different methods and algorithms. For that following are the defined objectives for SA on Marathi data.

1. To classify tweet data by using different methods.
2. To identify tweet data by using different algorithms, whether it is positive negative or neutral.
3. To shows accuracy of tweet data.

## II. BACKGROUND AND RELATED WORK

SA has been studied and employed widely for the last two decades. Most of the works in SA are specific for the English language.

Pang and Lee proposed three different machine learning algorithms such as NB, Maximum Entropy, and SVM with unigram and bigram features for SA of

movie reviews in English. They showed that SVM outperforms other two classifiers [1].

SA has been done in different Indian languages like Bengali, Hindi, Punjabi, Manipuri, Kannada, Tamil and Malayalam. Soumya S., Pramod K.V proposed Sentiment analysis of Malayalam tweets using machine learning techniques classified into positive and negative using different machine learning algorithms such as NB, SVM, RF [2]. Sentiment Analysis of Malayalam Tweets using Machine Learning Technique is done in this paper. By using different machine learning technique tweets are classified into positive and negative. And also shows the higher accuracy. Marathi language is very expressive language and the language is write in the form of text. Text contain word as well as hyperlink, special character, punctuation, number, symbols, etc. to removing such type of expression is the major task. In the Marathi language, there is multiple meaning of the one word when we are talking. In Marathi Language there are multiple pronunciation of one word but its meaning is different. For that word is difficult calculate accuracy of Marathi word. For that we refer Hindi language paer. Charu Nanda, Mohit Dua, Garima Nanda proposed Sentimental Analysis for Movie Reviews in Hindi Language using Machine Learning. In this paper an approach to sentiment Analysis on movie review in hindi language is discussed for social websites like facebook, twitter are widely posting the user review about different thing such as movie, food, fashion etc. Review and opinion play a role in identifying the level of satisfaction of user [3].

Mohammed Arshad Ansari, Sharavari Govilkar, proposed Sentiment Analysis of mixed code. In that they transliterated Hindi and Marathi text The designed system is an effort which classifies Hindi as well as Marathi text transliterated documents automatically using KNN, NB and SVM and ontology based classification; and results are compared to in order to decide which methodology is better

suites in handling of these documents [4]. Mohd Sanad Zaki Rizvi Article on 3 Different NLP Library for Indian Language Analytics Vidya Article. In that they discuss about the different types of NLP library and how it works. This Article for Indian language [5]. Parul Sharma and Teng-Sheng Moh proposed Prediction of Indian Election Using Sentiment Analysis on Hindi Twitter in that they used SVM, NB for prediction [6]. Binita Verma, Ramjeevan Singh Thakur proposed Sentiment Analysis using Lexicon and Machine Learning Based Approach [7]. Sentiment Analysis of Urdu Tweets is done in this paper. By using different Lexicon based and machine learning technique. Tweets are classified into positive and negative [8].

### III. PROPOSED METHODOLOGY

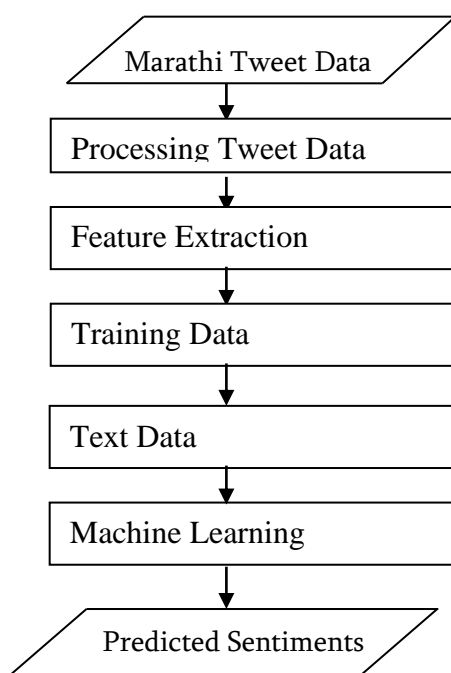


Fig 1. Proposed Architecture for SA

This section explains about the Dataset, Preprocessing Methods, Feature Selection, and Classifiers used in our experimental setup. The architecture of the proposed method is shown in Fig. 1.

#### 3.1. Dataset

Due to the unavailability of the sentiment tagged

dataset in Marathi, we have created the dataset in Marathi Language. Then used that data for identifying it is positive, negative and neutral.

#### 3.2. Preprocessing

The retrieved tweets contain hyperlinks, punctuations, special characters, etc., these have been removed using regular expressions in python language. After that manually verified that data and assigned it is positive, negative or neutral. For that first we input data manually. And then doing tokenization process on the input data and then remove stopwords and special symbols of the input data.

#### 3.3. Feature selection

Feature selection is the procedure of reducing the number of input variables when progressing a predictive model. It is used to calculate accuracy of input data set. BOW, TF-IDF, Unigram with sentiwordnet and Unigram with Sentiwordnet with negation word have been considered for feature vector formation of the input data set.

- BOW: In BOW, the text is transformed into a bag of words where each entry corresponds to the number of occurrences of a particular term in the sentence. The feature matrix is created with  $m * n$  dimension where  $m$  is the number of sentences and  $n$  is the number of unique words in the corpus.

#### 3.4. Machine Learning Approach

Machine learning is an application of artificial intelligence (AI) that gives systems the ability to automatically learn and better from experience cut off being direct programmed. NLP is the one of the part of machine learning language. In that we used NLP library for identify sentiments for Marathi language. The selection of hyper parameter is most challenging for accurate prediction of data.

- NLP

Natural Language Processing (NLP) allows machines to break down and interpret human language. NLP is a field in machine learning with the ability of a computer to understand, analyze, manipulate and potentially generate human language.

The use of algorithms to determine properties of natural, human language so that computers can

understand what humans have written or said. NLP includes teaching computer systems how to extract data from bodies of written text, translate from one language to another, and recognize printed or handwritten words. Notably, NLP is the field that allows for our everyday use of virtual assistants.

The best known library for NLP is,

- iNLTK.

iNLTK stands for Natural Language Toolkit for Indic Language iNLTK, an open-source NLP library consisting of pre-trained language models and out-of-the-box support for Data Augmentation, Textual Similarity, Sentence embeddings, Word embeddings, Tokenization and Text Generation in 13 Indic Languages. This identification is done based on this library. For identification this language they give the various types of code for every language for example Marathi “mr”, hindi “hi”, etc. by using this toolkit we doing process on input data.

### 3.5. Fornulation

After this all process we calculate the polarity of that data it means it is positive, Negative or Neutral. For that we used percentage formula. And then we show it in the form of graph. For calculating polarity we used percentage formula. For that first we calculate total number of word for that used

$$\text{total no. words} = (\text{no. positive words} + \text{no. negative words} + \text{no. neutral words})$$

Then calculate polarity,

$$\text{Percent positive} = \frac{\text{No. positive word}}{\text{Total no. word}} \times 100$$

$$\text{Percent negative} = \frac{\text{No. negative word}}{\text{Total no. word}} \times 100$$

$$\text{Percent neutral} = \frac{\text{No. neutral word}}{\text{Total no. word}} \times 100$$

### IV. RESULT AND DESCUSSION

If we input Marathi data,

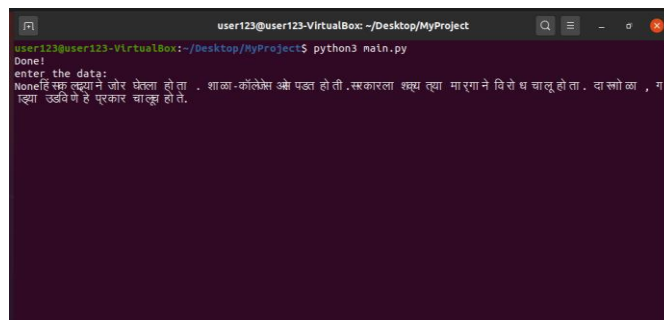


Fig. 2 screenshot of input data

In that we input data in Marathi language. Then we get this type of output,

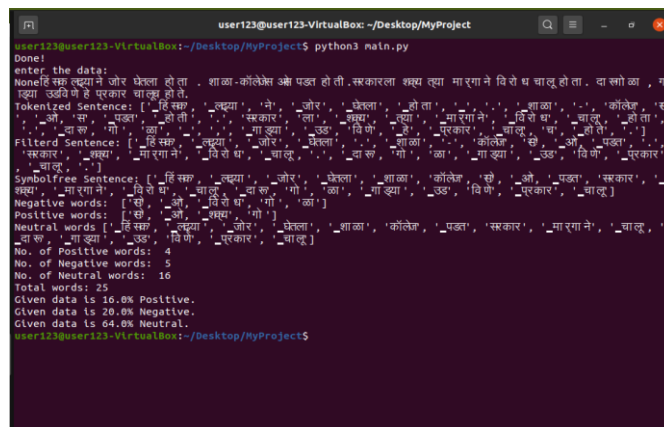


Fig. 3 screenshot of output data

In this screenshot it shows the output of that Marathi input data. It shows the input data is positive, negative or neutral. And also shows the polarity of input data.

### V. CONCLUSION

Sentiment Analysis of Marathi tweets using machine learning algorithm such as NLP are proposed in this work. Different feature selection method are considered for feature vector formation in the input data. And shows the better higher accuracy of Marathi tweet data.

### VI. ACKNOWLEDGEMENT

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# To Design Novel Approach for IoT Based Patient Health Monitoring System Using Wearable Sensors

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## ABSTRACT

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Internet of Things (IoT) and cloud computing yield great benefits by providing remote and efficient services. The aim of the project entitled as “Novel approach for IoT based Patient Health Monitoring System Using Wearable Sensors” is to computerize the management of the former Hospital office to make simple, fast and affordable software. Work of data collection patient access information etc. The main function of the program is to register and maintain patient information and physician information and to obtain such information as required and to use this information by installing patient information, diagnostics information, while the program goes out to receive this information on screen. This system is used to monitor the patient’s condition by a specialist remotely. And this program is used to locate a Covid-19 patient with neurological assistance.

**Keywords** : IoT (Internet of Things), Diagnosis, computer use, enroll, collection, expert, wearable

## I. INTRODUCTION

Today, the use of technology to improve the quality of life has become quite common in today’s society. When the technology is aimed at improving the Quality of Life (QoL), it is directed to the Internet of Things (IoT) [1]. To create a management plan for health facilities, we take care of patient registration, drug details and concerns such as queries and complaints. The project Hospital Management system

includes patient registration, record keeping, and electronic payments at pharmacies, and laboratories. The software has a facility to provide unique id for all patients and automatically stores the details of all patients and staff. The remote specialist can monitor the patient condition anytime and anywhere by using sensors attached to the patient body. And this program helps to find Covid-19 patient.

## II. PROPOSED SYSTEM

The Hospital Management System is designed for any hospital to replace their existing manual paper-based system. The new system is to control the information of patients. Room availability, staff and operating room schedules and patient invoices. These services are to be provided in an efficient, cost effective manner, with the goal of reducing the time and resources currently required for such tasks.

### 2.1 Implementation Plan:

The main plan for the system developed is to mimic the existing system as it is in the proposed system.

### 2.2 Study of the Existing System

The existing system is very complex as every work is done manually. By using the present system, work is done manually. So, each and every work takes much time to complete. Whenever the doctor needs the information it is very difficult for the employee to search for that particular opno details and the drug information to be ordered. Every time we should search the records at the shelves.

### 2.3 The Proposed system

The present system has obvious problems, inhibiting growth and more usage of man power. The present system which has been proposed is very easy to work. The computerization of every department in the health center will reduce the work that is done manually. The man power is reduced to the maximum extent. The patients at the registration office are registered within no time, because every time there is no need search for the particular opno in the shelf's. The drugs information are maintained without any complexity and all the calculations are made automatically by this system there is no need for the calculations.

### Advantages

1. A fast and more efficient service to all patients. As there are thousands of patients records; Searching process is an easy task.
2. Saving in staff time in entering and manipulating data.
3. Easy input, deletion and manipulation of lot, patients' details.
4. Simple correction of input errors and we can assess the calculations accurately.

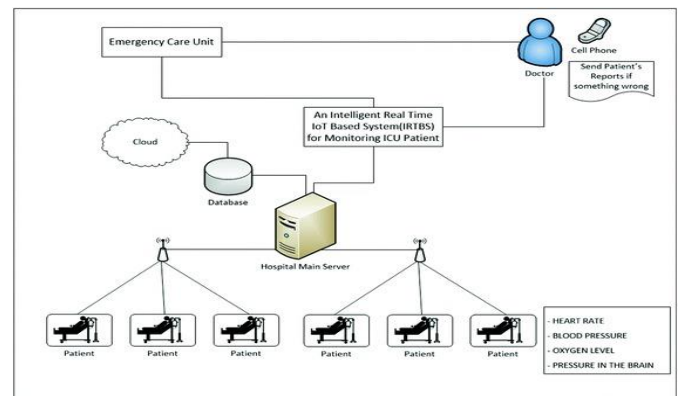


Fig.1 Block Diagram of Project

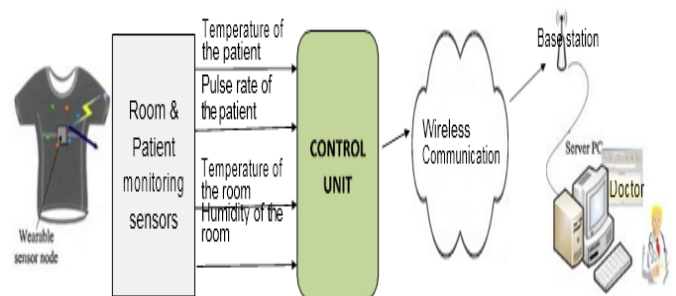


Fig.2 System Block Diagram (Journal of critical reviews 2020)

### 2.4 Objectives

1. To register patient, Nurse, Doctors and medicals in hospital system.
2. To monitor the patient condition Embedded technology will be use, and patients current condition monitor at doctor side.
3. To generate patient prescription and find the medicines for patient in medicals of that hospital premises the system will help for searching the medicine.

4. To detects the Covid-19 patient using temperature sensor and send their details to patient's relatives.

### 2.5 System Requirement:

- Software Requirement:

Framework: Dot Net framework 4.5 Java Script Framework

Technology: Dot Net (Desktop Technology) Android (Mobile Phone)

Language : VB.Net, React Native (Java script)

Database : MySQL 8.0

Server : Apache Xampp Server

IDE : Microsoft Visual Studio 2019

Editor : Microsoft Visual Code

OS : Windows 7, Windows 10

- Hardware Requirement:

HDD : 160

RAM : 2 GB

Processor : Dual Core, Core 2 Due and higher version 2.20 ghz

- External Hardware:

Microcontroller: atmega328, Arduino Uno

Sensors : Pulse Rate Sensor, Temperature Sensor LM35, BP Sensor

Wires : Connectors, serial connector, adapter

### III. FORMULATION

To design this system, I used the following materials:

- IoT (Internet of Things) : The Internet of Things (IoT) defines a network of materials – “ embedded objects”, software, and other technologies for the purpose of connecting and exchanging data with other devices & systems over the internet.

- WSN (Wireless Sensors Network) : Wireless sensors network (WSN) refers to a group of scattered and dedicated sensors for monitoring & recording the natural physical condition & organizing the data collected in a central location.

- Naive Bayes Algorithm: NB classifier are the collection of classification algorithm based on bayes theorem.

$$P(A|B) = P(B|A) P(A) / P(B)$$

- Pseudo Random Number Generator: Uses mathematical formulas to generate sequences of random numbers.

$$X_{n+1} = (aX_n + c) \text{ mod } m$$

### IV. RESULT

In a hospital health care monitoring system, it is necessary to constantly monitor the patient's physiological parameters. The project Hospital Management system includes registration of patients, storing their details into the system, and also computerized billing in the pharmacy, and labs. This system is also used to monitor the Covid-19 patient and inform the condition of Covid-19 patient to their relatives, an also it automatically recommend doctors list in the emergency condition.

#### 4.1 Experimental Result

The following are the screenshots of the project, according to that the project flow:

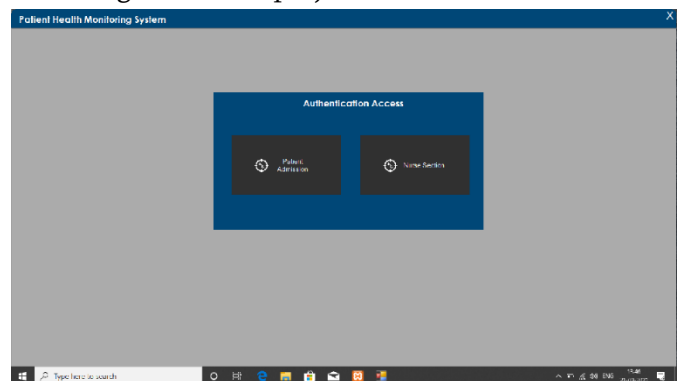


Fig 3. Main Page contain Admin section & Nurse section

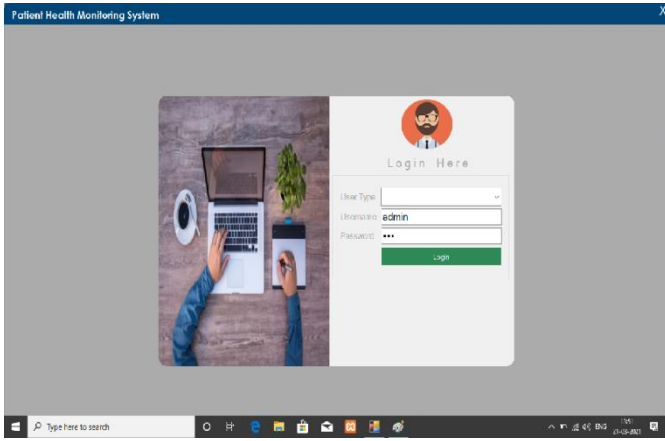


Fig 4. Login Page

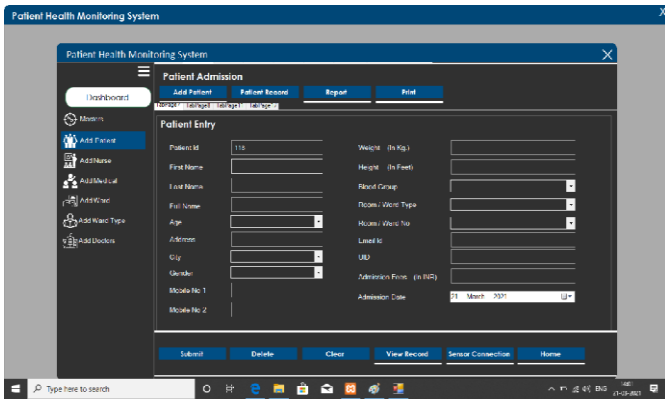


Fig 5. Patient Registration Page

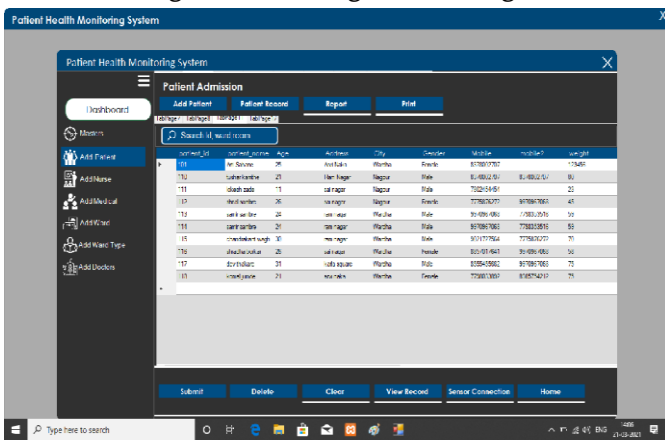


Fig 6. Patient Records

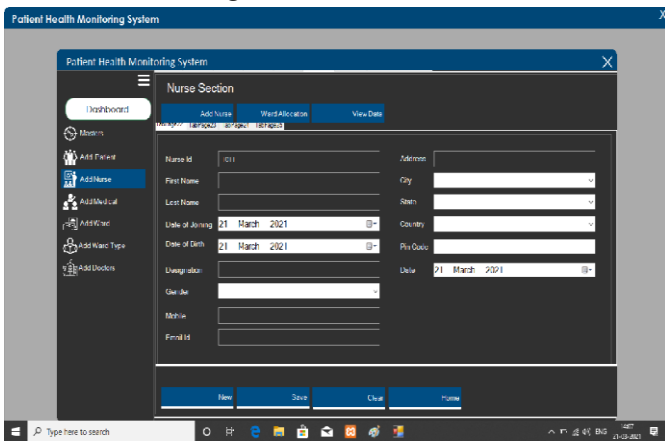


Fig 7. Nurse Registration

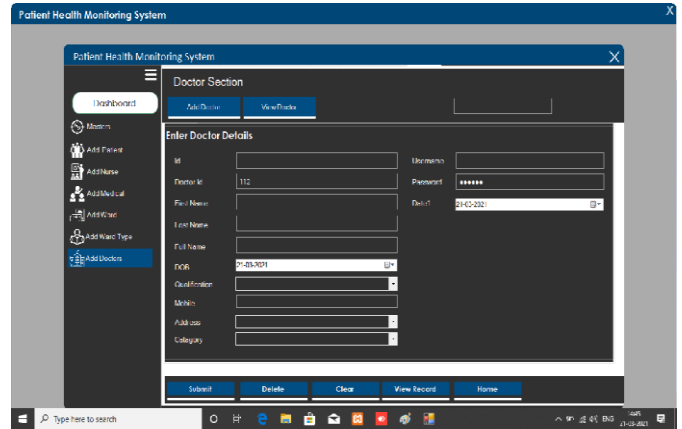


Fig 8. Doctor Registration

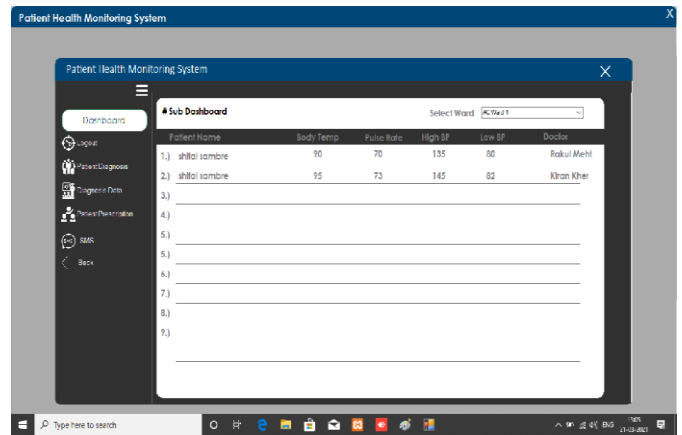


Fig 9. Patient Diagnosis Record

## V. CONCLUSION

Since we are entering details of the patients electronically in the "Hospital Management System", data will be secured. Using this application, we can retrieve patient's history with a single click. Thus, processing information will be faster. It guarantees accurate maintenance of Patient details. It easily reduces the book keeping task and thus reduces the human effort and increases accuracy speed.

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## Diseases Prediction Model using Machine Learning Technique

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### ABSTRACT

Now a day, people face various diseases due to the environmental condition and living habits of them. So prediction of disease at earlier stage becomes important task. But the prediction on the basis of symptoms becomes too difficult for doctor. The correctly prediction of disease is most challenging task. To overcome this problem data mining plays an important and efficient way to predict the disease. Medical science has huge amount of data growth per year. Due to increase amount of data growth in medical and healthcare field the accurate analysis on medical data which has been benefits from early patient care. With the help of disease data, data mining finds hidden pattern information in the large amount of medical data. We have designed the heart disease prediction system. We proposed multiple disease prediction based on symptoms of the patient. For the heart disease prediction, we used knn , naïve bayes machine learning algorithm for accurate prediction of disease. For disease prediction required disease symptoms dataset. Here we focused on heart disease prediction, because the heart disease is one of the leading causes of death among all other diseases. The heart disease prediction contains that whether the patient suffer from heart disease or not by using naïve bayes and KNN algorithm. In this heart disease prediction, the living habits of person and checkup information consider for the accurate prediction. The accuracy of heart disease prediction by using naïve bayes is 94.5% which is more than KNN algorithm. And the time and the memory requirement is also more in KNN than naïve bayes. After heart disease prediction, this system able to gives the risk associated with heart disease which is lower risk of heart disease or higher. For the risk prediction, we are using CNN algorithm.

**Keywords** : Classification algorithm, machine learning, heart diseases prediction, data mining

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## I. INTRODUCTION

Human face lots of problems related to the chronic disease. The main reason behind increase the chronic

disease such as improper living habits, insufficient physical exercise, unhealthy diet, and irregular sleeping. 80% of people in the United States, spent more amount on the diagnosis of chronic disease.

People give more aid for accurate prediction of disease.

Artificial Intelligence made computer more intelligent and can enable the computer to think. AI study consider machine learning as subfield in numerous research work. Different analysts feel that without learning, insight can't be created. There are numerous kinds of Machine Learning Techniques like Unsupervised, Semi Supervised, Supervised, Reinforcement, Evolutionary Learning and Deep Learning. These learnings are used to classify huge data very fastly. So we use K-Nearest Neighbor (KNN), Naïve Bayes and Convolutional neural network (CNN) machine learning algorithm for fast classification of big data and accurate prediction of disease. Because medical data is increasing day by day so usage of that for predicting correct disease is crucial task but processing big data is very crucial in general so data mining plays very important role and classification of large dataset using machine learning becomes so easy.

It is critical to comprehend the accurate diagnosis of patients by clinical examination and evaluation. For compelling determination decision support systems that depend on computer may assume an indispensable job. Health care field creates enormous information about clinical evaluation, report in regards to patient, cure, subsequent meet-ups, medicine and so forth. It is intricate to orchestrate appropriately. Quality of the data association has been influenced due to improper management of the information. Upgrade in the measure of data needs some legitimate way to concentrate and process information viably and efficiently. One of the many machine-learning applications is utilized to construct such classifier that can separate the data based on their characteristics. Data set is partitioned into two or more than two classes. Such classifiers are utilized for medical data investigation and disease prediction.

Today machine learning is present everywhere so that without knowing it, one can possibly use it many times a day. CNN uses both the structured and unstructured data of a hospital to do classification. While other machine learning algorithms only work on structured data and time required for computation is high also they are lazy because they store entire data as a training dataset and uses complex method for calculation.

The section I explains the Introduction of general disease prediction using classification method such as NB, KNN and CNN. Section II presents the literature review of existing systems and Section III present proposed system implementation details Section IV presents experimental analysis, results and discussion of proposed system. Section V concludes our proposed system. While at the end list of references paper are presented.

### Literature Review

M. Chen Proposed [1] a new multimodal disorder risk prediction algorithm based on Convolutional Neural Network (CNN) by using organized and unorganized data of hospital. M. Chen, Y. Hao, K. Hwang, L. Wang, and L. Wang Discovered disease prediction system for various regions. They performed disease prediction on three different diseases such as diabetics, cerebral infraction and heart disease. The disease prediction is performed on organized data. Prediction of heart disease, diabetes and intellectual infraction is performed by using various machine learning algorithm like naïve bayes, Decision tree and KNN algorithm. The outcome of Decision tree algorithm performs better than KNN algorithm and Naïve bayes. Also, they predict that either a patient experience from the high risk of cerebral infarction or minimum risk of cerebral infarction. They used CNN based multimodal disease risk prediction on text data, for the risk prediction of cerebral infraction. The accuracy comparison takes place between CNN based

unimodal disease risk predictions against CNN based multimodal disease risk prediction algorithm. The accuracy of disease prediction resulted up to the 94.8% with more fast speed than CNN based unimodal disease risk prediction algorithm. Step of similar as that of the CNN-UDRP algorithm the CNN based multimodal disease risk prediction algorithm step only the testing steps contains of two additional steps. Given paper work on both the type of dataset like organized and unorganized data. Author worked on unorganized data. While previous work only based on organized data, none of the author worked on unorganized and semi- organized data. But this system proposed work is depending on organized as well as unorganized data.

B. Qian, X. Wang, N. Cao, H. Li, and Y.- G. Jiang [2] planned the Alzheimer disease risk prediction system with the assistance of EHR information of the patient. Here they used active learning context to tackle a genuine issue endured by the patient. In this the risk model was construct. For that active risk prediction algorithm is used the risk of Alzheimer disease.

IM. Chen, Y. Mama, Y. Li, D. Wu, Y. Zhang, and C. Youn [3] proposed wearable 2.0 system in which configuration keen washable cloth that improves the QoE and QoS of the next-generation healthcare system. Chen structured new IoT based data collection system. In that new sensor based smart washable clothes created. By the utilized of this clothes, specialist caught the patient physiological condition. What's more, with the assistance of the physiological data analysis occur. In this reversal of washable smart cloth consisting of multiple sensor, wires and cathode with the assistance of this part component user can ready to gather the physiological state of patient as well as emotional health status information used of cloud based system. With the assistance of this material, it caught the physiological state of the patient. Also, for the examination reason, this information is utilized. Examined the issues

which are confronting while designing wearable 2.0 architecture. The issues in existing system consist of physiological data gathering, negative mental impacts, anti-wireless for body zone networking and Sustainable big physiological data accumulation and so on. The numerous activities performed on records like examination on data, monitoring and prediction. Again author classify the functional components of the smart clothing representing Wearable 2.0 into sensors Integration, electrical-cable-based networking, digital modules. In this, there are numerous applications talked about like chronic disease monitoring, elderly people care, emotion care etc.

Y. Zhang, M. Qiu, C.- W. Tsai, M. M. Hassan, and A. Alamri [4] designed cloud-based health -Cps system in which deals with the gigantic measure of biomedical data. Y. Zhang examined huge measure of information development in the medicinal field. The information is made inside the less measure of time and the normal for information is put away in various configuration so this is the thing that the issue identified with the big data. In this designed the Health-Cps system in that two advancements lean one is cloud and second one is big data technology. Cloud-like data analysis, monitoring and prediction of data. With the assistance of this system, an individual gets more data about how to deal with and deal with the enormous measure of biomedical information in the cloud. The three layers consider data collection layer, data management layer and data- oriented layer. The data gathering layer put away distributed storage and parallel computing. The data management layer used for distributed storage and parallel computing. By this framework various tasks are performed with the assistance of Health-cps system, the many Health-cps systems. Related to healthcare know by this system.

L. Qiu, K. Gai, and M. Qiu in [5] proposed telehealth system and examined how to deal with a lot of hospital data in the cloud. This paper author proposed



advance in the telehealth system, which is for the most part dependent on the sharing data among all the telehealth services over the cloud. Yet, the information sharing on the cloud confronting loads of issues like network capacity and virtual machine switches. In this proposed the data sharing on cloud approach for the better sharing of information through the data sharing ideas. Here planned the ideal strategy for telehealth sharing model. this model, author focus on transmission probability, network capabilities and timing constraints. For this creator concocted new big data sharing algorithm. By this calculation, clients get the ideal arrangement of handling biomedical data.

Ajinkya Kunjir, Harshal Sawant, Nuzhat F. Shaikh [6] proposed a best clinical decision-making system which predicts the disease based on historical data of patients. In this predicted various diseases and inconspicuous example of patient condition. Designed a best clinical decision- making system utilized for the exact disease prediction on the historical data. In that additionally decided various diseases concept and concealed example. For the perception reason in this used 2D/3D graph and pie Charts. And 2D/3D graph and pie charts representation reason.

S. Leoni Sharmila, C. Dharuman and P. Venkatesan [13] gives a similar investigation of various machine learning technique such Fuzzy logic, Fuzzy Neural Network and decision tree. They consider data set to classify and do study about nearly. As indicated by study Fuzzy Neutral Network gives 91% accuracy for classification in liver disease dataset than other machine learning algorithm. Author utilized Simplified Fuzzy ARTMAP in changed nature of application domains and is capable to perform classification all around productively and giving exceptionally superior performances.

Author have reasoned that machine learning algorithms for example, Naive Bayes and Apriori [14]

are very valuable for disease diagnosis on the given data set. Here little volume data utilized for prediction like symptoms or past learning got from the physical diagnosis. Confinement of this paper they couldn't consider huge dataset, presently a day's medicinal data is developing so needs to classify that and classification of that information is challenging.

Shraddha Subhash Shirsath [15] proposed a CNN-MDRP algorithm for a disease prediction from an extensive volume of hospital's organized and unstructured information. Utilizing a machine learning algorithm (Neavi- Bayes) Existing algorithm CNN-UDRP just uses an organized information however in CNN-MDRP center around both organized and unstructured information the accuracy of disease prediction is more and quick when contrasted with the CNN-UDRP. Here they think about consider big data.

## II. SYSTEM ARCHITECTURE

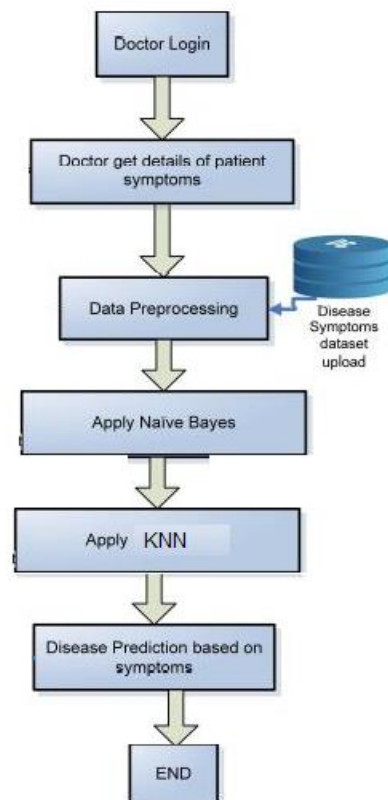


Fig 1. System Architecture

Fig1. Represent system architecture of proposed system. Initially we take disease dataset from UCI machine learning website and that is in the form of heart disease patient with different attributes and with its symptoms. After that preprocessing is performed on that dataset for cleaning that is removing unnecessary attributes and that is used as training dataset. After that feature extracted and selected. Then we classify that data using classification techniques such as NB, KNN and CNN. Based on machine learning we can predict accurate heart disease prediction.

### Algorithms

#### 1) Naïve Bayes Algorithm

Step 1 : Consider the training set of tuples be the T. It contains n number of attributes they are  $X = (x_1, x_2, x_3, \dots, x_n)$  etc.

Step 2 : Let K number of class for prediction ( $c_1, c_2, c_3, \dots, c_n$ ). The classifier predicts that x will belong to that class who's having maximum posterior probability. If want to predict x values among two probability class that is  $p(c_i/x)$  and  $p(c_j/x)$ . Then the values of  $p(c_i/x)$  should be maximum, if we want that x values into the class.

Step 3 : Create Likelihood table.

Step 4 : Calculate posterior probability for each class by using naïve Bayesian equation.

Step 5 : For prediction of X variable which is having high probability for the prediction outcomes.

Step 6 : Stop

#### 2) CNN Algorithm

Step 1: The dataset is converted into the vector form.

Step 2 : Then word embedding carried out which adopt zero values to fill the data. The output of word embedding is convolutional layer.

Step 3 : This Convolutional layer taken as input to pooling layer and we perform max pooling operation on convolutional layer.

Step 4 : In Max pooling the dataset convert into fixed length vector form. Pooling layer is connected with the full connected neural network.

Step 5 : The full connection layer connected to the classifier that is softmax classifier.

### III. RESULT AND DISCUSSIONS

#### Experimental Setup

All the experimental cases are implemented in Java in congestion with Netbeans tools and MySQL as backend, algorithms and strategies, and the competing classification approach along with various feature extraction technique, and run in environment with System having configuration of Intel Core i5-6200U, 2.30 GHz Windows 10 (64 bit) machine with 8GB of RAM

#### Dataset Description

Patient disease dataset downloaded from UCI machine learning website.

#### Result

This section presents the performance of the KNN and NB classification algorithms in terms of time required and memory and other performance measures such as FP measure, precision, recall and accuracy.

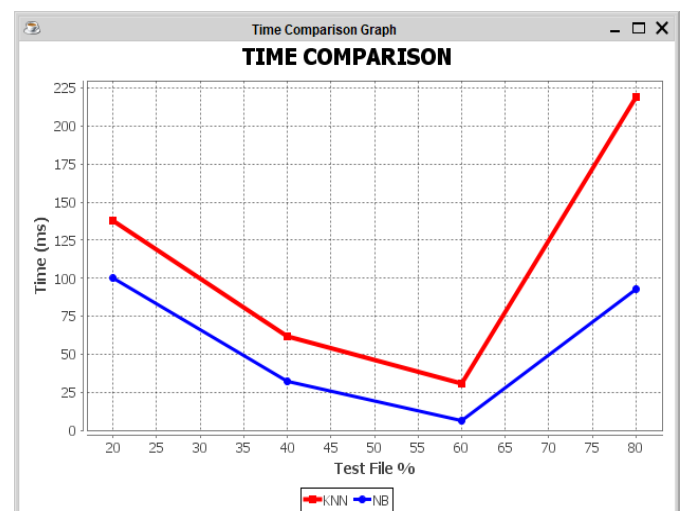


Fig 2. Time comparison line graph

Fig 2 Shows time comparison of KNN and NB algorithms for various Threshold. X-axis shows Algorithm & Y-axis shows time in ms. NB requires less time than KNN.

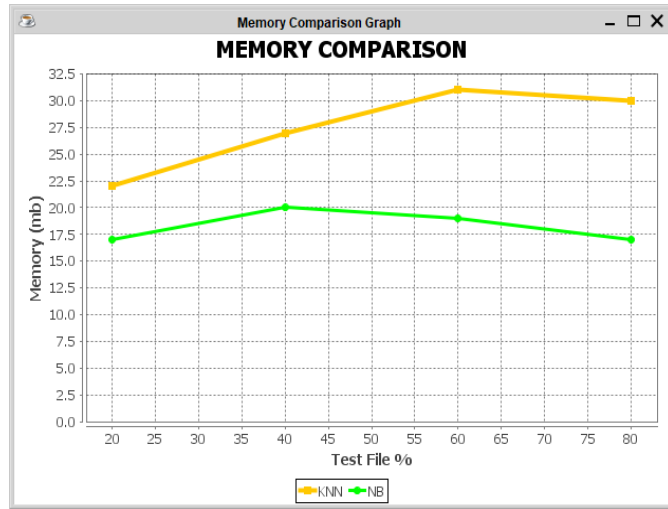


Fig 3. Memory comparison line graph

Fig 3 shows the Line graph of memory comparison of KNN and NB algorithms for various test file size. The X-axis shows test file size and Y- axis shows memory in bytes. The NB takes less memory than KNN for classifying large dataset.

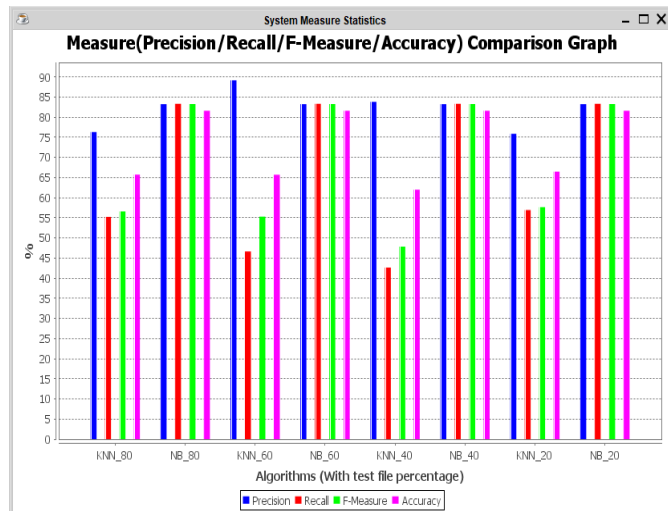


Fig 4. System measures comparison graph

Fig 4 shows the Bar graph of Algorithms measures (Precision/ recall/ f-measure/ accuracy) comparison of KNN and NB algorithms for various test file size. The

X-axis shows test file size with algorithms and Y- axis shows %.

#### IV. CONCLUSION

We proposed heart disease prediction system based on symptoms. For heart disease prediction based on symptoms, we used machine learning algorithm that is Naïve bayes and CNN. We performed heart disease prediction using naïve bayes algorithm and KNN algorithm. We compare the results between KNN and Naïve bayes algorithm and the accuracy of NB algorithm is 94% which is more than KNN algorithm. We got accurate heart disease risk prediction as output, by giving the input as patients record which help us to understand the level of heart disease risk prediction. Because of this system may leads in low time consumption and minimal cost possible for disease heart disease risk prediction.

In future, we will add more diseases and predict the risk which patient suffers from specific disease.

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# Survey on Security Issues in Decision Support System of Health Care Network

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## ABSTRACT

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Medical Secure Systems (MSSs) are spoken to by incorporating count and also physical procedures. The theories and uses of MSSs confront the huge issues. The main objective of this study is to give a more prominent comprehension summary of this developing techniques focusing on the security of the outsourced medical data. In this system, the main focus is on secure data transmission of medical data. Such system is called as Medical Secure Systems (MSS). It can transmit and process the data gathered from health observing systems, which comprises of BAN. The obtained data is transmitted to the private or open cloud which contains a set of calculations for investigating the patient data. These medical data oughts to be kept the mystery. In the wake of breaking down these data, the input is given to the specialists to make a remedial move. This system incorporates data obtaining which is fit for gaining data from body territory systems, data conglomeration which focuses the accumulated flag data, cloud preparing which incorporates numerous examination calculations and activity layer which create either physical activity or choice help. In this paper, we will talk about different issues that should be considered to satisfying the security and privacy necessities and furthermore examine about the important components and wordings utilized by the different specialists to illuminate those issues.

**Keywords** : Medical Cyber Physical Systems, Secure Digital Cover, Confidentiality, Homomorphic Encryption

## I. INTRODUCTION

Recently, researchers are more inclined towards the study in the area of Medical Cyber Physical Systems (MCPS). As it turned out to be famous in light of its

wide appearance in the public eye, economy, and condition and has pulled in different analysts from the scholarly community, association additionally from the government. It incorporates the physical parts known as cameras, sensors with cloud and

persistently screens the adjustments in the physical condition. As indicated by WHO report, coronary illness and heart stroke is the prime reason for death. These kinds of death count will reach up to 23.3 million by 2030. To offer regard for these issues, CPS is joined with the Healthcare field. In this way, CPS in Healthcare is regularly alluded to as Medical Cyber-Physical System or Medical Secure systems (MSS).

In this, Sensors is installed in, close by the patient's body to quantify patient's physiological essential signs, for example, temperature, circulatory strain, pulse, breath rate, ECG, EEG, and so forth., If these touchy data are hindered could prompt a few outcomes like mental unsteadiness, relationship issues, even occupation misfortune and wrong medications prompts tolerant demise. Because of this, more consideration ought to be given and taken to give security and privacy to the data. Also, guaranteeing the confidentiality and security of the individual medical data the sharing between the tactile systems to the cloud and from the cloud to specialists' cell phones will require the improvement of a modern cryptographic development for an MSS. While this structure suggests just secure capacity utilizing regular encryption plans, rising encryption plans gives a better substitution for performing secure data sharing and computation. This study discusses about condensing the difficulties identified with cloud and healthcare.

## II. REVIEW OF LITERATURE

Here in this part of the discussion we examine the literature survey in insight regarding the secure medical data outsourcing.

Here in this research [1] the author present the structure of an MCPS. This system consist of 4 main layers which are, Data procurement, Data accumulation, Cloud preparing, and activity. It also

differentiates in gear and the limits of each layer, a proper encryption design must be used to ensure that the data ensured in that layer. In the present survey author consolidates common and methods for encryption considering its ability to give ensured capacity, data sharing, and secure estimation. Executing MCPSs would require vanquishing inventive snags in building the basic fragments of the MCPS, for example, sensors, distributed computing designs, and fast Internet and phone associations. Furthermore, ensuring the assurance of the individual health records at some point or another of the transmission from PDA associations and from the cloud to specialist's cell gadgets will require the plan of a propelled cryptography structure for an MCPS. While this structure suggests just secure capacity the utilization of customary encryption plans, rising encryption plans gives alternatives for secure data sharing and secure calculation. In this paper the commitment is two-cover: First of this audit used common and creating encryption intends to complete MCPS. Besides these, the presented designs give expansive appraisal and difference them in light of their ability to give a secure limit, secure data sharing, and secure estimation.

Healthcare turns into a major issue because of the absence of accessibility of master specialists. Because of this issue, there is a change in perspective from need-based health checking to preventive health observing administration. Keeping in view this situation author in this paper [2] proposed a health care system which will be coordinated with distributed computing. That will make the system fit for creating EMR, for example, Electronic Medical Records of patients which will assume a valuable job for patient's analytic and quick enhancement process just as for medical rehearsing specialists who require vast medical cases for their very own examination reason. This system will monitor a patient's health in an opportune way and create a ready when the patient's indispensable parameters cross the typical

esteem. The significant data will be exchanged to the distributed storage that can be gotten to by enlisted master specialists and patients by means of the Android App.

This study [3] presented a novel content approach attribute-based encryption (CP-ABE) methods. In CP-ABE logical AND is used to present the plan with a special case. Start with the arrangement, they start another methodology that uses address an attribute by solitary total part. Also the current designs of a system need to use three assemble segments for the three possible qualities by addressing an attribute. The presented methodology in this study results in a fresh out of the plastic new CP-ABE plot with steady figure content size, which, in any case, can't shroud the entrance arrangement utilized for encryption. The main aim of this study is the demonstration of another CP-ABE contrive with concealed to get added to game plan by a method for enhancing the strategy this used inside the age of our in any case plan. Especially, demonstrate a way to connect ABE essentially rely upon AND with trump card with interior item encryption after which utilize the last to get the motivation behind concealed access approach.

Xin Sun [4] et al present a view on the structure of a novel hybrid system for recognizing peculiar traffic in huge scale and strategy rich data systems. This methodology joins static setup investigation and dynamic traffic examination. At first build up the deliberations and scientific models to appropriately display the system and security arrangements to statically check for infringement of system wide invariants, which are potential security vulnerabilities. At that point create dynamic data systematic procedures to examine traffic in real-time and distinguish odd traffic designs that might be abusing the security vulnerabilities. The aftereffects of the static examination will be utilized to help and guide the dynamic traffic investigation to upgrade the asset portion and limit false positives.

In this research author discussed a technique [5] that leave data insurance stresses in general society cloud circumstance, by a technique for utilizing a developing encryption strategy called Fully Homomorphic Encryption (FHE). FHE is capable of performing computations without the complete revelation the data itself settle on it an engaging decision for certain therapeutic applications. The study also uses the cardiovascular health watching for our possibility assessment and give the inclinations and challenges of our methodology by utilizing a dug in FHE library called HELib. Distributed computing can diminish healthcare costs by growing the capacity and calculation.

O. Kocabas [6] endeavors to break down the present examination and improvement on wearable biosensor system for health perceptions. WHMS is vital in the exploration network amid the most recent decade as it is brought up by the various and yearly expanding relating research. As healthcare costs are expanding and the total populace is maturing, there has been a need to screen a patient's health status while he is out of the doctor's facility in his own condition. To address this interest, an assortment of system models and business items have been created throughout ongoing years, which go for giving constant medical data after examination is offered, either to the patient or to a medical center or straight to a directing healthcare experts, while having the capacity to alarm the individual if there is conceivable fast approaching health-compromising conditions. Last few years have seen a developing enthusiasm for portable sensors and today some devices are economically accessible for individual health care, wellness, and movement mindfulness.

T. Soyata [7] proposed a strategy alongside this these systems in health observing utilizations patient's physiological readings and store it in a private or open cloud for a long haul. In the ordinary technique, breaking down a patient's health status, for example,

body temperature ECG etc. is a tedious procedure and may have some blunder factors as well. Be that as it may, on current advancements, for example, remote wearable sensors, it is exceptionally helpful and powerful to investigate patient's health status. In a rush world, it is progressively versatile. Over this procedure, Body Area Network is equipped for catching the flag from the sensors and keep track a record of patient's health status.

At the point when an individual counsels specialist for checking his physical health data, the specialist have the typical lab tests reports, as well as have data that accumulated from the remote wearable sensors. With the assistance of accessible data and data gathered from the system that additionally approach an expansive corpus of perception data for different people, the specialist can improve a much visualization for your health and prescribe treatment, early intercession, and way of life decisions that are especially viable in enhancing the wellness of the body. Such an exceptionally valuable innovation can enhance the field of medical application and ensure and sure about the patient health status. This may summon new musings in the zone of medical science.

There are two enemy models dynamic foe model and latent foe show. The MCPS [8] gives data privacy on dynamic enemy display whereas it gives both privacy and accuracy on inactive for demonstrate. Hotel request to dissect the security needs of the MCPS inactive enemy is broadly utilized.

In distributed computing, the issue related to privacy is based on multi-keyword looking over encoded data. So it requires a set of privacy necessities. It is finished with an effective strategy called —coordinate coordinating. To quantitatively assess such similitude measure. Another strategy utilized is —inner item similitude. To accomplish different stringent privacy prerequisites in two diverse danger models, here first

propose a fundamental thought for the MRSE based on secure inward item calculation.

S. Dziembowski proposed encryption components that go through thorough numerical and hypothetical cryptanalysis to give security and privacy, the system may lose data because of the vulnerabilities in its product and equipment usage. Assaults based on such spilled data are called side-channel assaults. These assaults can be averted by utilizing spillage safe cryptography [9]. Looking for countermeasures, one can attempt to avert side-channel assaults by changing the usage or anchoring equipment. This prompts an experimentation approach where usage is made secure against a specific kind of assault just before another progressively successful assault shows up. Spillage Resilient Cryptography receives an alternate perspective by endeavoring to give provably anchor natives within the sight of an extensive variety of side-channel data. Planning measures are spare within the sight of spillage is a troublesome yet not feasible undertaking. The most recent couple of years, the cryptographic network has put a great deal of exertion in developing spillage flexible natives. As the establishments for a hypothetical treatment of the subject have been set, we anticipate that inside the following years increasingly more spillage versatile natives will be developed that will endure more extravagant and more extravagant families F of spillage capacities. Side channel assaults focus on acquiring the mystery/private key by utilizing each layer of the system, instead of simply the data that is being prepared by the system. While numerous kinds of side channel assaults exist for almost every encryption conspire.

Side-channel attacks [10] are emerging because of programming or equipment structure issues. It is anything but difficult to execute against amazing assaults, and their objectives incorporate natives, conventions, modules, and gadgets to even systems. These assaults are causes Sevier issue to cryptographic



segments. To maintain a strategic distance from these issues some cryptographic investigation must be considered. This includes the strategies and systems utilized in these assaults, the damaging impacts of such assaults, the countermeasures against such assaults and assessment of their plausibility and appropriateness; Finally, the most essential end from this paper is that it isn't just a need yet additionally an absolute necessity, in the coming variant of FIPS 140-3 standard, to assess cryptographic modules for their counteractive action towards side channel assaults.

Timing assaults on elliptic bend cryptosystem focus on the scalar augmentation task. It is forestalled by utilizing Montgomery's augmentation strategy which is proposed by P. L. Montgomery [11] plays out the duplication free from the bits of the private key.

This incorporates a calculation for computing elliptic scalar increases on non-excessively particular elliptic bends characterized over  $GF(2^m)$ . The calculation is a little form of technique examined is based on Montgomery's strategy. The calculation is anything but difficult to actualize in both equipment and programming. It works for any elliptic bend over  $GF(2^m)$ , and it requires no pre-processed products of a point and is quicker overall than the expansion subtraction strategy. In an expansion, the strategy requires less memory than projective plans and the measure of calculation required for a scalar increase is settled for all multipliers of a similar double length. Hence, the enhanced strategy has numerous attractive highlights for executing elliptic bends in limited situations. It is a productive strategy for figuring elliptic scalar increases. The strategy performs precisely  $6\log_2 kc + 10$  field augmentation for figuring KP on elliptic bends chose indiscriminately, is anything but difficult to execute in both equipment and programming, requires no pre-calculations, works for any usage of  $GF(2^n)$ , is quicker than the expansion subtraction technique by and large, and utilization less registers than strategies based on projective plans.

Thusly, the technique seems helpful for uses of elliptic bends in requirement situations, for example, cell phones, and shrewd cards.

J. L'opez proposed a strategy for power examination assaults on AES [12] can be counteracted by utilizing randomized covers for AES activities that scramble the connection between the AES mystery key and the middle of the road esteems produced amid each AES round. Assaults on usage are of specific worry to guarantors and clients of smart cards. Smartcards are turning into a favoured method for safely overseeing applications in businesses, for example, broadcast communications, health care, transportation, pay-TV and web trade. Smartcards have likewise been proposed for use in security applications, for example, organize get to and physical access to areas, for example, cars, homes, and organizations. Smartcards, anyway are conceivably helpless against usage assaults. A smart card microchip has a negligible measure of processing force and memory. Shockingly, programming countermeasures against power examination assaults can result in huge memory and execution time overhead. The measure of overhead appears to rely upon the sort and course of action of the major activities utilized by a calculation. Here it inspects the key activities utilized by every one of the AES finalist calculations. At that point create procedures that utilization irregular veils to make programming executions of these activities impervious to control examination assaults. At long last, utilize these new countermeasures to execute covered renditions of every one of the remaining AES calculations. The execution and usage attributes of these countermeasures in a 32-bit, ARM-based smartcard are broke down.

Power examination based assaults on ECC-based encryption plans can be moderated by techniques recommended that randomize middle of the road calculations to evade data spillage about the private key from power utilization designs.

A ton of consideration has been paid to elliptic bends for cryptographic applications and it has turned out to be progressively regular to actualize open key conventions on elliptic bends over a substantially limited field. Elliptic bends (EC) [13] give a gathering structure, which can be utilized to decipher existing discrete-logarithm cryptosystems into the setting of EC. The executions of elliptic bend crypto-systems, for example, El-Gamal type encryption or Diffie-Hellman key trade are helpless against Differential Power Analysis. Here presented three counter estimates that address explicitly these assaults. Those countermeasures are anything but difficult to actualize and don't affect effectiveness fundamentally. To take care of the issues confidentiality and data security in IoT, a lightweight no-blending ABE method is proposed which is based on a homomorphic encryption mechanism called as Elliptic Curve Cryptography (ECC). The proposed plan assures the safety based on the ECDDH suspicion despite bilinear Diffie-Hellman suspicion, and is demonstrated in the specific set model based on attribute. By consistently looking at the criteria and characterizing the measurements for estimating the correspondence computational load, the balance investigations with the predominant ABE plans are made in detail.

A tale therapeutic circulated processing strategy that sheds security concerns associated with the cloud provider. Our strategy use totally Homomorphic Encryption (FHE), which permits computations on individual health data without when in doubt viewing the fundamental data. For consideration, system exhibits a use of a whole deal heart health watching application [14].

The developer focused on programming improvement technique for cryptograph based systems are presented in this study [15]. To diminish the heap on cryptographer creators planned and build the structure. Machine level code, frequently an

execution bottleneck, is written in C and is called from the abnormal state Python code. Engineers build their conventions in Python and appreciate the upsides of the implicit highlights of that abnormal state dialect, and the structure Toolbox and different systems offered by Charm. Appeal contains a convention motor that deals with the correspondences, serialization and other house-keeping that is basic to executing a multi-party convention. Consequently, engineers are shielded from the minutia that isn't identified with the cryptographic hypothesis in their convention.

We did comparative studied on some paper publish on this topic. Here in below table shows previous systems and their disadvantages which are overcome in our system.

Sr . No	Title	Techniques	Advantages	Disadvantages
1.	Emerging Security Mechanisms for Medical Cyber Physical Systems	MCPA System	Their significant Speed-up is necessary either through theoretical advancements or by utilizing GPUs, ASICs, or FPGA-based hardware accelerators.	Low security
2.	A lightweight attribute-based encryption scheme for the internet of things	a lightweight no-pairing ABE scheme based on elliptic curve cryptography	The proposed scheme has improved execution efficiency and low communication costs	Poor Flexibility in Revoking Attribute. Poor Scalability

3.	Towards privacy-preserving medical cloud computing using homomorphic encryption	a novel medical cloud computing approach that eliminates privacy concerns associated with the cloud provider	This study is a good step towards making FHE-based medical cloud computing a reality.	Low security
4.	Charm: A framework for rapidly prototyping cryptosystems	A Framework for Rapidly Prototyping Cryptosystems	Charm is designed to minimize code complexity, promote code re-use, and to automate interoperability, while not compromising on efficiency.	development requirements cannot support Python

### III. PROPOSED SYSTEM

This section discusses the system overview in detail, proposed algorithm, and mathematical model of the proposed system. Detailed descriptions of the proposed system are as follows:

- Browse Dataset

User browse the input dataset, this dataset is depend on medical dataset of patients. Details about the dataset were discussed in the next sections.

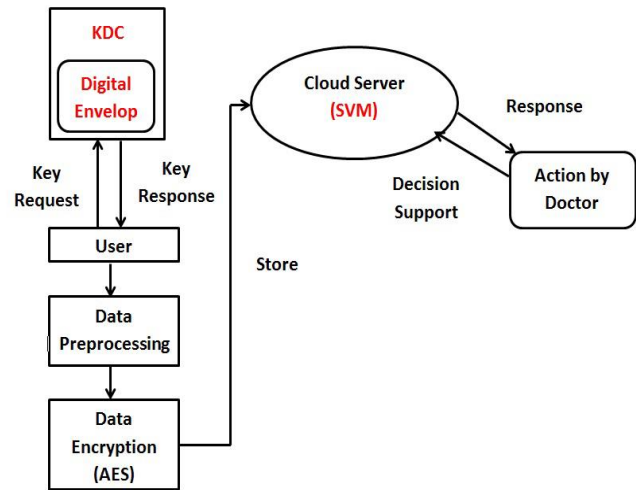


Fig. 1. System Architecture

- Data Preprocessing

In data preprocessing of dataset is done. Firstly dataset is read and produce the training file for the classification process.

- Data Encryption

Due to the security purpose the system encode the data by using the AES Algorithm. Steps of AES algorithm and working of AES algorithm discuss in the algorithm sections.

- Classification

Classification execute the operation of decision support system, for recognizing the patient data. Initially doctor send the request to the server for identifying the health data, at server side SVM classifier perform the classification process and give the results to the doctor, doctor get data and decrypt the data.

- Key Distribution Center (KDC)

This plan includes KDC and TPA which execute Digital encompass and respectability checking individually. Right off the bat, framework login to cloud server and mention to KDC for the key. KDC will create an ace key and pair of open key and mystery key by utilizing AES and ECC calculation. At that point KDC encodes the ace key utilizing ECCs open key of the mentioned information proprietor and sends the scrambled ace key and mystery key to information proprietor. Subsequent to getting key,

information proprietor section the record into squares, encode them utilizing a scrambled ace key, and send to the cloud server.

#### IV. CONCLUSION

In MSS The security winds up significant concern issues in light of the fact that the data outsourced on cloud is the most valuable assets. In this paper we assessed about the different procedures utilized in Medical Cyber Physical Systems, for example, remote body zone systems, cloud, electronic health record, enormous data, web of things and so forth. The security prerequisites of MCPS are likewise examined. Surmising's from the different strategies, required learning about the difficulties and instruments will be valuable to assemble a productive Healthcare System.

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# Seasonal Changes and Spatial Variation of Reactive Nitrogen in Sultanpur Lake, Haryana, India

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## ABSTRACT

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Sultanpur Lake is a rain-fed seasonal water body that dries up in summer. It is a haven for avian fauna and has been attracting birds for the past 100 years. This study examined the spatio-temporal variability of reactive nitrogen species in Sultanpur Lake using the geostatistical module of ArcGIS which is based on the monitoring data collected from 2017 to 2019. Seasonal concentration and spatial distribution of reactive nitrogen (nitrate, nitrite, ammonia, organic nitrogen, and total Kjeldahl nitrogen) in Sultanpur Lake's surface water were assessed at eight points. Seasonally, the concentration of reactive nitrogenous species was found to be maximum in winter followed by monsoon and summer. Spatially, the concentration varied at different points. Points 1, 2, 3, and 4 (right side) had less concentration of reactive nitrogen as compared to Points 5, 6, 7, and 8 (left side). The seasonal variation is found to be associated with extreme climatic conditions. This study highlights the areas of the lake which are under anthropogenic stresses such as agricultural runoff, manual water pumping, livestock from the nearby fields. This study will help to frame better management practices for this important wetland which harbors avian fauna during the winter season.

**Keywords:** ArcGIS, reactive nitrogen, spatial distribution, Sultanpur Lake, temporal variation

## I. INTRODUCTION

During the last few centuries, the global nitrogen cycle is highly altered due to human activities. Excess use of fertilizers, fossil fuel combustion, severe change in land use land cover pattern has intensely affected the movement of nitrogen into the freshwater system

(Jansson et al., 1994; Vitousek et al., 1997; Moffat, 1998). Elevated concentration of nitrogen, surges the risk of eutrophication in the aquatic ecosystem (Moffat, 1998). Wetlands has an ability to retain a high proportion of nitrogen followed by lakes and then rivers (Saunders and Kalff, 2001). Over a wide range of spatial and temporal scales, wetlands are in

constant instability due to natural and anthropogenic sources. They are highly dynamic systems constituting lakes, marshes, peatlands, floodplains, and mangroves, which are constantly or periodically submerged under flowing or still fresh, salty, or brackish water (Smith et al., 1995; Syphard and Garcia, 2001). For hundreds of years, Sultanpur Lake has been attracting bird species from around the world. Wetlands being guardians of water birds attract many migratory and resident bird species due to their high nutritional value and productivity (Weller, 1999; Stewart, 2001; Manikannan et al., 2012; Siva and Neelanarayan, 2017). In 1969, the conference of the International Union of Conservation of Nature and Natural Resources (IUCN), in New Delhi identified the potential of this wetland which was serving as a harbor for many migratory and resident species. On July 5, 1991, the bird sanctuary was notified as a National park under section 35 of the Wildlife Protection Act 1972 (Kalpavriksh, 1994). This shallow lake is fed by overflowing agricultural fields nearby and receives water from the Gurugram canal of river Yamuna (Banerjee and Pal 2017). The water level in the lake remains maximum during monsoon and winter, and dry condition prevails during the summer months when small pools of water are formed of about 30 cm depth. Seasonal aquatic vegetation and open grassland, and human-made mounds of grasses and mud prove to be an excellent habitat for different species of birds for resting and roosting (Banerjee and Pal, 2017).

The chemical composition of surface water varies greatly depending on the type and use of the surrounding area. Nutrients, primarily in the form of nitrogen and phosphorus, are the main components that cross rivers and lakes in small agricultural catchments (Koc and Solarski, 2006; Czyżyk and Strzelczyk, 2008; Sapek, 2008). The land use assessment indicates that the local villagers graze their livestock within the sanctuary premises and collect aquatic vegetation for thatch and fodder. There is a high level of disturbances from the tourist activities,

especially when the water levels are low and the birds are concentrated within a small area (Singh et al., 2017). Excavation of the sand is done for nearby lime and brick industries. Land-use modifications in the catchment such as expanding settlements, construction of farmhouses, and other buildings have obstructed the natural flow into the lake, thereby causing the drying of the lake. Due to scanty rainfall, artificial pumping of water from the river Yamuna is performed, which causes the entrance of African Catfish (*Clarias gareipinus*) along with water, thereby damaging the ecosystem (Banerjee and Pal, 2017). It is an omnivorous predator that feeds on the native flora and fishes, which hamper the natural availability of food for birds and animals.

The objective of the study is to assess spatial and temporal variation of reactive nitrogen concentration in the water column and estimate variation in concentration seasonally, which will help highlight the part of the lake that is under anthropogenic stress to attain better management.

## II. METHODS AND MATERIAL

### *Study area*

Sultanpur National Park (28°28' N Latitude and 76°53' E Longitudes) is located in a predominantly agricultural landscape (Fig. 1). It is situated in the Gurugram district of Haryana in village Sadhrana. It covers an area of 13,727 ha with a core area of 143 ha containing the main lake area of approximately 96 ha. (Islam and Rahmani, 2004; Birdlife international, 2019). This lake is a seasonal freshwater marshy natural depression with irregular margins contained in a salt pane. The water level fluctuates throughout the year. It is a large area of seasonally flooded sedges that extends from the northern part to the main lake area (Kalpavriksh, 1994). This shallow lake is fed by overflowing agricultural fields nearby and receives water from the Gurugram canal of river Yamuna (Banerjee and Pal, 2017).

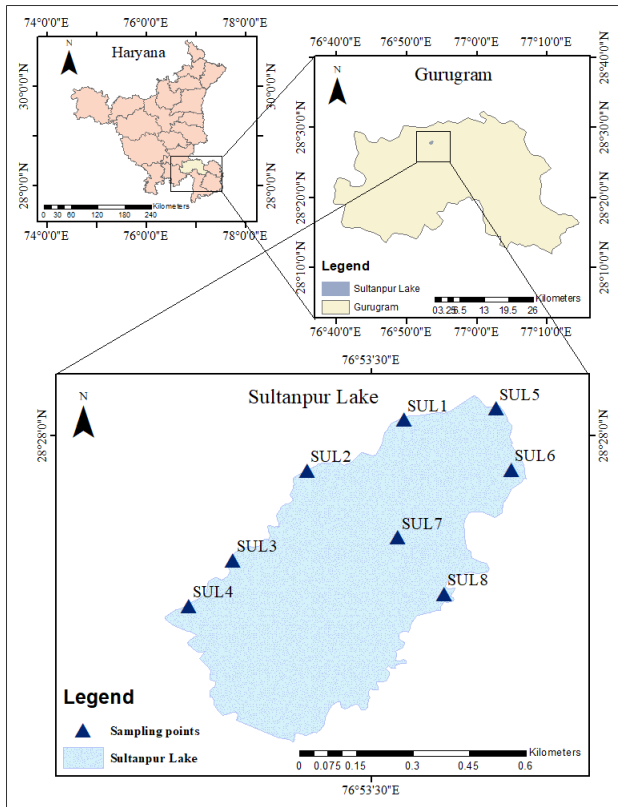


Fig 1: Sampling points in Sultanpur Lake

**Sample collection**

The water samples were collected from Sultanpur Lake seasonally (summer, monsoon, and winter) from 2017 to 2019. The position of the sampling points was located using GPS (Garmin eTrex 20x). The distribution of the sampling points is shown in Fig.1. The water sampling points were located radially on the periphery of the lake. There were 8 sampling points along the lake. Three replicates were collected from each sampling point.

**Experimental and analytical methods**

The water samples were collected in polypropylene plastic bottles and were stored at a constant temperature in an icebox. The samples were transported to the laboratory for further processing. The samples were filtered with the help of filtration assembly using Grade 1 Whatman paper. The samples were analysed for nitrate (NO<sub>3</sub>) by UV spectrophotometry, nitrite (NO<sub>2</sub>) by colorimetric method, ammonia (NH<sub>3</sub>) by distillation method, Total Kjeldahl nitrogen (TKN) and Organic nitrogen (OrgN)

using total Kjeldahl method, and Total nitrogen (TN) was calculated using the sum of Kjeldahl nitrogen, nitrate, and nitrite (APHA, 1999; CPCB, 2011).

**Spatial interpolation mapping in Geographic information system**

Using the spatial analyst tool of ArcGIS software 10.3.1, a spatial distribution for the point data collected from the location was interpolated to create thematic maps that present spatio-temporal dynamics of the reactive nitrogen forms within the surface boundaries. The inverse distance weighted (IDW) interpolation has been applied in estimating the values between measured data points. In this technique, the computation of weighted values of the unsampled point is inversely proportional to the squared distance between observed point data and point of unsampled location (Burrough and Mc Donnell, 1998)

**III.RESULTS AND DISCUSSION**

Nitrogen is an essential resource for the proliferation and growth of aquatic plants in the lake. Most of the time, it is referred to as an important factor affecting the lake’s primary productivity and environmental quality. (Lehtoranta et al., 1997; Devine and Vanni, 2002; Li et al., 2007; Huang et al., 2010; DongNan et al., 2011). It enters into the system in various forms that may be organic and inorganic. Several factors affect the concentration of different forms of nitrogen, including proximity to point and non-point sources, the influence of groundwater baseflow discharging into the water, area, type of wetland, and other natural and anthropogenic factors.

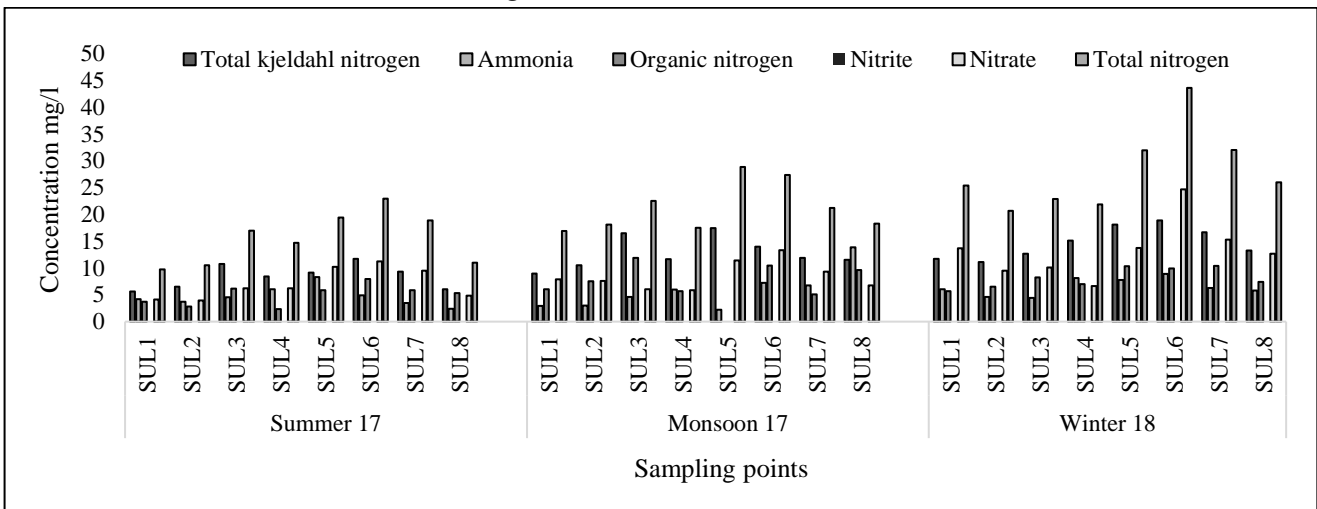
Fig. 2 and 3 graphically represents the spatio-temporal comparison between different reactive nitrogen (TKN, NH<sub>3</sub>, OrgN, NO<sub>2</sub><sup>-</sup>, NO<sub>3</sub><sup>-</sup> and TN) concentration.

**Ammonia**

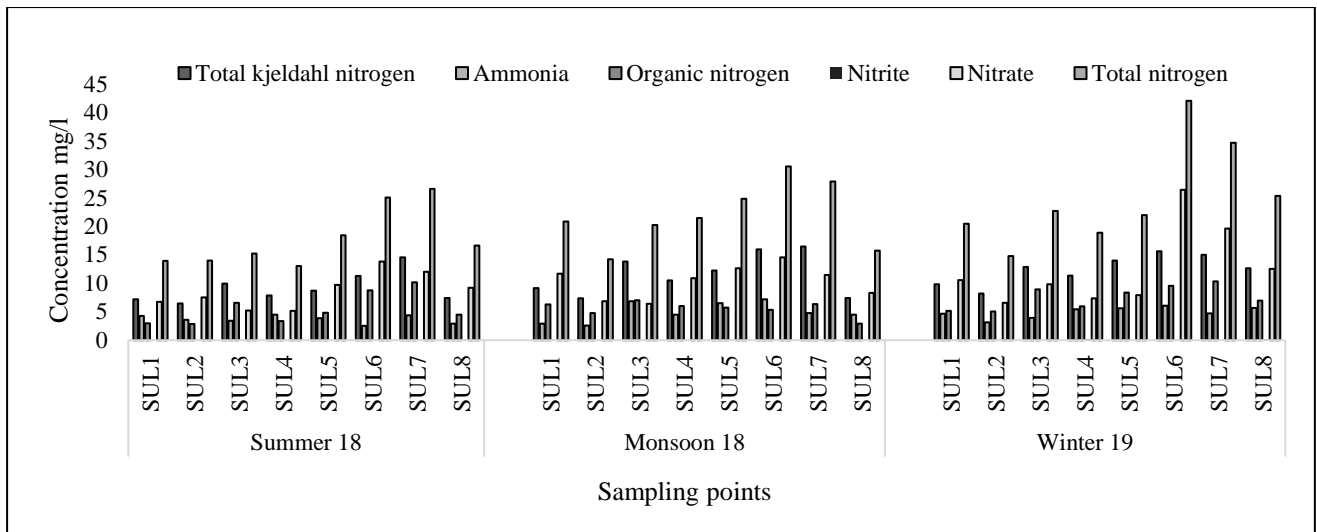
In 2017-18, the range of ammonia was 2.39 to 8.29 mg/l, 2.19 to 13.83 mg/l, and 4.43 to 8.92 mg/l in



summer, monsoon, and winter respectively (Fig. 2). are 4.70 mg/l, 5.81mg/l, 6.49 mg/l respectively. The summer, monsoon and winter average values



**Fig 2:** Seasonal change in the concentration of reactive nitrogen forms at different sampling location in Sultanpur Lake in 2017-18



**Fig 3:** Seasonal change in the concentration of reactive nitrogen forms at different sampling location in Sultanpur Lake in 2018-19

The IDW maps show the spatial distribution of ammonia in different seasons. The change in colour shows the minimum and maximum concentration at different sampling points which may be affected by different factors. The red colour denotes the highest concentration at sampling points SUL 5, 6, and 8 due to the return flow from agricultural fields and the blue colour denotes the lowest concentration. Waste from agriculture and aquaculture is rich in nitrogenous compounds (Krithika et al., 2008). The lowest concentration was noted at SUL 2 because not

much of the activity occurs in that area except birding trails (Fig. 4 a, b, c). Seasonally the maximum concentration of ammonia was observed in monsoon (13.83 mg/l) followed by winter (8.92 mg/l) and summer (8.3 mg/l). Due to the high growth of planktons and aquatic plants, which are mostly populating during summer season, the lowest concentration was observed (Abdel-Moati et al., 1990; Okbah and Hussein, 2006).

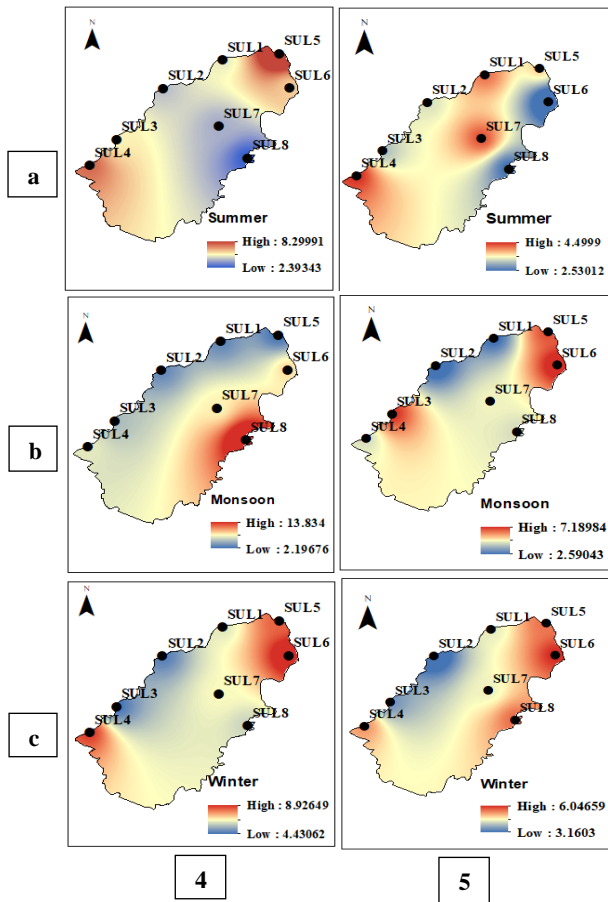


Fig 4a, b, c: shows spatial and seasonal variation of NH<sub>3</sub> in 2017-18

5a, b, c: shows spatial and seasonal variation of NH<sub>3</sub> in 2018-19

In 2018-19, the range of ammonia is 2.53 to 4.49 mg/l, 2.59 to 7.18 mg/l, and 3.16 to 6.04 mg/l in summer, monsoon, and winter respectively (Fig. 3). The summer, monsoon, and winter average values are 3.68 mg/l, 4.97 mg/l, 4.89 mg/l respectively. The highest concentration was observed at sampling points SUL 4 and 6 and lowest at SUL 2 (Fig. 5 a, b, c). Seasonally, the maximum concentration was observed in monsoon (7.18 mg/l) followed by winter (6.04 mg/l) and summer (4.05 mg/l). The yearly average shows that the concentration of ammonia was found to be higher in 2017-18 than in 2018-19.

**Nitrate**

Oxidation of ammonia forms nitrate as its final product (Meng et al., 2018). In 2017-18, the range of nitrate was 3.95 to 11.22 mg/l, 5.84 to 13.35 mg/l and

6.63 to 24.66 mg/l in summer, monsoon and winter respectively. The summer, monsoon, and winter average values are 7.04 mg/l, 8.53 mg/l, 13.28 mg/l respectively. The highest concentration was observed at sampling points SUL 6, which may be primarily due to groundwater pumping and agricultural return flow. When the waterbody originates or is surrounded by an agricultural field, nitrate concentration is more than organic nitrogen (Araújo, 2011; Wall, 2013). Seasonally the maximum concentration was observed in winter (24.66 mg/l) followed by monsoon (13.35 mg/l) and summer (11.22 mg/l) (Fig. 6 a, b, c).

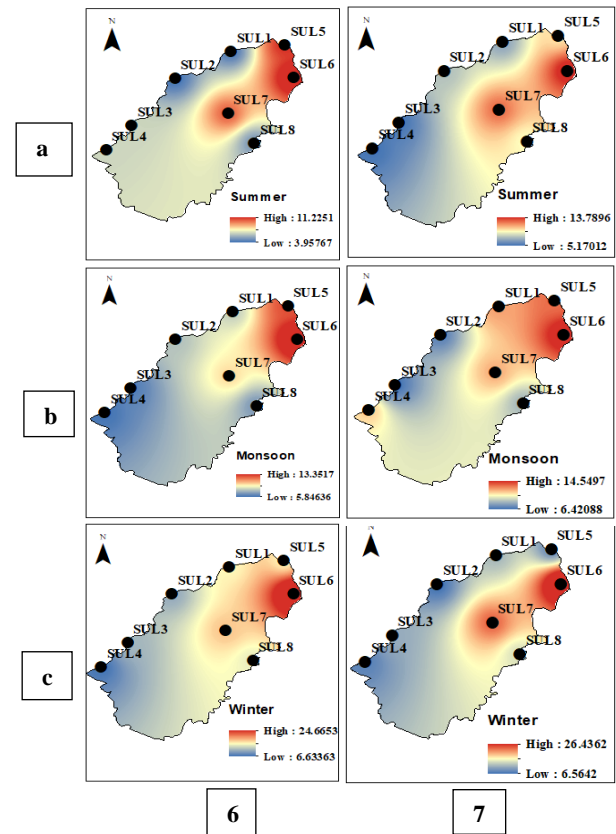


Fig 6a, b, c: shows spatial and seasonal variation of nitrate in 2017-18

7a, b, c: shows spatial and seasonal variation of nitrate in 2018-19

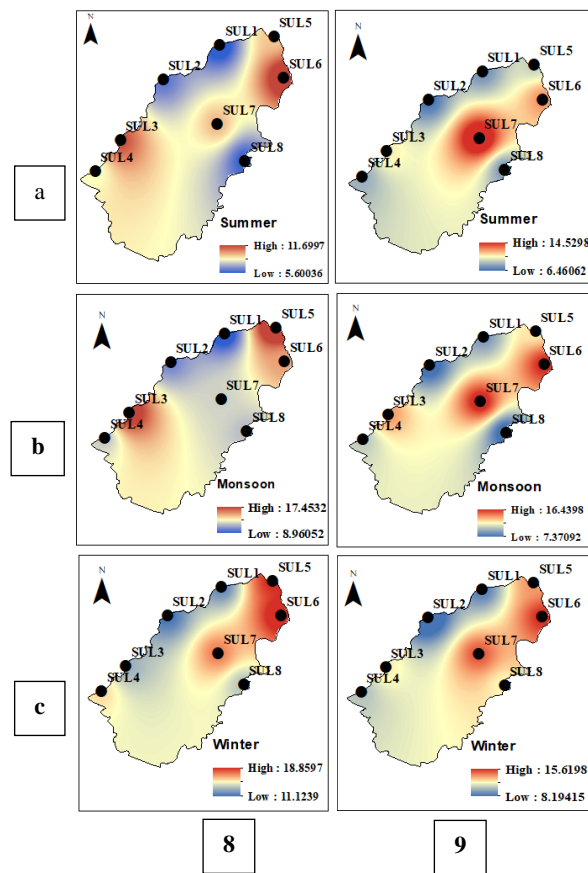
In 2018-19, the range of nitrate was 5.17 to 13.78 mg/l, 6.41 to 14.55 mg/l, and 6.56 to 26.43 mg/l in summer, monsoon, and winter respectively (Fig. 3). The summer, monsoon, and winter average values are 8.67

mg/l, 10.34 mg/l, 12.60 mg/l respectively. The highest concentration was observed at sampling point SUL 6 and lowest at points 2, 3, and 4 in winter, monsoon, and summer, respectively (Fig. 7 a, b, c). Overall concentration increased in 2018-19 as compared with 2017-18 due to some dredging activities taking place near SUL 5 and 6 which led to the disturbance of the bottom sediment allowing it to mix with water. The levels of nitrate in water are less than one ppm usually. The presence of higher levels means that the water is polluted. Fertilizers, animal wastes, septic tanks, municipal sewage treatment systems, and decaying plant debris are common sources of nitrate pollution (Rajamohan and Elango, 2005; Prasanna et al., 2011; Brindha et al., 2012; Priyadarshni et al., 2017). Seasonally the maximum concentration was observed in winter (24.66 mg/l), followed by monsoon (13.35 mg/l) and summer (11.22 mg/l).

**Total kjeldahl nitrogen**

Total Kjeldahl nitrogen includes organic nitrogen and ammonia. Typically, the organic-N fraction of TKN in surface waters is much higher than the ammonia plus ammonium-N fraction (Wall, 2013). In 2017-18, the range of total Kjeldahl nitrogen was 5.60 to 11.69 mg/l, 8.96 to 17.45 mg/l, and 11.12 to 18.85 mg/l in summer, monsoon, and winter, respectively (Fig. 2). The average value was 8.4 mg/l, 12.80 mg/l, and 14.69 mg/l in summer, monsoon, and winter respectively. Seasonally the concentration of total Kjeldahl nitrogen was maximum in winter (18.6 mg/l) followed by monsoon (17.45 mg/l) and summer (11.7 mg/l). The maximum concentration was observed due to fecal matter from migratory that visit the water body in the winter season. Nutrients derived from fecal can enrich surface water and lead to eutrophication, which causes lakes to mature more rapidly (Fleming and Fraser, 2001). The highest concentration was observed at sampling point SUL 6 and lowest at SUL 1 in all the seasons (Fig. 8 a, b, c). In 2018-19, the total Kjeldahl nitrogen range was 6.46 to 14.52 mg/l, 7.37 to 16.43 mg/l, and 8.19 to 15.61

mg/l in summer monsoon and winter, respectively (Fig. 3). The average value was 9.17 mg/l in summer followed by 11.61 mg/l in monsoon and 12.43 mg/l in winter. The highest concentration was observed at sampling point SUL 7 and lowest at SUL 2 for all the seasons (Fig. 9 a, b, c). Mostly the birds flock around SUL 7 that may be the reason for high concentrations. Seasonally the concentration of total Kjeldahl nitrogen was more or less similar in all the seasons. The yearly average shows that the concentration of total Kjeldahl nitrogen was higher in 2018-19 as compared to 2017-18.



**Fig 8a, b, c:** shows spatial and seasonal variation of total Kjeldahl nitrogen in 2017-18

**9a, b, c:** shows spatial and seasonal variation of total Kjeldahl nitrogen in 2018-19

**Total nitrogen**

In 2017-18, The range of total nitrogen was 9.71 to 22.95 mg/l, 16.88 to 28.85 mg/l, and 20.66 to 43.59 mg/l in summer, monsoon, and winter, respectively

(Fig. 2). The average concentration of total nitrogen was 15.51 mg/l, 21.34 mg/l, and 28.03 mg/l in summer, monsoon, and winter. The highest concentration was observed at sampling points SUL 5 and 6 and lowest at SUL 1 and 2 (Fig. 10 a, b, c). When precipitation is high during the monsoon, the hydrodynamic condition is increased, which reduces nutrient retention time, resulting in a decrease in total nitrogen concentration (Goedkoop and Petersson, 2000; Sun et al., 2009; Zhu et al., 2011). Seasonally the maximum concentration was observed in winter (43.59 mg/l) followed by monsoon (28.85 mg/l) and summer (22.96 mg/l). The increased concentration of total nitrogen is the result of domestic sewage discharge, agricultural runoff, and land-use change.

In 2018-19, the total nitrogen range was 13.05 to 26.57 mg/l, 14.22 to 30.53 mg/l, and 14.79 to 42.06 mg/l in summer, monsoon, and winter, respectively (Fig. 3). The average value was 17.86 mg/l in summer, followed by 21.97 mg/l in monsoon and 25.11 mg/l in winter. The highest concentration was observed at sampling points SUL 6 and 7 and lowest at SUL 1 and 2 for all seasons (Fig. 11 a, b, c). Seasonally the maximum concentration was winter (42.07 mg/l) followed by monsoon (30.53 mg/l) and summer (26.57 mg/l). The maximum concentration was observed in winters due to the accumulation of nutrients in the absence of precipitation during the non-flood season. The yearly average shows that the total nitrogen concentration was almost similar for both years of sampling.

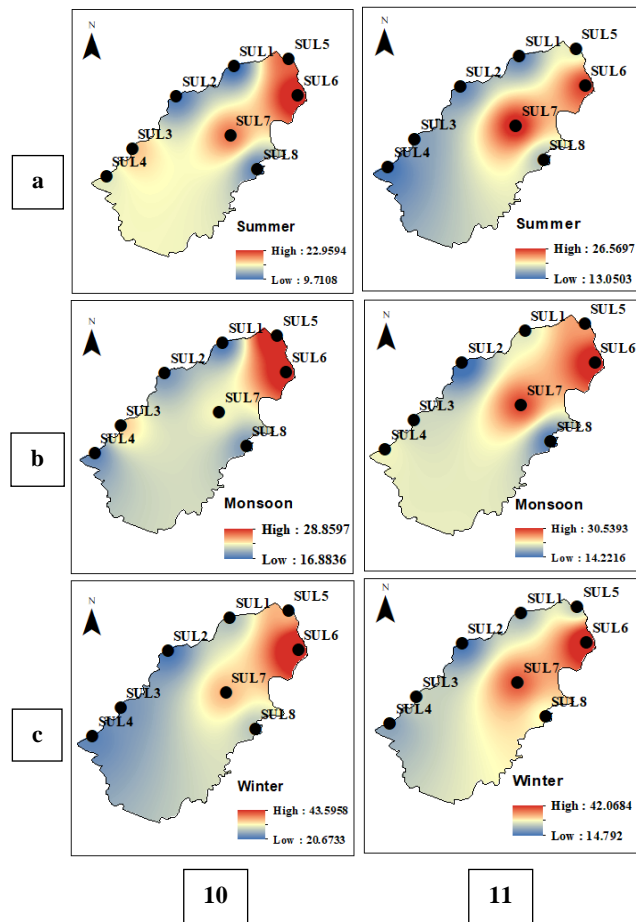
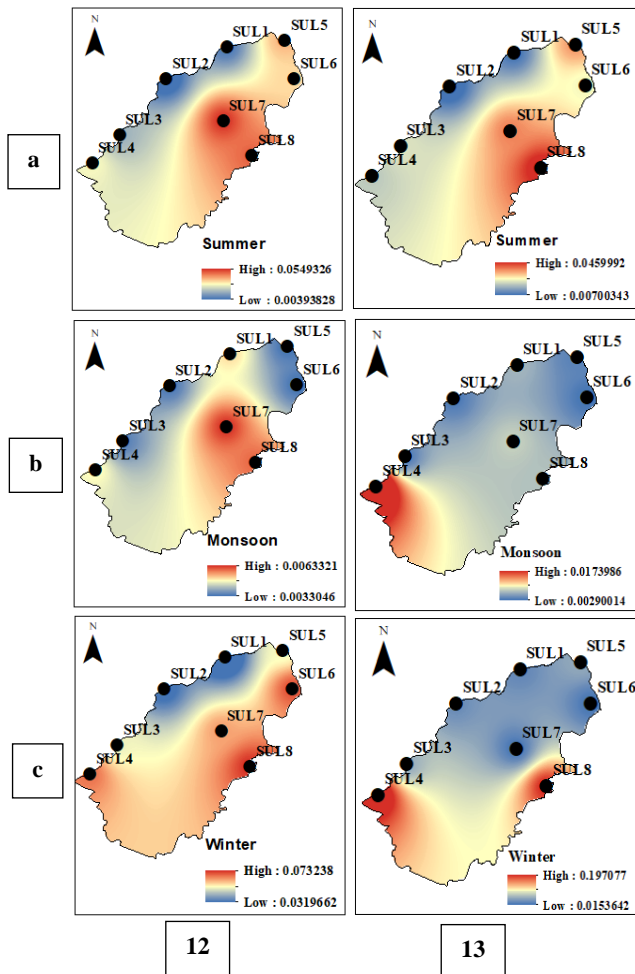


Fig 10a, b, c: shows spatial and seasonal variation of total nitrogen in 2017-18

11a, b, c: shows spatial and seasonal variation of total nitrogen in 2018-19

### Nitrite

Nitrite is typically an intermediate product when ammonium is transformed into nitrate by microscopic organisms and is therefore seldom elevated in waters for long periods. It is also an intermediary product as nitrate transforms to nitrogen gas through denitrification (Wall, 2013). In 2017-18, the range of nitrite was 0.0039 to 0.054 mg/l, 0.0033 to 0.0063 mg/l and 0.031 to 0.073 mg/l in summer, monsoon and winter, respectively (Fig. 2). The average value was 0.030 mg/l, 0.0044 mg/l and 0.05 mg/l in summer, monsoon and winter respectively. Seasonally, the maximum concentration was observed in winter (0.073 mg/l) followed by monsoon (0.0063 mg/l) and summer (0.0031mg/l). The highest concentration was observed at sampling points SUL 7 and 8 and lowest at SUL 1 and 2 in all the seasons (Fig. 12 a, b, c).



**Fig 12a, b, c:** shows spatial and seasonal variation of nitrite in 2017-18  
**13a, b, c:** shows spatial and seasonal variation of nitrite in 2018-19

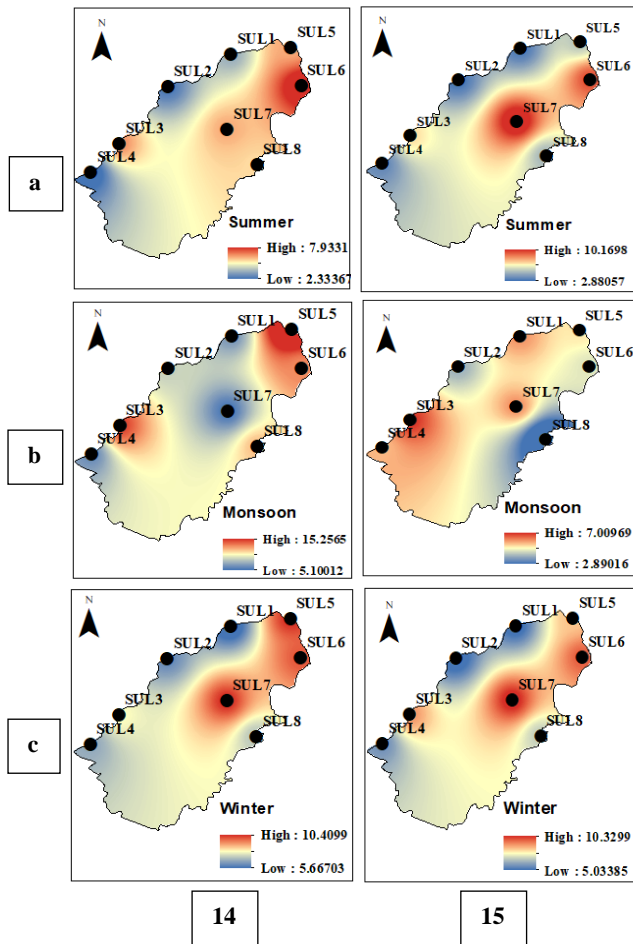
High nitrite concentration in the surface water shows a mechanism in which nitrogenous organic compounds oxidize into nitrate (Meng et al., 2018). In 2018-19, the range of nitrite was 0.0070 to 0.045 mg/l, 0.0029 to 0.017 mg/l, and 0.015 to 0.19 mg/l in summer, monsoon and winter respectively (Fig.3). The average value was 0.025 mg/l in summer, followed by 0.0058 mg/l in monsoon and 0.0068 mg/l in winter. The highest concentration was observed at sampling point SUL 8 and 4 and lowest at SUL 2, 6, and 7 for summer, monsoon, and winter respectively (Fig. 13 a, b, c). This is possibly due to livestock manure in and nearby the lake area (Meng et al., 2018). Seasonally, the maximum concentration in winter (0.19 mg/l) followed by summer (0.045 mg/l)

and monsoon (0.017 mg/l). The yearly average shows that the concentration of nitrite was higher in 2018-19 as compared to 2017-18.

**Organic nitrogen**

In nature, organic nitrogen is directly transformed to the ammonium form followed by nitrite and nitrate. Dissolved organic nitrogen are generally found in lakes and streams as a product by photosynthetic organism, excretion by the animals, leachate from the soil and sewage discharge (Jørgensen, 2009; Wall 2013). In 2017-18, the range of organic nitrogen was 2.33 to 7.93 mg/l, 5.10 to 15.25 mg/l, and 5.66 to 10.40 mg/l in summer, monsoon, and winter, respectively (Fig. 2). The average value was 4.99 mg/l, 8.93 mg/l, and 8.19 mg/l in summer, monsoon, and winter. Seasonally the maximum concentration was observed in monsoon (15.25 mg/l) followed by winter (10.41 mg/l) and summer (7.93 mg/l). Generally, dissolved organic nitrogen is found to be higher in summer than winter because of the frequent release by algae and macrophytes (Jørgensen, 2009). But, in Sultanpur lake, due to continuous water pumping into the system, dilution of dissolved organic nitrogen occurs, which tends to lower the concentration. The highest concentration was observed at sampling points SUL 5 and 6 due to and lowest at SUL 1 and 4 in all the seasons (Fig. 14 a, b, c).

In 2018-19, the range of organic nitrogen was 2.88 to 10.16 mg/l, 2.89 to 7.00 mg/l and 5.03 to 10.32 mg/l in summer monsoon and winter respectively (Fig. 3). The average value was 5.49 mg/l in summer, followed by 5.54 mg/l in monsoon and 7.54 mg/l in winter. The highest concentration was observed at sampling points SUL 5 and 6 and the lowest SUL 1 and 4 for all the seasons (Fig. 15 a, b, c). Summer (10.16 mg/l) and monsoon (10.33 mg/l) had almost equal concentration followed by monsoon (7.00 mg/l). The yearly average shows that the concentration of organic nitrogen was higher in 2017-18 as compared to 2018-19.



14a, b, c shows spatial and seasonal variation of organic nitrogen in 2017-18

15a, b, c shows spatial and seasonal variation of organic nitrogen in 2018-19

#### IV. CONCLUSION

Ammonia concentrations were discovered to be greater than categories D and A of CPCB and BIS IS: 10500 standards respectively whereas nitrate was within the standard limits. Standards for organic nitrogen, nitrite, and total nitrogen are not available in the Indian context. According to BIS and CPCB standards, levels exceeding 45 mg/l for nitrate and 1.2 mg/l for ammonia in surface water can lead to human and health problems (Gupta et al., 2010; Prakasa Rao et al., 2017).

Human interventions are responsible for the increase in the reactive nitrogen concentration. Enrichment of nitrogenous species has a detrimental effect on the

water quality of lakes, rivers, aquifers, and coastal water bodies, leading to the phenomenon of eutrophication (Rao and Puttanna, 2006). A notable seasonal variation characterized the average concentration of reactive nitrogen forms in the surface water of Sultanpur lake. The largest concentration was observed in the winter season and lowest in the summer season at the analyzed sampling points. The concentration of nitrate and ammonia indicated that the contamination concentration was mainly located near the points that are influenced by anthropogenic inputs of pollutants, the biochemical process of aquatic plants, and hydrodynamic conditions. Currently, the main factors influencing Sultanpur Lake are irrigation return flow and groundwater pumping. An important consideration which will help minimize reactive nitrogen losses into the environment is to keep applied and residual sources of nitrogen within the soil-crop system by curtailing transport processes (leaching, runoff, erosion, and gaseous losses) that carry nitrogen into the surrounding environment. With the increasing urbanizations and anthropogenic threats, it is necessary to frame and execute a management plan for the wetland and facilitate conservation efforts. Creating awareness among the local people regarding the importance of the wetland which plays a very crucial role in sustaining the local environment.

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## The Degree of Availability of E-Learning Competencies : A Survey Study Among the Faculty Staff Members at Jazan University- Saudi Arabia

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### ABSTRACT

The purpose of this study was to investigate the availability of e-learning competencies among the faculty staff members at Jazan University, Kingdom Saudi Arabia. The study conducted in the academic year 2020. A purposive sample of (330) male and female staff members of Jazan University, was chosen. The questionnaire was used for collecting data. SPSS used for analyzing data. Appropriate statistics for description (frequencies, percentage, means, standard deviations, Mann Whitney Test, T-Test and One-Way ANOVA Test) were used. The results showed that: There were significant differences in the aspects (competencies of e-learning culture) and (competencies of designing and managing e-learning) related to college variable, in favor of humanities colleges. There were significant differences between the faculty staff member responses on the availability of e-learning competencies, related to gender variable, in favor of male gender. There were significant differences in the aspect (competencies of designing and managing e-learning) related to experience variable, in favor of experience from 5 years and more. There were significant differences in the e-learning competencies, due to the difference in qualification variable. There were significant differences in the e-learning competencies, related to the training courses.

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## I. INTRODUCTION

### *Background*

The scientific and technological progress that the world is witnessing today, necessitates many and varied duties on peoples and individuals, and drives them to initiate using the maximum available from this contemporary technology to develop teaching

and learning methods, in order to get rid of traditional methods, to keep pace with the rapidly changing world, therefore, it is necessary to prepare individuals with special characteristics who are able to adapt to the scientific and technological changes that will happen in the future (Kulab, 2011, p2).

The growing demand for higher education, and awareness of higher educational institutions and

stakeholders, and the widespread penetration of communications and information technology affecting the current era (Al-Saif, 2009, p 2). These developments have made a great force and influence of computers on the educational process, as it provided new tools and interactive means to overcome time and distance to reach students anywhere and at any time (Al-Hady, 2005, p142).

The educational process is one of the processes that go through many stages of continuous development and growth due to its innovations in many and varied aspects, the educational process is no longer based only on the teacher and the student and the curriculum, but many innovations emerged from the beginning of the use of computers in education. These recent technological developments are accelerating in various areas of life, as technology has become coexist with us in our daily lives, whether at home or work, and the student needs to develop their technological skills and their understanding of the world in which they live, where technological education helps the student to develop the adaptive feature required for work in a rapidly changing world (hassan, 2017, p 1).

As a result of the continuous changes in the areas of education and training, the term e-learning has emerged a great deal in education and training services, and this term has spread very quickly (Kulab, 2011, p2) and widely throughout the world, due to its benefits. It helps teachers and students to develop information and communication technologies in the teaching and learning processes, as the ease of using the internet has led to many other technical means to displace the classrooms with the electronic space (Sultan, 2001, p165).

E-learning has become an effective pattern in education that combines digital transmission of content and the availability of educational support and services, and what is meant by providing support is the role of the teacher in supporting and assisting the student at any time, and this is what distinguishes e-learning from computer education as a simple educational presentation tool (Kinsara, 2005, p20).

E-learning is defined as: " A creative way to present a well-designed, pre-designed, interactive environment accessible to anyone, anywhere and anytime, using the features and resources of the Internet and digital technologies in conformity with educational design principles appropriate for an open, flexible and distributed learning environment" (Sallam, 2013, p9).

Technology has changed the possibilities within teaching and learning. Traditional classrooms, no longer have to be designed in that manner. Faculty members should use modern technologies to improve the teaching and learning environment. Therefore, they have to possess technological competencies in using hardware and software inside classrooms (Duffin, 2020, p 30).

Competencies are defined as: " The various forms of performance that represent the minimum required to achieve a goal, they are the sum of the attitudes, forms of understanding and skills that would facilitate the educational process to achieve its mental, emotional and psychological goals" (Al-Umary, 2009, p14).

The use of information and communications technology in the field of education is a strategic choice and an urgent necessity in light of the great knowledge flow, the technological and the communications revolution, requires preparing teachers and students to deal with these technologies and the need for teachers to possess these modern technological competencies (Merdas, 2014, p. 41).

The competent e-learning teachers are the key to successful e-Learning implementations, so, they should have the appropriate skills and experience for the effective implementation of e-learning in their classrooms. Online teachers should possess e-learning competencies and skills than a traditional teacher does. These competencies and skills are systematically constructing the competencies of the teachers who want to teach online (Gulbahar & Kalelioglu, 2015, pp. 140-143).

***Previous studies***

Hassan (2017) study was aimed to explore e-learning competencies among secondary school teachers in Omdurman city, Sudan. The researcher used the descriptive analytical method because it most suits the study. The sample of the study consisted of (139) secondary school teachers who were randomly selected; the researcher used questionnaire for data collection and SPSS for data analysis. The study has arrived at the following results: The competencies that relate to the e-learning culture of the secondary school teachers were available at an intermediate degree. The competencies that relate to the use of the computer were available to the secondary school teachers to a high degree. The competencies that relate to the use of the Internet are available to secondary school teachers with an intermediate degree. The competencies that relate to software and multimedia design are available to secondary school teachers with an intermediate degree. The competencies that go into the use of modern technologies are available to secondary school teachers with an average degree.

Sayegh (2017) study was aimed to identifying the degree to which e-learning competencies are practiced among faculty members, King Abdelaziz University (KAU), College of Education, Kingdom Saudi Arabia (KSA). The sample size was (135). A questionnaire was used for collecting data. The study results were as follows: the degree to which faculty members at KAU possessed e-learning competencies was available at medium degree. E-learning practiced by the faculty members at KAU was available at medium degree. There were statistically significant differences in the degree of the faculty members' possession of e-learning competencies due to the college variable, in favor of the college of computing and information technology; However, there were no statistically significant differences in the degree of the faculty members' possession and the extent to which e-learning competencies were practiced; There were statistically significant differences in the degree of the

faculty members' possession and practicing of e-learning competencies due to country of obtaining qualification variable, in favor of individuals who graduated from Universities in Western countries.

Merdas (2014) study was conducted to verify e-learning competencies among teachers of Islamic education teachers at higher school in some States of Kuwait. Purposive sample size was (135) teachers. A questionnaire was used for collecting data. Data was analyzed by SPSS program. The study came out with the following results: There was severe impairment in the teachers' ability to plan and design of any educational software, or use electronic tests to assess students in e-learning. In the light of the results, the researchers recommended that: Holding more training courses for Islamic education teachers at higher school to develop and enhance their competencies in planning and designing e-learning techniques. Establishing an integrated training program by the Ministry of Education for Islamic education teachers at higher school in Kuwait to train on developing their competencies in planning and designing e-learning techniques.

Ahmed (2014) study was aimed to identifying the level of E-learning and its competencies availability for the faculty staff members at the colleges of Sudanese Universities in Khartoum state, Sudan, and to which extent the faculty staff members use it. The study was carried out during the period 2013-2014. Descriptive method was used. the study sample consisted of (188) faculty staff members. A questionnaire and interviews were used for collecting data. The study came out with the following results: The competencies of using the computer and the Internet among the faculty members of the Colleges of Education in the Sudanese universities in Khartoum State were available in a high degree. The e-learning competencies of the faculty members at the colleges of education in the Sudanese universities in Khartoum state were generally available at a medium level; The competencies of planning and evaluation are widely available among the faculty

members of the Colleges of Education in Sudanese universities in Khartoum State. Through these results, the study reached a set of recommendations, the most important of which are: the need to train faculty members in colleges of education to use e-learning, the need to motivate faculty members to use e-learning, provide adequate budget for the use of e-learning in colleges of education in Sudanese universities, and establish an appropriate infrastructure.

Sallam (2013) study was aimed to identify the availability of e-learning competencies among faculty members at the University of Ibb, Yemen, the researcher used the descriptive survey method. A questionnaire used for collecting data. The study sample consisted of (77) faculty members. The results showed that faculty members at the University of Ibb Yemen possess the competencies of e-learning in the aspect of the use of computer and its Peripherals, the aspect of the use of networks and Internet was available with high degree, and possess the qualifications of a culture of e-learning, the design and management of e-learning was available with medium degree.

Al-Anzi (2012) study conducted to find out the faculty members' viewpoint on e-learning in the Kingdom of Saudi Arabia. This study included 500 faculty members from Al-Jouf University and Northern Border University. A questionnaire was used for collecting data. The study came out with the following results: the faculty members have the ability to deal with computers more when compared to their abilities to deal with e-learning, all the faculty members, whether male or female, felt that they are more confident and more suitable for using e-learning and more comfortable with it. The study showed that the female was more enjoyable in e-learning and more preferable to using multimedia. The study indicated that there were no significant differences between males and females in their perceptions of the benefit of e-learning. The study also included knowledge of the self-efficacy of e-

learning, and it was found that members under the age of 45 years have above average competency of members over the age of 45 years. Whereas, members between the ages of 27-32 are more enjoyable in using e-learning than the older members. Younger members indicated that e-learning is beneficial. The study, also, showed that members at the age of 26 have more intentions to use e-learning than members at the age of 39-44 years. The study indicated that members younger than (45) scored highly for their satisfaction with the system.

Kulab (2011) study aimed to identifying the degree of e-learning competencies of the computerized interactive learning teachers at UNRWA schools in Gaza and its relationship to their attitudes. The sample size was (62) teachers of all teachers at UNRWA schools in Gaza, (26) male and (36) female teachers. A questionnaire was used for collecting data. Percentage, Pearson correlation, (T) test and one-way ANOVA were used. The results showed that: There are significant differences at the level of significant (0.05) between the average male and female teachers' grades at the centre of the culture of e-learning, driving computer in favour of males, while there are differences between the averages of the male and female teachers at the centre of the leadership of the Internet, the focus of software design and multimedia multi-educational, There are no statistically significant differences at the significance level (0.05) in all aspects of e-learning competencies according to the number of years of service, There is a correlation at the significance level (0.05) between the degree of availability of e-learning competencies and the degree of trend towards computerized interactive learning. The higher the competencies, the greater the positive trend towards interactive learning. In light of the results, the researcher recommended the necessity of holding training courses for teachers to acquire basic competencies for designing lessons and activities electronically and disseminating the experience of interactive, interactive learning in the schools of the Relief Agency in Gaza.

Al-Umary (2009) study examined the recognition of electronic learning competencies and their degree of availability among the high school teachers at Al-Mekhwah Educational Governorate. The study sample consisted of all high school teachers at Al-Mekhwah Educational Governorate, which reached (306) teachers. A questionnaire used for collecting data. SPSS was used for analysing data. The study results were as follows: There were statistically significant differences at the level of significant (0.05) between the study participants responses due to years of experience in favour of modern service teachers. There were no statistically significant differences at the level of significant (0.05) between the study participants responses due to computer and network training courses. According to the study results, the researchers recommended the following: conducting educational training courses in e-learning field; conducting special courses to provide the teachers with basic electronic skills for lessons and activities; linking the teachers functional performance with training courses attendance and their use of available systems in their classrooms.

Al- Saif (2009) study sought to reveal E-learning Competencies of female faculty staff at the College of Education, King Saud University. The study used descriptive methodology. A questionnaire was used for collecting data. The study sample reached (245) members where (153) have responded. After collecting the related and analysing the related data were analyses by SPSS program. A number of results have been obtained, the most important ones are: The e-learning competencies of the female faculty staff are medium in general, they are represented in high level of using PC in the first place. Also, this is followed by using internet on a high level as well as e-courses design and teaching management system use on a medium level. The study found out that there are statistically significant differences of indication among faculty staff attributed to age regarding the mean of using PC competencies, in favour of staff who are less than 35 years old. There are no

statistically significant differences of indication attributed to age variable in the mean of the other competencies. There are statistically significant differences of indication attributed to variables of scientific degree, place of acquisition, experience in university teaching or the related training courses. The study found out that the obstacles impeding female faculty staff and other related staff from their competencies' development represent in many administrations and teaching loads, discrepancy of academic subjects' time table with training programs provided inside and outside the university; this is in addition to difficulty of designing the e-courses. The study found out that the suitable recommendations of e-learning competencies, development of female faculty staff and other related staff represent in decreasing the teaching load, building training programs conforming to their requirements, variety of provided training programs methods including standard lessons, single learning method and distance learning method. The study provided a recommended method to develop e-learning competencies including mechanisms and policies of development; this is in addition to development programs conforming to three stages: (pre-preparation stage, preparation stage and post training stage) in addition to a number of research suggestions resulted from this study outcomes.

Through the previous studies mentioned above, the researchers found that: four of these studies were conducted at Saudi Arabia, three of which are similar the current study in the topic and study population, such as Sayegh (2017), Al-Saif (2009), Al-Anazi (2012) but differs in study spatial boundaries (KAU, KSU, Al-Jouf U.); the fourth study (Al-Umary, 2009) was similar to the current study in the topic, but differs in the study population and special boundaries (higher school teachers at Al-Makhwah Educational governate. The current study applied in southern KSA (Jazan University) – Jazan City- and the study sample were (faculty staff members (Male & Female)).

## II. METHODS AND MATERIAL

### *Research Goal*

The purpose of this study was to investigate the availability of e-learning competencies among the faculty staff members at Jazan University, Kingdom Saudi Arabia.

### *Sample and Data Collection*

The sample had been selected from the study population by using a purposive sample. A questionnaire was used for collecting data. The researchers had used a readymade questionnaire designed by (Sallam, 2013). The questionnaire consisted of four aspects, first aspect "the competencies of using the computer and its accessories" which consisted of (16) items; the second aspect " the competencies of using networks and the Internet", which consisted (14) items; the third aspect " the competencies of E-learning culture", which consisted of (16) items; the fourth aspect " the competencies of designing and managing E-learning", which consisted of (16) items. Sallam (2013), measured the validity and reliability of the questionnaire by using: Pearson Correlation Coefficient and Cronbach Alpha Coefficient. A typical fifth-level Likert item had been used in the questionnaire, the fifth-level Likert item as follows: (Strongly Applicable), (Applicable), (Applicable to some extent), (Not applicable), (Not Strongly Applicable). The data were analyzed with SPSS personal computer program.

### *The Study Hypotheses*

There is a degree of availability of E-learning competence among the faculty staff members at Jazan University.

There are no significant differences at the level of significance (0.05) between faculty staff members' responses on the availability of E-learning competencies, related to college variable:

$$H_0: \mu_1 = \mu_2$$

$$H_A: \mu_1 \neq \mu_2$$

There are no significant differences at the level of significance (0.05) between faculty staff members' responses on the availability of E-learning competencies, related to experience variable.

$$H_0: \mu_1 = \mu_2$$

$$H_A: \mu_1 \neq \mu_2$$

There are no significant differences at the level of significance (0.05) between faculty staff members' responses on the availability of E-learning competencies, related to qualification variable.

$$H_0: \mu_1 = \mu_2$$

$$H_A: \mu_1 \neq \mu_2$$

There are no significant differences at the level of significance (0.05) between faculty staff members' responses on the availability of E-learning competencies, related to training course variable.

$$H_0: \mu_1 = \mu_2 = \mu_3$$

$$H_A: \mu_1 \neq \mu_2 \neq \mu_3$$

(or at least two means are not equal)

### *Analysing of Data*

All data were analyzed with the SPSS personal computer program. Appropriate statistics for description (frequencies, percentage, means, standard deviations, Mann Whitney test, T-Test, and ANOVA One Way Test) were used.

## III. RESULTS AND DISCUSSION

### RESULTS

#### *A. Research Participants*

The research participants consisted of (330) staff members, who participated in this study and filled out and submitted the electronic questionnaire. All participants were staff members, in different colleges at Jazan university. Information pertaining to the personal and vocational details of the study participants is given in Table (1).

TABLE 1  
THE PERSONAL DATA OF STUDY  
PARTICIPANTS

Variable		Frequency (F)	Percentage (%)
Gender	Male	120	36.4%
	Female	210	63.6%
Qualification	Professor	12	3.6%
	Associate Professor	39	11.8%
	Assistant Professor	141	42.7%
	Lecturer	123	37.3%
	Teaching Assistant	12	3.6%
	Language Teacher	3	1.0%
College	Humanities	138	41.8%
	Science	192	58.2%
Experience	Less than 5 years	15	4.6%
	5-10 years	174	52.7%
	More than 10 years	141	42.7%
Training courses	Non training course	42	12.7%
	1-2 courses	132	40.0%
	More than three courses	156	47.3%

(63.6%) (f: 210) of the study participants were female, with (36.4%) (f: 120) male. In review of participants qualification, Assistant professor is the largest group (42.7%) (f: 141), lecturer is the second largest (37.3%) (f: 123), Associate professor is third largest (11.8%) (f: 39), Professor and teaching assistant are the fourth largest (3.6%) (f: 12), and language teacher is the fifth largest (1%) (f: 3). In the review of College correlation, Science is the largest group (58.2%) (f: 192), Humanities is the second largest (41.8%) (f: 138). In the term of Experience correlation, from 5 to 10 years is the largest group (52.7%) (f: 174), More than 10 years is the second largest group (42.7%) (f: 141), less than 5 years is the third largest group (4.6%) (f: 15). In the review of Training Courses in E-learning, more than three courses, is the largest group (47.3%) (f: 156), from one to two courses is the second largest group (40.0%) (f: 132), and Non training course is the third largest group (12.7%) (f: 42).

#### B. *The first hypothesis*

There is a degree of availability of E-learning competence among the faculty staff members at Jazan University.

To verify this hypothesis, the questionnaire was divided into four aspects, each aspect consisted of a number of items. Mean, standard deviation values for every item were calculated.

#### *First Aspect: The competencies of using computer and its accessories*

This aspect consisted (16) items (1 to 16). Mean, standard deviation values for every item of the first aspect (The competencies of using computer and its accessories) were calculated. Table (2) displayed the mean and standard deviation values.



TABLE 2  
MEAN AND STD. DEVIATION ANALYSIS FOR  
COMPUTER AND ITS ACCESSORIES  
COMPETENCIES

N o.	Competence	Mea n	Std. Deviation
1.	I have the ability to handle Windows	4.72	0.44
2.	I have the ability to operate computer peripherals such as: microphone, camera, printer, scanner)	4.69	0.56
3.	I can use external storage such as: CDs, optical pen, external hard disk, flash memory	4.61	0.67
4.	I can install different programs on Windows	4.35	0.89
5.	I can remove different computer programs from Windows operating system	4.35	0.89
6.	I have the ability to create and organize folders	4.71	0.52
7.	I can distinguish between file types by extension, such as: Docx., Pptx., Html, pdf, AVI	4.50	0.65
8.	I can distinguish between image types according to the extension, such as: JPEG or JPG, PNG, RAW, BMP, TIFF, GIF	4.07	0.98

N o.	Competence	Mea n	Std. Deviation
9.	I have the ability to use antivirus and protection software	4.18	0.91
10.	I can compress or decompress files using a program to decompress and compress files such as: WinZip, WinRAR	4.30	0.93
11.	I can use Microsoft Word perfectly (writing, editing, formatting, tables, revising)	4.77	0.44
12.	I can convert text documents into Pdf	4.81	0.40
13.	I use PowerPoint presentations to design scientific material presentations	4.65	0.54
14.	I can convert audio and video files from one format to another using the appropriate programs	3.82	1.05
15.	I can check the defect if the software or hardware attached to the computer is not working	3.76	1.08
16.	I can use the Data Show and connect it to a computer	4.28	1.00
	Total	4.41	0.74

Table (2) showed values of mean and std. deviation for computer and its accessories competencies. The

biggest mean value (4.81) with standard deviation (0.40) is for the participants who can convert text documents into pdf. The second biggest mean value (4.77) with standard deviation (0.44) is for those who can use Microsoft Word perfectly (writing, editing, formatting, tables, revising). The third biggest mean value (4.72) with standard deviation (0.44), is for the participants who have the ability to handle Windows. The fourth biggest mean (4.71) with standard deviation (0.52) is for the participants who have the ability to create and organize folders. The fifth biggest mean (4.69) with standard deviation (0.56) is for the participants who have the ability to operate computer peripherals such as: microphone, camera, printer, scanner). The sixth biggest mean (4.65) with standard deviation (0.54) is for the participants who use PowerPoint presentations to design scientific material presentations. The seventh biggest mean (4.61) with standard deviation (0.67) is for the participants who can use external storage such as: CDs, optical pen, external hard disk, flash memory. The eighth biggest mean (4.50) with standard deviation (0.65) is for the participants who can distinguish between file types by extension, such as: Docx., Pptx., Html, pdf, AVI. The ninth biggest mean (4.35) with standard deviation (0.89) is for the participants who can remove different computer programs from Windows operating system and who can install different programs on Windows. The tenth biggest mean (4.30) with standard deviation (0.93) is for the participants who can compress or decompress files using a program to decompress and compress files such as: WinZip, WinRAR. The eleventh biggest mean (4.28) with standard deviation (1.00) is for the participants who can use the Data Show and connect it to a computer. The twelfth biggest mean (4.18) and standard deviation (0.91) is for the participants who have the ability to use antivirus and protection software. The Thirteenth biggest mean (4.07) and standard deviation (0.98) is for the participants who can distinguish between image types according to the extension, such as: JPEG or JPG, PNG, RAW, BMP,

TIFF, GIF. The fourteenth biggest mean (3.82) and standard deviation (1.05) is for the participants who can convert audio and video files from one format to another using the appropriate programs. The fifteenth biggest mean (3.76) and standard deviation (1.08) is for the participants who can check the defect if the software or hardware attached to the computer is not working.

This result due to the nature of the faculty members at Jazan University, since the majority of them have a doctorate during recent years, and they have used computers during their studies, in addition to the availability of computers with most of the faculty staff members, especially after Jazan University dispensed laptop devices for all staff members in the university. Also, these competencies do not require high skills to master them, and they cannot be dispensed with while we live in the twenty-first century.

#### *Second Aspect: The competencies of using networks and the Internet*

This aspect consisted (14) items (17 to 30). Mean, standard deviation values for every item of the second aspect (The competencies of using networks and the Internet) were calculated. Table (3) displayed the mean and standard deviation value.

TABLE 3:  
MEAN AND STD. DEVIATION ANALYSIS FOR  
NETWORK AND INTERNET COMPETENCIES

No.	Competence	Mean	Std. Deviation
17.	I can deal efficiently with web browsers like: Firefox, Internet Explorer, Google Chrome	4.74	0.47
18.	I can use search engines like: Google, Yahoo to get scientific information	4.75	0.54

No.	Competence	Mean	Std. Deviation
19.	I can diagnose and address simple network problems	3.98	1.09
20.	I have e-mail handling skills (send-receive)	4.80	0.48
21.	I can handle Attachment files of all kinds - text, images, audio, video	4.70	0.62
22.	I use social networking sites such as; Facebook, Twitter	4.45	0.81
23.	I have the ability to download files from the Internet or upload them.	4.71	0.47
24.	I can use the mailing lists	4.53	0.62
25.	I use some instant chat programs such as; Messenger, Skype, Yahoo	4.50	0.78
26.	I can use online video and audio conferencing	4.27	0.89
27.	I can play online videos like: YouTube	4.65	0.57
28.	I participate in forums and sites related to my specialty	4.10	1.02
29.	I can search specialized databases and electronic information such as databases: ERIC, Science Director	4.00	1.07
30.	I have the ability to create my own website (site)	3.60	1.14
	Total	4.41	0.75

Table (3) showed values of mean and std. deviation for network and INTERNET competencies. The biggest mean value (4.80) with standard deviation (0.48) is for

the participants who have e-mail handling skills (send-receive). The second biggest mean value (4.75) with standard deviation (0.54) is for those who can use search engines like: Google, Yahoo to get scientific information. The third biggest mean value (4.74) with standard deviation (0.47), is for the participants who can deal efficiently with web browsers like: Firefox, Internet Explorer, Google Chrome. The fourth biggest mean (4.71) with standard deviation (0.47) is for the participants who have the ability to download files from the Internet or upload them. The fifth biggest mean (4.70) with standard deviation (0.62) is for the participants who can handle Attachment files of all kinds - text, images, audio, video. The sixth biggest mean (4.65) with standard deviation (0.57) is for the participants who can play online videos like: YouTube. The seventh biggest mean (4.53) with standard deviation (0.62) is for the participants can use the mailing lists. The eighth biggest mean (4.50) with standard deviation (0.78) is for the participants who use some instant chat programs such as; Messenger, Skype, Yahoo. The ninth biggest mean (4.45) with standard deviation (0.81) is for the participants who use social networking sites such as; Facebook, Twitter. The tenth biggest mean (4.27) with standard deviation (0.89) is for the participants who can use online video and audio conferencing. The eleventh biggest mean (4.10) with standard deviation (1.02) is for the participants who participate in forums and sites related to my specialty. The twelfth biggest mean (4.00) with standard deviation (1.07) is for the participants can search specialized databases and electronic information such as databases: ERIC, Science Director. The thirteenth biggest mean (3.98) with standard deviation (1.09) is for the participants who can diagnose and address simple network problems. The fourteenth biggest mean (3.60) with standard deviation (1.14) is for the participants who have the ability to create my own website (site).

This result due to the nature of the faculty members at Jazan University, since the majority of them have a

doctorate during recent years, and they have used computers during their studies, in addition to the availability of computers with most of the faculty staff members, especially after Jazan University dispensed laptop devices for all staff members in the university. Also, these competencies do not require high skills to master them, and they cannot be dispensed with while we live in the twenty-first century.

The researchers attribute the results of the study in the competencies of using networks and Internet to the widespread use of computers and the Internet in recently, and its availability among many people in general and faculty staff members in particular, where they have a high level of culture and education that enables them to access the Internet and interact with others, in addition to the availability of the Internet to most of the faculty staff members at homes, or at Jazan University.

*Third Aspect: The competencies of E-learning culture*

This aspect consisted (16) items (31 to 46). Mean, standard deviation values for every item of the first aspect (The competencies of E-learning culture) were calculated. Table (4) displayed mean and standard deviation results:

TABLE 4  
MEAN AND STD. DEVIATION ANALYSIS FOR  
THE COMPETENCIES OF E-KNOWLEDGE  
CULTURE

No.	Competence	Mean	Std. Deviation
31.	I have an understanding of the concept of e-learning	4.54	0.59
32.	I have knowledge of e-learning goals	4.53	0.64
33.	I have knowledge of the benefits of e-	4.51	0.68

No.	Competence	Mean	Std. Deviation
	learning		
34.	I have a good knowledge of the types of e-learning	4.23	0.78
35.	I know the downsides of e-learning	4.46	0.71
36.	I can distinguish between e-learning and traditional learning	4.71	0.45
37.	I have knowledge of the difficulties facing the e-learning application	4.44	0.72
38.	I have knowledge of international e-learning standards such as: SCORM	3.29	1.23
39.	I have knowledge of e-learning management systems such as: Blackboard, Moodle	4.34	0.72
40.	I have knowledge of some e-content authoring programs such as: Course Lab, Author ware	3.18	1.16
41.	I have a knowledge of the concept of Learning Objects	3.67	1.03
42.	I have knowledge of the second-generation concept of e-learning	3.53	1.09

No.	Competence	Mean	Std. Deviation
43.	I have knowledge of the steps to switching to e-learning	4.11	0.86
44.	I have knowledge of the teacher's roles in e-learning	4.42	0.69
45.	I have knowledge of the student's roles in the e-learning application	4.45	0.70
46.	I have knowledge of e-learning applied models for teaching	4.26	0.81
	Total	4.17	0.80

Table (4) showed values of mean and std. deviation for competencies of E-knowledge culture. The biggest mean value (4.71) with standard deviation (0.45) is for the participants who can distinguish between e-learning and traditional learning. The second biggest mean value (4.54) with standard deviation (0.59) is for those who have an understanding of the concept of e-learning. The third biggest mean value (4.53) with standard deviation (0.64), is for the participants who have knowledge of e-learning goals. The fourth biggest mean (4.51) with standard deviation (0.68) is for the participants who have knowledge of the benefits of e-learning. The fifth biggest mean (4.46) with standard deviation (0.71) is for the participants who know the downsides of e-learning. The sixth biggest mean (4.44) with standard deviation (0.72) is for the participants who have knowledge of the difficulties facing the e-learning application and those who have knowledge of the student's roles in the e-learning application. The seventh biggest mean (4.42) with standard deviation (0.69) is for the participants have knowledge of the teacher's roles in e-learning. The eighth biggest mean (4.34) with standard

deviation (0.72) is for the participants who have knowledge of e-learning management systems such as: Blackboard, Moodle. The ninth biggest mean (4.26) with standard deviation (0.81) is for the participants who have knowledge of e-learning applied models for teaching. The tenth biggest mean (4.23) with standard deviation (0.78) is for the participants who can have a good knowledge of the types of e-learning. The eleventh biggest mean (4.11) with standard deviation (0.86) is for the participants who have knowledge of the steps to switching to e-learning. The twelfth biggest mean (3.67) with standard deviation (1.03) is for the participants who have a knowledge of the concept of Learning Objects. The thirteenth biggest mean (3.52) with standard deviation (1.09) is for the participants who have knowledge of the second-generation concept of e-learning. The fourteenth biggest mean (3.29) with standard deviation (1.23) is for the participants who have knowledge of international e-learning standards such as: SCORM. The fifteenth biggest mean (3.18) with standard deviation (1.16) is for the participants who have knowledge of some e-content authoring programs such as: Course Lab, Author ware.

The researcher explains the result of the study in the e-learning competencies, to the government's interest in general and Jazan University in particular, and to the existence of a valid environment as this is also due to the application of this type of education recently in the shadow of the COVID 19.

#### *Fourth Aspect: The competencies of designing and managing E- learning*

This aspect consisted (16) items (47 to 62). Mean, standard deviation values for every item of the first aspect (The competencies of designing and managing E- learning) were calculated. Table (5) displayed mean and standard deviation results:

TABLE 5  
MEAN AND ETD. DEVIATION ANALYSIS FOR  
THE COMPETENCIES OF DESIGNING AND  
MANAGING E-LEARNING

No.	Competence	Mean	Std. Deviation
47.	I can determine the suitability of the course to be taught electronically	4.35	0.75
48.	I have the ability to set general goals for the e-course	4.30	0.76
49.	I can analyze the characteristics of learners associated with e-learning	4.06	0.98
50.	I can formulate e-course learning goals in a clear, measurable procedural manner	4.04	1.02
51.	I have the ability to define steps for designing online lessons	4.11	0.89
52.	I have the ability to define electronic content and specifications	4.17	0.85
53.	I can apply one of the educational design templates in e-learning	3.92	0.99
54.	I have the ability to convert design specifications into electronic content using authoring tools like: Course Lab, Author ware, PowerPoint	3.74	1.03

No.	Competence	Mean	Std. Deviation
55.	I can include online lessons with activities that encourage student interaction	4.20	0.83
56.	I can include scenes and enrichment links in e-lessons	4.13	0.84
57.	I can choose appropriate teaching and learning strategies for e-learning	4.26	0.77
58.	I have the ability to manage electronic dialogues	4.11	0.89
59.	I can define the feedback patterns that make e-learning successful	4.11	0.89
60.	I have the ability to use assessment methods appropriate for e-learning	4.15	0.84
61.	I have the ability to prepare students to take responsibility for e-learning	4.22	0.80
62.	I can use an e-learning system like: Blackboard, Moodle	4.51	0.64
	Total	4.20	0.85

Table (5) showed values of mean and std. deviation for the competencies of designing and managing E-learning. The biggest mean value (4.51) with standard deviation (0.64) is for the participants who can use an e-learning system like: Blackboard, Moodle. The second biggest mean value (4.35) with standard

deviation (0.75) is for those who can determine the suitability of the course to be taught electronically. The third biggest mean value (4.30) with standard deviation (0.76), is for the participants who have the ability to set general goals for the e-course. The fourth biggest mean (4.26) with standard deviation (0.77) is for the participants who can choose appropriate teaching and learning strategies for e-learning. The fifth biggest mean (4.22) with standard deviation (0.80) is for the participants who have the ability to prepare students to take responsibility for e-learning. The sixth biggest mean (4.13) with standard deviation (0.84) is for the participants who can include online lessons with activities that encourage student interaction. The seventeenth biggest mean (4.17) with standard deviation (0.85) is for the participants who have the ability to define electronic content and specifications. The eighteenth biggest mean (4.15) with standard deviation (0.84) is for the participants who have the ability to use assessment methods appropriate for e-learning. The nineteenth biggest mean (4.13) with standard deviation (0.84) is for the participants who have the ability to manage electronic dialogues. The twentieth biggest mean (4.11) with standard deviation (0.89) is for the participants who can define the feedback patterns that make e-learning successful, and for the participants who have the ability to define steps for designing online lessons and those who can include scenes and enrichment links in e-lessons. The twenty-one biggest mean (4.06) with standard deviation (0.98) is for the participants who can analyse the characteristics of learners associated with e-learning. The twenty-two biggest mean (4.04) with standard deviation (1.02) is for the participants who can formulate e-course learning goals in a clear, measurable procedural manner. The twenty-three biggest mean (3.92) with standard deviation (0.99) is for the participants who can apply one of the educational design templates in e-learning. The twenty-four biggest mean (3.74) with standard deviation (1.03) is for the participants who have the

ability to convert design specifications into electronic content using authoring tools like: Course Lab, Author ware, PowerPoint.

The researcher interprets the result of the study in the competencies of e-learning design and management aspect, that the sample of the faculty staff members at Jazan University have attended many training courses provided by the deanship of e-learning at the university about designing and managing e-learning.

**C. The Second Hypothesis**

There are no significant differences at the level of significance (0.05) between faculty staff members' responses on the availability of E-learning competencies, related to college variable:

$H_0: \mu_1 = \mu_2$

$H_A: \mu_1 \neq \mu_2$

This hypothesis aimed to indicate that, whether the college variable has an effect on faculty staff members' responses on the availability of E-learning competencies. To test this hypothesis, the T-test was used for the difference between two independent sample averages and the results were shown in table (6).

TABLE 6  
T-TEST TO DISPLAY DIFFERENCE BETWEEN THE STUDY PARTICIPANTS' RESPONDES ACCORDING TO COLLEGE VARIABLE

Aspects	College	N	Mean	Std. Deviation	t	df	Sig. (2-tailed)	95% confidence interval		Sig.
								L	U	
1-The competencies of using computer and its accessories	Humanities	138	72.43	7.97	3.333	328	0.001	-0.111	6.262	0.713
	Science	192	69.35	8.47						
2- The competencies of using networks and the Internet	Humanities	138	63.43	6.99	3.568	328	0.000	0.088	5.437	0.929
	Science	192	60.67	6.89						
3- The competencies of	Humanities	138	70.08	8.04	5.421	328	0.000	2.083	9.402	0.00*

E-learning culture	Science	192	64.34	10.40					
4- The competencies of designing and managing E-learning	Humanities	138	70.71	9.14	5.979	328	0.000	3.074	11.485
	Science	192	63.43	12.01					0.000*

\*Significant differences at the level of significance (0.05)

As appeared in table (6), there were significant differences in the aspects, competencies of E-learning culture and the competencies of designing and managing E-learning, in favour of faculty members at humanities colleges, these results due to that, most of colleges of humanities courses taught through e-learning. And it is also noticed that there are no statistically significant differences at the level of significance (0.05) in the remaining aspects of the study, due to the difference in the college variable (Humanities, Science).

**D. The Third Hypothesis**

There are no significant differences at the level of significance (0.05) between faculty staff members' responses on the availability of E-learning competencies, related to gender variable.

$H_0: \mu_1 = \mu_2$

$H_A: \mu_1 \neq \mu_2$

This hypothesis aimed to indicate that, whether the gender variable has an effect on faculty staff members' responses on the availability of E-learning competencies. To test this hypothesis, Mann Whitney U test was used for the difference between two independent sample averages and the results were shown in table (7).

TABLE 7

MANN WHITNEY TEST FOR THE DIFFERENCES IN THE MEANS OF THE STUDY SAMPLE RESPONSES ACCORDING TO THE GENDER VARIABLE

Aspects	Gender	N	Mean Rank	Sum of Ranks	Mann Whitney U	Sig.
1- The competencies of using computer and its accessories	Male	123	222.46	2736	5724.00	0.00
	Female	207	131.65	2725		
2- The competencies of using networks and the Internet	Male	123	229.74	2825	4828.50	0.00
	Female	207	127.33	2635		
3- The competencies of E-learning culture	Male	123	221.77	2727	5809.50	0.00
	Female	207	132.07	2733		
4- The competencies of designing and managing E-learning	Male	123	215.99	2656	6520.50	0.00
	Female	207	135.50	2804		
Total of Aspects	Male	123	227.07	2793	5157.00	0.00
	Female	207	128.91	2668		

As appeared in table (7), there were significant differences between faculty staff members' responses on the availability of E-learning competencies, related to gender variable (Male, Female), in favour of male gender, therefore the Null hypothesis is rejected. The researchers attribute this to the fact that the E-learning competencies are related to the gender variable, and that the male gender have E-learning competencies more than females, these results due to the fact that, the males have more free time than females, which give them an opportunity to enrol in e-learning training courses.



**E. The Fourth Hypothesis**

There are no significant differences at the level of significance (0.05) between faculty staff members' responses on the availability of E-learning competencies, related to experience variable.

H0:  $\mu_1 = \mu_2$

HA:  $\mu_1 \neq \mu_2$

This hypothesis aimed to indicate that, whether the experience variable has an effect on faculty staff members' responses on the availability of E-learning competencies. To test this hypothesis, the T-test was used for the difference between two independent sample averages and the results were shown in table (8).

TABLE 8

MEANS AND STD. DEVIATION AND T-TEST VALUES OF STUDY PARTICIPANTS

Aspects	Experience	N	Mean	Std. Dev.	t	df	Sig. (2-tailed)	95% confidence interval		Sig.
								L	U	
1-The competencies of using computer and its accessories	Less than 5 years	5	68.20	9.38	-1.156	38	0.249	6.92	1.799	0.374
	5 years and more	35	70.76	8.34						
2- The competencies of using networks and the Internet	Less than 5 years	5	60.00	6.64	-1.026	28	0.306	5.58	1.756	0.736
	5 years and more	35	61.91	7.07						
3- The competencies of E-learning and culture	Less than 5 years	5	63.40	12.04	-1.342	28	0.181	8.66	1.632	0.154
	5 years and more	35	66.90	9.77						
4- The competencies of designing and managing E-learning	Less than 5 years	5	57.60	15.31	-3.109	28	0.002	5.19	-3.417	0.014*
	5 years and more	35	66.90	11.11						

\*Significant differences at the level of significance (0.05) and less

Table (8) showed that the mean value of the experience from 5 years and more (66.90), whereas, experience less than 5 years (57.60), for the fourth aspect (the faculty staff members competencies of designing and managing e-learning. The calculated t value is (3.109) which is bigger than the statistical t table value (1.960), df (328). As  $Cal\ t > Tab\ t$  and  $Sig.\ (2\text{-tailed})\ (0.002) < 0.025$ .  $Sig.\ (0.014) < Sig.\ (0.05)$ . This indicated that there are significant differences at the level of sig. (0.05) between experience from 5 years and more and experience less than 5 years in favour of the experience from 5 years and more. It is noticed from Table (8) there were no significant differences, in the other aspects due to the differences in experience variable.

The researcher attributes the result showed in table (8) to the fact that the e-learning competencies (using computers, using internet, and e-learning culture) are not related to the experience in teaching, and that because most of the faculty staff members at Jazan University use computers in their daily lectures, and they use the Internet in their lectures and in taking attendance for their students through their webpage at the university's academic system. But for e-learning competencies of designing and management of e-learning the result related to the experience variable, that may be due to the scarcity of training on this e-learning competency for all faculty staff members

**F. The Fifth Hypothesis**

There are no significant differences at the level of significance (0.05) between faculty staff members' responses on the availability of E-learning competencies, related to qualification variable.

H0:  $\mu_1 = \mu_2$

HA:  $\mu_1 \neq \mu_2$

This hypothesis aimed to indicate that, whether the qualification variable has an effect on faculty staff members' responses on the availability of E-learning competencies. To test this hypothesis, the T-test was used for the difference between two independent

sample averages and the results were shown in table (9).

TABLE 9

MEANS AND STD. DEVIATION AND T-TEST OF THE STUDY PARTICIPANTS

Aspects	Qualification	N	Mean	Std. Dev.	t	df	Sig. (2-tailed)	95% Confidence		Sig.
								L	U	
1-The competencies of using computer and its accessories	Assistant Professor and above	195	70.44	7.92	-0.518	328	0.605	-2.337	1.363	0.504
	Lecturer and less	135	70.93	9.05						
2- The competencies of using networks and the Internet	Assistant Professor and above	195	61.75	7.02	-0.227	328	0.821	-1.736	1.377	0.977
	Lecturer and less	135	61.93	7.13						
3- The competencies of E-learning culture	Assistant Professor and above	195	67.58	10.00	1.859	328	0.064	-0.119	4.222	0.994
	Lecturer and less	135	65.53	9.63						
4- The competencies of designing and managing E-learning	Assistant Professor and above	195	67.40	11.54	1.753	328	0.081	-0.274	4.763	0.848
	Lecturer and less	135	65.15	11.28						

No significant differences at the level of significance (0.05) and less

Table (9) showed that there are no statistically significant differences at the level of significance (0.05) and less in the E-learning competencies among the faculty staff members, due to the difference in the qualification variable (Assistant Professor and above, Lecturer and less). The researcher attributes this result to the fact that the e-learning competencies are not related to the qualification, and that all faculty staff members with their different qualifications carry out the same teaching tasks in the university, under the same circumstances, and may be due to the scarcity of training on any of the e-learning competencies for all members of the university's faculty regardless of their teaching qualification.

G. The Sixth Hypothesis

There are no significant differences at the level of significance (0.05) between faculty staff members' responses on the availability of E-learning competencies, related to training course variable.

H0:  $\mu_1 = \mu_2 = \mu_3$

HA:  $\mu_1 \neq \mu_2 \neq \mu_3$

This hypothesis aimed to indicate that, whether the training course variable has an impact on the availability of E-learning competencies. To test this hypothesis, the One ANOVA Test was used. Table (10) showed the means and standard deviation values of the study participants.

TABLE 10

MEANS AND STD. DEVIATION VALUES OF STUDY PARTICIPANTS

Aspects	Variable	N	Mean	Std. Dev.	95% Confidence	
					L	U
1-The competencies of using computer and its accessories	None training course	42	74.71	8.90	71.937	77.490
	From One to Two courses	129	67.32	8.23	65.891	68.659
	Three courses and above	159	72.26	7.42	71.101	73.427
2- The competencies of using networks and the Internet	None training course	42	65.78	6.29	63.822	67.748
	From One to Two courses	129	58.72	7.38	57.435	60.006
	Three courses and above	159	63.30	5.92	62.373	64.230
3- The competencies of E-learning culture	None training course	42	72.35	7.42	70.043	74.670
	From One to Two courses	129	62.81	8.95	61.254	64.373
	Three courses and above	159	68.45	10.03	66.881	70.024
4- The competencies of designing and managing E-learning	None training course	42	74.50	8.49	71.853	77.146
	From One to Two courses	129	62.27	10.77	60.402	60.155
	Three courses and above	159	67.77	11.31	66.000	69.546

Table (10) showed the mean & std. deviation values of study participants' responses on the availability of E-learning competencies, related to training course variable. The mean value of participants who have not attended any course (74.71, 74.50, 72.35, & 65.78) respectively, whereas the mean value of the participants who have attended three courses and above (72.26, 68.45, 67.77, & 63.30) respectively, and the mean value of participants who have attend from 1-2 courses (67.32, 62.81, 62.27, & 58.72) respectively, so, as showed in table (10),  $\mu_1 \neq \mu_2 \neq \mu_3$ . To verify this result, one-way ANOVA test was used, as appeared in Table (11).

TABLE 11  
ONE-WAY ANOVA TEST TO FOND OUT DIFFERENCES BETWEEN STUDY PARTICIPANTS ACCORDING TO CLASSROOM VARIABLE

Aspects	Sources of contrast	Sum of squares	df	Mean squares	F	Sig.
1-The competencies of using computer and its accessories	Between groups	2533.716	2	1266.858	20.069	0.000
	Within groups	20641.803	327	63.125		
	Total	23175.518	329			
2- The competencies of using networks and the Internet	Between groups	2248.620	2	1124.310	25.974	0.000
	Within groups	14154.534	327	43.286		
	Total	16403.155	329			
3- The competencies of E-learning culture	Between groups	3780.044	2	1890.022	21.743	0.000
	Within groups	28424.574	327	86.925		
	Total	32204.618	329			
4- The competencies of designing and managing E-learning	Between groups	5244.088	2	2622.044	22.534	0.000
	Within groups	38050.303	327	116.362		
	Total	43294.391	329			

Table (11) showed calculated (Cal) (F) value as an indication of differences between the study participants responses on the availability of E-learning competencies, related to training course variable. Cal (F) value was (20.069, 25.974, 21.743, & 22.534), whereas (F) value that derived from the statistical table (Tab) was (2.995). Since F Cal value > F Tab value, and also level of significant adopted for this study (0.05) > (0.000). Thus, the null hypothesis (H0) (There were no significant differences between faculty staff members' responses on the availability of E-learning competencies, related to training course variable) was rejected. Once the null hypothesis was rejected, we have to determine which of the means is not equal, to verify this, comparison differences were used to compare every two mean values together, the hypotheses for this is as follows:

H0:  $\mu_i = \mu_j$ ,  
HA:  $\mu_i \neq \mu_j$ ,  $i < j = 1, 2, 3$

TABLE 12  
MULTIPLE COMPARISON TO COMPARE MEAN VALUES TO GETHER

Aspects	Training courses (i)	Training courses (j)	Mean difference (i-j)	Std. Error	Sig.	95% Confidence	
						L	U
LSD 1-The competencies of using computer and its accessories	None training courses	From 1-2 courses	7.38870*	1.41149	0.000	4.6120	10.1655
		3 courses and above	2.45013	1.37840	0.076	-0.2614	5.1618
		None training courses	-7.38870*	1.41149	0.000	-10.1655	-4.6120
From 1-2 courses	3 courses and above	None training courses	-4.93857*	0.94146	0.000	-6.7907	-3.0865
		From 1-2 courses	4.93857*	0.94146	0.000	3.0865	6.7907
		3 courses and above	-2.45013	1.37840	0.076	-5.1618	0.2614
Thre e	None traini	-2.450	1.37840	0.076	-5.1615	0.2615	

Aspects	Train ing cours es(i)	Train ing cours es(j)	Mean differ ence (i-j)	Std. Erro r	Sig.	95% Confidence		Aspects	Train ing cours es(i)	Train ing cours es(j)	Mean differ ence (i-j)	Std. Erro r	Sig.	95% Confidence		
						L	U							L	U	
						<b>2- The competencies of using networks and the Internet</b>								courses and above	13	
None training courses	7.06478*	1.1688300	0.0000	4.7654	9.3642			None training courses	From 1-2 courses	12.22093*	1.9163900	0.0000	8.4509	15.9909		
None training courses and above	2.48383*	1.1414336	0.0084	0.2384	4.7293			None training courses and above	3 courses	6.72642*	1.8714600	0.0000	3.0448	10.4080		
From 1-2 courses	-	7.06478*	1.1688300	0.0000	-			9.3642	From 1-2 courses	None training courses	-	12.22093*	1.9163900	0.0000	-	15.9909
Three courses and above	-	2.48383*	1.1414336	0.0000	-			4.7293	Three courses and above	3 courses and above	-	5.46452*	1.2782300	0.0000	-	8.0091
None training courses	-	2.48383*	1.1414336	0.0030	-			4.7293	None training courses	None training courses	-	6.72642*	1.8714600	0.0000	-	10.4080
From 1-2 courses	-	9.54319*	1.6563500	0.0000	-			12.8016	From 1-2 courses	From 1-2 courses	-	5.49452*	1.2782300	0.0000	-	2.9799
None training courses and above	-	3.90431*	1.6175100	0.0000	-			7.0864	None training courses and above	None training courses	-	12.22093*	1.9163900	0.0000	-	15.9909
From 1-2 courses	-	9.54319*	1.6563500	0.0000	-			12.8016	From 1-2 courses	From 1-2 courses	-	5.63888*	1.1047800	0.0000	-	7.8123
Three courses and above	-	2.48383*	1.1414336	0.0016	-			4.7293	Three courses and above	None training courses	-	3.90431*	1.6175100	0.0064	-	7.0823
None training courses	-	7.06478*	1.1688300	0.0000	-			9.3642	None training courses	None training courses	-	9.54319*	1.6563500	0.0000	-	12.8016

\*The mean difference is significant at the (0.05) level.

Table (12) showed the comparison mean values, which compared every two mean values together to determine which value is significant. The researchers notice that, regarding the first aspect (The competencies of using computer and its accessories): The differences between mean values of (None training course) group and (From 1-2 courses) group are significance. The difference between mean values of (None training course) group and (Three courses and above) group is not significance. The difference between mean values of (From 1-2 courses) group and (Three courses and above) group is significance. Regarding the third aspect (The competencies of E-

knowledge culture): The differences between mean values of (None training course) group and (From 1-2 courses) group are significance. The difference between mean values of (None training course) group and (Three courses and above) group is significance and the difference between mean values of (From 1-2 courses) group and (Three courses and above) group is significance. Regarding the fourth aspect (The competencies of designing and managing E- learning): The differences between mean values of (None training course) group and (From 1-2 courses) group are significance. The difference between mean values of (None training course) group and (Three courses and above) group is significance and the difference between mean values of (From 1-2 courses) group and (Three courses and above) group is significance. Regarding the second aspect (The competencies of using networks and the Internet): The differences between mean values of (None training course) group and (From 1-2 courses) group are significance. The difference between mean values of (None training course) group and (Three courses and above) group is significance and the difference between mean values of (From 1-2 courses) group and (Three courses and above) group is significance.

#### IV. CONCLUSION

The research concluded that:

1- Personal data of the faculty staff members were analysed. (63.6%) of them were female; (42.7%) of them were assistant professor; (58.2%) of them were from Science colleges; (52.7%) of them their experience ranged between 5-10 years; (47.3%) of them were those who were attended more than three courses in e-learning.

2- According to study participants' response to the questionnaire aspects, the participants possess electronic learning competencies.

3- There were statistically significant differences in the aspects (competencies of e-learning culture) and (competencies of designing and managing e-learning)

related to college variable, in favour of humanities colleges.

4- There were statistically significant differences between the faculty staff member responses on the availability of e-learning competencies, related to gender variable, in favour of male gender.

5- There were statistically significant differences in the aspect (competencies of designing and managing e-learning) related to experience variable, in favor of experience from 5 years and more.

6- There were statistically significant differences in the e-learning competencies, due to the difference in qualification variable.

7- There were statistically significant differences in the e-learning competencies, related to the training courses.

#### RECOMENDATION

Organizing training courses in the field of e-learning for faculty members at Jazan University in the Kingdom of Saudi Arabia, especially in the field of designing and managing e-learning.

#### SUGGESTION

The researcher suggests conducting the following studies:

1- Conducting a similar study on other Saudi Arabian universities.

2- Conducting a study to find out the degree of availability of e-learning competencies among Jazan University students.

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# Proctored Online Examination System Using Deep Learning and Computer Vision

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## ABSTRACT

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This paper focuses on the online examination system developed with the goal to make online examinations more accessible and reliable using deep learning models for the proctoring system. It also covers the various technologies and languages used in the development process, including but not limited to HTML3, CSS5, BOOTSTRAP5, Django, Python. The developed system is reliably able to detect and counter any attempts at cheating during the exam, and provides a user-friendly system interface with focus on ease of use and simplicity.

**Keywords** : Online Examination System, Django, Opencv, Facial Feature Detection.

## I. INTRODUCTION

Today, the Covid-19 pandemic has completely changed the way our world works. Everything from healthcare, government, to education has been affected by it. Its times like these that call for revolutions in our systems. Our education system is currently undergoing such drastic change, with immense focus on minimizing physical contact, and switching to virtual alternatives.

Our goal while developing this web based system has been the same, to change the way we've perceived exams, to take things online while ensuring the system prevents any attempts at cheating. To achieve this, we've developed the system as simple and reliable as possible, and have used Tensorflow 2.5, and the OpenCV libraries to train and deploy the face

detection model. The back-end is completely developed using the Django framework, in Python3.

## II. EXISTING EXAMINATION SYSTEMS

Our education system has always been dependent on physical examinations. However, that is not an option anymore due to risks of COVID-19 infection. Over 1,00,000 new positive patients are found every single day in the state of Maharashtra (\*as of the writing of this paper). With schools and colleges closed down, and the risk of another lockdown to be put in effect, the authorities have made attempts to take things online.

However, after multiple exams being conducted online, it is observed that students have scored remarkably high in tests without any camera based

proctoring, indicating ill-measures taken by students during the exams. To tackle this, platforms have implemented different forms of proctoring system. However, their reliability is still not on par with physical examinations.

### III. SYSTEM DESIGN BASICS

Our system is web-based, which is needed for it being easily accessible with a basic internet connection. The front-end for the system is developed using HTML3, CSS5, and some bootstrap components. This includes

- Home Page
- Login/Sign-up page
- User account home, and dashboard.
- User specific feature pages, etc

The back-end is completely done using the Django framework, and the SQLITE3 database. This includes- Three types of User Profiles (Admin, Student, Teacher)

Separate login/sign-up access for each.

Complete logic for the quiz system.

User identification and based on it access and working of user specific features.

The proctor system has following features implemented so far:

- Face Tracking
- Gaze Detection
- Mouth and Gesture detection

The complete system design will be explained in detail as we move forward.

### IV. RESEARCH AND LEARNING CURVE

Great development has been done so far in fields of image detection and UI design. Platforms like Django, Bootstrap make UI design, back-end work a

pleasurable breeze IF you have experience and knowledge using them.

However, without proper knowledge, time has to be dedicated to perform research and study in respective technologies. Our research was focused on learning the different libraries available for face detection, and using Tensorflow to implement a model using those libraries that can efficiently perform the required task without excess load on a user's system.

On average it took us around 1 week to learn these technologies, with 2-3 hours of time invested every day. Similar times can be expected if you have a good object-oriented coding background.

Documentation is openly available for the same, while research papers were acquired and studied from IEEE, and are mentioned at the end of the paper.

### V. DETAILED SYSTEM WORKING

The entire system is based on the three main user types, i.e. student, teacher, admin. This has been implemented in the Django User model using one to one relationship to the User model itself. (Check Django Documentation online for more information.)

Their roles are as follows-

#### A. Student -

- A student will be able to register/login to the system. For registration, student needs to enter appropriate details followed by uploading their profile picture. For logging in, they need to enter the username and password they entered during the registration system.
- After logging in, student can perform two main actions, take an exam and check scores of previous attempts.



- The exams are divided by their respective courses, and each exam has a certain number of questions with their respective marks and time limit.
- Once a student starts an exam, the timer starts on the server side and tracks the exam throughout the time limit. During that, the student is monitored using the proctoring system (more details in next section), and if the system detects three major malpractices, it automatically disqualifies the student.
- Every attempt of the student is recorded and the results of which are available to be checked at their desire.

#### B. Teacher -

- A teacher is responsible for adding proper quizzes to the system, adding questions and has a certain salary for their activities,
- After registration (process is similar to student), a teacher's account has to be accepted by an admin before they can make any changes to the system. During that, the admin also enters appropriate salary for the teacher.
- As mentioned above, a teacher can add quizzes based on their course, and has to enter the following details regarding a quiz - quiz name, course, total questions, time limit.
- After creating a quiz, a teacher can add questions for that particular quiz from the add questions menu.

#### C. Admin -

- The admin has the most privileges and responsibilities in the system.
- The admin can check and update any teacher or student profile in the system.
- They can also add/change quizzes and add/remove questions.
- They can also check results of all student attempts so far in the system.

- Along with this, admin access allows a user to directly change values in the database using Django admin module.

The logic for all the above operations is implemented using the Django framework. The user-specific login system uses Django's built-in "login" and "login\_required" functions, where the latter is also useful in preventing unauthorized access to any features of the system. Django uses the Python language for everything, making it extremely convenient and easy to learn. There's a plethora of built-in features like support for multiple relational databases, built-in function libraries being constantly updated by the community, etc. The database used in our system is SQLITE3, due to its simplicity and low system load.

The front end for the system was developed using HTML3, CSS5, JavaScript. Some components from the BOOTSTRAP frameworks like "cards" and "jumbotron" were also used for making the design more responsive and visually appealing.

- So, Where is Deep Learning working?

Online exam is not about just conducting the examination. To make it more realistic and trustworthy, monitoring examinee during exam is the most essential part. To add this functionality, deep learning and computer vision has a lot to offer. Automated proctoring of examinee using webcam can be used to monitor the examinee.

During a test, it is required for the user to keep their webcam active. Using the real-time captured data from webcam, data is sent to trained models which further help in monitoring examinee. It will check for following functionalities:

- A. Face spoofing: To identify whether the examinee is real or a photograph or image as per the

captured image, Face spoofing is used. Caffe module of OpenCV's DNN module is used to check the user. After capturing image, required region of face is taken into consideration and further transformed into color-spaces. Later, calculation of histogram and sending required data to the model is carried out to get expected output which is then checked as per the probability function.

- B. Head pose estimation: To check in which direction the examinee is looking, Head Pose estimation is used.
- C. Eye tracking: Extracting features and facial landmarks from data allows the algorithm to map the region near the eyes. This mapped region is then used to detect the sight of the user.

By carefully analyzing these features and the extracted information, Monitoring of examinee is done.

## VI. ADVANTAGES

Simple and user friendly yet eye catching UI, variety of features, and the proctoring system can be termed as the jewels of the system. Our Proctoring AI tracks multiple facial features, making it more reliable at detecting malpractice. The system itself has moderate system load, and is able to run smoothly on weak system.

The system tests were performed on a laptop with following specifications-

- Second Gen Intel I3 processor.
- 6GB Ram
- 128GB SSD
- Intel HD Graphics 2000

During testing, the implemented models were able to give 5-10 fps constantly.

## VII. CONCLUSION

Proposed paper gives a good idea about design and development process of an online examination system using a web-based application and monitoring the user throughout the session using different deep learning and computer vision algorithms and libraries.

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# Interoperability and Synchronization Management of Blockchain-Based Decentralized e-Health System

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## ABSTRACT

A huge amount of data, generated by different applications in computer network, is growing up exponentially based on nonstop operational states. Such applications are generating an avalanche of information that is disruptive for predictable data processing and analytics functionality, which is perfectly handled by the cloud before explosion growth of Big Data. Blockchain technology alleviates the reliance on a centralized authority to certify information integrity and ownership, as well as mediate transactions and exchange of digital assets, while enabling secure and pseudo-anonymous transactions along with agreements directly between interacting parties. It possesses key properties, such as immutability, decentralization, and transparency that potentially address pressing issues in healthcare, such as incomplete records at point of care and difficult access to patients' own health information. An efficient and effective healthcare system requires interoperability, which allows software apps and technology platforms to communicate securely and seamlessly, exchange data, and use the exchanged data across health organizations and app vendors. Unfortunately, healthcare today suffers from fragmented data, delayed communications, and disparate workflow tools caused by the lack of interoperability. Blockchain offers the opportunity to enable access to longitudinal, complete, and tamper-aware medical records that are stored in fragmented systems in a secure and pseudo-anonymous fashion. The proposed work carried out blockchain implementation in distributed computing environment and it also provide the automatic recovery of invalid chain. This also determines the impact of those security issues and possible solutions, providing future security-relevant directions to those responsible for designing, developing, and maintaining distributed systems.

**Keywords:** Blockchain Technology, Decentralization, Decentralized System, Distributed Computing, Peer-to-Peer Network, Healthcare

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## I. INTRODUCTION

A blockchain system can be considered as a virtually incorruptible cryptographic database where critical medical information could be recorded. The system is maintained by a network of computers, that is accessible to anyone running the software. Blockchain operates as a pseudo-anonymous system that has still privacy issue since all transactions are exposed to the public, even though it is tamper-proof in the sense of data-integrity. The access control of heterogeneous patients' healthcare records across multiple health institutions and devices needed to be carefully designed. Blockchain itself is not designed as the large-scale storage system. In the context healthcare, a decentralized storage solution would greatly complement the weakness of blockchain in the perspective.

The blockchain network as a decentralized system is more resilient in that there is no single-point attack or failure compare to centralized systems. However, since all the bitcoin transactions are public and everybody has access, there already exist analytics tools that identify the participants in the network based on the transaction history. With popularity analytics, similarity or closeness among topics within large volume of data can be detected. Groups of items or topics can be system generated using closeness relationship formulation. As information flows among different nodes in bitcoin network, Bitcoin transaction is slow due to the fact that information needs to be propagated across the network to synchronize the ledger replicas. The slow dissemination of information exposes a potential security hole for the malicious attacks. Some measures have been implemented to mitigate the number of the blockchain forks in the network

by 50%. However, a long-term solution is still needed. Like any other networks, Bitcoin network is no exception when it comes to malicious attacks. One of the notable forms of attack against Bitcoin network topology is eclipsing attack by using information propagation knowledge. Bitcoin peer-to-peer network topology can be inferred and utilized by malicious attackers to perform precise attacks such as eclipsing attack. By observing the flooding process of the information flow, a flooding network's topology can be inferred. A network topology inference method has been proposed along with a proof of concept in real network. The critical players of bitcoin transactions can be identified use various network centrality metrics. Blockchain might replace conventional methods of keeping track of valuable information such as contracts, intellectual-property rights, and corporate accountings. Personal healthcare records need to be protected with the highest standard. With the increasing number of data breach incidents in the past several years, the awareness of the general public about the personal data privacy will continue to increasing. The necessity for data privacy will grow stronger with an increasing number of services and device collecting our personal data associated with our personal identity. There are techniques that obfuscate the linking of pseudonymous address and the real person such as Coin Join.

## II. LITERATURE SURVEY

- According to **Davidson et al. 2016** [1] as said, BT is a new institutional technology of governance that competes with other economic institutions of capitalism, namely firms, markets, networks, and even governments. present this view of BT through a case study of Back feed, an Ethereum-

- based platform for creating new types of commons-based collaborative economies. This case was developed for evaluating contributions to projects on a network. Back feed introduces a social protocol on top of blockchain-based infrastructures to coordinate individuals through the creation and distribution of economic tokens and reputation scores. Its purpose is to eventually allow for the emergence of meritocratic systems and emergent alternative economies that can variously augment or substitute for extant modes of economic governance (i.e. provided by hierarchies or markets). At its core, Backfeed is an engine for decentralized cooperation between distributed agents. It implements a Social Operating System for decentralized organizations, enabling massive open-source collaboration without any form of centralized coordination.
- According to **Johansen, 2016** [2] Due to the novelty of concepts and the underlying technologies, system provide a new overview on recent developments and related literature in this book and strive to explore the related concepts in the literature. Through exploration of the concepts, system dive into the blockchain utilization as a technological platform for an upcoming ecosystem of applications and software and look at the theoretical features of the technology as a foundation for this paper. Thus, system enhance the understanding of the technology in other contexts throughout the literature and explore the current contributions to the literature. This study has implications for both researchers and practitioners. For researcher's system seek to open research lines on enablement of the BT as a platform-centric technology for ecosystems to flourish as those of OI. For practitioners, system illustrate that it is crucial to keep developing on the technology, as research indicates that system have still not reached the tipping point of the technology.
  - According to **Glaser Bezzenger, 2015** [3] following the theoretical introduction, this system aims to further elaborate on the theoretical grounding in order to give a brief summary of prior research and highlight potential areas for future research. Additionally, system seek to establish a common understanding of the theory within the field of OI regarding the BT. Within the OI research area, BT is still considered a novel innovation and has yet to become a part of the mainstream OI research. This is furthermore supported by the general landscape, whose primary focus has been on the blockchain as a cryptographic economic system, e.g. Bitcoin.
  - According to **Lember, 2017** [4] In fact, the several technologies associated with the smart city, such as electronic sensors or urban control rooms and city labs, as well as emerging technologies, such as blockchain, 21 that enable peer-to-peer service delivery are becoming more central to the ways citizens engage with public-service delivery under the schemes of OI dedicated user/citizen-innovation, technology, and living labs to accelerate technological innovations in the public sector. All these approaches aim at putting user experience at the center of the public sector innovation processes; however, these experimental units and methods are still far from becoming an organic part of the public sector and its change.
  - According to **Pazaitis et al., 2017** [5] explores the potential of the blockchain technology in enabling a new system of value that will better support the dynamics of social sharing. System study begins with a discussion of the evolution of value perceptions in the history of economic thought. Starting with a view on value as a mechanism that defines meaningful action within a certain context, system associate the price system with the establishment of capitalism and the industrial economy. system then discuss its relevance to the information economy, exhibited

as the techno-economic context of the sharing economy, and identify new modalities of value creation that better reflect the social relations of sharing. Through the illustrative case of Backfeed, a new system of value is envisioned, comprised of three layers: (a) production of value; (b) record of value; and (c) actualization of value. In this framework, system discuss the solutions featured by Backfeed and demonstrate a conceptual economic model of blockchain-based decentralized cooperation.

### III. PROPOSED WORK

The security challenges are still among the major obstacles when considering cloud adoption services. The main reason is that the database is hosted and processed in the cloud server, which is beyond the control of the data owners. For the numerical query, these schemes do not provide sufficient privacy protection against practical challenges. In this system we propose different data instance architecture for a secure database with that provide protection to several questions related to the numeric range. We implement a three-layer/instance storage framework based on data computing.

The technology of Blockchain attracts high attention first of all due to the possibility of decentralizing highly risky operations, which are traditionally carried out in predetermined data centers. The most well-known example of use is the replacement of the function of conducting transactions within the system of bank transfers to a decentralized network of cryptographic handlers. The essence of this method of processing financial transactions is the encryption of transaction sets combined into blocks with the inclusion in the code of the unique identifier code of the previous block.

- Large data storage at the required of decentralized data storage as well as information system

- The different attack issues in centralized database architectures.
- There is no automatic attack recovery in central data architectures
- The decentralized architecture provides the automatic data recovery from different attacks.

After the analysis of this system we move to develop the decentralized system architecture, and distributed computing provide parallel processing in distributed environment.

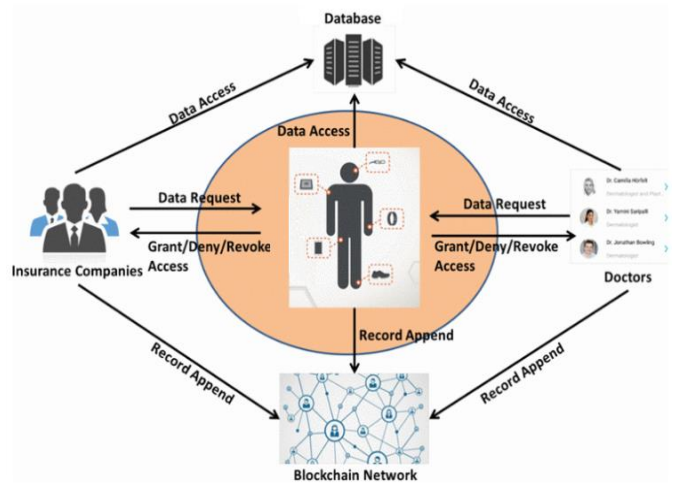


Figure1 : System Architecture

### IV. OBJECTIVES

- To design approach for health insurance company where system store all historical data into block chain manner.
- To create a distributed computing environment hierarchy for parallel data processing for end user's applications.
- To design implement own SHA family block for whole blockchain.
- Each transaction has stored on dependent blockchain in cloud environment.
- To design and implement a new mining technique for generate new block for each transaction.
- To implement a verification algorithm which can validate each peer on every access request.

## V. CONCLUSION

There are many research directions in applying Blockchain technology to the healthcare industry due to the complexity of this domain and the need for more robust and effective information technology systems. An interoperable architecture would undoubtedly play a significant role throughout many healthcare uses cases that face similar data sharing and communication challenges. From the more technical aspect, much research is needed to pinpoint the most practical design process in creating an interoperable ecosystem using the Blockchain technology while balancing critical security and confidentiality concerns in healthcare. Whether to create a decentralized application leveraging an existing Blockchain, additional research on secure and efficient software practice for applying the Blockchain technology in healthcare is also needed to educate software engineers and domain experts on the potential and also limitations of this new technology. Likewise, validation and testing approaches to gauge the efficacy of Blockchain-based health care architectures compared to existing systems are also important (e.g., via performance metrics related to time and cost of computations or assessment metrics related to its feasibility). In some cases, a new Blockchain network may be more suitable than the existing Blockchain; therefore, another direction may be investigating extensions of an existing Blockchain or creating a healthcare Blockchain that exclusively provides health-related services.

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# A Review on $Mn_3O_4$ and Its Composite Nanomaterials of Diverse Morphologies as an Electrode Material in Supercapacitors

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## ABSTRACT

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$Mn_3O_4$  and its composite nanomaterials have become promising candidate as an electrode for supercapacitor devices, because of its low cost, non-toxicity, large abundance, high porosity and high capacitance values in aqueous electrolyte. Here, we systematically summarized the impact of different morphologies of  $Mn_3O_4$  and its composite nanomaterials on supercapacitive performance. Many researchers synthesized various  $Mn_3O_4$  and its composite nanomaterials of exceptional properties and different morphologies for energy storage. This article reviews recent efforts and developments in synthesis methods  $Mn_3O_4$  and its composite nanomaterials as an electrode material in supercapacitor.

**Keywords:**  $Mn_3O_4$  and its composite, Electrode material, Supercapacitor.

## I. INTRODUCTION

Due to vital scientific significance and wide applications arises because of their tunable properties, nanomaterials having at least one dimension is less than 100 nm, have attracted great attention of many researchers. In addition, nanomaterials have phase, size and morphology dependent physical and chemical properties and applications; therefore, many efforts made to govern the phase, shape, size and morphologies of nanomaterials. The nanomaterials can be synthesized using variety of reagents and tactics with extensive range of reaction circumstances [1]. The electrodes of nanomaterials Manganese oxide have enormous applications in electrochemistry, due to

their exceptional electrochemical properties such as high capacitance, huge surface area, and small current densities [2]. Water purification, catalysis, sensors, supercapacitors, and alkaline and rechargeable batteries were some fascinating applications of Manganese oxide having different phases such as  $MnO$ ,  $MnO_2$ , and  $Mn_3O_4$ , and their composite materials. Particularly, the  $Mn_3O_4$  electrode replaced the toxic  $RuO_2$  electrode in electrochemical charge storage devices due to the its parameters like low cost, non-toxicity, large abundance, high porosity and high capacitance values in aqueous electrolyte [3]. The proper dopant can perturb the growth process of the  $Mn_3O_4$  electrode, during chemical reaction and it can modify the morphology of nanostructure. So selecting

proper dopant, there is possibility to change morphology of  $Mn_3O_4$  nanostructured electrode. [4]. There are numerous synthesis techniques have been reported by various researchers to prepare Manganese oxide nanomaterials of several morphologies and distinct properties, such as Electrodeposition, Sol-gel, Hydrothermal, Chemical bath deposition, SILAR, Spray pyrolysis etc. [5]. In last decade, many efforts executed to inspect the different properties and applications of  $Mn_3O_4$  nanostructured electrode, for example, Y. Kong et al. reported the synthesis of octahedron-like  $Mn_3O_4$  nanocrystals by single-step hydrothermal reduction method and reported that it is the most promising element in assemble lithium-ion batteries [6]. X. Zhang et al successfully synthesized  $Mn_3O_4$  nanowires of diameter 15 nm and a length of the order of several micrometers hydrothermally, without any use of surfactants [7]. H. Shah and coworkers prepared square-shaped nanostructures by hydrothermal-growth method and reported that it has potential applications in supercapacitors and Li ion batteries [8]. Thus, to keep the readers up-to-date of the rapid development, it is essential to review the advancement of  $Mn_3O_4$  nanomaterials. In this article, we review the different  $Mn_3O_4$  nanomaterials of various morphologies and their supercapacitive application.

## II. SYNTHESIS OF $Mn_3O_4$ NANOMATERIALS

At room temperature,  $Mn_3O_4$  has a tetragonal structure and due to Jahn–Teller distortion along c axis at the  $Mn^{3+}$  sites, it has a distorted spinel structure. Manganese ions lodge the octahedral site ( $Mn^{3+}$ ) and tetrahedral site ( $Mn^{2+}$ ) corresponds to a normal spinel structure. There are 32 oxygens and 24 cations in the unit cell. Generally, the ionic formula of  $Mn_3O_4$  is  $Mn^{2+}[Mn_2^{3+}]O_4$ . At 33 K, the chemical and magnetic unit cells become identical with rearrangement of moments and it is ferromagnetic up to 43 K. Therefore, its study gains importance as it has wide applications [9].

A. Ullah et al. via a gel formation route reduced the  $KMnO_4$  with glycerol at 80 °C in aqueous media to synthesize  $Mn_3O_4$  nanoparticles. They observed temperature dependent phase transformation of  $Mn_3O_4$  into  $Mn_5O_8$  and  $Mn_2O_3$  with distinct surface morphologies viz., spherical, rod and cube shape respectively through heat treatment [10]. Using the precipitation method, in presence of CTAB, H. Dhaouadi et al. synthesized  $Mn_3O_4$  nanoparticles of tetragonal structure with crystallite size ranges from 20 nm to 80 nm. They observed that temperature dependence of dielectric properties of  $Mn_3O_4$  nanoparticles at higher frequency [11]. Y. Tan successfully fabricated 1D single-crystalline  $Mn_3O_4$  nanostructures under solvothermal conditions. They easily tuned the diameter and length of nanostructures by altering the concentration of the precursor [12]. W. Wang did decomposition the precursor  $MnCO_3$  nanoparticles in NaCl flux to synthesize nanowires of  $Mn_3O_4$  with diameters 30 -60 nm [13]. Using co-precipitation, sol-gel and hydrothermal methods, B. Jhansi Rani et al synthesized different nanostructures of Hausmannite ( $Mn_3O_4$ ) plate like nano-grains, coin like nano-sphere and nano-petals and they studied the structural, morphological, optical, electrochemical and magnetic properties of nanostructured materials [14]. A. U. Ubale et al employed simple and economic SILAR method for deposit nanostructured thin films on glass surface at room temperature [15]. Using  $MnCl_2 \cdot 4H_2O$  and KOH precursors, A.M. Toufiq and coworkers grown self-assembled 3D coins-like nanostructures having single-crystalline tetragonal  $Mn_3O_4$  nanoparticles of average diameter 95 nm and thickness 35 nm [16]. H. K. Yang et al. to fabricated homogeneous micro-spherical particles having porous structure of  $Mn_3O_4$  carbon composite material using ultrasonic spray pyrolysis technique with the help of surfactants TX 114, P123, F127. They elaborated particles of smaller size and high surface area using TX 114 surfactant with active bi-functional catalyst [17]. H. L. Fei and coworkers explained the synthesis of microflowers of  $Mn_3O_4$  made up of super thin nano

sheets by solvothermal method using CTABr surfactant. They reported the morphology dependence of  $Mn_3O_4$  on solvent [18]. Low temperature chemical bath deposition technique was used to prepare  $Mn_3O_4$  thin films of smooth surface made up of the crystalline nanograins by H. Y. Xu. et al [19]. J. K. Sharma et al. reported the low budget green synthesis, using the reducing agent, a leaf extract of *A. Indica* (Neem) plant, synthesize uniform  $Mn_3O_4$  nanoparticles for chemical sensor application [20].

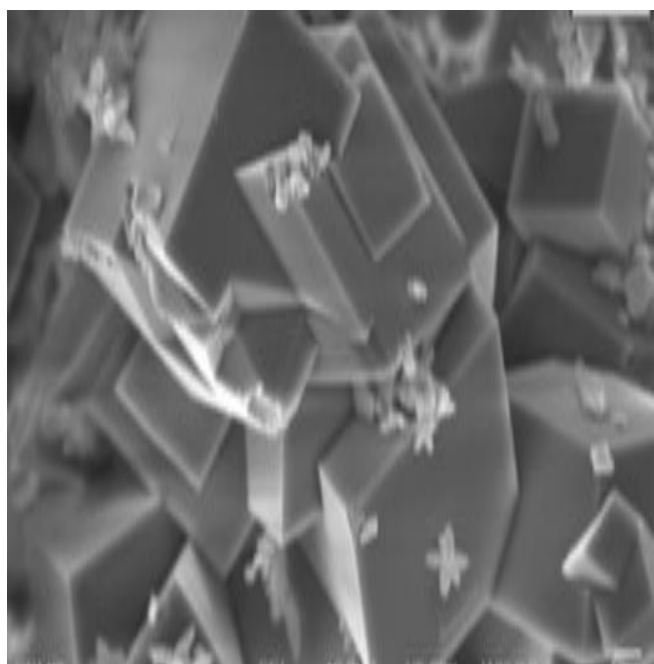


Figure 1 The SEM images of  $Mn_3O_4$  thin film at (a)  $\times 2000$  and (b)  $\times 5000$  magnifications (interlocked cubes) [21]

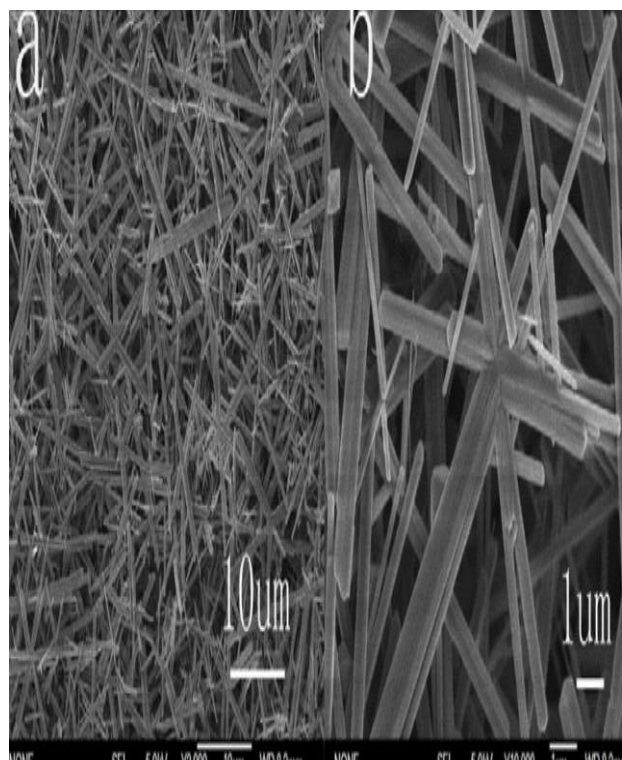


Figure 2 Low (a) and (b) high magnification FESEM images of  $Mn_3O_4$  nanorods [22].

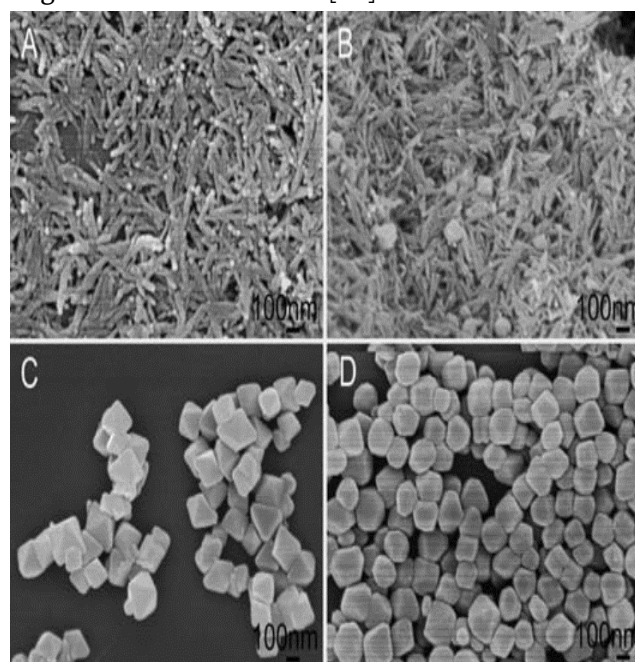


Figure 3. FESEM images of the  $Mn_3O_4$  nano-octahedrons for various reaction times: (A) 1.5 h; (B) 2 h; (C) 3 h; (D) 8 h [33].

### III. $Mn_3O_4$ NANOMATERIALS FOR SUPER CAPACITOR APPLICATION

Supercapacitors have the ability to charge and discharge quickly, high power density and outstanding cyclic stability, but their small energy density dragged them back in several such applications. Depending on mechanisms, that governing capacitance the supercapacitors are classified into two types. First type is electrical double layer capacitor (EDLC) in which double layer of charges at the interface of electrode and electrolyte is responsible for capacitance and in second type pseudo or redox capacitor where capacitance arises due to oxidation-reduction reactions. Researchers are trying to search many novel materials and processes to improve energy density values by manufacturing new electrode materials, electrolytes and device designing [23]. Among many metal oxides,  $Mn_3O_4$  and its composites have attracted more attentions due its large advantageous parameters and special properties.

Y. Luo and coworkers synthesized interlocked  $Mn_3O_4$  cubes by mixing 1.9791g  $MnCl_2 \cdot 4H_2O$  and ethyl alcohol with constant stirring for 30 min. at room temperature. Then they dried the solution in an oven at 100 °C for eight hours with final calcination at 500 °C for two hours. They observed that it could be a promising candidate as electrode material for super capacitors showing excellent specific capacitance in terms of fast charge–discharge rate, high specific power and long life span [24]. Microwave-assisted reflux synthesis method used by K. V. Sankar  $Mn_3O_4$  nanoparticles of size 50 nm having tetragonal structure. Low internal resistance, high capacitance (94 F g<sup>-1</sup>) in 6M KOH with long stability reveals  $Mn_3O_4$  electrode is suitable for supercapacitor application [25]. J.W. Lee  $Mn_3O_4$  nanorods of 100 nm to one  $\mu m$  length dispersed on graphene sheets using ethylene glycol as a reducing agent by simple template-free hydrothermal reaction of  $KMnO_4$ . The composite of Graphene/ $Mn_3O_4$  showed

better supercapacitive performance than free  $Mn_3O_4$  nanorods [26]. D. Li et al. employed one-step hydrothermal method for synthesize  $Mn_3O_4$  nanorods on Ni foam using aqueous solutions of  $Mn(NO_3)_2$  and  $C_6H_{12}N_4$ . Due to porous Ni foam fast charge transfer takes place, high surface area and conductivity, this composite has shown better supercapacitor performance [27]. R. Aswathy anchored the surface of oxidized graphite paper by  $Mn_3O_4$  nanoparticles using hydrothermal method. They calculated the high specific capacitance value 471Fg<sup>-1</sup> at 1 mA cm<sup>-2</sup> current density in 1 M  $Na_2SO_4$  solution [28]. By heavily distributing, the  $Mn_3O_4$  particles of size 10 nm graphene nanosheets, B. Wang et al. observed that the functional groups of  $Mn_3O_4$  attached to the nanosheet and increased surface area plays a key role in improving the electrochemical performance. A specific capacitance value for these  $Mn_3O_4$ /graphene nanocomposites was 256 F g<sup>-1</sup> that was almost double that of the pure graphene nanosheets [29].

H. U. Shah and coworkers have successfully synthesized exceptional spongy  $Mn_3O_4$  nanoparticles, through hydrothermal method. They observed high specific capacitance value 380 Fg<sup>-1</sup>, which is quite larger than previously synthesized  $Mn_3O_4$  nanoparticles. [30]. H. Jiang fabricated octahedron of  $Mn_3O_4$  of base length 160 nm with smooth surface by a simple EDTA-2Na assisted hydrothermal method, and he reported that it shows excellent electrochemical performance [31]. Doping with different transition-metal ions, size controlled synthesis of  $Mn_3O_4$  octahedrons were synthesized by R. Dong et al. and reported improvement in the capacitive properties  $Mn_3O_4$  by doping transition metals signifying a doping effect for the growth and electrochemical performance [32].

List of pure and composite materials based on  $Mn_3O_4$  based electrode material reported recently

Sr. No.	Compound	Method	Morphology	Electrolyte	Specific Capacitance $Fg^{-1}$	Ref.
1.	Mn <sub>3</sub> O <sub>4</sub>	Hydrothermal	Nanoparticles	0.5 M Li <sub>2</sub> SO <sub>4</sub>	198	[33]
2.	Graphene/Mn <sub>3</sub> O <sub>4</sub>	CBD	Nanoparticles	1 M Na <sub>2</sub> SO <sub>4</sub>	193	[34]
3.	Graphene/Mn <sub>3</sub> O <sub>4</sub>	Hydrothermal	Nano rods	1 M Na <sub>2</sub> SO <sub>4</sub>	121	[26]
4.	Mn <sub>3</sub> O <sub>4</sub>	Chemical precipitation	Nanoparticles	1 M Na <sub>2</sub> SO <sub>4</sub>	322	[35]
5.	Mn <sub>3</sub> O <sub>4</sub>	CBD	Thin film	1 M Na <sub>2</sub> SO <sub>4</sub>	321	[36]
6.	Mn <sub>3</sub> O <sub>4</sub>	Hydrothermal	Nano octahedron	1 M Na <sub>2</sub> SO <sub>4</sub>	153	[37]
7.	Ni-Mn <sub>3</sub> O <sub>4</sub>	Chemical oxidation	Nano composite	0.5 M Na <sub>2</sub> SO <sub>4</sub>	230	[38]
8.	Mn <sub>3</sub> O <sub>4</sub> /multi-walled carbon nanotube	CBD	Nano composite	1 M Na <sub>2</sub> SO <sub>4</sub>	257	[39]
9.	Graphene/Mn <sub>3</sub> O <sub>4</sub>	Arc discharge	Nano composite	1 M Na <sub>2</sub> SO <sub>4</sub>	38	[40]
10.	rGO-Mn <sub>3</sub> O <sub>4</sub>	Microwave hydrothermal	Nano composite	1 M Na <sub>2</sub> SO <sub>4</sub>	153	[41]
11.	rGO-Mn <sub>3</sub> O <sub>4</sub>	Electrodeposition	Nano composite	1 M Na <sub>2</sub> SO <sub>4</sub>	364	[42]
12.	Mn <sub>3</sub> O <sub>4</sub>	Electrodeposition	Nanostructure	3 M Na <sub>2</sub> SO <sub>4</sub>	210	[43]
13.	Mn <sub>3</sub> O <sub>4</sub>	Hydrothermal	Square-shaped nanostructures	1 M KOH	355.5	[8]
14.	Mn <sub>3</sub> O <sub>4</sub> -Activated Carbon	Sonication-assisted mechanical-stirring method	Nano composite	1 M Li <sub>2</sub> SO <sub>4</sub>	106	[44]
15.	Cr- Mn <sub>3</sub> O <sub>4</sub>	Hydrothermal	Nanocrystal	1 M Na <sub>2</sub> SO <sub>4</sub>	272	[32]
16.	Mn <sub>3</sub> O <sub>4</sub>	SILAR	Thin film	1 M Na <sub>2</sub> SO <sub>4</sub>	314	[45]
17.	Mn <sub>3</sub> O <sub>4</sub>	Hydrothermal	Nano sheet	1 M Na <sub>2</sub> SO <sub>4</sub>	1014	[46]
18.	Mn <sub>3</sub> O <sub>4</sub>	Hydrothermal	Nano octahedron	1 M Na <sub>2</sub> SO <sub>4</sub>	322	[31]
19.	Mn <sub>3</sub> O <sub>4</sub> /rGO	Solution thermal decomposition	Nano sheet	0.1 M Na <sub>2</sub> SO <sub>4</sub>	342	[47]
20.	Ni-Mn <sub>3</sub> O <sub>4</sub>	Spray pyrolysis	Thin film	1 M Na <sub>2</sub> SO <sub>4</sub>	705	[48]
21.	Co - Mn <sub>3</sub> O <sub>4</sub>	Co-precipitation	Nano granules	6 M KOH	2701	[49]
22.	Mn <sub>3</sub> O <sub>4</sub>	Spray pyrolysis	Nanoparticles	1 M Na <sub>2</sub> SO <sub>4</sub>	187	[50]
23.	RuO <sub>2</sub> -Mn <sub>3</sub> O <sub>4</sub>	Electrospinning	nanofiber	1 M Na <sub>2</sub> SO <sub>4</sub>	293	[51]
24.	Mn <sub>3</sub> O <sub>4</sub>	spray pyrolysis	Thin film	1M Na <sub>2</sub> SO <sub>4</sub>	394	[52]
25.	Mn <sub>3</sub> O <sub>4</sub>	Ultrasonic irradiation assisted co precipitation	Nanoparticles	1M Na <sub>2</sub> SO <sub>4</sub>	296	[53]
26.	Mn <sub>3</sub> O <sub>4</sub>	Hydrothermal	Nanoparticles	1M Na <sub>2</sub> SO <sub>4</sub>	435	[54]
27.	Mn <sub>2</sub> O <sub>3</sub> and Mn <sub>3</sub> O <sub>4</sub>	Co precipitation	Nanoparticles	1M H <sub>2</sub> SO <sub>4</sub>	305	[55]
28.	Mn <sub>3</sub> O <sub>4</sub> - CNT	Chemical reflux method	Nanoparticles	PVP: Na <sub>2</sub> SO <sub>4</sub>	499	[56]

29	Mn <sub>3</sub> O <sub>4</sub> - Li <sub>4</sub> Mn <sub>5</sub> O <sub>12</sub>	Electrochemical deposition	Nanofibers	Li <sub>2</sub> SO <sub>4</sub>	527	[57]
30	Mn <sub>3</sub> O <sub>4</sub> @carbon Foam	Hydrothermal	Nanoparticles	1M Na <sub>2</sub> SO <sub>4</sub>	212.8	[58]

#### IV. CONCLUSION

In summary, we have reviewed recent development of Mn<sub>3</sub>O<sub>4</sub> nanomaterials. We discussed about simple and effective methods to synthesize Mn<sub>3</sub>O<sub>4</sub> nanomaterials of high surface area, unique morphologies possessing outstanding supercapacitive performance. In short, we expect that this paper will not only show the recent advances in Mn<sub>3</sub>O<sub>4</sub> nanomaterials but also give the readers some motivation to discover novel techniques for the synthesis of Mn<sub>3</sub>O<sub>4</sub> nanomaterials of excellent supercapacitive properties.

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## Human Stress Monitoring System Using Convolution Neural Network

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### ABSTRACT

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Psychological problems are becoming a major threat to people's life. Mental stress is a major issue nowadays, especially among youngsters and working people. The age that was considered once most carefree is now under a large amount of stress due to the surroundings. It is important to detect and manage stress before it turns into a severe health issue. Stress increase nowadays leads to many problems like depression, suicide, heart attack, and stroke. In this paper, the stress of the working people is being monitoring in their work environment. Image processing technique is used to monitor the stress of a person. The stress is identified by the face detection mechanism. In this face detection project, a computer system will be able to find and recognize human faces fast and precisely in images or videos that are being captured through a surveillance/web camera. It helps in conversion of the frames of the video into images so that the face of the student can be easily recognized for their face expressions. The dataset is taken from various people and their face expressions. These expressions are stored as values in XML files. These values are used to train the system using Convolution Neural Network algorithm. It predicts the results based on the values in the dataset. The resulting values will be stored in the text document. It will be helpful to their organisation counsellor for further future reference.

**Keywords :** Consumer Face Detection, Face Expressions, Stress Monitoring, Neural Network, Convolutional Neural Network.

### I. INTRODUCTION

The technology aims in imparting a tremendous knowledge oriented technical innovation these days. Machine Learning is one among the interesting domain that enables the machine to train itself by

providing some datasets as input and provides an appropriate output during testing by applying methods. Stress is our body's response to pressure. Many different situations or life events can cause stress. It is often triggered when we experience something new, unexpected or that threatens our

sense of self, or when we feel we have little control over a situation. The physical effects of prolonged stress are numerous, including a greater susceptibility to illness, a lack of energy, problems with sleep, headaches, poor judgment, weight gain, depression, anxiety, and a host of other ills. Stress is one of the mental disorders which can also be identified by facial expressions. It is a feeling of emotional or physical tension.

It can come from any event or thought that makes you feel frustrated, angry, or nervous. Stress is your body's reaction to a challenge or demand. In short bursts, stress can be positive, such as when it helps you avoid danger or meet a deadline. Not all stress is bad. But long-term stress can lead to health problems. Preventing and managing long-term stress can lower your risk for other conditions like heart disease, obesity, high blood pressure, and depression. "Prevention is better than cure"

In this paper, the stress of a person is identified and monitoring through facial expressions using the Convolutional Neural Network. The early detection of stress can help the person to get out of the stress easily. The early prevention of stress is to save a life of a person.

## II. PROCESSES IN CNN

### a. Dataset collection

Appropriate datasets are required at all stages of object recognition research, starting from training phase to evaluating the performance of recognition algorithms. All the images collected for the dataset were downloaded from the Internet, searched by name on various sources in different languages.

### b. Image Preprocessing and Labelling

Images downloaded from the Internet were in various formats along with different resolutions and quality. In order to get better feature extraction, final images intended to be used as dataset for deep neural

network classifier were preprocessed in order to gain consistency. Furthermore, procedure of image preprocessing involved cropping of all the images manually, in order to highlight the region of interest.

### c. Augmentation Process

The main purpose of applying augmentation is to increase the dataset and introduce slight distortion to the images which helps in reducing overfitting during the training stage. Image data augmentation is a technique that can be used to artificially expand the size of a training dataset by creating modified versions of images in the dataset.

Training deep learning neural network models on more data can result in more skillful models, and the augmentation techniques can create variations of the images that can improve the ability of the fit models to generalize what they have learned to new images.

### d. Neural Network Training

The main goal of training the network is for neural network to learn the features that distinguish one class from the others. Therefore, when using more augmented images, the chance for the network to learn the appropriate features has been increased.

### e. Testing Trained Model with Valuation Data

Finally, the trained network is used to detect the disease by processing the input images in valuation dataset and results are processed.

## III. Related Work

### Multimodal Emotion Recognition Integrating Affective Speech with Facial Expression

Previous works are focused on eliciting results from unimodal systems. Machines used to predict emotion by only facial expressions or only vocal sounds. After a while, multimodal systems that use more than one features to predict emotion has more effective and gives more accurate results. So that, the combination of features such as audio-visual expressions, EEG, body gestures have been used since. More than one intelligent machine and neural networks are used to implement the emotion recognition system.

Multimodal recognition method has proven more effective than unimodal systems by Shiqing et al. Research has demonstrated that deep neural networks can effectively generate discriminative features that approximate the complex non-linear dependencies between features in the original set. These deep generative models have been applied to speech and language processing, as well as emotion recognition tasks. Martin et al. showed that bidirectional Long Short-Term Memory (BLSTM) network is more effective than conventional SVM approach.; In speech processing, Ngiam et al. proposed and evaluated deep networks to learn audio-visual features from spoken letters. In emotion recognition, Brueckner et al. found that the use of a Restricted Boltzmann Machine (RBM) prior to a two-layer neural network with fine-tuning could significantly improve classification accuracy in the Interspeech automatic likability classification challenge.

The work by Stuhlsatz et al. took a different approach for learning acoustic features in speech emotion recognition using Generalized Discriminant Analysis (GerDA) based on Deep Neural Networks (DNNs). Yelin et al. showed three layered Deep Belief Networks (DBNs) give better performance than two layered DBNs' by using audio visual emotion recognition process. Samira et al used Recurrent neural network combined with Convolutional Neural Network (CNN) in an underlying CNN-RNN architecture to predict emotion in the video. Some noble methods and techniques also enriched this particular research. They are more accurate, stable and realistic. In terms of performance, accuracy, reasonability and precision these methods are the dominating solutions. Some of them are more accurate but some are more realistic. Some take much time and require greater computation power to produce the more accurate result but some compromises accuracy over performance. The idea of being successful might differ but these solutions are the best possible till now.

### **Data driven framework to explore patterns (timings and durations) of emotion evidence, specific to individual emotion classes**

In Previous work explore whether a subset of an utterance can be used for emotion inference and how the subset varies by classes of emotion and modalities. They propose a windowing method that identifies window configurations, window duration, and timing, for aggregating segment-level information for utterance-level emotion inference. The experimental results using the IEMOCAP and MSPIMPROV datasets show that the identified temporal window configurations demonstrate consistent patterns across speakers, specific to different classes of emotion and modalities. They compare their proposed windowing method to a baseline method that randomly selects window configurations and a traditional all-mean method that uses the full information within an utterance. This method shows a significantly higher performance in emotion recognition while the method only uses 40–80% of information within each utterance. The identified windows also show consistency across speakers, demonstrating how multimodal cues reveal emotion over time. These patterns also align with psychological findings. But after all achievement, the result is not consistent with this method.

### **Towards robust emotion recognition in the wild**

A. Yao, D. Cai, P. Hu, S. Wang, L. Shan, and Y. Chen used a well-designed Convolutional Neural Network (CNN) architecture regarding the video-based emotion recognition. They proposed the method named as HOLONET has three critical considerations in network design.

- (1) To reduce redundant filters and enhance the non-saturated non-linearity in the lower convolutional layers, they used modified Concatenated Rectified Linear Unit (CReLU) instead of ReLU.
- (2) To enjoy the accuracy gain from considerably increased network depth and maintain efficiency,

they combine residual structure and CReLU to construct the middle layers.

3) To broaden network width and introduce multi-scale feature extraction property, the topper layers are designed as a variant of the inception-residual structure. This method more realistic than other methods here.

#### **Semi-Supervised Learning (SSL) technique**

Zixing Zhang, Fabien Ringeval, Eduardo Coutinho, Erik Marchi and Björn Schüller proposed some improvement in SSL technique to improve the low performance of a classifier that can deliver on challenging recognition tasks reduces the trust ability of the automatically labelled data and gave solutions regarding the noise accumulation problem - instances that are misclassified by the system are still used to train it in future iterations. they exploited the complementarity between audio-visual features to improve the performance of the classifier during the supervised phase.

Then, they iteratively re-evaluated the automatically labelled instances to correct possibly mislabelled data and this enhances the overall confidence of the system's predictions. This technique gives a best possible performance using SSL technique where labelled data is scarce and/or expensive to obtain but still, there are various inherent limitations that limit its performance in practical applications. This technique has been tested on a specific database with a limited type and number of data. The algorithm which has been used is not capable of processing physiological data alongside other types of data.

#### **Personalizing EEG-Based Affective Models with Transfer Learning, Center for Brain-like Computing and Machine Intelligence**

Wei-Long Zheng and Bao-Liang Lu proposed EEG-based effective models without labelled target data using transfer learning techniques (TCA-based Subject Transfer) which is very accurate in terms of positive emotion recognition than other techniques used before. Their method achieved 85.01% accuracy. They used to transfer learning and their method

includes three pillars, TCA-based Subject Transfer, KPCA-based Subject Transfer and Transductive Parameter Transfer. For data pre-processing they used raw EEG signals processed with a bandpass filter between 1 Hz and 75 Hz and for feature extraction, they employed differential entropy (DE) features. For evaluation, they adopted a leave-one subject-out cross-validation method. Their experimental results demonstrated that the transductive parameter transfer approach significantly outperforms the other approaches in terms of the accuracies, and a 19.58% increase in recognition accuracy has been achieved.

#### **IV. SYSTEM MODEL**

Mental stress is a major issue nowadays, especially among youngsters. The age that was considered once most carefree is now under a large amount of stress. Stress increase now a days leads to many problems like depression, suicide, heart attack and stroke. In this paper, we are also calculating the mental stress of students one week before the exam and during the usage of the internet.

Our objective is to analyse stress of working people at different points in his life. The effect that exam pressure or recruitments stress has on the students often goes unnoticed. We will perform analysis on how these factors affect the mind of a student and will also correlate this stress with the time spent on the internet.

The dataset was taken from Jaypee Institute of Information Technology and it consisted of 206 student's data. Four classification algorithms Linear Regression, Naïve Bayes, Random Forest and SVM is applied and sensitivity, specificity and accuracy are used as performance parameter. The accuracy and performance of data are further enhanced by applying 10-Fold cross-validation.

The J48 algorithm, Sequential Minimal Optimization algorithm, Bayesian Network algorithm for predicting stress on the data collected from 16 peoples under four different stressful conditions. And also used HRV

features and EEG signal to predict the stress level. Various features like HRV, heart rate, ECG are used to predict the stress level. Then, authors used decision tree algorithm is applied on a dataset collected from two test completed that these tests to be unsatisfactory.

### V. PROPOED SYSTEM IMPLEMENTATION

The proposed system aims at creating a digital way of identifying the stressed people in the work place to avoid the adverse effect of stress. Human Stress Monitoring System is a digital way that would enable us to find the facial expression and identifies the stressed persons saving lots of time. The Convolutional Neural Network (CNN) detects and monitoring the facial expression of a person through camera module. It helps to reduce the unnecessary counselling process for the identification of stressed people, In the initial phase, the developer creates the dataset to train the system. Once the dataset is created, the system will be trained based on the dataset. After completing the training, the system will start to detect and monitor the facial expression of a person and converting them into values to find the stressed level of that person. Finally, the results will be stored in the text document for further reference.

#### a. Convolutional Neural Networks Working

There are four layered concepts we should understand in Convolutional Neural Networks:

1. Convolution,
2. ReLu,
3. Pooling and
4. Full Connectedness (Fully Connected Layer).

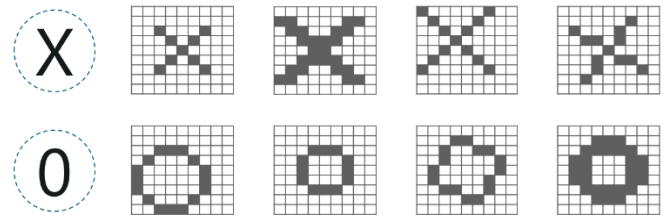


Figure 1 Convolution Neural Network Example

Here, there are multiple renditions of X and O's. This makes it tricky for the computer to recognize. But the goal is that if the input signal looks like previous images it has seen before, the “image” reference signal will be mixed into, or convolved with, the input signal. The resulting output signal is then passed on to the next layer.

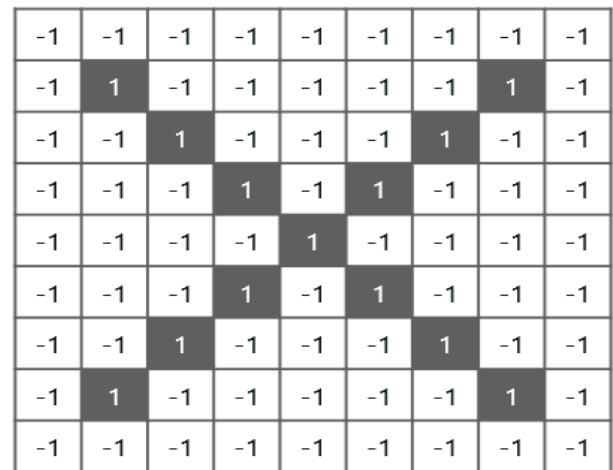


Figure 2 Computer Understanding of Pixels

So, the computer understands every pixel. In this case, the white pixels are said to be -1 while the black ones are 1. This is just the way we've implemented to differentiate the pixels in a basic binary classification.

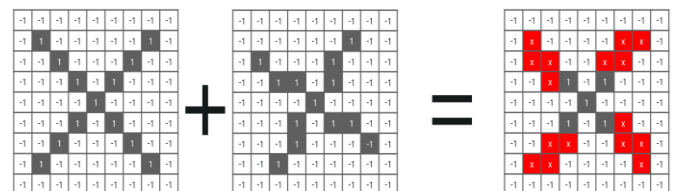


Figure 3 Adding the pixels

Now if we would just normally search and compare the values between a normal image and another 'x' rendition, we would get a lot of missing pixels.

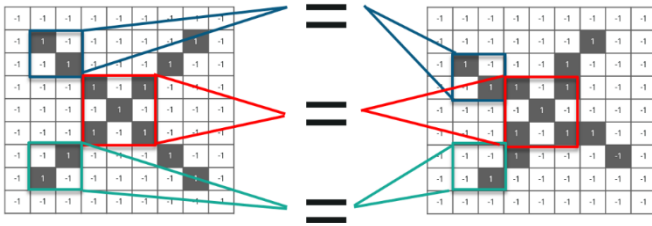


Figure 4. Mapping the pixels

We take small patches of the pixels called filters and try to match them in the corresponding nearby locations to see if we get a match. By doing this, the Convolutional Neural Network gets a lot better at seeing similarity than directly trying to match the entire image.

### b. Convolution of an Image

Convolution has the nice property of being translational invariant. Intuitively, this means that each convolution filter represents a feature of interest (e.g. pixels in letters) and the Convolutional Neural Network algorithm learns which features comprise the resulting reference (i.e. alphabet).

There are 4 steps for convolution:

- Line up the feature and the image
- Multiply each image pixel by corresponding feature pixel
- Add the values and find the sum
- Divide the sum by the total number of pixels in the feature

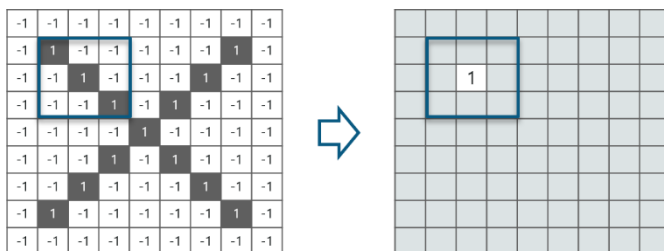


Figure 5: Filtered image example

Now, we can move this filter around and do the same at any pixel in the image.

### ReLU Layer

Rectified Linear Unit (ReLU) transform function only activates a node if the input is above a certain quantity, while the input is below zero, the output is zero, but when the input rises above a certain threshold, it has a linear relationship with the dependent variable.

### Face detection and Prediction Phase:

The final phase of our system is prediction. It predicts the output based on the dataset values by detecting the face of a person. The results will be emotions of a person who is in front of the camera. The resulted outputs will be stored as a text document.

## VI. CONCLUSION

Thus, the Human Stress Monitoring System has gained a greater attraction in most of the fields. The system is designed to overcome the issues in existing similar systems. Core part of the system was achieved using extraction of the facial expressions. The face detection mechanism played the major role in this system. After extraction of facial expression, these values will be stored as a text document for further reference. It will be helpful to counselors to take the necessary preventive measures for the stressed persons. In the proposed system, data sheet in the XML file format is used to identify the facial expressions of a person by fixed values instead of that, adaptive learning method can be used to train the model. We can suggest the remedies to the persons who are stressed, to prevent them from taking any unstable decision. The facial expressions of a person can be monitored and the values are then exported into Excel sheet as report for further future reference. An additional module of sending a text message to his/her organization counselor can be added to the system to make it even more effective. The text message system can be automated to send messages at regular intervals of time.

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## Review on PLC Based Crankshaft Oil Hole Checking Automation

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### ABSTRACT

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Crankshaft oil hole checking automation is nothing but the machine used to check the lubrication oil holes on crankshaft. Because of manufacturing inaccuracies or errors there may have chances of blocked or undrilled or semi drill lubrication holes on crankshaft. And due to these inaccuracies or errors no proper lubrication is provided to the complete engine and engine cease may occur. While driving a vehicle this engine cease is occurred then it can causes severe accidents and person may losses his/her life. To avoid this problem this automation is specifically design to check all lubrication hole presence on crankshaft with the help of sensors and actuators and controlled by Programmable Logic Controller (PLC). If all pokayoke sensors are giving desired signal then machine display will show all hole presence with green light and ok job counter, else any of hole is missing or blocked or hole length is improper display will show not ok signal for respective hole and job is not ok with red light indicator and buzzer. This helps to detect the problem at the stage of manufacturing before assembly results in increased productivity and stoppage of severe accidents.

**Keywords :** Programmable logic controller (PLC) , Pokayoke Sensors, Actuators (Cylinders), Productivity Enhancement, Maximum accuracy, Programming, Mechanical Integration.

### I. INTRODUCTION

**Definitions:** Crankshaft is a large component with a complex geometry in the engine, which converts the reciprocating displacement of the piston to a rotary motion with a four link mechanism. Since the crankshaft experiences a large number of load cycles during its service life, fatigue performance and durability of this component has to be considered in

the design process. Design developments have always been an important issue in the crankshaft production industry, in order to manufacture a less expensive component with the minimum weight possible and proper fatigue strength and other functional requirements. These improvements result in lighter and smaller engines with better fuel efficiency and higher power output.

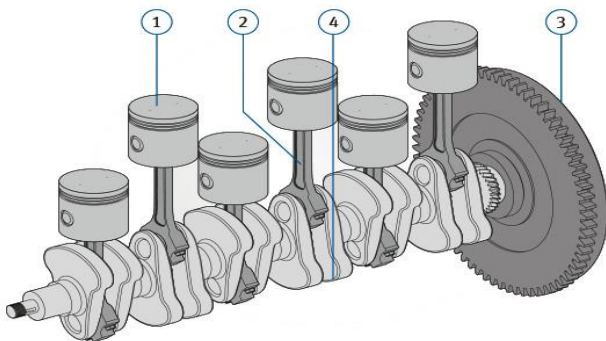
A **crankshaft** is a shaft driven by a crank mechanism, consisting of a series of cranks and crankpins to

which the connecting rods of an engine are attached. It is a mechanical part able to perform a conversion between reciprocating motion and rotational motion. The crankshaft is a moving part of the internal combustion engine (ICE). It's main function is to transform the linear motion of the piston into rotational motion. The pistons are connected to the crankshaft through the connecting rods. The crankshaft is mounted within the engine block

1. Pistons
2. Connecting rods
3. Flywheel
4. Crankshaft

The pistons, connecting rods and crankshaft together form the **crank mechanism** as shown in Figure 1.1.

The crankshaft, connecting rod, and piston constitute a four bar slider-crank mechanism, which converts the sliding motion of the piston (slider in the mechanism) to a rotary motion. Since the rotation output is more practical and applicable for input to other devices, the concept design of an engine is that the output would be rotation



**Figure 1.1** Engine Crank Mechanism

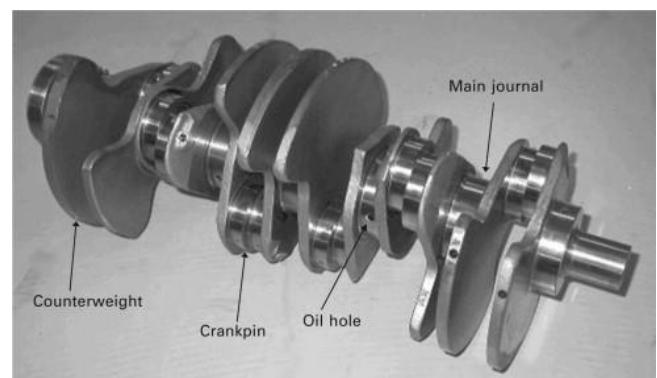
Crankshaft oil hole checking automation is nothing but the machine used to check the lubrication oil holes on crankshaft. Because of manufacturing inaccuracies or errors there may have chances of blocked or undrilled or semi drill lubrication holes on crankshaft. This automation is specifically design to check all lubrication hole presence on crankshaft with the help of sensors and actuators and controlled by Programmable Logic Controller (PLC). If all pokayoke sensors are giving desired signal then machine display will show all hole presence with

green light and ok job counter, else any of hole is missing or blocked or hole length is improper display will show not ok signal for respective hole and job is not ok with red light indicator and buzzer.

The project includes the following objectives:

- Comparing the available components from the market which meet the best solution. i.e.(PLCs), Pokayoke Sensors, Actuator(Cylinders),Debarring gun, Machine designing concepts etc.
- Designing a layout for the installation of PLC, a Mechanical support assembly and other components together.
- Wiring Design and wiring installation
- Designing and construction of actual machine parts And its assembly
- Designing of the process to check lubrication holes
- Programming
- Testing and Finalizing
- Documenting

**Crankshaft types:** The crankshaft converts reciprocative motion to rotational motion. It contains counter weights to smoothen the engine revolutions. There are two types of crankshaft, the monolithic type (Fig. 8.1), used for multi-cylinder engines, and the assembled type, fabricated from separate elements, which is mainly used for motorcycles. The type of crankshaft determines what kind of connecting rods are used, and the possible combinations of crankshafts and connecting rods and their applications are listed in Table 1.1.



**Figure 1.2.** Monolithic crankshaft for a four-stroke engine. The fueling holes are for lubrication.

Table 1.1. Combination of crankshafts with connecting rods. The monolithic crankshaft uses the assembled connecting rod, while the assembled crankshaft uses the monolithic connecting rod

Crankshaft type	Con-rod type	Engine
Monolithic	Assembly	Multi-cylinder four-stroke car engine, outboard marine engines
Assembly	Monolithic	Single- or twin-cylinder four-stroke engine, two-stroke engine

**Crankshaft Oil Hole Checking:** In the manufacturing industry which has implemented production management system which is good, so pay attention to matters related to the amount of product that is rejected due to a process that does not meet the standards and production down time due to trouble on a production machine. This is because it will affect the production cost. Industries always make improvements to meet the standards of the process of a product and reduce maintenance time action against the production machines. If the company is able to reduce the rejected products and production down time, then the greater profits to be obtained by the company concerned. In the process of manufacturing a piston, particularly the DOH (Oil Drill Hole), there are still some drawbacks.

Among them is rejected due to a process that does not meet the standards and production down time due to trouble on the production machine DOH is still above 3.4% of the total production within one month. This happens because when a broken or broken drill tool, the perforation process is still being done. Operators who run these machines do not know when the drill will break. This is what the reason of rejection but this problem of missing or blocked hole is to be

detected before the assembly of it into the engine earlier it was checked only with manual eyes and there may have chances manual error and faulty job cannot catch or detected in inspection. This is what underlies this research and concept of PLC Based Crankshaft Oil Hole Checking Automation

## II. DESIGN AND DESCRIPTION OF PROTOTYPE

The main objective of this project is to, check all lubrication hole presence on crankshaft for this the machine design and sequence of operation is as shown in flow chart figure 1.3

- Initially operator need to pick a crankshaft from bin and place it on fixture properly and then press two hand safety start push buttons
- As start push buttons are pressed machine cycle is started and crankshaft is clamped horizontally on fixture with clamp cylinder, head of the clamp is made up of nylon material to protect crankshaft from scratches or marks.
- Once job (crankshaft) clamp is confirmed to the PLC then checking rods from the top are coming down to check 3 holes with the help of proximity sensors and checking confirmation is taken by Reed switch connected to the vertical top cylinder.
- If all the three holes are ok then three green LED's for respective hole is on and top cylinder will goes up and if any one of the hole is not ok it will indicate with red light.
- Now left side cylinder for the left hole checking on crankshaft is forwarded with the checking rods near the deburring gun (make-Cargo Pneumatic) is attached so that with the hole length checking bur removal operation is also performed.
- If this hole is ok it will be shown with green light on display and left side cylinder is reverse.

- Now right side cylinder connected on cross flang comes forward to check the cross hole which is the 5<sup>th</sup> hole with the help of check rods, again if the length is ok then green LED is on else red LED is shown on display and right side cylinder is reverse and for ok job with all holes ok marking cylinder is forward and dot marking is done on crankshaft, marking is done to identify ok and not ok job at the assembly stage.
- By taking confirmation from reverse reed switches of all cylinders clamping cylinder is reverse and job is declamped, cycle completed, if all holes are ok job counter counts 1 and if not then not ok counter will be 1 as shown in flow chart Figure 1.3

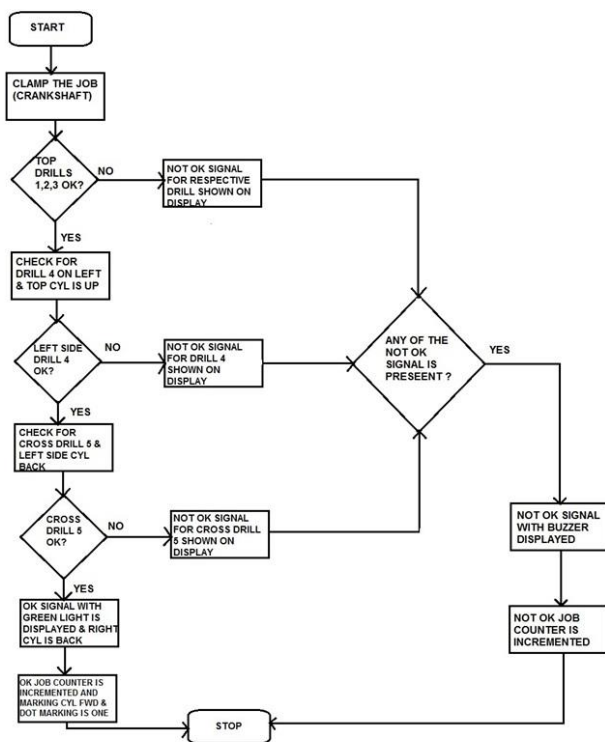


Figure 1.3. Flow Chart

**Hardware and Software Requirements:** For this project, we require different hardware component and different software. So that this project is a combination which full fill the definition of automation. This is a list of all the hardware components that will be used in this guide:

- Programmable logic controller (PLC)
- Reed Switches
- Pneumatic cylinders
- Proximity sensors
- Solenoid Valve
- Relay board
- Contactor
- Power supply
- Miniature circuit breaker (MCB)
- Wires with dia 0.5sq.mm, 1sq.mm

Three different types of Sectors covered in this project is Mechanical, Pneumatic, Electronics (which includes software) and the Software used in this project is as below:

- PLC programming software CODESYS V2.3

**Hardware Configuration:**

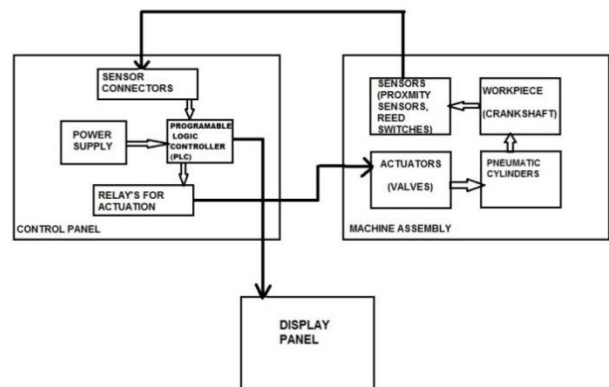


Figure 1.4. Block Diagram

Automation is defined as a combination of hardware and software, here basically software part is provided by PLC programming software and hardware part is mechanical assembly. We are now going to see main block in detail

- **Programmable Logic Controller:** A programmable logic controller (PLC) or programmable controller is a digital computer used for automation of electromechanical processes, such as control of machinery on factory assembly lines, amusement rides, or light

fixtures. PLCs are used in many industries and machines. Unlike general-purpose computers, the PLC is designed for multiple inputs and output arrangements, extended temperature ranges, immunity to electrical noise, and resistance to vibration and impact. Programs to control machine operation are typically stored in battery-backed-up or non-volatile memory. A PLC is an example of a hard real time system since output result must be produced in response to input conditions within a limited time, otherwise unintended operation will result[8]



Figure1.5. PLC NG16DL

- **Sensors and Actuators:** In this automation sensors and actuators are used to drive complete machine system. Variety of sensors such as inductive proximity sensors (M8,M12,M18) , Reed switches are used also different actuators (specifically Pneumatic) are used with different dimensions cylinders with diameters and length details of these blocks are below:

1. **Sensors:** Sensors are the devices used for data acquisition i.e. whenever particular object comes in front of the sensor it will give high pulse signal to the PLC in form of voltage (24VDC). Different type of sensors such as proximity sensors, optical sensors, magnetic sensors are available in market, Here in this

project proximity sensors (Inductive type) and magnetic sensors which are nothing but reed switches of SMC make and optical or photoelectric sensor (100 mm range) of baner make is used.

- **Proximity Sensor:** A proximity sensor is a non-contact sensor that detects the presence of an object (often referred to as the “target”) when the target enters the sensor’s field. Depending on the type of proximity sensor, sound, light, infrared radiation (IR), or electromagnetic fields may be utilized by the sensor to detect a target. Here M12 PNP NO non flash inductive type proximity sensor is used as shown in Figure1.6



Figure 1.6. Proximity Sensor

- **Reed Switch:** A magnetic reed switch is an electromagnetic switch used to control the flow of electricity in a circuit. When the piston with the magnetic band passes under the pneumatic cylinder Reed Switch, the switch’s reeds close a circuit to generate a signal that can be used to control an electric operated device. In this project SMC make (DM9B) reed switches are used for oil hole depth confirmation via checking rods connected to the cylinder Figure1.7 shows SMC make reed switch.



Figure 1.7. Reed Switch

➤ **Photoelectric or Optical Sensor:**

A photoelectric sensor is a device used to determine the distance, absence, or presence of an object by using a light transmitter, often infrared, and a photoelectric receiver. A photoelectric sensor emits a light beam (visible or infrared) from its light-emitting element. A reflective-type photoelectric sensor is used to detect the light beam reflected from the target. A thru-beam type sensor is used to measure the change in light quantity caused by the target crossing the optical axis. Here Banner make photoelectric sensor having range 100 mm is used for presence of the job (Crankshaft) as shown in Figure 1.8



Figure 1.8. Photoelectric Sensor

2. **Actuators:** Actuators are the device that causes a machine or other device to operate. Here in this project basically the actuators are pneumatic cylinders (Figure 1.9) operated through solenoid valve. Different cylinders are used such as cylinder for job lamping is clamp cylinder, left and right side hole checking cylinders, cross hole checking cylinder operated through respective solenoid valve connected through pneumatic piping.



Figure 1.9. Pneumatic Cylinder

➤ **Solenoid Valve:** A solenoid valve is an electro-mechanical valve that is commonly employed to control the flow of liquid or gas. There are various solenoid valve types, but the main variants are either pilot operated or direct acting. Here single coil SMC make valve (SY Series) are used for cylinder actuation shown in Figure 2.0. As per the command given by the PLC (i.e PLC output is on) written in logic sequence particular solenoid coil is on and will actuate respective cylinder connected to it.



Figure 2.0. Solenoid Valve

Therefore sensor and actuators are another important block for working for this automation

- **Display panel:** Machine display panel is the actual surface on which information is displayed to public view that it is the window through which operator or user can be able to evaluate the Ok or not Ok crankshaft through the result shown or displayed on display panel. Specifically this machine's display panel is having different indicators in red and green light to show status of Ok (by green indicator) and not Ok (by red indicator) for respective crankshaft oil hole. This display panel also provides switches for manual operation of machine. This machine operates in two modes 'Auto Mode' and 'Manual Mode' by selecting auto-manual switch position on panel. For manual operation of individual cylinder multiposition selector switch is also provided on display panel, selection of the manual operating cylinder is indicated via yellow light on display panel. Hence the display panel is the actual interface between operator or user and machine.

After complete crankshaft checking if the result is ok then making ok is done on object with the marking unit which also the part of display panel.

- **Mechanical Assembly:** Machine assembly is nothing but the complete integrated view of different parts for specific task which is to be performed. Here in this project task is to check crankshaft oil holes presence and this is done by actual machine assembly which is nothing but integration of sensors, actuators through fixtures and mechanical parts made up of different engineering materials such as table structure is made up of mild steel (MS), some parts are of EN31, Where there is sliding or moving parts in between part harden material is used (by changing material property through heat treatment). Control panel is mounted on below side of the machine table and display panel is on front top side of the machine table. This complete crankshaft oil hole checking automation is made up of basic three important blocks- control panel, display panel and machine assembly as shown in block diagram Figure 1.4

### III. CONCLUSION

This paper, presents what Crankshaft oil hole checking automation is, which components are necessary to make a Crankshaft oil hole checking automation. Thus at the end the machine used to check the lubrication oil holes on crankshaft in hazardous environment with same accuracy and precision for long time. This is one of the low cost solution among all other special purpose machines available in market. Also the following objectives of dissertation are accomplished :

- Comparing the available components from the market which meet the best solution. i.e. (PLCs), Sensors, Actuators, Engineering materials etc.
- Designing a layout for the installation of PLC, and other components together.

- Wiring Design and wiring installation
- Designing and construction of a wiring rail and machine operation system
- Designing the automation (machine)
- Programming
- Testing and Finalizing
- Documenting

This Application notes detailed how to design and install Crankshaft oil hole checking automation and testing them. This automation can be used many of the industries with slight changes for the purpose of a specific industry following are Some of the applications where this type of machine with slight design changes.

1. Defense Applications
2. Medical Applications
3. Pharmaceutical Industries
4. Automobile Industries
5. Process industries

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# Authentication Schemes for Session Passwords Using Color and Images

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## ABSTRACT

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Authentication is the first and the most important step in information security. It is used to authenticate the user identity. Where user need to memorize their password and remember at login time. Normally user use textual password to provide security, but textual passwords are vulnerable to many cyber-attacks, Such as - dictionary attacks, shoulder surfing etc. Graphical password schemes are used to overcome these problems. A Session password is a new technique based on the graphical password in which we using combination of text, color and images to solve the problem of security. Every time session password can be used to create password for user authentication, by this technique we can overcomes the attacks like shoulder surfing, dictionary attacks. We can use this method for PDAs (Personal Digital Assistants). A multitude of graphical based password scheme which have been proposed as alternative to text based password scheme, motivated by the promise of improved password memorability and thus usability. This paper presents a detailed evaluation of the various Authentication schemes which provides high level of security and provides security to your folder. It consists of three authentication methods like text, picture and colors for providing higher security.

**Keywords :** Authenticatin, Colors, Credentials, Password, Graphical Password, Images.

## I. INTRODUCTION

Authentication is the process of recognizing a user's identity. It is the mechanism of associating an incoming request with a set of identifying credentials. The credentials provided are compared to those on a file in a database of the authorized user's information on a local operating system. The authentication

process always runs at the start of the application, before the permission and throttling checks occur, and before any other code is allowed to proceed. Different systems may require different types of credentials to ascertain a user's identity. The credential often takes the form of a password, which is a secret and known only to the individual and the system. Three categories in which someone may be

authenticated are: something the user knows, something the user is, and something the user has.

Authentication process can be described in two distinct phases - identification and actual authentication. Identification phase provides a user identity to the security system. This identity is provided in the form of a user ID. The security system will search all the abstract objects that it knows and find the specific one of which the actual user is currently applying. Once this is done, the user has been identified. The fact that the user claims does not necessarily mean that this is true. An actual user can be mapped to other abstract user object in the system, and therefore be granted rights and permissions to the user and user must give evidence to prove his identity to the system. The process of determining claimed user identity by checking user-provided evidence is called authentication and the evidence which is provided by the user during process of authentication is called a credential.

Personal Digital Assistants are being used by the people to store their personal and confidential information like passwords and PIN numbers. Authentication should be provided for the usage of these devices. In this, two new authentication schemes are proposed for PDAs. These schemes authenticate the user by session passwords. Session passwords are passwords that are used only once. Once the session is terminated, the session password is no longer useful. For every login process, users input different passwords.

The session passwords provide better security against dictionary and brute force attacks as password changes for every session. The proposed authentication schemes use text and colors for generating session passwords. Our main aim is to provide security to the confidential website and web application in computing devices through session passwords by using techniques like Pair based and Hybrid based authentication.

## II. Related Work

### a. Graphical Password Scheme using Color Login

In Dec 2009 author H. Gao proposed graphical password scheme using color login. In this color login uses background color which decrease login time. Possibility of accidental login is high and password is too short. The system developed by Sobrado is improved by combining text with images or colors to generate session passwords for authentication. Session passwords can be used only once and every time a new password is generated. The advantages of this system is that it reduces the login time, session passwords are also generated to improve security. The disadvantage of this system is that it the possibility of accidental login is high and password is too short.

### b. Hybrid Textual Authentication Scheme

In this paper M.Sreelatha proposed Hybrid Textual Authentication Scheme. This scheme uses colors and user has to rate the colors in registration phase. During login phase four pairs of colors and 8\*8 matrix will be displayed. As the color rating given by the user, the password will generate. First color shows row number and second shows column number of the grid. The drawback of this system is intersecting element is the first letter of the password. The user has to memorize the rating and order of the colors. So it becomes very hectic to user. The benefit of this system is that it is flexible and simple to use.

### c. Graphical Password Based Authentication for Mobile Systems

A hybrid graphical password based method is advised, which is a mixture of recognition and recall based methods having many advantages as compare to existing systems and more suitable for the user. In this system the user draws the selected object which is then stored in the database with the specific username. Objects may be symbols, characters, auto

shapes, simple daily seen objects etc. Then the user draws pre-selected objects as his password on a touch sensitive screen with a mouse. Then the system performs preprocessing. Then after stroke merging, the system constructs the hierarchy then the next step is sketch simplification, then the three types of features are extracted from the sketch drawn by the user. The last step is called hierarchical matching. The plus point of this system is it's a combination of recognition and recall based technique, hence provides flexibility. This system performs some complex actions like pre-processing, stroke merging. So it can be a weakness of this system.

#### **d. Password Authentication using text and colors**

Authors proposed a system in which password scheme uses colors and text for generating session password. They have introduced a session password scheme in which the passwords are used only once for each session and when session is completed the password is no longer in use. In this system two session password schemes pair-based textual authentication scheme and color code-based authentication scheme are introduced. In the pair based textual authentication scheme the user submits his password during the registration. The password should contain number of characters. When the user enters login an interface containing of a grid is showed during the login phase. The grid is of size 6 x 6 and it contains of alphabets and numbers. These are randomly placed on the grid and the interface changes every time. Depending upon the password which is submitted during the registration phase, user has to enter the password. Users have to consider his password in terms of pairs. In the color code based scheme, the user has to get his password with the help of colors. During registration phase, user should fill up all his information and also rate colors. The merit of this system is it provides much better security. Demerit of the system is sometimes users may consider wrong password as they are supposed to consider the password in terms of pair.

#### **e. Graphical Password as an OTP**

In Graphical password as an OTP proposed by authors, she used the scheme of OTP. As there are many drawbacks of using alphanumeric passwords, people tend to forget the password, or they may write the password somewhere. Hence they have developed authentication methods that use pictures as passwords known as graphical password to solve this problem. They have provided an additional layer of security by generating one-time password(OTP) which is send to the users mobile. Using the instant messaging service available on internet, user will obtain the One Time Password (OTP). The OTP will be the information of the items present in the image to be clicked by the user. The users will authenticate themselves by clicking on various items in the image based on the information sent to them. The main aim of this system is to avoid Shoulder surfing attack. It also aims to avoid other attacks like dictionary attack, brute force attack and guessing attack. The OTP is sent on the user's mobile number from the database. The positive point of this system is it provides better security as it avoids shoulder surfing by using OTP. Negative point of this system is user must click within the tolerance of their chosen pixels and also in correct sequence.

#### **f. Color Shuffling Password Based Authentication**

Authors proposed a scheme which mainly focuses on shoulder surfing. In this system, they proposed a new click based color password scheme called Color Click Points (CCP). It can be viewed as a combination of Pass-Points, Pass faces, and Story. A password consists of one click-point per Color for a sequence of Colors. The next Color displayed is built on the previous click-point. In this proposed scheme, we propose an improved text-based shoulder surfing resistant graphical password scheme by using colors. In the proposed scheme, the user can easily and efficiently login system. Afterward, we examine the security and usability of the proposed system, and show the resistance of the proposed system to shoulder surfing

and accidental login. The benefit of this system is that it reduces the login time & it is an efficient system.

### **g. Authentication by Drawing Signature Using Mouse**

Syukri has designed a technique where in authentication is actually done by drawing digital signature using a mouse. The technique includes two stages, in stage one registration is to be done and the other stage is verification. During registration stage user draws his signature with a mouse, after which the system extracts the signature area. It takes the user signature as an input and performs the normalization process after which extraction of the parameters of the signature is done in the verification stage. The disadvantage in this technique is forgery of signatures. Drawing with mouse is not familiar to most of the people and it is also a bit difficult to draw the signature in the same perimeters during registration time.

## **III. SYSTEM MODEL**

**Persuasive Cued Click Points:** An authentication system works by having the user select the images, in a specific order. The Persuasive Technology guides and encourages the user to select stronger passwords (i.e. click-points), but not entirely impose system generated passwords. The proposed system consists of two modules; user registration and user login. The registration phase, in which user registers a unique username and the graphical password in the database, is followed by user login phase. During login, the user is asked to provide the username and correct graphical password. Upon successful verification of the user profile from the database, the user is now able to encrypt/decrypt his files.

### **Disadvantages**

Graphical passwords using the traditional attack methods such as brute force search, dictionary attack, or spy ware. However, since there is not yet wide

deployment of graphical password systems, the vulnerabilities of graphical passwords are still not fully understood. Overall, the current graphical password techniques are still immature. Much more research and user studies are needed for graphical password techniques to achieve higher levels of maturity and usefulness. So this approach is that such systems can be expensive and the identification process can be slow.

### **a. Proposed System**

Personal Digital Assistants are being used by the people to store their personal and confidential information like passwords and PIN numbers. Authentication should be provided for the usage of these devices. Two new authentication schemes are proposed for PDAs. These schemes authenticate the user by session passwords. Session passwords are passwords that are used only once. Once the session is terminated, the session password is no longer useful. For every login process, users input different passwords. The session passwords provide better security against dictionary and brute force attacks as password changes for every session. This system uses AES algorithm for generating password. The proposed authentication schemes use text, image and colors for generating session passwords.

### **AES Algorithm**

The AES algorithm (also known as the Rijndael algorithm) is a symmetrical block cipher algorithm that takes plain text in blocks of 128 bits and converts them to ciphertext using keys of 128, 192, and 256 bits. Since the AES algorithm is considered secure, it is in the worldwide standard. The AES algorithm uses a substitution-permutation, or SP network, with multiple rounds to produce ciphertext. The number of rounds depends on the key size being used. A 128-bit key size dictates ten rounds, a 192-bit key size dictates 12 rounds, and a 258-bit key size has 14 rounds. Each of these rounds requires a round key, but since only one key is inputted into the algorithm,

this key needs to be expanded to get keys for each round, including round 0.

AES is based on a design principle known as a substitution– permutation network, and is efficient in both software and hardware. Unlike its predecessor DES, AES does not use a Feistel network. AES is a variant of Rijndael, with a fixed block size of 128 bits, and a key size of 128, 192, or 256 bits. By contrast, Rijndael per se is specified with block and key sizes that may be any multiple of 32 bits, with a minimum of 128 and a maximum of 256 bits.

AES operates on a  $4 \times 4$  column-major order array of bytes, termed the state. Most AES calculations are done in a particular finite field. For instance, 16 bytes, are represented as this two-dimensional array. The key size used for an AES cipher specifies the number of transformation rounds that convert the input, called the plaintext, into the final output, called the ciphertext. The number of rounds are as follows.

- 10 rounds for 128-bit keys.
- 12 rounds for 192-bit keys.
- 14 rounds for 256-bit keys.

Each round consists of several processing steps, including one that depends on the encryption key itself. A set of reverse rounds are applied to transform ciphertext back into the original plaintext using the same encryption key. The more popular and widely adopted symmetric encryption algorithm likely to be encountered nowadays is the Advanced Encryption Standard (AES). It is found at least six times faster than triple DES. A replacement for DES was needed as its key size was too small. With increasing computing power, it was considered vulnerable against exhaustive key search attack. Triple DES was designed to overcome this drawback but it was found slow.

### AES Analysis

In present day cryptography, AES is widely adopted and supported in both hardware and software. Till date, no practical cryptanalytic attacks against AES has been discovered. Additionally, AES has built-in

flexibility of key length, which allows a degree of ‘future- proofing’ against progress in the ability to perform exhaustive key searches. AES is an iterative rather than Feistel cipher. It is based on ‘substitution– permutation network’. It comprises of a series of linked operations, some of which involve replacing inputs by specific outputs (substitutions) and others involve shuffling bits around (permutations).

Interestingly, AES performs all its computations on bytes rather than bits. Hence, AES treats the 128 bits of a plaintext block as 16 bytes. These 16 bytes are arranged in four columns and four rows for processing as a matrix – Unlike DES, the number of rounds in AES is variable and depends on the length of the key. AES uses 10 rounds for 128-bit keys, 12 rounds for 192-bit keys and 14 rounds for 256-bit keys. Each of these rounds uses a different 128-bit round key, which is calculated from the original AES key.

### Encryption Process

Here, we restrict to description of a typical round of AES encryption. Each round comprise of four sub-processes. The 16 input bytes are substituted by looking up a fixed table (S- box) given in design. The result is in a matrix of four rows and four columns. Each column of four bytes is now transformed using a special mathematical function. This function takes as input the four bytes of one column and outputs four completely new bytes, which replace the original column. The result is another new matrix consisting of 16 new bytes.

It should be noted that this step is not performed in the last round. The 16 bytes of the matrix are now considered as 128 bits and are XORed to the 128 bits of the round key. If this is the last round then the output is the ciphertext. Otherwise, the resulting 128 bits are interpreted as 16 bytes and we begin another similar round.

### Decryption Process

The process of decryption of an AES ciphertext is similar to the encryption process in the reverse order. Each round consists of the four processes conducted in the reverse order

- Add round key
- Mix columns
- Shift rows
- Byte substitution

Since sub-processes in each round are in reverse manner, unlike

### Steps

- 1) The user register themselves by giving their details and choosing image point and password from the grid.
- 2) System stores these details.
- 3) User login with the details and have to choose the correct color code and image point and correct password from the grid.
- 4) System uses AES algorithm for authentication.
- 5) After successful authentication, user can get access to the system.

## IV. PROPOSED SYSTEM IMPLEMENTATION

### a. User Registration Panel

The user has to register themselves with their mobile number, email id and the color code used while login process. Then the image panel will be opened and the user have to choose an image and have to choose the coordinate. Then a 5x5 matrix was displayed and it consists of numbers and letters. The user have to choose a password from the grid and click ok button. Now the user is successfully registered.

### b. Login Panel

On running the application, a login form turn up, allowing the user to enter the username and password. If the user is already a registered one, then clicking on "login" button after filling username and password block. System will check the given data from database, if username exist then proceed to grid phase where there is a 5x5 grid displayed with mix of numbers and letters where the user have to choose the correct password. After successful validation of password color phase will be displayed. In Color Phase, there is displaying five colors (Red, Blue, Black, Yellow, Pale yellow) and user need to rate the color in between (0-9) value must be same as user gave while register. System will check the given data from database, if data match then proceed to Image phase where the user have to select the correct image coordinate otherwise no authentication is done.

## V. CONCLUSION

The past decade has seen a growing interest in using graphical passwords as an alternative to the traditional text-based passwords. In this project, two authentication techniques based on text and colors are proposed. These techniques are resistant to dictionary attack, brute force attack and shoulder-surfing. Both the schemes can be up-scaled to make it more resistant to shoulder surfing attacks. To achieve higher levels of maturity and usefulness in graphical password authentication we introduced these methods. These schemes are completely new to the users and the proposed authentication techniques should be verified extensively for usability and effectiveness. These techniques can also be developed as ATM application where the person standing outside the transparent door could guess the ATM pin with the same Debit card or can be used against the key loggers in cyber cafe or windows application such as a folder locker or an external gateway authentication to connect the application to a database or an external embedded device.

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## Estimation of Queue Length at Signalized Intersection : A Review

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### ABSTRACT

In this growing world, traffic conjunction is considered as most growing problems in both urban as well as sub-urban areas. Traffic congestion is a major issue in day to day life. It has a tremendous impact on the nation's economy, air pollution, water pollution, travel behavior, accidental risk, land-use and to its end users. Various studies have shown that there is a sudden increase in the traffic congestion. Traffic congestion leads to queuing. Queuing process takes place in both signalized as well as non-signalized intersections, freeways, bottlenecks, incident sites, toll plazas, parking and the areas near the freeways. Queuing also occurs in many non transportation fields. Hence it is very important to study the queue length pattern, its estimation, methods of calculating queue length and give a solution. Hence various methods for estimation of queue length is reviewed.

**Keywords** : RFID (Radio Frequency Identification), Tailed Interval-based Method (TIM), Passing Time-based Method (PTM), Trail Interval and Passing Time-based Method (T-PM), MAPE (Mean Average Percentage Error).

## I. INTRODUCTION

Traffic Congestion is a term which is characterized by longer trips, slower speeds and increase in the queue length. Intersection delays increase with the increase in the queue length. Mostly it reduces the capacity of the intersection through spillback and storage blocking between the lanes. Therefore queue length has been identified as the most important major for the calculation of operational performance of signalized intersection. Queue length is also used to determine the spacing between the intersections so that the queue does not spillover the upstream intersection. There are many methods for the

estimation of queue length. We are going to study different methods to check which one is better.

## II. LITERATURE REVIEW

[1] Dongfang Ma, Dianhai Wang, Yiming Bie, Feng Sun, and Sheng Jin—Using the data of roll time occupancy, a method was proposed to estimate the queue length in urban street networks. The main idea of this paper is that this speed of the following vehicles to pass through the detector will become smaller as the queue length in front of the queue detector becomes larger, leading to higher density with constant traffic frequency. Twelve different

conditions were planned, and traffic data was collected using VISSIM simulation under different conditions, taking into account the relationship between roll time occupancy and queue length influenced by multiple variables such as connection length, lane width, lane number and bus ratio. Based on the simulation data review, it was decided to build an S-type logistic model for the relationship between queue lengths and roll time occupancy, and in the twelve simulation situations the fitting equations were obtained. Successive multiple linear regression with the fitting equation parameter and simulation parameter provided the average model for the relationship between queue length and roll time occupancy, and the estimation model for queue length was presented by evaluating the average relationship model equation..

[2]**Aoxiang Wu, Xiaoguang Yang**—Basic method for input and output approach for the queue length estimation method can only accommodate queues shorter than the distance between the vehicles detector and intersection stop line, since once the detector is filled by the queue, the total vehicle count for the arrival traffic is not available. The paper proposes a model to detect the real time queue length based on RFID (Radio frequency Identification) detector data on the basis of study of the traffic flow shock wave profile on the approach of signalized intersection. The model addresses the issue of measuring the intersection queue length by exploiting the queue length of every single vehicle instead of counting the traffic flow rate at signalized intersections. Using RFID detector at the field, the data was carried out at the Nanjing Intersection.

[3]**Haijian Li, Na Chen, Lingqiao Qin, Limin Jia, Jian Rong**—The queue length estimation mechanics were modeled and analyzed by various layout strategies in this paper. Depending on the intersection percentage of the roads, several feasible techniques for magnetic sensors are proposed for intersection. In addition, a one single magnetic sensor is suggested for the queue

length estimation. Specifically, three methods of single-sensor based estimation method are used which are Tail Interval-based Method (TIM), Passing Time-based Method (PTM) and Trail Interval and Passing Time-based Method (T-PM). The algorithm and the corresponding optimal layout strategy of the queue length estimation were presented on the basis of field data. The finding suggested that in terms of accuracy and robustness, T-PM had better results. It was checked that this strategy with a single magnetic sensor was the most economical strategy for estimating the queue length of the immediate past signal cycle..

[4]**Shuzhi Zhao, Shidong Liang, Huasheng Liu, and Minghui Ma**—Traditional methods seems insufficient to predict the length of the queue when the state of traffic varies significantly. The problem is solved in this paper by using Cell Transmission Model, a macroscopic flow of traffic, to explain the accumulation and discharge phase of vehicles at a signalized intersection. Some of its rules have been modified accordingly to adapt the model correctly to the urban traffic. Besides, in a short interval we can approximate the density of each cell of the path. Second, we define the cell were the queues tail is located. Then we determine the exact position at the back of the queue. The models are estimated by comparing the maximum queue length and average queue length predicated with the results of simulation carried out by data acquired from the field and queue tail trajectory testing.

[5]**Qing CAI, Zhongyu Wang, Bing Wu, PhD**—Measuring service level such as queue length at intersections in real time has received considerable attention with the explosion of traffic sensing data. In this paper, by using the data of an upstream point sensor and the moving trajectory of prob. vehicle observed by a mobile sensor, we study how to estimate real time cycle-by-cycle queue length at signalized intersections. Based on the space relationship between the rear of the queue, the point

sensor position and the vehicle stop or start-up point, three cases may be divided. Critical break point can be identified by fusing the point data and mobile sensors to show many main stages of queue forming and dissipation. For the three cases, estimation models of the full queue length are suggested based on the Light-Witham-Richards theorem. In this paper, the algorithm has zero restriction on the traffic state (i.e. oversaturated and under-saturated conditions). In Shanghai, China, the technique is applied to the data which has been observed from the field. As a result, 11.60% and 9.98% are the mean average percentage errors (MAPEs) of the first two cases, which mean that the models have fair accuracy of estimation for the cases. For the third case, the Mean Average Percentage Error (MAPE) of the model is 26.40%, suggesting that the output degrades but still has a reasonable precision.

**[6]Anusha S. P, Lelitha Devi, Anuj Sharma**—In this paper a simple method is developed for estimation of queue length at signalized intersection. Two intersections were taken in which loop detectors are installed at both entry and exit at the intersection. They are placed at 90m & 100m behind stop line and in front of stop line respectively. The results we get is in the form of 0-1 digital pulses along with time stamps. The number of vehicles estimated are at 10 seconds time interval with the help of the advance and stop bar detectors.

**[7]Bing li, Wei Cheng, and Lishan**—In this paper LWR shockwave theory and Robertson's method is used to determine the real time prediction model of lane based queue length at intersections. Various assumptions are made in this model. The predicted model is used for the design of the predictive signal control.

**[8]Fuliang Li, Keshuang Tang, Jiarong Yao**—There are many methods to estimate the queue length based on various types of data sources. With the increase in the use of probe vehicles there is an increase in the research of estimation of cycle by cycle queue length

by using probe data. In this paper they have proposed cycle by cycle queue length by using vehicle trajectory data with assumptions. With the help of the probe vehicles we can have vehicles incoming and outgoing data for both saturated and unsaturated traffic conditions.

**[9] Ning Wu**—At various signalized intersections the traffic at red end is of much importance for determining the lengths of the lane also green end is not that important but it helps in determining the queue length . In this paper the 95<sup>th</sup> & 99<sup>th</sup> percentile of queue length is estimated under various traffic conditions . Regression model is used and then the data required for regressions is calculated by Markov Chains.

**[10] Zahra Amini, Ramtin Pedarsani, Alexander Skabardonis, Pravin Varaiya**—In this paper the real time queue length is estimated by using the magnetic sensors. Three types of sensors detectors are used viz. advance, stop bar, departure. The readings are recorded as per the vehicles crossings the detectors .it can't give accurate results. Advance detectors are placed at upstream of the intersection at 200-300 feet and stop bar detectors are in front of the detectors and vehicle detector to detect a vehicle as it enters in the intersection.

### III. DISCUSSION

1. Study of estimation of queue length mostly depends on three parameters viz. Detection, Estimation & Prediction.
2. In Detection, cameras are mostly used for estimating queue at signalized intersection, main disadvantage is we cannot obtain maximum queue also it does not consider the fluctuations in the traffic flow.
3. Estimation is done by using Input-output models & Shockwave models, as it provides better analysis framework for queue length estimation.

4. Prediction is the new developing trend in which we can predict the traffic behavior and plan accordingly for signal priority and queue length management.
5. Manual calculation of Queue length is most accurate and reliable.

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# Comparative Analysis of Performance Indonesia with the Philippines Banking Stock Using the Sharpe, Treynor, and Jensen Index

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## ABSTRACT

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This study aims to analyze the comparison of the performance of banking stocks on the LQ 45 index in Indonesia and the Philippines PSEi during the 2014-2018 period. This type of research is descriptive with a quantitative approach. The research used is to calculate the return and risk of banking stocks. For further analysis, it measures performance based on the Sharpe, Treynor, and Jensen indexes. Comparative testing was performed using the Independent Sample T-Test. Based on the return calculation, Indonesian banking stocks have a significantly greater return than the Philippines. As for the risk, there is no significant difference, but the risk of Indonesian banking stocks is relatively greater. Performance measurement results based on the index of Sharpe, Treynor, and Jensen is the Indonesian banking stocks relative performance is better than the Philippine banking stocks, although there was no significant difference.

**Keywords :** Banking Stocks, LQ 45, PSEi, Sharpe Index, Treynor Index, Jensen Index, T- Test

## I. INTRODUCTION

### 1.1 Background

The enactment of the ASEAN Economic Community (MEA), is generally defined as an integrated community with one another, where there is free trade among ASEAN member countries aiming to transform ASEAN into a more stable and competitive in economic development. With the MEA, it will make it easy for a number of foreign securities companies to offer products throughout the ASEAN

region and encourage local companies to list their shares in the capital markets of other countries.

Indonesia and the Philippines are increasingly being looked at by foreign countries as investment destinations. The report released by US News named the Philippines and Indonesia as the world's first and second-best investment destinations. Indonesia is considered to have relatively stable economic growth in the coming years as well as policy reforms that are combined with national economic performance. The Philippines is aggressively accepting increased foreign

investment from strong economies such as China. One of the advantages of this country is a trained workforce with relatively affordable wages. The countries of Indonesia and the Philippines share the same socio-economic sector with the fastest economic growth trend in other ASEAN countries. In addition to the economic sector which is growing quite rapidly. Currently, Indonesia and the Philippines have the majority of the population in their productive age. The banking sector in Indonesia and the Philippines has several financial indicators in common, including the ratio of domestic credit to Gross Domestic Product (GDP) in the range of 33.8% and 43.6% in 2016, supported by strong capital.

Many stock market analysts argue that the drop in banking shares, in general, occurs because of three things that last year the banking stock price has gone up high, economic conditions such as the trade war between the US and China that could lead to recession, and rising interest rates. The financial sector has the largest market capitalization 31.05%. Some capital market experts, the prospects in the financial sector is still good, especially for banks are still attractive for their collection. This is because, in general, banks are still solid fundamentals and a decline in stock prices in the market sentiment due to the external sector [1].

An important step in the investment process is the portfolio performance evaluation stage. Several factors are concerned in evaluating portfolio performance including the level of risk, time period, selection of appropriate benchmarks, and investment objectives [2]. There are several methods that are relevant in measuring the performance of the portfolio based on risk and return is the Sharpe index, Treynor index, and Jensen index [3]. Sharpe index aims to compare portfolios against overall risk. Treynor Index is based on the same thing as the Sharpe index which forms the portfolio of the systematic risk is the market risk. While the Jensen

index can be interpreted as a measure of how much of the portfolio beat the market.

This study will assess the performance of stock investment in Indonesia through the capital market indicator that will be compared to the Philippines. The object of the research is banking shares incorporated or listed in LQ 45 index PSEi to Indonesia and the Philippines. Stocks that are incorporated in the index are stocks that have high liquidity and large market capitalization and supported by the company's fundamentals are good. The sample data used data with coverage year period 2014-2018. This research is the development of a research conducted by Akbar (2017) that analyzes the comparative performance of shares on the stock exchanges of ASEAN, namely Indonesia, Malaysia, Philippines, Singapore, and Thailand.

Based on this background, the researchers are interested in doing research titled "Comparative Analysis Stock Performance Banking Indonesia and the Philippines Using Sharpe, Treynor, and Jensen Index"

## 1.2 Problem Formulation

Based on the description above, the problems to be discussed in this study can be formulated as follows:

1. What is the description of the performance of banking stocks in Indonesia and the Philippines based on the Sharpe, Treynor, and Jensen Index?
2. How comparative analysis of the performance of banking stocks between Indonesia and the Philippines produces the best performance based on the Sharpe, Treynor, and Jensen Index?

## 1.3 Research Objective

In accordance with the formulation of the problem already described above, the objectives of this research are:

1. Analyzing the performance of Indonesian and Philippine banking stocks for the period 2014-

2018 based on the measurement of the performance of the Sharpe, Treynor, and Jensen Index.

## 2. Comparing the performance of banking stocks in Indonesia and the Philippines

### 1.4 Research Benefit

This research is expected to provide contributions and benefits to various parties, including:

1. For investors expected to provide an overview that will invest in stocks, especially banking stock instruments, to make investment decisions that can maximize the return and minimize the risk by considering the performance of the stock instrument and not overriding any consistency factor of an investment manager.
2. For academics and researchers in the education sector, this research can be used as a reference and add to the study materials and literature on capital markets in particular stocks. Moreover, providing additional insights and views on the performance of a stock portfolio with index method Sharpe, Treynor, and Jensen Index in a diversified stock.
3. Provide information to the investment manager, to always do the evaluation and improvement of the investment is managed.

## II. LITERATURE REVIEW

### 2.1 Return

Return is the result obtained from the realization of investment activities in the form of return and return expectations [4]. Form of return can be a return realization that has happened and return expectations that have not happened yet, but investors are expected to occur in the future. In measuring realized return, total return is widely used, which is the total return of an investment in a certain period. In this return, the calculation is based on historical data. This realized return can be used as a measure of company performance and the basis for determining future return expectations and risks. Conversely, the

expected return is the return that investors expect to receive in the future.

### 2.2 Risk

Risk is defined as the uncertainty of the results obtained in the future or the chance of loss of revenue in the future [5]. Standard deviation calculation stating the magnitude of expected risk. In principle, the risk can be divided into two parts, namely [6]:

#### 1. Non-systematic Risk

The risks associated with a stock can generally be avoided or minimized. This risk is often referred to as a specific risk or company risk. Non-systematic risk can generally be managed using the portfolio, such as through diversification.

#### 2. Systematic Risk

Market risk is of a general nature and applies to all stocks in the capital market is concerned. This type of risk cannot be avoided by investors even through diversification. An example is an increase in interest rates (interest-rate risk), rising inflation (inflationary risk), and high market volatility (market risk). Systematic risk measurement of a portfolio or security can be calculated using the beta. To calculate the portfolio beta, the beta of each security must be known in advance because the beta of a portfolio is the weighted average of the beta of any securities. A security's beta is the return covariance between the i-th security and the market return divided by the variance of the market return.

### 2.3 Composite Stock Price Index (IHSG)

An index to measure the movement of all shares listed on the Indonesia Stock Exchange. According to [7], the Stock Price Index is an indicator that shows stock price movements. The index serves as an indicator of market trends, where the movement of the index describes market conditions when the market is active or sluggish. IHSG is strongly influenced by stocks that have large market capitalization, which is often called the index movers or movers stock index. IHSG is commonly known as the JKSE code.

## 2.4 PSEI Index

If in Indonesia using the IHSG, to the Philippines using PSEi. Philippine Stock Exchange Composite Index (PSEi), formerly named Phisix, are 30 companies listed, carefully selected to represent the general movement of the stock market. In other words, this is a benchmark that measures the performance of the Philippine stock market. Consisting of stock representatives from Industry, Property, Services, Holding Companies, the Financial Sector, Mining and Oil.

## 2.5 Sharpe Index

Sharpe is often referred to as the Reward to Variability. Sharpe measure against the return of a portfolio standard deviation or total risk. This method uses the concept of a capital market line as a benchmark by dividing the portfolio risk premium by its standard deviation [8]. In portfolio theory, the standard deviation is the sum of the total risk of market risk (systematic) and unique risk (non-systematic). Sharpe index takes into account three things: the portfolio return, standard deviation, and the risk-free rate.

If the Sharpe index value is positive and the greater the portfolio performance is getting better. The portfolio with the highest Sharpe ratio performed the best and vice versa. To determine the ranking of the portfolio, the Sharpe ratio of the portfolio should be compared with the Sharpe ratio of the portfolio of another.

## 2.6 Treynor Index

Treynor Index is commonly called the concept of the securities market line, which defines the relationship between the portfolio return to the market, where the slope of the line measures the relative volatility of the portfolio to the market (beta). In principle, the beta coefficient is used to measure the volatility of the stock, portfolio, or the market itself. The bigger the slope of the line, the better the trade-off. Treynor

Index takes into account three things: the return of portfolio, risk-free rate, and beta portfolios.

If the Treynor index value is positive and the greater the portfolio performance is getting better. Treynor ratio is a simple extension of the Sharpe ratio and completes the first restrictions Sharpe ratio by replacing the beta risk with total risk. [3]

## 2.7 Jensen Index

This index measures the difference between the actual return and the CAPM based on the same risk (beta) [9]. This identifies the ability of active management to improve returns more as a reward from risk. Jensen is very concerned at CAPM to measure the performance of the portfolio which is often called ALPHA Jensen.

The Jensen Index value ( $\hat{\alpha}_p$ ) shows whether the portfolio has outperformed the market. If  $\hat{\alpha}_p$  positive, then the portfolio has outperformed the market; if  $\hat{\alpha}_p$  is negative, the portfolio has underperformed the market. A positive index means that the portfolio provides a return greater than the expected return, so it is a good thing because a portfolio has a relatively high return for its level of systematic risk.

## 2.8 Independent T-Test

Test T serves as a data analysis tool to test one or two populations population and compare the two mean (average) to determine whether there are differences in average real differences or due to chance. Before the independent T-test was carried out, the data normality test was carried out. If the data are normally distributed, then tested the homogeneity or variance to test F-test or Levene's Test.

The decision is based on a comparison of the significant value in a test independent sample t-test is based on the basis of a decision as follows: [10]

- If Sig. (2-tailed) > 0,05 then accept  $H_0$   
There were no differences in average significantly
- If Sig. (2-tailed) < 0,05 then accept  $H_1$   
There are differences in the average significantly



III. RESEARCH METHODOLOGY

3.1 Data Source

Sources of data used in this study using a non-participant observation. Non-participant observation carried out by observing and recording all the data required in this study of historical data monthly closing price of bank shares state of Indonesia and the Philippines. The data used in this study used secondary data collected in the 2014-2018 period. Data is internal or external organizations and accessed via the internet or publication of information.

1. The closing price of monthly banking shares that entered LQ-45 from the Indonesia Stock Exchange (IDX) and the PSEi composite index from the Philippine Stock Exchange
2. The interest rate on Bank Indonesia SBI report, central statistical agency (BPS), and BSP Central Bank of the Philippines.
3. The market price index derived from IHSG and PSEi

3.2 Determination of Stocks

The period in the determination of the stock in this study period from 2014 until 2018. Where such shares are entered into the category of index LQ-45 and PSEi. Only select banking stocks that are listed on the LQ-45 index and the PSEi composite index for 5 consecutive observation periods during the 2014 - 2018 period

Table 3.1 object of research

Country	Code	Emitten
Indonesia	BMRI	PT Bank Mandiri (Persero) Tbk
	BBRI	PT Bank Rakyat Indonesia (Persero) Tbk
	BBNI	PT Bank Negara Indonesia (Persero) Tbk

	BBCA	PT Bank Central Asia Tbk
Philippine	BDO	BDO Unibank, Inc.
	BPI	Bank Of The Philippine Islands
	MBT	Metropolitan Bank & Trust Company

3.3 Data Analysis

Analysis of the data used in this research is descriptive quantitative

1. Calculating the average stock return  
Comparison of the difference in the percentage of the closing price of the stock [3]

$$R_{p(t)} = \frac{P_t}{P_{t-1}} - 1 \tag{1}$$

$$R_p = \sqrt[n]{\prod_{t=1}^n (1 + R_{p(t)})} - 1 \tag{2}$$

$$R_p = (1 + R_p)^{12} - 1 \text{ (annualized)} \tag{3}$$

2. Calculating the average return of the market (benchmark)

Comparison of the percentage difference from the closing price of the benchmark index [3]

$$R_{m(t)} = \frac{IB_t}{IB_{t-1}} - 1 \tag{4}$$

$$R_m = \sqrt[n]{\prod_{t=1}^n (1 + R_{m(t)})} - 1 \tag{5}$$

$$R_M = (1 + R_m)^{12} - 1 \text{ (annualized)} \tag{6}$$

3. Calculating of *risk free rate* [3]

$$R_f = \frac{\sum \text{risk free rate}}{n} \tag{7}$$

4. Calculating the standard deviation

Standard deviation is generated using the following formula [3]

$$\sigma_p = \sqrt{\frac{\sum_{t=1}^n [R_{p(t)} - R_P]^2}{n-1}} \tag{8}$$

$$\sigma_P = \sigma_p \sqrt{T} \text{ (annualized)} \tag{9}$$

5. Calculating the Beta value ( $\beta$ )

Beta is measured by dividing the covariance between market and stock returns by the benchmark variant [3]

$$\sigma_{pm} = \frac{\sum_{t=1}^n [R_{p(t)} - R_P] - [R_{m(t)} - R_M]}{n} \tag{10}$$

$$\beta_p = \sigma_{pm} / \sigma_m^2 \tag{11}$$

6. Calculating performance measurement

a. Sharpe Index

The formula used by the Sharpe index is as follows [3]:

$$\hat{S}_p = \frac{R_p - R_f}{\sigma_p} \tag{12}$$

b. Treynor Index

The formula used by the Treynor index is as follows [3]:

$$\hat{T}_p = \frac{R_p - R_f}{\beta_p} \tag{13}$$

c. Jensen Index

The formula used by the Jensen index is as follows [3]:

$$\hat{\alpha}_p = R_p - [R_f + (R_M - R_f) \beta_p] \tag{14}$$

7. Comparison with Statistical Test

1) Normality Test

Shapiro-Wilk is one of the normality tests recommended by many researchers if the sample size is small, which is less than or equal to 50 samples ( $\leq 50$ ) [12]. This test is very sensitive or suitable for detecting any abnormal data distribution. Decision making in the normality test is: [11]

1. If the value of Sig. (Significance)  $\leq 0.05$  (Sig. Value greater than 0.05), then the data is not normally distributed
2. If the value of Sig. (Significance)  $> 0.05$ , (the Sig. Value is smaller than 0.05), then the data is normally distributed.

2) T-Test

If the data are normally distributed, then tested the homogeneity of variance to test F-test or Levene's Test

$$F = \frac{S_1^2}{S_2^2} \tag{15}$$

The T-test for the same variant uses the Polled Variance formula, as follows:

$$t = \frac{\bar{X}_1 - \bar{X}_2}{\sqrt{\frac{(n_1-1)S_1^2 + (n_2-1)S_2^2}{n_1+n_2-2} \left(\frac{1}{n_1} + \frac{1}{n_2}\right)}} \tag{16}$$

The T-test for different variants used the separated variance formula, as follows:

$$t = \frac{\bar{X}_1 - \bar{X}_2}{\sqrt{\frac{S_1^2}{n_1} + \frac{S_2^2}{n_2}}} \tag{17}$$

IV. ANALYSIS AND DISCUSSION

4.1 Banking Stocks Performance Indonesia And Philippines

1. Return of Indonesian and Philippine Banking Stocks

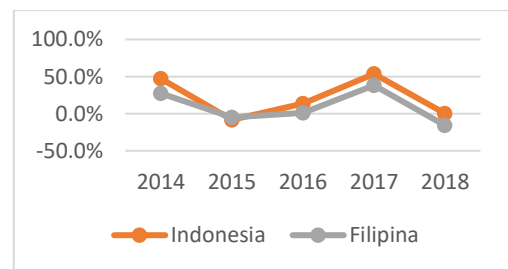


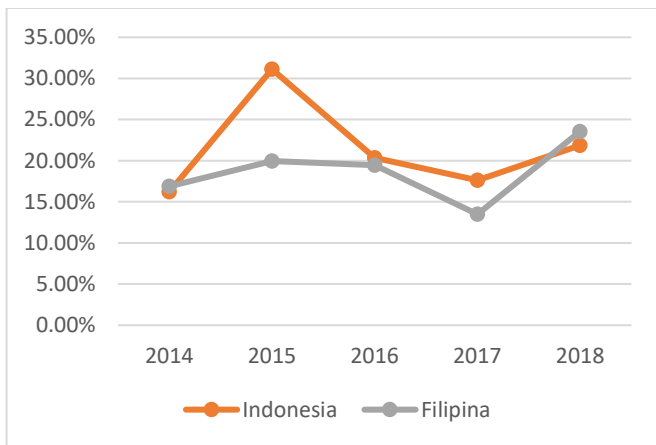
Figure 4.1

Return Chart for Banking Stocks in Indonesia and the Philippines, 2014-2018

Based on Figure 4.1, in 2015, banking stocks in Indonesia and the Philippines experienced a

decline. It can be seen that the average return in 2015 was negative. This is due to the increase in the Fed's interest rate. The World Bank report, economic big countries and developing ASEAN will be strengthened in 2017. The Philippines benefits from higher public spending on infrastructure, an increase in private investment, credit expansion, and increased income from abroad. Meanwhile, for Indonesia, credit expansion and rising oil prices will boost economic growth in 2017. In 2018, there was a trade war between China and the US that lasted quite a long time. The incidence of severe consequences for investment in world capital markets. Market capitalization, especially for the financial sector in Indonesia, is the largest and most dominant. Where the largest index is a bank. Unlike the Philippines, the financial sector is not the largest capitalization.

2. Banking Stocks Risk of Indonesia and the Philippines

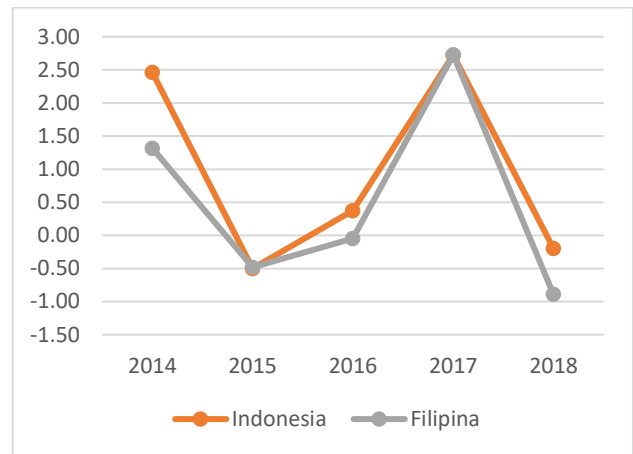


**Figure 4.2.** Risk Chart for Banking Stocks in Indonesia and the Philippines, 2014-2018

Based on Figure 4.2, the comparison of risk levels shows that the risk of banking shares in Indonesia and the Philippines shows that Indonesian banking stocks have a greater risk level than the Philippines. In 2018, Bank Indonesia and the Philippines Central Bank

raised interest rates five times the impact commencing until economic conditions the US and China trade war. With an increase in interest rates, the company's expenses will increase. Increasing expenses will reduce the level of company profits so that the stock price will also be depressed. This will make investors withdraw their capital from the capital market. Increased borrowing costs and the exchange rate against the US dollar strengthening caused financial pressures in developing countries such as Indonesia and the Philippines. It can trigger risk aversion and asset sales in the financial markets.

3. Banking Stocks Performance with Sharpe Index



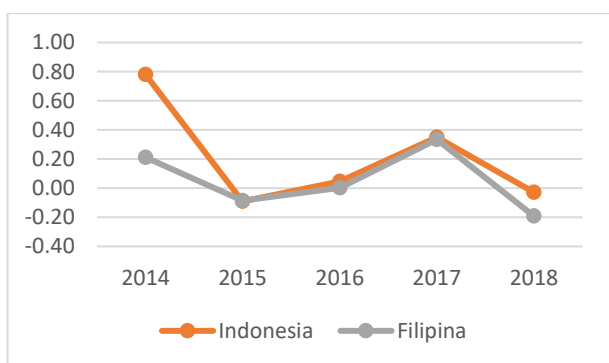
**Figure 4.3** Comparison chart of the performance of the Indonesian and Philippine Banking Stock Sharpe index in 2014-2018

In addition to the increase of the federal funds rate in the US in 2015 that affected the decline in stock prices in the ASEAN, issues related to non-performing loan (NPL) is a non-performing loan, which is one key to assessing the quality of the bank's performance. If the NPL increases would negatively impact the bank. One negative effect is to reduce the amount of capital owned by banks. NPL trigger factor is the US trade war with China and the weakening of the currency in 2018, the debtor is not able to resolve the problem of bad loans due to high-interest rates. FSA data by the end of 2018, the position of NPL was at 2.2%, the

ratio is much lower compared to the year 2017 was at the level of 2.59%. As for the Philippines, the NPL ratio at the end of 2018 stood at 1.8%, the ratio was higher at a 1.7% position in 2017.

Based on the performance of a financial index, throughout 2018 for Indonesia posted a positive 3.05% while the Philippines recorded a poor result which fell by 20.19%. This causes excess return Indonesian banking shares is greater than the Philippines for each unit of total risk. That is the advantage to invest in banking stocks Indonesia and the Philippines is greater than the profit of investments in risk-free assets, the benefit of investment in the Indonesian banking shares is greater than the Philippines when viewed from the risk of the total for each index.

#### 4. Banking Stocks Performance with Treynor Index



**Figure 4.4.** Comparison chart of the performance of the Indonesian and Philippine Banking Stock Treynor index in 2014-2018

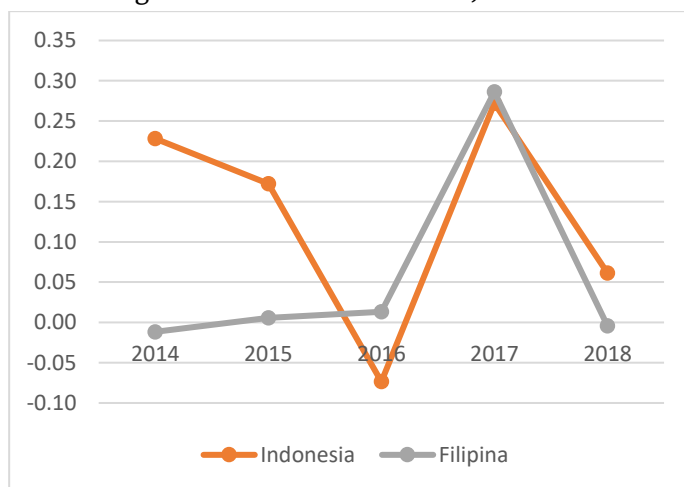
In 2015 all the performance of banking stocks in Indonesia and the Philippines declined. This is not apart from the crisis global economy and the Fed's interest rate hikes. Especially to the Philippines, they have a huge debt of around 77% of GDP which inhibits repair of the economic situation of the Philippines. Allocation of funds for debt is higher than in other sectors. The main problem faced by the banking Philippines also of the crisis today is too concentrated bank lending to the corporate sector. As a result, banks are very

vulnerable to systemic risks. Another difficulty in making banking supervision in the Philippines is not effective is banking too many banks. This can occur because the central bank has been too focused on payment systems and banking supervision instead.

Indonesia's positive performance in 2016 was supported by a package of government policies that create runaway inflation and a decline in the benchmark interest rate. In addition, a tax amnesty program or a tax amnesty contributed to the positive performance of the capital markets in Indonesia so the impact on stock prices, especially banking stocks.

ASEAN economic growth declined in 2018. According to data collected by the Asian Development Bank (ADB), the economic growth of five ASEAN countries including Indonesia and the Philippines reached 4.8%. In addition to its US and China trade war, countries in the ASEAN region weaken the exchange rate. Philippine economic growth fell from 6.7% in 2017 to 6.2%. While Indonesia was 5.17% in 2018 compared to 5.07% in 2017. This was due to the increase in private consumption, namely the Asian Games.

#### 5. Banking Stocks Performance with Jensen Index



**Figure 4.5.** Comparison chart of the performance of the Indonesian and Philippine Banking Stock Jensen index in 2014-2018

Based on the research results and comparisons show Jensen index performance measurement is based on the theory of the Capital Asset Pricing Model (CAPM), which compares the excess return with the required return predicted from the CAPM. Jensen index performance measurement results are positive on banking stocks in both countries. This indicates that investment managers in each country generally perform better than expected. The index of banking stocks is positive means Indonesia and the Philippines provide a return greater than the return expectations (placed above the securities market) so it is a good thing because banks have a relatively high return to the level of systematic risk.

Jensen index measurement acquisition during the period 2014-2018 explained that the investment manager to the Indonesian banking stocks outperformed the Philippines. This suggests that the Indonesian banking stocks have an actual rate of return that is relatively larger than the Philippines against the expected return.

In 2016, the performance of Indonesian banking stocks was below the Philippines. This is due to the domestic economic slowdown which is inseparable from the global economic recovery is still weak. Based on the report of the Central Statistics Agency (BPS), Indonesia's economic growth during the first quarter of 2016 only 4.92%, lower than the fourth quarter of 2015 by 5.04%. In addition, bank net profit decreased by 2.29% based on OJK data. The decrease in net income was also due to an increase in operating expenses. Because the real sector in the doldrums, the impact of lending also weakened. Until the third quarter of 2016, NPL is still on an upward trend. Data from Bank Indonesia (BI) noted the NPL ratio to 3.2% by August 2016.

The Deposit Insurance Corporation (LPS) noted that the net interest margin (NIM) or net interest gain in national banking is still at the highest rate in the world at 5%. This happens due to the growth of the banking business in Indonesia. In the period of November 2018, NIM Commercial Bank Business Activity (BOOK) IV recorded a rate of 5.77%. NIM Indonesia including the highest rated. High NIM describes inefficiencies due to expensive venture production costs due to interest, in other words, credit is expensive. Compared to banks in ASEAN in the range of 1-2%, due to cost-efficient due to good infrastructure networks and geographical conditions of a country. In addition, people are familiar with electronic money, credit cards, so that operating costs can be cheaper.

In 2018, bank credit growth in Indonesia has been on target which is 11.75% YoY. NPL ratio of the banking industry managed to a level of 2.37%. Performance data bank fundamentals are in accordance with market expectations and even more. Throughout 2018, bank lending grew by double digits. This indicates a positive impact to the bank for successfully passing the unfavorable global conditions.

#### **4.2 Comparative Stock Performance Banking Indonesia And Philippines**

Of normality test results it can be concluded that all of the data in the study had a normal distribution. This is indicated by all the Sig count > 0.05. Then it can be continued with different tests T-test was used to compare the average difference between the two different samples.

##### **1. Return**

Based on the results of data processing using SPSS, known to the Sig. 0.03 < 0.05 means that there is a significant difference between the returns of banking stocks in Indonesia and the Philippines. Return Indonesia three times larger than the

Philippines. This is in line with Indonesia's anticipation banking company better. Based on BEI report that Filipina market return in YTD 2018 decreased sharply by 12.76% compared to Indonesia just 2.54%

## 2. Risk

Based on the results of data processing using SPSS, known to the Sig.  $0.37 > 0.05$  means that there is no significant difference in risk between Indonesian and Philippine banking stocks. Although Indonesia has a bigger risk. This is in line with Indonesia's Credit Default Swap (CDS) value of 103, which is still higher for the Philippines at 56

## 3. Sharpe Index

Based on the results of data processing using SPSS, known to the Sig.  $0.17 > 0.05$  means that there is no significant performance difference between Indonesia and the Philippines banking stocks. Although Indonesia has performed better. This is in line with the Indonesian banking stocks excess return greater than the Philippines for each unit of total risk so that the larger benefits of investing in Indonesia.

## 4. Treynor Index

Based on the results of data processing using SPSS, known to the Sig.  $0.35 > 0.05$  means that there is no significant performance difference between Indonesia and the Philippines banking stocks. Although Indonesia has a better performance. This is in line with economic growth in Indonesia was increased from 5.07% (2017) to 5.17% (2018). Meanwhile, the Philippines opposite from 6.7% to 6.2%.

## 5. Jensen Index

Based on the results of data processing using SPSS, known to the Sig.  $0.1 > 0.05$  means that there is no significant performance difference between Indonesia and the Philippines banking stocks. Although Indonesia has performed better. This is in line with the Chamber of Commerce reports that the Net Interest Margin (NIM) Indonesia is

high in ASEAN, with a value of 5% and 3% Philippines.

## V. CONCLUSIONS AND RECOMMENDATIONS

### 5.1 Conclusions

1. Banking Stocks Performance Indonesia and the Philippines
  - a. Performance Indonesian banking stocks have performed well (positive) in the period 2014-2018. Performs above the market and the banking company which is a large market capitalization in ASEAN
  - b. In general, Philippine banking stocks performed quite well. Although for the most part, the banking performance is negative or under market. Has a relatively low level of investment risk
2. Comparative Stock Performance Banking Indonesia and the Philippines
  - a. The comparison returns showed that the Indonesian banking stocks had an average return rate significantly higher than the Philippines during the period 2014-2018
  - b. The comparison showed that the risk of the Indonesian banking stocks has an average higher relative risk than the Philippines during the period 2014-2018. However, there was no significant difference.
  - c. The results of performance comparisons based on the Sharpe, Treynor, and Jensen indices show that the performance of Indonesian banking stocks is relatively better than in the Philippines for the 2014-2018 period. However, there was no significant difference.

### 5.2 Recommendations

1. Sharpe index when the market value or its performance is negative, then the use of this index measurement with potential to cause an error of interpretation.

2. Using other ratios and duplicated data samples in order to increase research accuracy and to always monitor the dynamic development of the banking industry in accordance with ASEAN and global macroeconomic conditions.
  3. Things that must be considered in order for Indonesia to enter QAB are maintaining a strong level of capital and having good fund management and corporate governance.
  4. The performance of Indonesian banking stocks is better than that of the Philippines, however, Indonesian stakeholders must continue to improve Indonesia's economic fundamentals so that the investment risk perception indicator (CDS) can decrease.
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# A Review on Recent Advances of Diagnosis and Monitoring of Different Kinds of Diabetes Mellitus

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## ABSTRACT

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The increased incidence of non-communicable diseases like Diabetes, with its associated mortality and morbidity amount has contrived the healthcare society to come up with a new way to deal with it. Type 1 Diabetes has usually been the area of importance as the source of the autoimmune reaction, can be refer to many genetic and environmental circumstance. These audits of essay aims to element the origins of Type 1 and Type 2 Diabetes and also investigate novel procedure in the examination and monitoring of patients, within the area from conventional blood glucose levels and glycosylated in the level of hemoglobin to genetic markers, hormone levels and autoimmune antibody levels. Monitoring and therapeutic mediation have also proceed from syringe and vial policy of glucose to portable Glucometers, insulin pumps and the artificial pancreas device system. The invention of the Non-invasive Blood glucose monitoring structure is also ongoing. Digitalization in healthcare management has get to the improvement of smart phone operation for the desertification of health data for diabetic patients leading to further global electronic health records that can promote care delivery. The advocacy of self-management with the support of health data operation, increased the consciousness due to diabetic educators, national and global campaigns, and the arrangement of hysterical and psychological support to the patients, has helped to improve consent to fight the disease. The holistic, interdisciplinary and patient centric design used to access the management of Type 1 and Type 2 Diabetes, has shown revised patient result.

**Keywords** : Type 1 Diabetes, Insulin, Hyperglycemia, Autoimmune disorder, Type 2 Diabetes, Digitization in Healthcare, Genetic defects of the  $\beta$ -cell



## I. INTRODUCTION

Diabetes mellitus is a metabolic disorder that is usually occurring due to defects in insulin secretion, insulin action, or both [1]. Diabetes mellitus is a major public health concern in both developed and developing countries with many medical and economic burdens. The risk factors associated with diabetes include renal disease, adult blindness, impotence, and non-traumatic lower-limb amputation and in some cases, it can lead to death. Despite the challenges in diagnostic and therapeutic options in the treatment of diabetes, there is an improvement in the last two decades. The incidence of diabetes continued to rise in 2007 and the global frequency of diabetes is projected to reach 366 million by the year 2030 [2]. The acute hyperglycemia of diabetes has been associated with some damage, due to the dysfunction, and failure of various parts of the human body, such as the eyes, kidneys, nerves, heart, and blood vessels. The pathogenic processes are involved in the advances of diabetes [1]. Diabetes mellitus is a metabolic disorder, which is associated with an increased risk of micro vascular and macro vascular disease. Its main clinical characteristic is hyperglycemia [1]. The Signs of the deficiency of glucose include polyuria, polyphagia, polydipsia, weight loss, and sometimes blurred vision. The growth and susceptibility of certain infections may also be caused by acute or chronic hyperglycemia. The acute, life-threatening effect of uncontrolled diabetes is an extremely high level of glucose with ketoacidosis or the non-ketosis hyperosmolar syndrome [3]. It took a while for the researchers to discover the mechanisms that lead to hyperglycemia and the effect it has on the human body. The identification of insulin has played a key role in glucose metabolism [4]. Type 1 diabetes was identified in early childhood while type 2 diabetes was discovered in adults. There are two categories of TD1 they include, monogenic diabetes syndromes, which are been found in maturity, and latent

Autoimmune Diabetes that are found in adulthood. In recent years, patients have been exhibiting features of both types of diabetes in the community, making it a high challenge. There is a new experimental technique that shows the measurement of insulin 'impedance' with a peripheral effect of insulin and 'non-insulin-dependent diabetes that lead to the formation of the term "insulin resistance". Further research was been discovered on the role of insulin resistance in cardio metabolic alterations such as dyslipidemia, inflammation, and high blood pressure. During pregnancy, Gestational diabetes starts to raise in blood glucose values above normal but below those conditions of diabetes that occur during the pregnancy. Women, who suffer from gestational diabetes, are at an increased risk of complications during the time of delivery. They are also at increased risk of TD2 in the future [5]. Hemoglobin A1C is a test that stable glycoprotein when glucose binds with hemoglobin A in the blood by managing the hyperglycemia in uncontrolled diabetic patients.

## TYPES OF DIABETES MELLITUS (DM)

### Type 1(DM)

In type 1 diabetes 5%-10% of subjects are diagnosed with diabetes [6]. Type 1 usually occurs due to autoimmune destruction of the pancreas in the  $\beta$  cells that give responses to the T-cell which mediates the inflammatory response (insulinitis) as well as a humeral response (b cells)[7]. The autoantibodies that are present in the pancreatic islet cells are the hallmark of type 1 diabetes (DM), though the presence of the antibodies in the pathogenesis of the disease is not active. Autoantibodies include glutamic acid decarboxylase, islet cell autoantibodies, and autoantibodies to insulin, zinc transporter protein, and protein tyrosine phosphatase [6]. These pancreatic autoantibodies are epitomized by type 1 diabetes (DM) and are been discovered in the serum of the patients, some months or years before the onset of the disease [8]

Autoimmune type 1 diabetes has a strong human leukocyte antigen(HLA), with linkage to DR and DQ genes. HLA-DR/DQ alleles can be either predisposing or protective [9]. According to International Diabetes Federation (IDF), the

number of youth (0-14 years) diagnosed with type 1 diabetes worldwide in 2013 was 497100 (Table 1) and the number of newly diagnosed cases per year was 78900.

Table1

Region	Type 1 diabetes in children (0-14yr)		Diabetes in adults (20-79yr)				Hyperglycemia in pregnancy(20-49yr)	
	2013	2035	2013	2035	2013	2035	2013	2035
	Number in thousands	Newly diagnosed in thousandth	Number in millions	Comparative prevalence	number in millions	Comparative prevalence	Cases in Live Births in Millions	Comparative prevalence
<b>Africa</b>	39.1	6.4	19.8	5.7%	41.5	6.0%	4.6	14.4%
<b>Europe</b>	129.4	20.0	56.3	6.8%	68.9	7.1%	1.7	12.6%
<b>Middle East and North Africa</b>	64.0	10.7	34.6	10.9%	67.9	11.3%	3.4	17.5%
<b>North America and Caribbean</b>	108.6	16.7	36.8	9.6%	50.4	9.9%	0.9	10.4%
<b>South and Central America</b>	45.6	7.3	24.1	8.2%	38.5	8.2%	0.9	11.4%
<b>South America</b>	77.9	12.5	72.1	8.7%	123.0	9.4%	6.3	25.0%
<b>Central America</b>	32.5	5.3	138.2	8.1%	201.8	8.4%	3.7	11.9%
<b>Southeast Asia</b>	497.1	78.9	381.8	8.3%	592.0	8.8%	21.4	14.9%
<b>Western Pacific</b>								
<b>World</b>								

The symptoms of Type 1 diabetes can occur in some ways like polydipsia, polyuria, enuresis, lack of energy, extreme tiredness, polyphagia, sudden weight loss, slow-healing wounds, recurrent infections, and blurred vision [10].

### Type 2 (DM)

In type 2 diabetes insulin secretion becomes very low with a high demand for insulin due to the abrupt destruction of  $\beta$  cells [11]. This could change some in type 2 diabetes patients by being unable to become dependent on insulin, most

patients in TDM2 are not dependent on insulin where the secretion in the insulin continues and insulin reduction hardly occurs. Dependence of insulin is one of the main major differences from type 1 diabetes, with the absence of ketoacidosis in most patients of type 2 diabetes and it does not occur in the autoimmune destruction of the  $\beta$  cells. Both type 1 and type 2 diabetes have a genetic susceptibility to them, although, type 2 diabetes has a stronger gene, the genes are more characterized in type 1 diabetes (the TCF7L2 gene is strongly associated with type 2 diabetes) [12]. Its diagnosis is usually delayed for some years especially in some countries where regular checkup is not part of the activity. The delay in diagnosis could higher the prevalence of long-term complications in type 2 diabetes patients since hyperglycemia is not treated during this period. The addition to diabetes that has many manifestations of insulin resistance, includes obesity, nephropathy, essential hypertension, dyslipidemia (hypertriglyceridemia, low HDL, decreased LDL particle diameter, enhanced postprandial lipemia, and remnant lipoprotein accumulation), ovarian hyperandrogenism and premature adrenarache, non-alcoholic fatty liver disease and systemic inflammation[13,14]. Among the factors involving in the improvement of insulin resistance, obesity is the most common risk factor that leads to insulin insensitivity and diabetes which involves several mechanisms that engage the pathogenesis of the disease [15]. Obesity- in insulin increases the nutrient flux and energy accumulation in tissues that usually affect cell responsiveness to insulin [16]. **The other types of diabetes include Genetic defects of the  $\beta$ -cell.** Many forms of monogenetic diabetes are connecting with the defects in  $\beta$ -cell function. They are frequently illustrated by the onset of hyperglycemia at an early age before 25years. They are referred to as maturity-onset diabetes of the young (MODY) and are characterized by diminished insulin secretion with minimal or no defects in insulin action [1].**Genetic defects in**

**insulin action.** There are uncommon causes of diabetes that result from the genetic abnormalities of insulin action. The abnormalities which are associated with the mutations of the insulin receptor may limit from hyperglycemia to acute diabetes. Some Women may be civilized and have enlarged cystic ovaries. In the past, this syndrome was termed type (A) [1]. **Diseases of the exocrine pancreas.** The process that diffusely injures the pancreas can cause diabetes. These processes include pancreatitis, trauma, infection, pancreatectomy, and pancreatic carcinoma. With exception of cancer that is caused by the damage to the pancreas must be extensive for diabetes to occur; adenocarcinomas involve a small portion of the pancreas that is related to diabetes [1]. **Endocrinopathies.** The Somatostatinoma and aldosteronoma-induced hypokalemia can cause diabetes, at least in part, by the secretion of insulin inhibition. Hyperglycemia is normally determined by the successful removal of the tumor [1]. **Drug- or chemical induced diabetes.** Numerous drugs can damage insulin secretion and they may not cause diabetes by themselves, but it can lead to diabetes in individuals with insulin resistance. In most cases, the category of the sequence or relative importance of  $\beta$ -cell dysfunction and insulin resistance is unspecified [1].

### Diagnostic criteria of DM

The diagnostic criteria for diabetes are listed in Table 2. There are three ways to diagnose diabetes, and this is possible in the absence of unequivocal hyperglycemia which may be confirmed on the previous day, by any of the three procedures given in Table 2. The hemoglobin A1c (A1C) for the diagnosis of diabetes is not endorsed at this time [1].

### GDM

The criteria and diagnosis of abnormal glucose tolerance in pregnancy are those of Carpenter and Coustan [17]. Recommendations from the

American Diabetes Association’s Fourth International Workshop Conference on Gestational Diabetes Mellitus held in March 1997 support the use of the Carpenter/Coustan diagnostic criteria as well as the alternative use of a diagnostic 75-g 2-h OGTT. These criteria are summarized below [1].

1. Symptoms of diabetes plus casual plasma glucose concentration  $\geq 200$  mg/dl (11.1 mmol/l). Casual is defined as any time of day without regard to time since the last meal. The classic symptoms of diabetes include polyuria, polydipsia, and unexplained weight loss.  
Or
2. FPG  $\geq 126$  mg/dl (7.0 mmol/l). Fasting is defined as no caloric intake for at least 8 h.  
Or
- 2-h post-load glucose  $\geq 200$  mg/dl (11.1 mmol/l) during an OGTT. The test should be performed as described by WHO, using a glucose load containing the equivalent of 75 g anhydrous glucose dissolved in water.

In the absence of unequivocal hyperglycemia, these criteria should be confirmed by repeat testing on a different day. The third measure (OGTT) is not endorsed for routine clinical use.

**Testing for GDM.**

The earlier recommendations that include screening for GDM are carried out in all pregnancies. Although certain factors can put women at lower risk for the evolution of glucose intolerance at the time of pregnancy, Pregnant women who succeed in all of these criteria need not be screened for GDM.

This low-risk group include women who;

- have no antiquity of poor obstetric outcome
- have no antiquity of abnormal glucose metabolism
- are 25 years of age
- are normal in body weight

- are not members of an ethnic/racial group with a high prevalence of diabetes (e.g., Hispanic American, Native American, Asian American, African American, Pacific Islander)
- have no family history (i.e., first-degree relative) of diabetes

**One-step approach.** Perform the diagnostic of OGTT without any prior serum or plasma glucose screening. The one-step approach may be cost-effective in high-risk patients or populations (e.g., some Native American groups).

**Two-step approach.** Perform an initial screening by measuring the plasma or serum glucose concentration 1 h after a 50-g oral glucose load (glucose challenge test [GCT]) and perform a diagnostic OGTT on that subset of women exceeding the glucose threshold value on the GCT. When the two-step approach is used, a glucose threshold value  $>140$  mg/dl (7.8mmol/l) identifies 80% of women with GDM, and the yield is further increased to 90% by using a cutoff of 130 mg/dl (7.2 mmol/l). Diagnostic criteria for the 100-g OGTT are derived from the original work of O’Sullivan and Mahan [18], modified by Carpenter and Coustan and are shown in the top of Table 2.

**Table 2.** - Diagnosis of GDM with a 100-g or 75-g glucose load

	mg/dl	mmol/l
100-g Glucose load		
Fasting	95	5.3
1-h	180	10.0
2-h	155	8.6
3-h	140	7.8
75-g Glucose load		
Fasting	95	5.3
1-h	180	10.0
2-h	155	8.6

Two or more of the venous plasma concentrations must be met or exceeded

For a positive diagnosis. The test should be done in the morning after an overnight fast of between 8 to 14 h and at least 3 days of an unlimited diet of 150g carbohydrate per day and unregulated physical activity. The patient should remain seated and will be restricted from smoking throughout the test [17].

## II. Management

Diabetes mellitus is an incurable disease, which has no cure except in actual specific situations. Administration focus on keeping blood sugar levels as close to normal ("euglycemia") as possible, without producing hypoglycemia. This can normally be adept with a weight-reduction plan, workout, and use of good medications (insulin in the case of type 1 diabetes; oral medications, as well as possibly insulin, in type 2 diabetes). The complexity of diabetes is lesser common and lesser serious in people who have well-managed blood sugar levels [19]. The aim of treatment is an HbA1C level of 6.5%, but it shouldn't be lesser than that and maybe set beyond [19]. Consideration is also given to other health complications that may advance the destructive effects of diabetes. These involve smoking, elevated cholesterol levels, fatness, high blood pressure, and lack of regular workouts. There is particular footwear that is extensively used to reduce the risk of ulceration, or re-ulceration, in at-risk diabetic feet. confirmation for the efficacy of this remains ambiguous, however.[19]

## III. Medication

Metformin is normally suggested as a first line therapy for type 2 diabetes, as there is genuine evidence that it reduces mortality. Routine use of aspirin, however, has not been found to enhance the consequence in straightforward diabetes. Angiotensin-converting enzyme inhibitors (ACEIs)

enhance consequence in those with DM while the homogeneous medications angiotensin receptor blockers (ARBs) do not. Type 1 diabetes is sometimes treated with a mixture of systematic and NPH insulin, or synthetic insulin analogs. Insulin is used in type 2 diabetes, an enduring method is normally added originally, while ongoing oral cure. The amount of insulin will then be increased to effect. In those with diabetes, not too many suggest blood pressure levels below 120/80 mmHg; but, proof only supports less than or equal to someplace between 140/90 mmHg to 160/100 mmHg [19].

## IV. Conclusion

Diabetes mellitus has been the outbreak of many centuries and without successful diagnostic procedures at a premature stage, diabetes will continue to arise. This study focuses on the types of diabetes and the successful diagnostic procedure and test to be used for the detection of diabetes and prediabetes. Diabetes is a compound disease with a huge puddle of genes that are required in its evolution. The accurate recognition of the genetic foundation of diabetes potentially gives a requisite tool to enhance diagnoses, therapy, and greater successful genetic support. Moreover, the modern knowledge of the alliance linking the medical genetics and the chronic problem of diabetes will supply an extra advantage to detain or eliminate this problem that foists a huge pressure on patient's quality of life and the significantly arising cost of health-care assistance.

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# Post-Disaster Mitigation and Recovery in Tourism Destinations: Learning from The Lombok Earthquake

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This research's main objective is to study various patterns of collaboration between stakeholders (central and local governments, tourism industry players, and affected communities) in the post-earthquake mitigation and recovery processes in tourist destinations in West Nusa Tenggara. This research methodologically uses a literary study approach. The relevant information has been collected from various news sources from electronic media, and then the information is arranged chronologically and thematically so that it can be studied further. In the research results section, we describe flashbacks of the Lombok earthquake disaster and then explain what has been done by the stakeholders. Finally, what should be done next in the post-disaster tourism destination recovery agenda? This study's insights may help policymakers, tourism businesses, and affected communities consider strategic collaborative measures in post-disaster recovery.

**Keywords** : Stakeholder Collaboration; Disaster Management; Earthquake; Tourism Industry; Lombok-West Nusa Tenggara

## I. INTRODUCTION

The tourism industry in recent decades has received much attention and is one of the leading industries in the world [1]. As one of the largest economic sectors globally, tourism supports one in ten jobs worldwide and generates 10.4% of world GDP (www.wttc.org). In 2018, the travel and tourism industry experienced a growth of 3.9%, compared to the global economy

(3.2%). The industry created one in five new jobs in the past five years (www.wttc.org). For many countries globally, tourism has become the primary income source [3]. However, the tourism industry is more prone to disasters than other industries [4]. Natural and cultural resources are usually seen as the leading tourism product; however, the severe damage generated after a disaster can affect tourism demand leading to a decline in economic activity.

As mentioned briefly above, the tourism industry is one of the industries most vulnerable to disasters because it is very dependent on natural resources; in other words, the threat of natural disasters can come at any time and may not be avoided [5]. The United Nations International Strategy for Disaster Reduction (UNISDR) reports that the accumulated economic damage caused by the disaster has reached \$ 1.4 trillion from 2005 to 2014. The number of people affected is also vast [6]. UNISDR [7] defines a disaster as "a serious disturbance to the functioning of a community or society that causes widespread human, material, economic or environmental harm that exceeds the ability of the affected community/community to cope with its resources" (p. 13). It was noted that in many cases reported, both the government and the tourism industry encountered obstacles and difficulties in overcoming the disaster [8] because it is difficult to predict and usually brings significant adverse effects [9]. In responding to disasters, effective inter-agency collaboration is essential for tourism response and recovery and requires ongoing efforts to maintain and develop collaborative relationships [10]. The tourism industry itself is a complex mix of many stakeholders; therefore, a strong network of cooperation and well-coordinated joint efforts can help accelerate the recovery of post-disaster adverse effects [11].

The recent earthquake disaster in Lombok Island, West Nusa Tenggara (especially in North Lombok Regency and West Lombok Regency) is a case example of how a disaster significantly affects the tourism sector disrupts economic activity, both micro and macro. The earthquake disaster resulted in a significant decrease in tourist visits (both domestic and foreign)(disbudpar.ntbprov.go.id). The impact can be more severe due to this industry's characteristics, namely the interdependence of industry players as a business chain, such as restaurants, transportation entities, accommodation, and attractions [9]. Imagine if one tourism business chain does not function, it is very likely that it will

affect the entire industrial ecosystem. The nature of the interconnectedness and interdependence between various stakeholders has resulted in a complex and dynamic environment for the tourism industry [13]. Therefore, cross-sectoral stakeholder collaboration is crucial to managing industry events [14], especially when dealing with natural disasters that significantly affect the tourism industry [15].

This paper's main objective is to study various patterns of collaboration between stakeholders and make the Lombok earthquake disaster a case study. Next, we examine various literature that discusses how stakeholder collaboration and its impact on effective tourism disaster management (especially post-disaster). However, research on this topic has received much attention at the international level. However, to the best of our knowledge, particularly in West Nusa Tenggara itself, there have not been many similar studies conducted. In other words, studies on this topic have the potential to contribute to knowledge development and provide a practical overview of taking sensible steps in disaster management in a tourist destination such as West Nusa Tenggara Province. We seek to collect and review various reports and relevant literature, primarily related to how stakeholders in the tourism industry coordinate and collaborate and identify barriers that affect coordination and collaboration in tourism disaster management. The insights from this study may help policymakers, tourism business actors and communities affected by the disaster to be able to consider strategic steps in post-disaster recovery, especially in the region of Lombok Island, West Nusa Tenggara. At the same time, we are identifying barriers affecting coordination and collaboration in tourism disaster management. The insights from this study may help policymakers, tourism business actors and communities affected by the disaster to be able to consider strategic steps in post-disaster recovery, especially in the region of Lombok Island, West Nusa Tenggara. In contrast, they were identifying barriers affecting coordination and collaboration in tourism



disaster management. The insights from this study may help policymakers, tourism business actors and communities affected by the disaster to be able to consider strategic steps in post-disaster recovery, especially in the region of Lombok Island, West Nusa Tenggara.

The systematics of this paper can be described as follows. As a first step, we briefly describe why this research is essential to do. Presentation of data and some crucial narratives to strengthen arguments regarding this research's importance are presented in the introduction. In the next section, a brief literature review is presented that collects various discussions about stakeholder collaboration and disaster management, especially in the tourism industry. In the method section, we explain why we use literature studies to achieve our research objectives. As for the discussion section on our research results, we divide them into three sub-discussions, consisting of (i) flashbacks of the Lombok earthquake disaster, (ii) what have been done by the stakeholders? (iii) what to do next? In the end, we provide conclusions related to the topics studied.

## II. LITERATURE REVIEW

### Stakeholders Collaboration

Stakeholders are defined as individuals, groups, or organizations interested in the same problem, which can influence or be influenced directly by actions taken by other parties to achieve goals or solve problems [16]. Stakeholder involvement has become an essential requirement for effective and efficient risk governance [17]. Therefore stakeholder collaboration is recognized as an essential part of tourism destination planning and management. However, not all destination stakeholders have the same level of power and influence in collaborative activities or decision-making, with some groups exert more influence over the process [18]. A good understanding of the interdependence between organizations in disaster management is needed to

facilitate collaboration, especially collaboration that focuses on technical aspects [19].

Collaboration itself is described as a collaborative decision-making process among the main stakeholders of a problem domain [16] which combines the diverse views of diverse and interdependent stakeholders [13]. The main objective of stakeholder collaboration is to achieve mutual interests and benefits and resolve problems and obstacles. Jamal and Stronza [13] note the various problems and barriers that collaboration can overcome in tourism management. However, even though stakeholder collaboration has been widely recognized as an essential element in effective tourism disaster [15], [20], [21]. Unfortunately, the application in various places and conditions is still relatively weak.

Previous research claims that Destination Management Organizations (DMOs) can actively foster collaboration between stakeholders, which is key to ensuring destination competitiveness [22]. Jiang and Ritchie [5] identify how stakeholder collaboration is currently being studied, for example, from a "collaborative governance" perspective [23], "Cross-sector collaboration" [24], and "collaborative partnerships" [25]. This collaboration model usually shows clear collaboration stages, such as (i) the collaboration formation stage, (ii) the collaborative process stage, and (iii) the results and reflection stage. In the collaborative building stage, building collaborative relationships between stakeholders is highlighted, such as initial conditions, institutional design, direct antecedents, and activity/activity environment [23]–[25]. In the collaborative process stage, other models focus on the steps in the collaboration operation, the main actions in the collaborative process, and the important role of collaborative communication (see [23]–[25]).

### The Collaboration of Stakeholders in Tourism "Disaster Management"

The majority of studies on stakeholder collaboration in tourism disaster management were carried out in the 1990s. After the 21st century, most studies have focused on recovery strategies for a single tourism business/organization or a single purpose rather than building regional collaborations for disaster management. Besides, most of the stakeholder collaboration studies in tourism focus on sustainable tourism development and community-based tourism planning under normal conditions [26]–[29], the fact is that there is little literature that covers the management of extreme events such as disasters in the tourism sector. Although some tourism researchers have studied collaborative disaster management in tourism [30], the adoption of the concept of stakeholder collaboration is still lacking. Scarpino and Gretzel [31] highlighted the importance of multiple groups that "must" work together to overcome barriers during a crisis/disaster by addressing critical resources and stakeholder relationships (particularly collaboration with external parties). On this topic, too Scarpino and Gretzel [31] found that empirical studies are lacking. This finding is certainly surprising given the importance of stakeholder collaboration for effective tourism disaster recovery.

In the context of tourism disaster management, Fyall, Garrod, and Wang [32] have classified several theoretical perspectives to understand stakeholder collaboration. Three types of the theory were identified as the basis and motivation for stakeholder collaboration, namely (i) resource-based theories, (ii) relationship-based theories, and (iii) politics-based theories. Based on the classification and further explanation by Pennington-Gray et al. [20], the following section briefly discusses the theories that will help understand collaboration in tourism disaster management.

The resource-based theory focuses on using available resources to form collaborative efforts with other entities [20], [33]. This theory recognizes limited

resources and the need to acquire resources through collaboration, which provides a rationalization for trusting collaboration [32]. Giocchio and Michael [34] believe that sharing knowledge/information and obtaining financial support from the government is necessary for community collaboration after a disaster. Resource sharing is considered the basis of stakeholder collaboration applicable to tourism disaster management [35], [36]. This opinion is based on the tourism business's characteristics, namely that business actors in this sector are small businesses with a more uncertain resource base. The impact of resource loss is even more severe after natural disasters as businesses suffer asset loss/damage and a significant reduction in revenue in the tourism sector [37]. These tourism business actors can have cash flow problems and are more motivated to collaborate to source resources from other people. These shared resources include tangible assets such as financial support and collaborative capital and intangible assets, such as information, knowledge, and capabilities [35].

The relationship-based theory is driven by the recognition of interdependence and the need to exchange mutual interests [38]. The relational-exchange theory is based on the best interest of organizations working in the same problem area to solve common problems by developing a joint management structure [33]. Natural disasters usually bring significant physical and reputational damage to the tourism industry, a common problem for all stakeholders. Besides, network theory suggests that organizations can be motivated to collaborate from their past collaborative experiences to interact with other organizations [36]. Guo and Pickles [39] found that organizations with broader networks and positive past experiences were more likely to collaborate formally, which also applies to tourism disaster management.

Meanwhile, the political-based theory explores the nature of power in society [16] and measuring the balance of power between states, organizations,

groups and individuals [40]. Fyall, Oakley and Weiss [41] suggest that political theory is used to observe power dynamics and the distribution of benefits among stakeholders in the context of collaboration. Pennington-Gray et al. [33] use this theory to identify who can control the resources that affect the successful collaboration for tourism disaster management. Howes et al. [42] further demonstrate that the concepts of joint governance and network governance can be used to enhance policy integration. Based on this theory, the government's role is crucial in building stakeholder collaboration for tourism disaster management/management.

### III. RESEARCH METHODS

As mentioned at the end of the introduction above, this research methodologically uses a literary study approach. There are many reasons for conducting a literature review, one of them and perhaps the foremost being to make sure that the researcher knows what should be done and ensure that the review does not miss the vital knowledge required. A literature review is a written assessment of what is already known or existing knowledge about a topic [43]. The primary purpose of a literature review is to gather and collect the ideas and knowledge of others/other parties that have been studied previously [44]. A literature review is intended to review what has been done and is known regarding a particular topic, then rearrange the information in a relevant and critical way.

For this research, we collect various relevant information through the news media (especially online media) then compile the information chronologically for further study. Various other sources of information, for example, journal articles, textbooks, websites and other documents. Were examined to learn how the existing and "possible" stakeholder collaboration schemes could be adopted and implemented for post-disaster mitigation and recovery efforts in West Nusa Tenggara. So it can be

concluded, the use of literature review as used in this study is intended to gain adequate knowledge and understanding of how stakeholders in the tourism sector collaborate in post-disaster mitigation and strive to present steps that have been and will be taken to enhance effective collaboration. Such understanding can help stakeholders in the tourism industry evaluate mitigation strategies and promote practical efforts to restore tourism destinations.

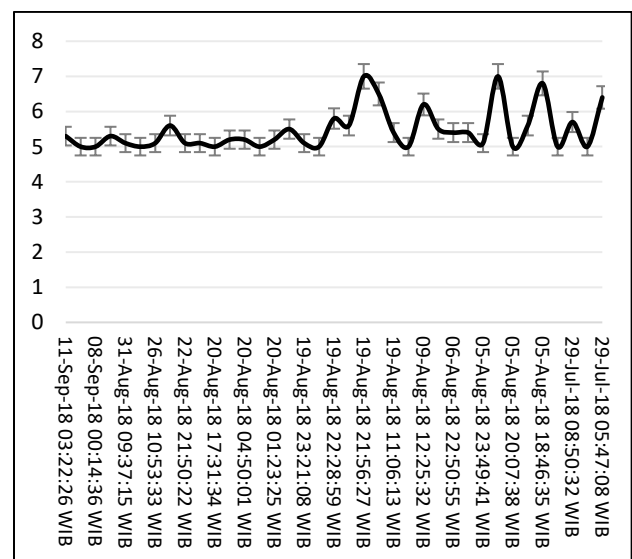
## IV. RESULTS AND DISCUSSION

### Flashback of the Lombok Earthquake Disaster

This section aims to provide important information related to the earthquake disaster that occurred on the island of Lombok (and part of the island of Sumbawa) and other information that is an integral part of the discussion in this study. The presentation style is deliberately arranged chronologically; this is intended to make it easier for readers to know and understand when, where and how the Lombok earthquake disaster.

The following shows the earthquake report's details ( $M \geq 5.0$ ) released by BMKG from 29 July 2018 to 11 September 2018.

Figure 1. Details of the Earthquake ( $M \geq 5.0$ )



Source: BMKG 2018 (data is summarized)

Sunday, 29 July 2018, at 05.47 WIB, a tectonic earthquake measuring 6.4 on the Richter scale occurred (BMKG, 2018a), making people panic, especially East, West and North Lombok. It seems that the earthquake was not only felt throughout the island of Lombok, parts of Bali and Sumbawa also felt the earthquake (although with a smaller shock intensity). The National Disaster Management Agency (BNPB) and the National Search and Relief Agency (BASARNAS) immediately acted for prevention and relief efforts and search for earthquake victims (both dead and injured). In this emergency condition, one of the locations that received attention from the government, followed up by the rescue team, was the tourist destination of Mount Rinjani, which was packed with climbers. To evacuate about 1,200 climbers (both residents (www.bbc.com, 2018), The Army Special Forces Command (Kopassus) was also involved in the evacuation process. After the earthquake, the Regional Government of West Nusa Tenggara Province immediately issued a policy to close all forms of activity in Mount Rinjani National Park. This step is taken to minimize the risk of "potential hazards" that may arise after the earthquake [47].

On 5 August 2018, to be precise, at 18.46 WIB, Lombok was again shaken by an earthquake with a magnitude of 7.0 SR. This earthquake by BMKG claimed to be the main earthquake in a series of earthquakes on Lombok Island since the initial earthquake measuring 6.4 on the Richter scale. Unlike the impact of the previous earthquake, in addition to its greater strength (greater destructive power), the BMKG also issued an early warning of the potential for a tsunami (for the coastal areas of North Lombok, northern West Lombok and northern East Lombok). Of course, this information makes the entire community on Lombok panic (both local people and tourists who are enjoying a vacation). People and tourists have flocked to stay away from the shoreline to a place that is considered relatively safe from the Tsunami's reach. The panic ended at 20.25 WIB when

the BMKG withdrew the Tsunami early warning. Suppose previously the earthquake (29 July) was only felt on three islands (Lombok, Sumbawa and Bali). In that case, the earthquake shocks with a 7.0 SR were reported by the United States Geological Survey (USGS) and were felt throughout Lombok Island, Bali Island, Sumbawa Island, Madura, Eastern part of Java Island and parts of Sumba Island and Flores Island. The physical damage caused by the 5 August earthquake was increasingly widespread, previously primarily centred in North Lombok Regency, then evenly spread to East Lombok, West Lombok, and Mataram City Regencies. According to BPBD West Nusa Tenggara, the economic loss was estimated at Rp. 1 trillion as a result of this disaster. The calculation is based on the five affected sectors: housing, infrastructure, and productive economy [48].

Then, Thursday, 9 August 2018, at 12.25 WIB, another earthquake with 6.2 SR was updated to 5.9 SR. This earthquake is a series of aftershocks from the main earthquake on 5 August 2018 [49]. It was not only finished there, on Sunday night, 19 August 2018, to be precise, at 21.56 WIB, but there was also another big earthquake with a magnitude of 7.0, which was updated to 6.9 SR by BMKG. This earthquake is a new major earthquake activity different from the main earthquake that occurred on 29 July, 5, and 9 August 2018; in other words, the 6.9 magnitude earthquake is not an aftershock from the previous earthquake [50]. According to data compiled from BMKG until 11 September 2018, aftershocks of smaller magnitude (see Figure 1) are still occurring. This series of earthquakes affected all forms of government activity, economic activity, and all activities of Lombok Island people as a whole.

### **What Has Been Done?**

After being "terrorized" by a series of earthquakes that occurred for several months, the tourism industry's activity on the island of Lombok decreased significantly. Stakeholders in the tourism sector suffer because tourists cancel their reservations, and all

domestic and foreign tourists who have been in Lombok choose to go elsewhere (e.g. Bali).

Post-earthquake Lombok is facing challenging times because it is in the reconstruction and repair stage as a whole, both from physical infrastructure, economic aspects, even aspects of human resources (community mentality), which are still overwhelmed by severe trauma related to the earthquake they faced. In this context, the government's financial support is needed for community collaboration after a disaster; this strategy is in line with resource-based theory [20], [32], [33], [34], [37].

Another issue that has arisen is the concern of various parties regarding the sustainability of Lombok Island tourism. Apart from Bali Island, Lombok Island is one of Indonesia's leading tourist destinations and has been designated by the Central Government as a Special Economic Zone for tourism development ([www.itdc.co.id](http://www.itdc.co.id)). An especially formidable challenge in managing post-disaster tourism destination recovery is restoring its image and reputation, which could be affected by harmful or inaccurate media coverage [52]–[56]. Media reports often have a far-reaching impact on a tourist destination affected by a disaster and pose a severe challenge to its marketability [52].

The debate about the status of a disaster from the central government also became a polemic. Many parties have pushed for the Lombok earthquake to be upgraded to a National Disaster. However, the central government remains committed to giving optimal attention to recovery and reconstruction without increasing its status to a National Disaster. The government's decision can be seen from several points of view, one of which is a form of anticipation regarding the image and selling power of Lombok tourism in the future. Several studies have found a tendency for excessive coverage of a disaster. The significant impact of the damage will cause the tourist destination is selling power to decrease [52]. Perhaps this is why the Central Government (represented by

the President of the Republic of Indonesia) does not want to make the Lombok Earthquake Disaster a National Disaster status. Because concerns about the image and selling power of Lombok tourism will be significantly disrupted, moreover Lombok is one of the Special Economic Zones with a leading sector, namely tourism. The government/state shows the very dominant nature of power to regulate policies that are deemed appropriate to maintain the stability and reputation of Lombok as a leading tourist destination is a representation of the political-based theory implemented by the central/state government.

Questions that will often arise after a disaster (in the context of Lombok tourism) include "how to encourage them to return?" The answer to this question can be understood through the following description. In the initial phase of disaster management, one of the central government policies (related to the tourism industry's stability) that is interesting to observe is the issuance of a policy to evacuate all foreign tourists out of Lombok. This policy should not be viewed from an opposing point of view. This policy has demonstrated responsive and anticipatory efforts by the government to maintain the tourism industry's stability. The government seems well aware that the response and delivery of prompt and appropriate services in a disaster are crucial indicators that receive serious attention from consumers of the tourism industry. These responsive and anticipatory efforts will give tourists a positive impression regarding their perceptions and beliefs in the government's role to support the comfort and safety of tourists. Of course, this will provide added value to the tourism sector in Indonesia in general. The positive perception of tourists regarding the safety and security factors they get allows them to avoid severe trauma, which causes them to have no longer worry about returning to visit post-disaster tourism areas. This case example reinforces the opinion expressed by these responsive and anticipatory efforts will give tourists a positive impression regarding their perceptions and beliefs in

the government's role to support the comfort and safety of tourists. Of course, this will provide added value to the tourism sector in Indonesia in general. The positive perception of tourists regarding the safety and security factors they get allows them to avoid severe trauma, which causes them to have no longer worry about returning to visit post-disaster tourism areas. This case example reinforces the opinion expressed by these responsive and anticipatory efforts will give tourists a positive impression regarding their perceptions and beliefs in the government's role to support the comfort and safety of tourists. Of course, this will provide added value to the tourism sector in Indonesia in general. The positive perception of tourists regarding the safety and security factors they get allows them to avoid severe trauma, which causes them to have no longer worry about returning to visit post-disaster tourism areas. This case example reinforces the opinion expressed by Of course; this will provide added value for Indonesia's tourism sector in general. The positive perception of tourists regarding the safety and security factors they get allows them to avoid severe trauma, which causes them to have no longer worry about returning to visit post-disaster tourism areas. This case example strengthens the opinion expressed by Avraham [57] on the perception of disaster risk and Khazai et al. [55] related to planning, making and implementing proactive policies.

In October 2018, the NTB Provincial Development Planning Agency (Bappeda) discussed economic recovery strategies due to the Lombok-Sumbawa earthquake's impact as an effort to accelerate economic development. The tourism sector, which has implications for other sectors, focusing on human

and institutional recovery, recovery of disaster-affected destinations, and marketing recovery, was not affected by the disaster [58]. The discussion involved various stakeholders, including the NTB Provincial Bappeda as the initiator, the NTB Provincial Tourism Office, representatives of the Mataram Tourism Workers Federation, the NTB Province Regional Tourism Promotion Board and representatives from the Academic element. The NTB Provincial Bappeda has also coordinated with the National Development Planning Agency to calculate the impact of the earthquake on NTB. Conditions as the start of new development planning in NTB and the division of authority between the centre and the regions in structuring tourist areas that pay attention to spatial aspects. Later, the coordination results with various stakeholders will contribute to becoming indicators in the initial draft of the 2019-2023 RPJMD.

### Next What To Do?

Natural disasters can significantly affect the image of a tourism destination [55]. The negative impact of natural disasters not only dramatically affects the tourism sector in developing countries, but developed countries also face similar problems. For example, a significant flood that hit Australia's northern region, the tourism industry is faced with a significant challenge to restore its activities to normal conditions as the flood has not occurred [59]. However, something different happened in the 2004 Indian Ocean Tsunami case, after the Tsunami, where the international media's attention was so great it directly affected tourist visits after the Tsunami (several years later) after the main and supporting infrastructure were repaired or reconstructed [60]–[63].

Referring to the example of flooding in Australia's northern region, Faulkner and Vikulov [51] reported that the "Katherine Back On-track" campaign had resulted in significant short-term financial losses. Damage to the tourism business can also be caused by negative media coverage of the news and a ruined image of the destination [52], [55], [64]. As reminded

by Khazai et al. [55], disasters can have long-term effects; repair and recovery are not only seen from the point of view of physical damage or efforts to rebuild infrastructure better. Nevertheless, attention to the affected community's psychology (reduce or eliminate trauma caused by the disaster) and rebuild confidence in the tourism market is a fundamental thing. This is why the obstacles are facing recovery are getting more extensive and more prolonged [65].

The government (both central and local) and actors in the tourism industry must have a measurable plan and suitable strategic management applications to deal with post-disaster recovery and recovery. For example, the UNWTO Handbook on Sustainable Development Indicators for Tourism Goals (as of 2004) was designed to help identify critical issues and indicators that decision-makers can use to respond effectively and sustain what makes tourist destinations more lively interesting [66]. Regrettably, however, the existing documents do not adequately describe destination safety or disaster resilience, both of which are central to a sustainable tourism sector [55]. After examining some of the existing research on crisis indicators on sustainable tourism, Khazai et al. [55] concluded the research trend focused on identifying indicators that monitor the negative impacts of tourism at the destination rather than indicators measuring recovery after a disaster. On the other hand, research on risk reduction by offering various disaster recovery indicator frameworks with many variations in structure, content and complexity has been proposed and applied [67]–[70].

Several experts suggest that crisis communication strategies in managing risk perceptions must be carried out correctly [57], [71]. Perceptions of risk are managed in such a way as to produce a view that does not lead to negative forms, this is what all stakeholders should strive for. This strategy will be effective if the communication plan is integrated with risk management policies and strategies [66]. The tourism industry follows up by communicating

positive messages that can increase the tourism market's confidence (domestic and foreign tourists) [71]–[73]. In other words, proactive policymaking, good planning and implementation are likely to increase the sector's ability to recover from crises and disasters [55].

Another post-disaster effort to "push them back" is to provide up-to-date information on the safety and status of infrastructure, attractions, accommodation, restaurants and other facilities and ensure tourists are aware of unaffected areas so that they have alternative destinations in areas that are not affected [55]. It is important to note that access to objective and reliable information is also beneficial in countering the adverse effects of the media over-reporting the disaster experienced and ensuring visitors can make choices based on the information provided [55].

## V. CONCLUSION

The earthquake that hit West Nusa Tenggara, especially on the island of Lombok, had a severe impact on several main sectors, such as housing, infrastructure, productive economy, socio-culture, and other cross-sectors. This paper pays special attention to the productive economy where the island of Lombok has long been recognized as a leading tourist destination in Indonesia. Post-disaster collaboration from stakeholders, both government/state and tourism industry players and the public in general, needs to be seriously initiated and facilitated to support the acceleration of the post-earthquake rehabilitation and reconstruction process.

The government has carried out responsive handling, countermeasures and first aid. This shows the government's seriousness in the disaster management process, which subsequently received positive appreciation from the domestic community and the international community. However, some notes need attention to improve and anticipate if a similar incident occurs again in the future. We think that the government's policies (both central and local) have

also been by the conditions and urgency of the problems at hand.

The economic recovery program due to the impact of the Lombok earthquake is still ongoing, especially the tourism sector, which has implications for other sectors, with a focus on restoring human and institutional resources and restoring disaster-affected destinations (both physical and non-physical). A sizeable budget has been allocated to support this recovery. Thus, the tourism industry's government and actors must have a measurable plan and suitable strategic management applications to handle post-disaster recovery and recovery. Finally, we suggest that disaster management principles should be integrated into destination management plans to increase tourist destinations' resilience against natural disasters.

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# Smart Basket : The Modern era IoT Application

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## ABSTRACT

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Smart basket is a technology that uses Arduino and RFID. During pandemic times like Covid-19 there gets the crowd in the grocery marts, and the customer must wait in queue for final billing. But there may be high risk during these times of spreading the disease, so Smart basket brings an ideal solution for getting the final billing done. Using Arduino and RFID tag customer gets a final bill through the web app which gives a list of products scanned by the smart basket. The customer can remove the products which he further wishes to eliminate from his basket and delete the item from the final bill in the web app which can result in savings too. This smart basket also reduces manpower as the traditional method of buying the products involves a long time, with RFID tag the same thing is performed in a modern way.

**Keywords** : Arduino, RFID tag, RFID reader, Shopping cart, Wireless Communication.

## I. INTRODUCTION

Smart basket is a technology used inside small grocery shops to big malls. With the use of an RFID tag and RFID reader, shopping is made easy. During times like pandemic or festive, there is a lot of crowds in malls. Overcrowding is the biggest issue in continents like Asia and Africa. But with evolving, IoT technology new solution devices are made each month. With Arduino, the technologies had a huge impact on human lives. With the use of Arduino and RFID technology, we had made a Smart basket that will use a Wi-Fi module. The customer must scan a product on an RFID reader, the products in near

future will come with In-built RFID tag chips on the product. The product details will be read by the RFID reader and a web application will be there where these scanned product details will be present. The customer must pay the final bill in any mode of payment and generate E-receipt. This way the Smart basket is avoiding overcrowding in the malls while customers must scan a product on the go. In past this technology had evolved a lot and yet must bring some new changes. We had discussed and used RFID technology and Node MCU(ESP2866). In this following paper, we had presented a survey on different techniques used in Smart Basket over the years.

It brings the ideal solution in this modern era, IoT appliances are evolving so is technology, which results in reduced manpower. Gone are the days where the customer must wait in long queues for getting the final billing done for his products and wait to exit with requiring tedious efforts. Arduino platform and RFID technology are bringing a solution embedded in the smart basket which helps the customer to get the best experience in shopping.

People are worried about how they can buy their favorite products during times like pandemic and a lot of restrictions which makes the sales of mall decrease and people face problems. But now IoT applications have made human life easy so people can save their time and get satisfaction.

With technology there exists pros and cons, when purchasing products there are lots of items from grocery essentials to electronic appliances, the customer must place the items and then go to checkout. The counter cashier must scan the barcode and make the final bill but IoT and Arduino make the process in a basket which saves times, with this shopper saves times and the bill is generated automatically with saving paper for environment. There is continuous development in domestic industry with these types of similar technology to enhance customer experience and save time and help the world. This strategy can help in smart scaling, wireless automation, and more scope in IoT embedded software and hardware.

Thus, this paper highlights our concern on a Smart basket that is solely based on IoT technology, which is an area evolving with changing world. In the use of this system, the shoppers will scan each item with the RFID reader, then the information about the products is displayed on a web application with the total amount due pending and when added payment method, the payment can be done automatically and immediately. [2]The microcontroller is placed beneath the basket and the RFID tag reader and scanner is embedded alongside the Arduino hardware

to scan and send the details of the product and the web app makes customer invoice.

Section 2 explores the literature review of the following paper. Section 3 demonstrates the proposed model, Section 4 highlights Implementation, Section 5 glimpses on Methodology of the Smart Basket and in the last section we had discussed the conclusion and future scope of Smart Basket using IoT technology.

## II. LITERATURE SURVEY

### 1. Smart Shopping Cart using RFID & Zigbee.

The smart basket technology had evolved a lot in the recent years, one such technique used was Zigbee device. This device is based on IEEE 802.15 standard. Zigbee is a device which transmit data covering longer distances. It passes data through intermediate devices to reach more longer ones i.e., devices, resulting in a mesh network. The RFID and Zigbee technology brought an automated billing system. The proposed system was as follows: Inside a shopping mall, each shopping cart was designed in such a way that each shopping basket would contain a RFID device i.e., to identify product. This was the product identification device which contained the microcontroller. As the customer would proceed to buy products the customer has to scan the product through RFID reader, the RFID reader reads the product details through the RFID chip. The basket containing product identification device also contains microcontroller, LCD, an RFID reader, EEPROM, and ZigBee module. The information read by the RFID reader is stored inside the EPROM and this data is sent to billing system by Zigbee module.

RFID is the radio frequency identification which is the on-going technology and progressing each day. It has been helping the IoT industry grow more and more towards sustaining environment and automation. The technology is old but with latest

trends in technology world RFID chips are made for ease of use of the humans. This technology is bringing and will change the supply-chain industry and logistics.

Zigbee is a network device which is built on top the IEEE 802.15.4 standard. Creating a mesh network and transmitting the data to distant device is done by Zigbee module. It provides wireless networking protocol at low cost with low data rate and power consumption which helps toward automation of remote-control applications.

## 2. Smart Trolley using RFID.

In this product the RFID technology was used with IR technology. The infra-red technology is another technology which was used in past years to get the Smart trolley work inside the mall. The system also contains ARM processor like in past microcontroller for processing of the desired data. The concept of smart shopping cart there was a use of IR sensor and ARM processor which made alert for the customer whether a product has been removed. This was introduced due to theft and fraud or any disputes between customer and shop owner. , and smart shopping trolley but depending upon growing technology, need of the market and hardware cost each year the products must bring some changes. In this product.

This product used a RS232 protocol which helps in the processing for billing purpose along with ARM processor. The working was simple and like past products but with ease of use. The customer must scan the RFID tag i.e., a chip on RFID reader the details of the product will be sent to system memory. As the customer scans the product there will be a option to check whether the product is available or not on LCD display. If the product is found the basic details such as name and price on LCD display. The product details are processed in a way where ARM

processor and the protocol i.e., RS232 will work to calculate and process the data. The IR sensor mentioned before is used for counting purpose i.e., to count the number of products. The sensor will emit the rays in continuous fashion and help in storing the products in ARM processor. After completion of the shopping, there is a button which when pressed indicates the final billing of the products on a web-based interface.

## III. PROPOSED WORK

The goal of the system is to deliver a system that is easy to work and generate automated invoices. Making this system easily accessible and deliver the shopping system with low-cost hardware, which will bring an ideal solution both for consumers and retailers. The basket will contain the sensor module with a circuit such that when an item is placed it will be scanned with an RFID reader, the product should include an RFID tag. When the item is scanned, and RFID has completed its work, the microcontroller will store the data using SPI protocol with and Node MCU [4] will help this data to store in the system. In this way, the sensor module will have Arduino embedded in the circuit with all necessary hardware components.

When the customer enters the shopping mall, he/she will take the basket. [3] The basket has the sensor module which contains an RFID reader per customer taking that basket, with customer inspecting the products they must scan the product through RFID tag and the RFID tag will send this detail to the RFID reader, which relates to Arduino (Arduino contains inbuilt microcontroller) now the Node MCU Wi-Fi module (ESP2866) will communicate with the database using SPI protocol and the products will be stored on the webpage of the shopper's website. The scaling and automation help in regulating the process easy and the bill is generated fast.

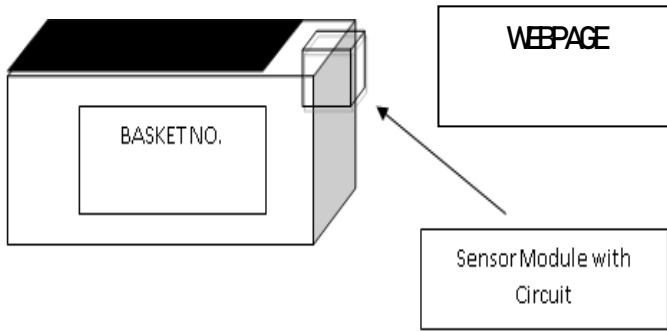


Figure 1: Design of setup.

#### IV. IMPLEMENTATION

The product can be demonstrated as follows, and one thing noteworthy is it provides the flexibility to carry out as a portable device in the IoT appliances.

##### 1. Hardware System

The following image has two RFID readers, one RFID tag, and Node MCU(ESP2866) module. These all three make up a sensor circuitry system to be placed below the smart basket. Once the customer scans the product barcode through an RFID tag, the data will be sent to an RFID reader and the Arduino code start implementing SPI protocol which helps the microcontroller to communicate with a web application by HTTP protocol on the Internet.

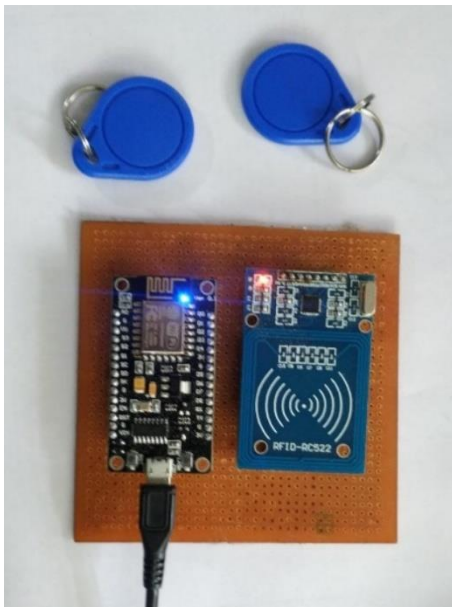


Figure 2: Smart Basket Circuitry system.

The reader receives the data from the tag which in turn makes the microcontroller compute the data. The Wi-Fi module will send this data to a web page which will be stored in the Database. The Database used is RDBMS (Relational Database Management System) which is using MySQL for storing this data. The checkout page has multiple modes of payment to offer such as Cash, Cheque, Card, Digital Wallet

##### 2. Software System

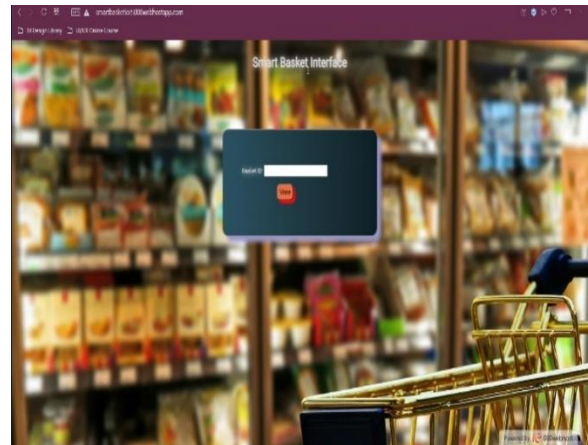


Figure 3. Login Page of Basket ID for the customer

The above image is the initial login page of the Smart Basket when the customer arrives in the store. The basket which he takes inside the mall is the basket ID for his whole shopping journey process inside the mall. He can check the list of products and their price on the check-in page. On the check-in page, there is a table that will help the customer to see the name of the product he scanned, the quantity and price of the product. This way he can ensure fast billing and getting invoices. Additionally, he can remove a particular product which he does not desire for.

Finally, he can choose various modes of cash payment which he wishes for and check out in the fastest mode.



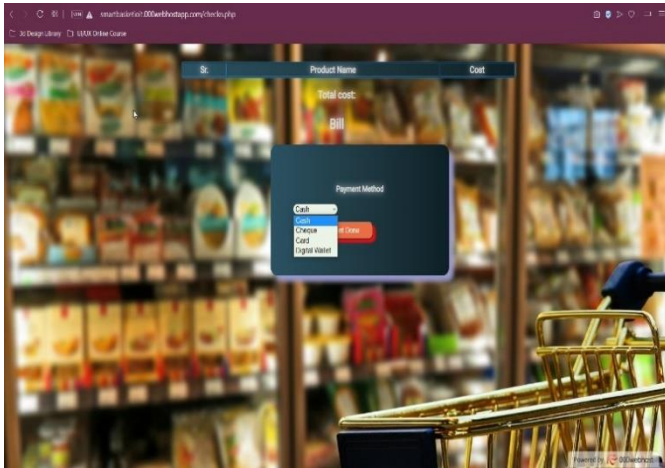


Figure 4: Check-in Page offering various payment modes for billing and invoice.

The image on left bottom is for the final check-out of the customer where he can choose the various mode of payment. The above image is for initial checking to ensure there is no fraud with him. When the customer is done with his shopping journey process, he can enter his basket ID (provided at the time when the customer enters the grocery store or mall) and come to this page for final billing.

### 3. Database System

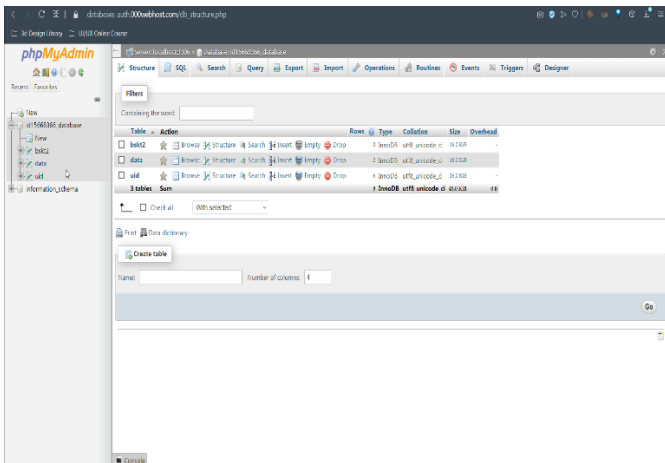


Figure 5: MySQL databases for Smart Basket

The above image shows the database used for Smart Basket. The admin used here is phpMyAdmin which uses MySQL database. The basket has three tables where data will store the product name and cost of the product. The user ID table will store user ID which is the customer's basket ID and data of the

products which he scanned to store and display when requested for the get-fetch cycle process.

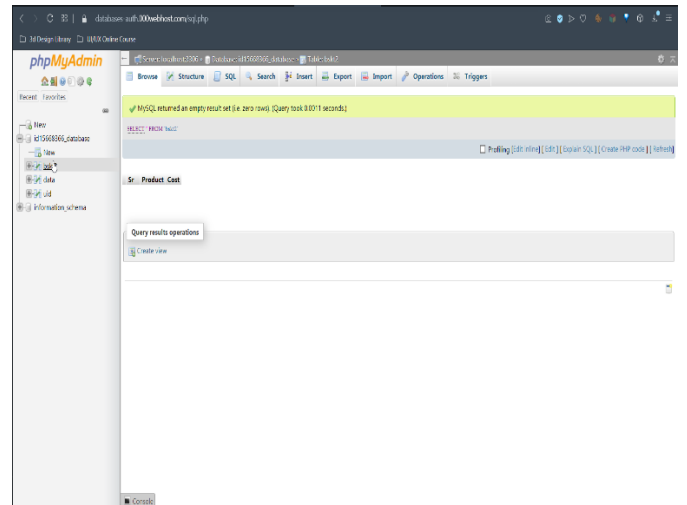


Figure 6: Basket table in MySQL. (customer product table)

The first table is of the basket where the list of the products with cost will be stored and displayed when requested.

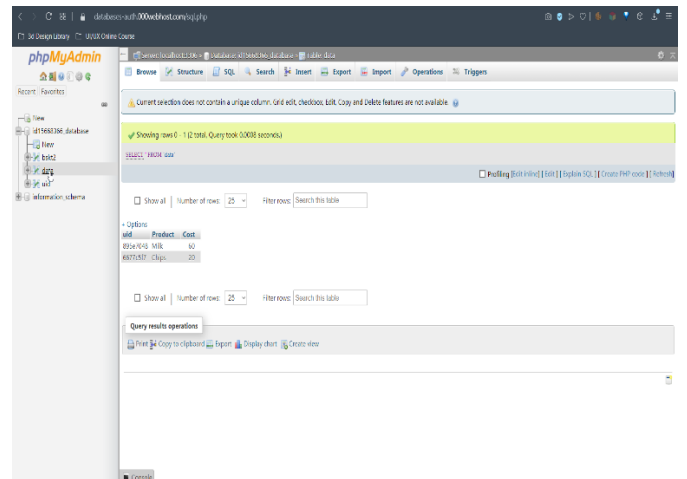


Figure 7: Product table having product name and cost stored in MySQL.

The second table is of data where the list of products is stored so when a customer scans a product the cost of the product and the product name will be fetched from this table.

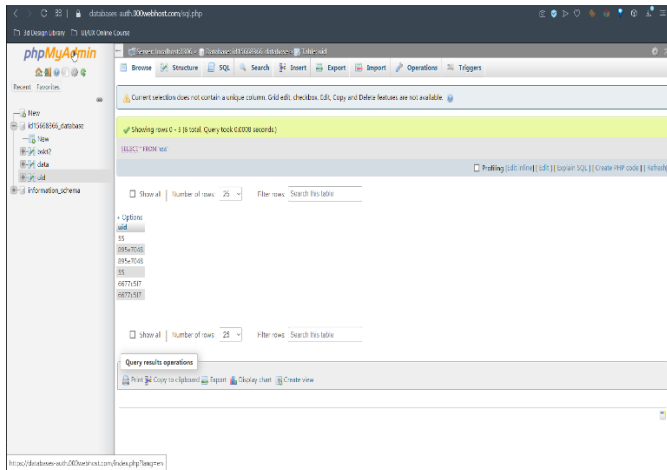


Figure 8: MySQL table of the customer (user ID table)

The third table consists of user ID which is assigned to the customer's basket for final checkout and in the process of the get-fetch-request cycle with the help of SPI and HTTP protocol to make the billing invoices fast and in an efficient manner.

## V. METHODOLOGY

### 1. RFID Technology

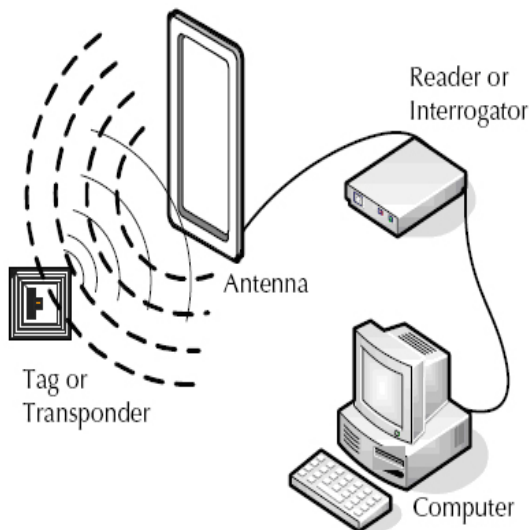


Figure 9: Basic Prototype of RFID Tag and Reader

RFID is a technology that stands for Radio Frequency Identification and is used to transfer data from devices in form of a wireless medium. Using this technology RFID tags allow users to automatically identify product barcode and details which help in identifying

them with tracking of prices. [4] A good application of RFID technology is in IoT applications.

In this paper smart basket uses an RFID tag and RFID reader.

### 2. RFID Tag



Figure 10: RFID Tag

These are used to track items using an RFID reader and antenna. The RFID tag, in a nutshell, comprises of two parts, first, is an antenna used basically for transmitting and receiving signals, and an RFID chip that tracks and stores the ID of the tag and other useful information.

RFID tags transmit signals with the help of radio waves to a reader or antenna or a combination of both. They work on radio waves generated by the reader, the energy work upon the internal antenna to tag's chip [4] [5]. The chip is activated by the energy which facilitates energy with useful information. This then transmits a signal back towards the antenna or reader.

### 3. RFID Reader



Figure 11: RFID Reader

This is a main central part of the RFID system; it is the brain of the RFID system and is important for any system to function and work. The RFID reader is also called interrogators. The Reader transmits and receives radio waves to set a medium and communicate with RFID tags. There are two major types of RFID readers: Fixed RFID Readers and Mobile RFID Readers.

**I Fixed RFID Readers:**

These RFID readers can be connected to eight different antennas using external antenna ports with one additional antenna that can be connected anywhere.

**II Mobile RFID Readers:**

These RFID readers are easy to use since they allow flexibility by allowing them to work with mobile. So, they are handheld devices that can read RFID tags while doing other work. They can communicate with a smart device such as IoT Appliances or a host computer.

**4. Arduino**

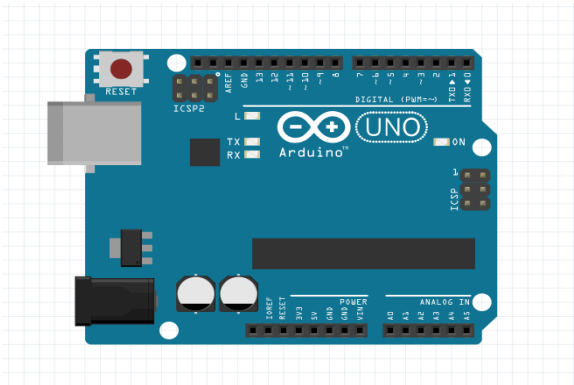


Figure 12: Arduino Hardware

Arduino is a hardware platform used for building electronic applications such as IoT, Digital circuits, LEDs, motors, etc. It is an open-source platform that consists of a piece of software or IDE that facilitates to program for hardware and another thing it consists of is a physical programmable circuit board such as a microcontroller [5]. The Arduino platform has made

it easy to load code from software to hardware such as microcontroller without any changes. It simply loads the code which uses C++ programming. It does not separate the hardware and software; it connects them with a USB cable. In this paper the smart basket stores the scanned product with RFID technology, and the memory is stored in a microcontroller that uses Arduino IDE to store and load the code for scanning the items. It processes data like CPU and helps to control all the components in the hardware.

**5. Node MCU ESP2866(Wi-Fi Module)**

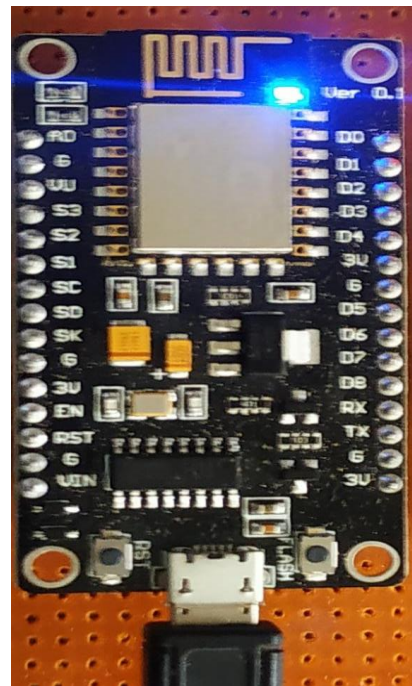


Figure 13: Node MCU ESP2866

Node MCU is an open-source LUA and developed for the Wi-Fi module. The Node MCU has a hardware design such that it makes it easy to edit/modify/build the module. Also, the ESP2866 is the most common chip used which is Wi-Fi enabled [6]. And it supports multiple protocols such as UART, SPI, I2C, etc. In this paper, the protocol used is SPI which is a serial protocol and can be connected to serial devices such as RFID tags and readers.

ESP2866 is a Wi-Fi Module that helps to send and receive data and communicate with hardware components such as a microcontroller, RFID reader, etc. The ESP2866 uses the analogy same as used in with smartphones. The same process is followed by ESP2866 of sending data or transferring data from Wi-Fi to smartphones, In the similar way this module sends data from RFID reader to mobile phone and microcontroller. In this paper smart basket uses ESP2866 to store the data in our local database (MySQL) or store it in a cloud server to download and upload the details of the products scanned. This module facilitates to transfer of the details to the billing software from the basket.

## VI. SCOPE OF IMPROVEMENT

With the advent and popularity of IoT appliances, there exist security issues for the payment of customers during final check-in. So as cybersecurity is an improving field there will arise a need for improvement of payment gateway. The RDBMS is good for small businesses, but NoSQL databases can help grocery stores and enterprise-level businesses, to store data more efficiently without any concerns about data manipulation. The Smart Basket needs security enhancement and a efficient data processing and data management system which will help the product for betterment of the world and society in upcoming future.

## VII. CONCLUSION

Considering the latest changes in IoT technology there are number of trends which are helping the world to grow a better place, so the Smart Basket IoT application will bring a change and make a new trend in retail shopping. This will become a necessity in the upcoming future for shopping and retail marketing industry, as it performs the fast billing. Further the cost of the Hardware module will decrease with new evolving technology, resulting in making more IoT

embedded hardware. Smart Basket will help the marketing industry to build more hardware with less cost. The automation industry will upgrade the IoT products so this product will work seamlessly resulting less manpower.

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# Palm Fracture Detection using Convolution Neural Network

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## ABSTRACT

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Palm fractures are due to punching heavy objects (such as a wall or a jaw). A major part of the human body is the palm. Palm provides the hand movement capability. Palm Bone breaks in the human body are fundamental. If the outcome of these fractures is someone's sting in the lips, the skin may be broken. In such instances, wound can be contaminated with bacteria from the other person's mouth and cause illnesses that can permanently impair use of the hand if they are not handled quickly. For analysis of the broken palm, the specialists use the X-ray picture. The manual crack detection is repetitive and the risk of error is high. In order to analyse the broken bone, a robotic system must therefore be developed. In this article, several methods are examined for identification, extraction and characterization. In addition, an inspection is often completed in good conditions and inconvenience. The proposed CNNs are also exploring the expectations of palm bone cracks as positive or negative.

**Keywords:** X-ray, Median Filter, Morphology Operation, OTSU Transform, CNN

## I. INTRODUCTION

There are many types of bones in the human body. Generally, a car wreck or a horrific fall leads to bone fractures. Due to its vulnerability, the risk of bone breakage is high in mature people. The fractured bone transforms by providing the patient with legitimate therapy. In order to analyse the broken bone, the specialist uses an X-beam or MRI image. The small gap in the bone is difficult for the surgeon to dissect. The manual cycle is repetitive for concluding the broken bone and the probability of blunder is high.

Thus, it is critical to develop a PC dependent structure to reduce the time and error probability for the determination of the crack bone. In clinical imaging, ongoing new AI technologies are commonly used as well as in the hardware sector of force. In the PC-based system, the x-beam or MRI image is used to detect the split bone. The image of the bone has cancer. A correct pre-preparation approximation is then used to remove commotion and borders from the image. And the highlights of the bone image are separated. The structure is finally prepared with highlights, and ML (AI) estimates and deep

determination are done for the classification how to create CNN which rightly recognises the crack.

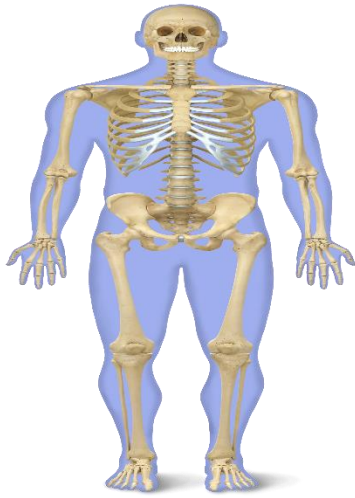


Figure 1: Human Body Bone

In the latter exams, the majority of them discriminate between breaches or intend a general classifier, for instance, manoeuvre through a crack, open break, direct break and switch break. A discreet per trochanteric break classifier is proposed in this article, which identifies five types of trochanteric break. Fig. 1, the initial image of human body is denoted by the Gaussian channel and lined up, followed by the separation regularisation stage technique to fragment the revenue district (ROI). The identification of the Canny edge is then used to determine the femoral development and then, according to the definition of the tropical crack, the image is insulated into a few bits.

## II. RELATED WORKS

In [1] The grouping method was developed by developing CNN using in-depth learning. Contrasting the sound bone and broken bones data collection provided the frame. The overfitting problem-using keras module has been improved. The last scale of the dataset is 4,000, 2000 of which were sound bones and 2000 were broken bones. The developed CNN with four levels was sufficiently accurate to achieve

precision of 92,44% for bone grouping. On larger information sets the model is still to be attempted.

In [2] the developers used a method called "Fuzzy Phrases," which had the option of producing desired results over SVM classification since this approach could individually classify each class and have improved results. The methodology was able to show a vice pinnacle without loss of any data in ex-parcel fluffy sets which can be explored by ascribers. The k-implies were used for the grouping of Fuzzy language and were used for bunching normal and uncommon groups. The best results were achieved with RBF kernels. In this connection. The trials were performed using 10 overlays and better accuracy and results were obtained.

There have been analyses in [4], 8 of which produced the right difference between tests and proof, 2 of which produced incorrect ID returns. The Contrast includes the line between the neighbouring pixels the distinguishing High estimates of general shifted image tests influence the picture ID in this way rather than various highlights of correlation, energy, and homogeneity. Surface analysis of x-beam images in the lowest possible point of bone breaks uses a GLCM strategy as a technique for retrieval of elements, and K-means as a measure of the clustering results in an accuracy of 80%.

In [5] the decrease in image commotion was finished with one of four GMF, MeF, MF, SSR calculations. The tactic used was to remove the disturbance, by which time the bone line was recognised and the broken bones were distinguished. In order to differentiate the SNAKE'S bone line, the algorithm was used to strengthen the bone line. At that time, external energy was removed to differentiate the split. The results demonstrate that the accuracy achieved was 89%.

In [7] the procedure of regularizations at separation levels is used for ROI portion of the boisterous foundation; the administrator of identification at Canny edge is used to remove breach borders; and afterwards the crack is ordered as a result of a

trochanteric split in consideration of differences between the reference traditional images and test images. If work is contrasting and exists, unpretentious cracks may be classified by trochanteric. This strategy's exploratory results have become the perfect exhibition.

The Hough Update Guideline [9] applies. The location of the line is completed by a useful adjustment to Hough. The image is examined and separated into one-pixel picture by changing watersheds. The boundary attachment is used to change over a single pixel image into a continuous image. Marker preparation is used at this stage to include an ex-parcel local number, regional area and various highlights. For dynamic splits, this estimate is not worthwhile.

[10] Multilayer Perceptron and Support Vector Machines have been compiled according to a community of imbalanced learners, who are favourable for modelling the trabecular bone crack zone expectation, using former research methods, Random Under-testing and over-Sampling for Synthetic Minority and classifiers. The optimum mixture (RU+SMOTE) was found to be (MLP) and high-light determination techniques were used to identify biomarkers for the problem of the Crack Zone anticipation.

Deep learning is implemented in the area of break identification and classification in [12]. The organisational model is set up and can accurately predict the kind of broken repositories. The model consists of three layers of convolution and one layer. Via the convolution layer, the enterprise continually removes the highlight data found in its actual limits by inserting this data through an entirely different layer and finally provides the most likely break standard through using the SoftMax work. The neural organisation of the convolution would certainly not overfit, like the conventional neural organisation of BP.

### III. PROPOSED SYSTEM

As shown in below figure 2 proposed system for Palm Fracture detection are perform in the flow.

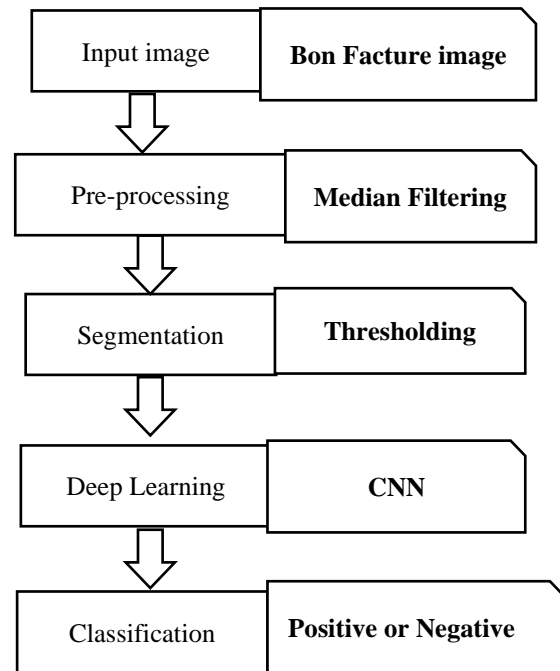


Figure 2: Proposed System Flow Diagram

#### A. Datasets [1]:

A large dataset of bone X-beams is MURA (musculoskeletal radiographs). The determination whether the X-Beam study is regular or anomalous is the responsibility for calculations. More than 1.7 billion people worldwide are affected by musculoskeletal conditions which are the most well-known reasons for severe, long-haul torments and incapacity with an annual increase of 30 million crises visits.

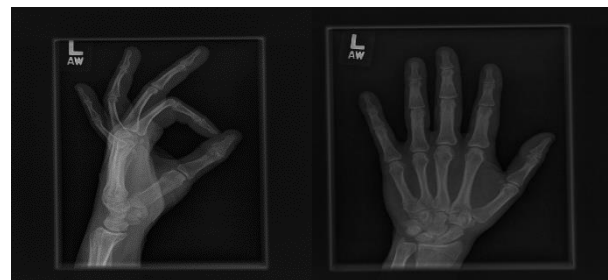


Figure 3: MURA Palm Images



**B. Median Filtering [3]:**

The middle channel is one kind of nonlinear channel. It is exceptionally viable at evacuating drive clamour, the "pepper and salt" commotion, in a picture. The rule of the middle channel is to supplant the dark degree of every pixel by the middle of the dim levels in an area of the pixels, rather than utilizing the normal activity. For middle separating, we indicate the portion size, list the pixel esteems secured by the bit, and decide the middle level.

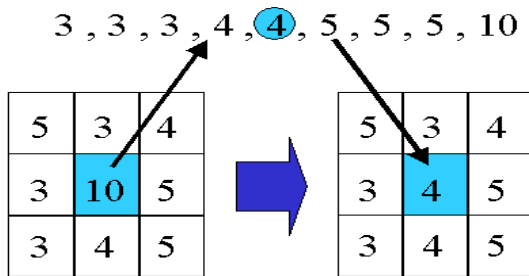


Figure 4: Median Filtering Matrix

**C. Segmentation [6]:**

i. OTUS Thresholding [6]: Otsu method is one of the most successful methods for image thresholding. Converting a greyscale image to monochrome is a common image processing task. Otsu's method, named after its inventor Nobuyuki Otsu, is one of many binarization algorithms. In the simplest form, the algorithm returns a single intensity threshold that separate pixels into two classes, foreground and background.

ii. Morphological based segmentation [8]: Converting the images to binary reduces computational complexity and storage issues and also is a pre-requisite for morphological segmentation of lungs.

- Morphological open operation,  
 $A \circ B = (A \ominus B) \oplus B$
- Morphological closing operation,  
 $A \bullet B = (A \oplus B) \ominus B$

**D. Convolution Neural Network**

Convolution Neural Network (CNN) is especially valuable for spatial information examination, picture acknowledgment, PC vision, characteristic language

handling, signal preparing, and an assortment of other various purposes. They are organically inspired by the working of neurons in the visual cortex to a visual upgrade. What makes CNN significantly more impressive contrasted with the other criticism forward organizations for picture acknowledgment is the way that they don't need as much human mediation and boundaries as a portion of different organizations, for example, MLP do. This is principally determined by the way that CNN's have neurons organized in three measurements. CNN's make the entirety of this sorcery occur by taking a bunch of info and giving it to at least one of the accompanying fundamental concealed layers in an organization to create a yield.

1. Convolution Layers
2. Pooling Layers
3. Fully Connected Layers

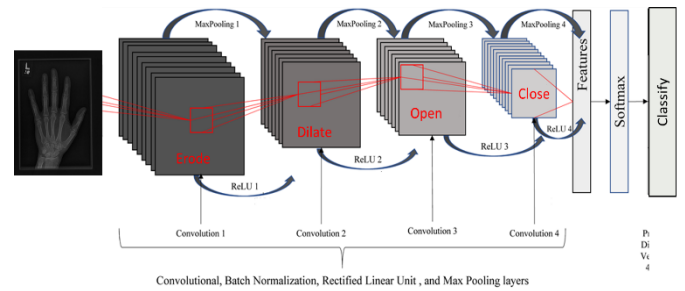


Figure 5: CNN layers

- Step 1: Firstly, Take an Input image of Bon Fracture
- Step 2: By using Prepressing technique Median filter.
- Step 3: For Segmentation of image used method K-mean.
- Step 4: Using Deep learning Algorithm DNN.
- Step 5: After finished above steps finally we have to Classify Fracture and its stage which detected by X-ray image.

**IV. Simulation Results**

Below Simulation results have been obtained with a Spyder Anaconda. This implementation has shown the robustness, versatility and speed of this smart x-

ray device. The findings of cancer identification using the training picture package resulted in 92.94% Classification.

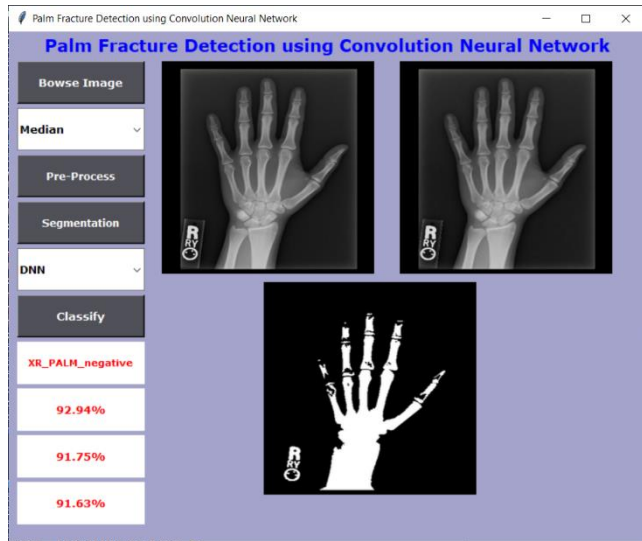


Figure 6: Front Palm

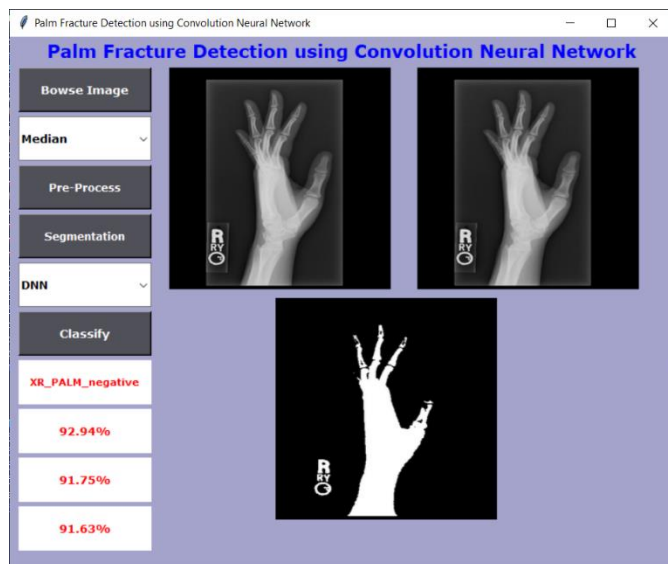


Figure 7: Side Palm

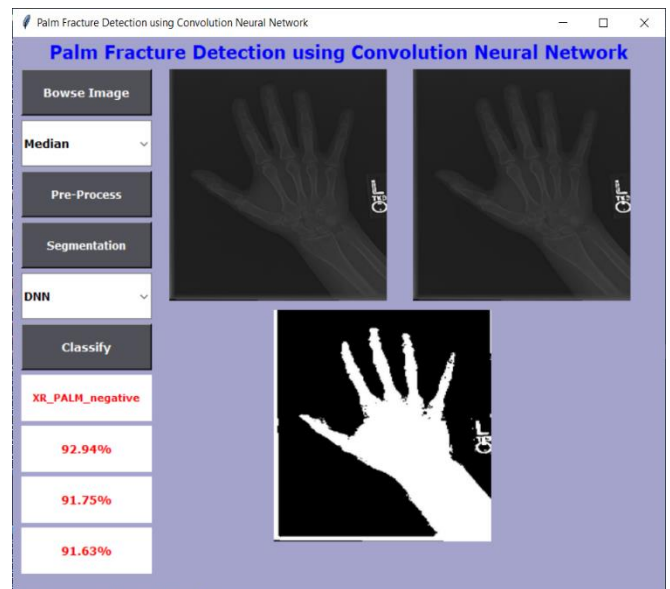


Figure 8: Right Palm

## V. CONCLUSION

Deep learning-based CNN methods for segmentation and classification Palm Fracture have been established in this article. Image processing techniques in medical matters, as in the X-ray machine, are very useful and important. When testing the system, the experimental findings showed that the Palm Fracture screening system produced is a robust image treatment that detects all anomalies in the bon region and particularly in small areas. The stability of the system is to note immediately at the first glance some abnormality in the Palm. In 92.94% accuracy, the system also directly labels the Positive or Negative in the palm bon, making our system successful.

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## A Review on Medicinal Plant used in Treatment of Diabetes

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### ABSTRACT

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Aim of the present study is evaluated various medicinal plants used for antidiabetic activity. Diabetes mellitus is one of the most common non-communicable diseases globally. It is the fourth leading causes of death in the most developed countries and there in substantial evendiced that it in epidemic in many developing and newly industrialized nations.

Keywords : Diabetes, Medicinal Plant , Hypertension, Blood Glucose Level

### I. INTRODUCTION

Introduction Diabetes mellitus is a common and very prevalent disease affecting the citizens of both developed and developing countries. It is estimated that 25% of the world population is affected by this disease. Diabetes mellitus is caused by the abnormality of carbohydrate metabolism which is linked to low blood insulin level or insensitivity of target organs to insulin[1]. Despite considerable progress in the treatment of diabetes by oral hypoglycemic agents, search for newer drugs continues because the existing synthetic drugs have several limitations. The herbal drugs with antidiabetic activity are yet to be commercially formulated as modern medicines, even though they have been acclaimed for their therapeutic properties in the traditional systems of medicine[2]. Type 2 diabetes usually occurs in obese individuals and is associated with hypertension and dyslipidemia. Thus the treatment aims to reduce insulin resistance and to

stimulate insulin secretion. Diabetes is a metabolic disorder where in human body does not produce or properly us insulin, a hormone that is required to convert sugar, starches, and other food into energy. Diabetes mellitus is characterized by constant high levels of blood glucose (sugar).



Human body has to maintain the blood glucose levels at a very narrow range which is done with insulin and glucagon. The function of glucagon is causing the liver to release glucose from its cells into the blood for the production of energy. Type 1 Diabetes leads to inability to release insulin results in low rates of

glucose uptake into muscles and adipose tissue[3]. Traditional medicine (herbal) is used for treatment of diabetes in developing countries where the cost of conventional medicines is a burden to the population[4]. Despite the introduction of hypoglycemic agents from natural and synthetic sources, secondary complications continue to be a major medical problem.

## II. METHODS AND MATERIAL

### Antidiabetic effect of folklore medicinal plants

#### 1. Brassica juncea:-

It is commonly used spice in various food items in Tamilnadu. B. juncea is a traditional medicinal plant which belongs to family Cruciferae. B. juncea aqueous seed extract has a potent hypoglycemic activity which was investigated in STZ induced diabetic male albino rat. Doses which have hypoglycemic activity was reported as 250, 350, 450 mg/kg[7]



#### 2. Coccinia grandis :-

Hypoglycemic activity was evaluated in alcoholic extracts of Coccinia grandis (C. grandis) leaves. Alcoholic extract 600 mg/kg bw was injected orally to mice. Oral administration of alcoholic extract of leaves of C. grandis showed significant hypoglycemic effect on blood glucose level in normal fasted rats[9].



#### 3. Alangium lamarckii:-

Antidiabetic effect of alcoholic extract of Alangium lamarckii (A. lamarckii). Alcoholic leaves extract 250 and 500 mg/kg bw was used for these studies. A. lamarckii have significant antidiabetic activity in STZnicotinamide induced diabetic rat[10]



#### 4. Albizia odoratissima :-

Antidiabetic effect of methanolic bark extract of Albizia odoratissima (A. odoratissima) in alloxan induced diabetic mice. The methanolic extracts were fed to the animals at a dosage of 250 and 500 mg/kg body weight. The significant reduced in the levels of serum cholesterol, triglycerides, SGOT, SGPT, alkaline phosphatase and decrement of total proteins in alloxan induced albino mice[11].



### 5.. *Artemis sphaerocephala* Krasch:-

Antioxidant effect of *Artemis sphaerocephala* (*A. sphaerocephala*) gum on STZ induced diabetic rat. Levels of serum and liver tissue thiobarbituric acid reactive substances (TBARS) and +OH were increased in STZ induced rat. The activity levels of liver and serum superoxide dismutase were decreased. After administration of extract of *A. sphaerocephala*, levels of TBARS and +OH were decreased in serum and liver tissue. The significant increments in the levels of liver and serum SOD. *A. sphaerocephala* is very good antioxidant activity[12]



### 6.. *Axonopus compressus* :-

The anti-diabetic effect of the methanolic leaf extract of the plant. Diabetes was induced in the rats by injection of alloxan. Methanolic leaves extract 250, 500 and 1 000 mg/kg bw was used for these studies. Methanolic leaf extract of *Axonopus compressus* (*A. compressus*) at all.



### 7.. *Berberis vulgaris* :-

Hypoglycaemic effect of *Berberis vulgaris* (*B. vulgaris*) L. in streptozotocin-induced diabetic rats *B. vulgaris* a traditional medicinal plant which belongs to family Berberidaceae. The results indicated that water extract and saponins shows significant hypoglycemic effect. The serum cholesterol and

serum triglycerides levels were significantly increased[14].



### 8. *Catharanthus roseus*:-

Hypoglycemic effect of the methanolic leaf extract of *Catharanthus roseus* (*C. roseus*) in alloxan induced diabetic rats. The levels of blood glucose were significantly decreased when compared with Control rat. The blood glucose lowering effect of *C. roseus* methanolic extract was more pronounced than Glibenclamide and Metformin.



### 9. Aloe Vera

Research suggests that aloe vera juice or supplements could have a number of possible benefits for people with diabetes: Lower fasting blood glucose levels. A 2015 study suggests that taking aloe vera gel can help people achieve better fasting blood glucose levels, as well as reduce body fat and weight.



#### 10. Lemon balm:-

Lemon balm is possibly safe when taken appropriately by mouth for about one month. Diabetes. Lemon balm might lower blood sugar levels in people with diabetes. Watch for signs of low blood sugar (hypoglycaemia) and monitor your blood sugar carefully if you have diabetes and use lemon balm.



#### 11. Rosemary:-

Studies have shown that compounds in rosemary tea may lower blood sugar, suggesting that rosemary could have potential applications for managing high blood sugar among people with diabetes.



#### 12. Marigold:-

The result showed that the Lutein extract from marigold flowers has the potential to reduce blood glucose levels and as an antioxidant characterized by a decrease in the levels of malondialdehyde in mice. Diabetes mellitus is a chronic disease characterized by blood sugar levels.



#### 13. Lavender:-

Researchers found that in animal experiments, lavender essential oil helped balance high blood sugar levels and protect against oxidative stress, which causes complications in people with diabetes. Lavender oil is available for purchase online.



#### 14. Peppermint :-

Peppermint essential oil alleviates hyperglycemia caused by streptozotocin- nicotinamide-induced type 2 diabetes in rats. Biomed Pharmacother.



## LIST OF MEDICINAL PLANT USED IN DIABETES

PLANT NAME	FAMILY	PART TO BE USED	TYPE OF EXTRACT	ACTIVITY	METHOD	CHEMICALS
ANKOL	Aliginaceae	Leaves	Alcoholic	Antihyperglycemic	Extraction	Alloxan
BLACK SERIES	Milimoseceae	Bark	Mentholic	antidiabetic	Normal contrl	Alloxan
BLANKET GRASS	Poaceae	Leaves	Aqueous	hypoglycem	Injection Method	Glabiclimide
BARBERRY	Berberidiceae	Root	Mentholic	antidiabetic	Extraction	Amylase
BLACK MUSTARD	Cruciferae	Seed	Alocoholic	antidiabetic	Extraction	Streptozot Ozotocin
TERIPOD	Fabeceae	Root	Aquous	antidiabetic	Extraction	Amuase
VINCA	Apocunaceae	Leave	Alcoholic	antidiabetic	Extraction	Bergenin
BITTER HERB	Gentineacea	Leaves	Mentholic	antidiabetic	Normal Control	Algenin
SWEET FLAG	acorbicae	rizome	aquous	antidibetic	exteaction	gurmarin



**Other medicinal plants**

<i>PLANT NAME</i>	<i>FAMILY</i>	<i>PART TO BE USED</i>	<i>TYPE OF EXTRACT</i>	<i>ACTIVITY</i>	<i>METHOD</i>	<i>CHEMICAL</i>
<i>Sugar Apple</i>	<i>Anonneceae</i>	<i>Root</i>	<i>Alcoholic</i>	<i>Antidibetic</i>	<i>Extraction</i>	<i>Trymitham Ine</i>
<i>Buddha Tree</i>	<i>Anonneceae</i>	<i>Bark</i>	<i>Mentholic</i>	<i>Antidiabetic</i>	<i>Injection Methid</i>	<i>Gallocatec Hin</i>
<i>Sinking Gum</i>	<i>Apiceae</i>	<i>Resin</i>	<i>Aqeous</i>	<i>Antidiabetic</i>	<i>Normal Control</i>	<i>Epigallo Cate</i>
<i>Physic Nut</i>	<i>Euphorbiceae</i>	<i>Leaves</i>	<i>Alcoholic</i>	<i>Antidiabetic</i>	<i>Extraction</i>	<i>Marsupine</i>
<i>Indian Berry</i>	<i>Euohorbiceae</i>	<i>Seed</i>	<i>Aquous</i>	<i>Antidiabetic</i>	<i>Extraction</i>	<i>Petrostill Ben</i>
<i>Onion</i>	<i>Lilieacea</i>	<i>Oil</i>	<i>Mentholic</i>	<i>Antidiabetic</i>	<i>Extraction</i>	<i>Polyphenol L</i>
<i>Chinis Hibiscus</i>	<i>Malveceae</i>	<i>Flower</i>	<i>Aquous</i>	<i>Antidiabetic</i>	<i>Extraction</i>	<i>Stz</i>
<i>caalluma</i>	<i>asclipideace</i>	<i>roots</i>	<i>mentholic</i>	<i>Antidiabetic</i>	<i>Injection method</i>	<i>Alloxan Stz</i>

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## Developing A GIS-Based Approach for Enhancing Revenue Management of Fish Cold-Room Businesses in Oyo East Territory, Oyo State, Nigeria

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### ABSTRACT

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Cold-room or Refrigerating Chamber is a post-harvest warehouse in which a specific temperature is artificially generated, maintained and purposely designed for storing products in an environment below the outside temperature. An ideal fish cold-room is a category of cold storage system usually design for frozen fish or kinds of seafood since the spoilage of post-harvest fish due to protein denaturation, fat changes and dehydration are experimentally slowed down by reducing the storage temperature. Fish is one of easily perishable protein foods that need careful handling but most traditional fish farmer in the study area always prefer to sell their fish in bulk at either profitable or unprofitable price during harvest time due to lack of adequate post-harvest fish preservative and processing techniques. Hence, the study aimed at developing GIS based approach for the available post-harvest fish cold-rooms in the study area to ensure effective control and management of revenue from this informal business. The objectives include: to determine the available number of fish storage cold-rooms and identify likely problems associated with cold-rooms storage businesses in the study area, to identify necessary practical measures for solving the so identified problems. Also, the methodology adopted includes database design, data acquisition using GPS and Scanner respectively and as well as creation of spatial and attribute database for the acquired Cold-rooms Storage Facilities using ArcGIS 10.2.2. Various results were generated that pointed in the direction of uneven distribution of the fish storage facilities. It is therefore recommended that it is necessary for various concerned Local Government Authorities to align with “Sustainable Development Goal’s Fourteen (SDGs14th) [1] on Food Security from Life below Water” by encouraging the establishment of adequate Modern Post-Harvest Cold-rooms Storage Facilities within their territory and equally ensure that

they are always in good condition for public use.

Keywords : Cold-room, Management, Warehouse, Seafood, Storage-temperature, database.

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## I. INTRODUCTION

Low temperature is one of the keys in the transportation of live fish. At these conditions metabolic and respiration rates are so low that fish or crustaceans can be transported for a long time with high survival rates [2]. Temperature is one of the physical parameters that affects the life process of fish, because fish are poikilothermal animals whose body temperature is influenced by the temperature of their habitat so that metabolism is highly dependent on the surrounding environment [3]. Arable farmers who could not afford to get their products to the market due to poor transport and storage facilities were forced to sell them at very low prices to middlemen, who eventually made more money than arable farmers [4].

Creating of artificial spawning nests is the unique and inexpensive way to improve the environmental conditions of water bodies for fish spawning. Exploitation of spawning nests construction is based on the use of the biological characteristics of fish spawning and implemented in several stages, with considering climatic, hydrological and water temperature factors. Construction of nests protects fish eggs from destruction; they are advanced for specific species of fish and can be characterized by high efficiency of substrate development and increased output of viable young fish [5].

Cold Chain Management [6] emphasized that cold storage is one of the most important parts of the frozen food supply chain that is always linking the manufacturing process with transportation to the

retailer. The supply chain is becoming more complex and increasing in lengths, it is more important than ever for cold storage provider to ensure that perishable products that are stored in their warehouses are kept within the strict temperature (normally  $-20^{\circ}\text{C}$  and  $-28^{\circ}\text{C}$ ). Hence, the design of cold-room should analyze and always compare before choosing the best match for each business.

Code of Practice by Food and Agriculture Organization of United Nations [7] stated that frozen products should be stored at temperatures approximate for the species, type of products and intended time of storage. The code also expressed that the International Institute of Refrigeration (IIR) recommends the storage temperatures of  $-18^{\circ}\text{C}$  for lean fish,  $-24^{\circ}\text{C}$  for fatty species and  $-30^{\circ}\text{C}$  for lean fish intended to be kept in cold storage for over a year. According to [8], [9] and [10], once fish is frozen, it must be stored at a constant temperature of  $-23^{\circ}\text{C}$  ( $-10^{\circ}\text{F}$ ) or below to maintain a long shelf life and ensure quality. Problems posed by the conservation of perishable food items in the rural areas of Nigeria justify the interests shown on the application of solar energy for refrigeration; through solar energy has the limitation of intermittency and weather dependence but can be aided by back-up or auxiliary solar thermal energy storage device for continuous application during the period when solar power system is not available [11].

According to [12], many challenges of increasing fish supply to meet growing demand for food, reducing the food loss and waste will contribute to the

objectives of at least five out of targets of United Nations Sustainable Development Goals:

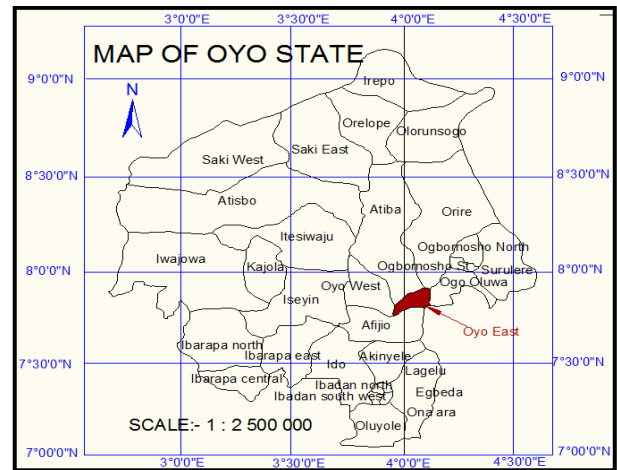
- ✓ No Poverty.
- ✓ Zero Hunger.
- ✓ Responsible Consumption and Production.
- ✓ Life below Water
- ✓ Partnerships for the Goals.

The long distance of distribution necessitates some processing and storage, as preservation through refrigeration is not readily available in Nigeria [13]. Also, the insect infestation is the cause of most prominent losses in quality and quantity of stored, dried fish in Nigerian [14]. The need for the development of fish preservation and processing machinery and techniques for effective fish handling, harvesting, processing and storage can never be over-emphasized especially now that aquaculture production is on the increase in Nigeria [15].

### 1.1 THE STUDY AREA

The study area (Oyo East local government) is in Oyo town (see fig. 1) and was among additional ten local government area councils created in Oyo State during military governance in December 1996 having divided the then Oyo Divisional Council into three (Oyo east, Oyo west and Atiba). It is currently classified among the local government councils forming zone four (Oyo areas) based on the distribution of geographical zones and classification in Oyo State.

Oyo East local government Area is geographically bounded in northern part by Atiba L.G.A, in the southern part by Afijio L.G.A and in the eastern part by Ogo-Oluwa L.G.A. The land mass of the study area spread approximately between latitude of  $7^{\circ}45'34''$  N and  $7^{\circ}58'56''$  N and longitude  $3^{\circ}53'31''$  E and  $4^{\circ}07'06''$  E respectively (See figure 1 representing the geographical location of Oyo East L.G.A.).



**Figure 1.** Map of Oyo State indicating Oyo East L.G.A. in Shaded Portion

### 1.2 CONCEPTUAL FRAMEWORK:

- i. Data Representation: The real world objects of interest acquired in this study are represented as either raster or vector data.
- ii. Database: Is the process adopted in this study to ensure that collected data for a particular area or subject for specific purpose are organized so that information can be easily accessed, managed and updated.
- iii. Networking: the entire road connectivity within the study area (major road and streets) were digitized to form road network in order to ensure network analysis.

## II. MATERIALS AND METHODS

The methodology section of this study involve:

- Database Design.
- Data Acquisition.
- Database Creation.
- Information Presentation.

### 2.1 DATABASE DESIGN

Database Design phase is made of three main stages, namely: Conceptual, Logical and Physical At the conceptual stage, basic entities were determined, the spatial relationships among the entities and attributes of each entity which supports the process and the

application for which the database is designed were considered and interested entities were represented as points, line and polygon which formed the basic data sets. Also, the logical phase translated the conceptual design to reflect the recording of data in computer system. Meanwhile, the relational data structure was adopted out of the existing hierarchical, network or relational approach. A sample of the records is shown in Tables 1,2 and 3.

**Table 1.** Point Table (Entities and Attributes)

Attribute Name	Description of Attributes
PE & PN	Easting and Northing of Available Fish Cold-room Storage Facility
C_CDT	Cold-room Condition
C_ADR	Cold-room Address
C_TR	Cold-room Tax-Rate
C_TYPE	Cold-room Type
C_OVIEW	Cold-room Overview

**Table 2.** Road Table

Attribute Name	Description Of Attributes
R_ID	Road Identifier Number
R_Status	Road Status
R_Length	Road Length

**Table 3.** Polygon Table

Attribute Name	Description Of Attributes
BDR	Boundary
ZN_1 and ZN_2	Zone 1 and Zone 2
ZN_3	Zone 3

## 2.2 DATA ACQUISITION

The datasets required were sourced from both primary and secondary data sources. The primary data were directly collected from the field with the aid of GPS and these include the following:

- a) The location data of identified Cold-room Storage facilities that were not captured or precisely identified on the downloaded imagery were determined using Hand Held GPS.
- b) Geometric coordinates of roads or streets that were not captured by the imagery as at time downloaded were also fixed by using GPS.
- c) Other information (like road names through oral interview) that were taught useful in this study were adequately sourced through social survey.

The secondary datasets were also sourced from various sources:

- a) Scanning and Digitizing of Administrative maps of the study area collected from Local Government Secretariat.
- b) Downloading of Satellite Imagery of Oyo East LGA Administrative maps).

The georeferenced imagery, the GPS acquired data and digitized administrative boundary of Oyo East LGA were overlaid respectively using ArcGIS 10.2.2. and the shape file of the boundary of Oyo East LGA was traced out. The boundary was then partitioned into three zones 1, 2 and 3 respectively.

## 2.3 DATABASE CREATION

Geodatabase was created for acquired fish cold-rooms within the study area, they were captured into the database and the imported data for each of the entities were converted to shapefiles. The attribute data of each storage facility were populated into the database. Also, the shapefiles of the digitized entities from the

satellite imagery were integrated into the geodatabase in the Arc Catalog.

The geodatabase created for the identified cold-rooms within the study area contains the following:

- (i) (P\_E) & (P\_N) represent the coordinates of each informal economic source.
- (ii) 'Z\_N' that stands for zone in which each cold-room belongs to.
- (iii) 'C\_TR' represents cold-room tax rate.
- (iv) 'C\_ADR' is the address of the location of each cold-room facilities.
- (v) 'C\_TYPE' represents the actual type of cold-room (is it water private or public own)?
- (vi) 'C\_CDT' represents the condition of each cold-room (active or non-active)?
- (vii) 'C\_OVIEW' is a brief summary or comments based on the gathered information.

### III. INFORMATION PRESENTATION

Composite map showing the spatial distribution of fish cold-rooms within the study area was produced (see figure 2). Also, various analyses were performed from the composite map as further presented and discussed as thus:

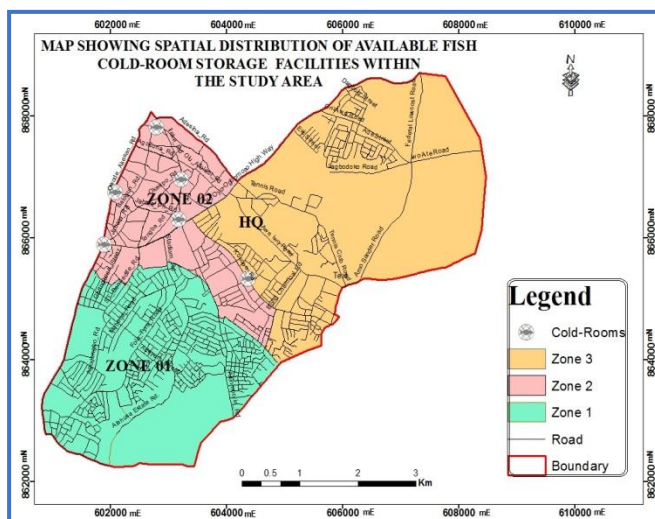


Figure 2. Map of Available Cold- rooms Storage Facilities within the Study Area.

### Discussion:

Figure 2 is a map displaying spatial distribution of available six (6) cold-rooms within the study area. Based on the data acquired, the findings revealed that zero (0), Five (5) and One (1) cold-rooms are available in Zone 1, Zone 2 and Zone 3 respectively as at the time of capturing the data used for this study. As shown in Figure 2, the spatial locations of the existing cold-rooms were not evenly distributed within the study area. Meanwhile, fish is one of the easily perishable protein foods that need careful handling but most of indigenous or traditional fish farmers in the study area always prefer to supply and sell all their fish in bulk at profitable or non-profitable price during the harvest time as a result of lack of adequate post-harvest fish preservative, processing and storage facilities within the vicinity of the study area. Sad enough, the findings of this study also confirmed that majorly the imported/foreign species of fish are commonly available at the so identified cold-rooms. This is not encouraging enough in the part of those having the mind of venturing into the practice of aquacultures.

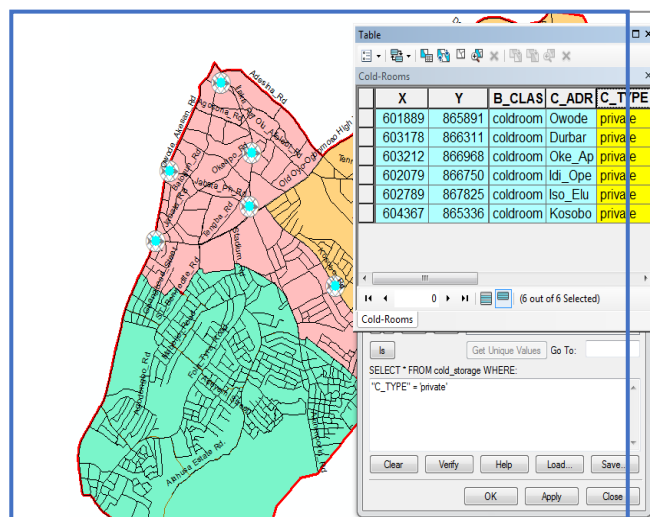


Figure 3. Result of Query Displaying All Private Owned Cold-rooms within the Study Area.

### Discussion:

All the available Six (6) cold-rooms storage facilities were all private owned and no single one out of the

existing six (6) was owned by the concern state or local government authority. Graphically, the locations of the existing private cold-rooms are not evenly distributed within Oyo East Local Government Territory. This map could serve as a basic tool to provide vital information for the Local Government Authority in understanding what is where, planning and making rightful decision for the establishment of modern storage facilities for fish production and other agricultural products at will.

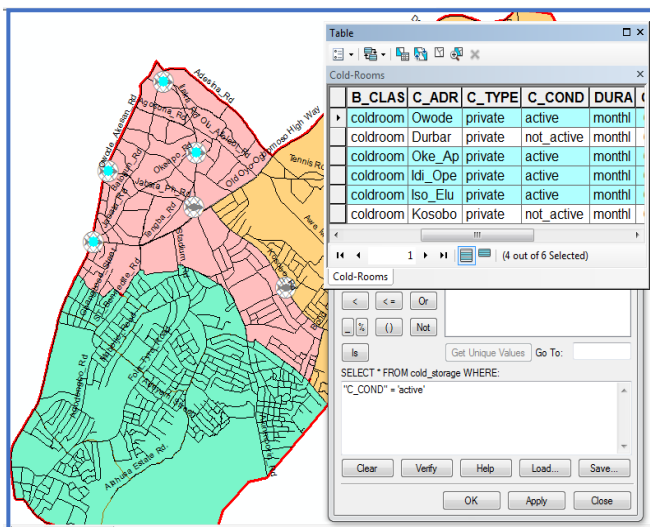


Figure 4. Result of Query Displaying All Active Cold-rooms within the Study Area

**Discussion:**

The Figure 4 shows the highlighted positions of the Four (4) active cold-rooms out of the Six (6) available within the study area. This is an indication that Two (2) were not in use and were tagged as “not-active” as at time of acquiring the data. Form the finding of this study, the two storage facilities were fold up as a result of high cost of running, fueling and maintaining the business due to inadequate supply of electricity.

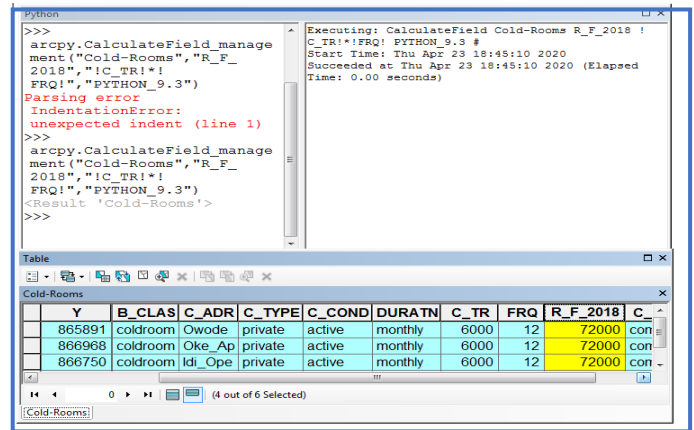


Figure 5. Python Interface Displaying the sample of likely Generated Annual Revenue from the Available Active Cold-rooms.

**Discussion:**

The figure 5 showcased in yellow column the annual revenue generation from each available active cold-room within the study area using Python written program in Arcpy. environment of ArcGIS 10.2 Software Version.

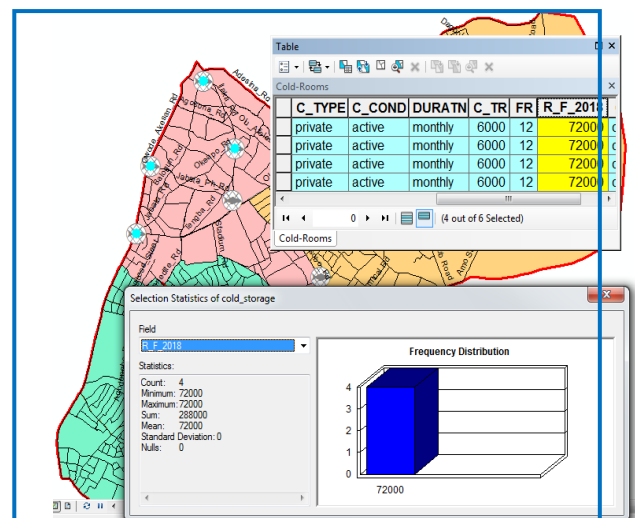


Figure 6. Result showing Annual Revenue that could be generated from all the Active Cold-rooms based on Monthly Tax Rate.

**Discussion:**

Based on the tax rate, the total amount of Seventy-Two Thousand Naira (72,000.00) could be generated annually from each private owned cold-room as shown in figure 6. If Government at Local levels now venture into construction and establishment of



modern cold storage facilities, then reasonable amount of revenue can be realized from this informal sector as well as process of empowering the youths.



**Figure 6.** Sample of Private Cold-room at Durbar Area, Oyo East L.G.A.

#### IV. CONCLUSION AND RECOMMENDATIONS

##### 4.1 CONCLUSION

The acquired data were used to develop a geo-database for available fish cold-rooms storage facilities that were identified within Oyo East Local Government Territory. This could serve as a vital tool to understand the spatial distribution of cold storage facilities within the study area by the concerned authority and investigate the factors militating against this informal business in order to develop effective strategies to minimize these factors at will. The created geo-database was tested and has capabilities to search, retrieve, delete and update the information about each and every available cold-room. Cost of cold-room construction, maintenance cost, inadequate electricity supply among others are identified as the problems facing the private individual venturing into this kind of informal business. Having carried out these analyses, it was concluded that the aim and objectives of this study were achieved.

##### 4.2 RECOMMENDATIONS

On the basis of the findings of this study, the following recommendations are put forward:

- i) As part of Sustainable Development Goals (SDGs) especially target fourteen (14) on food security from life below water, every local government should take the establishment of modern and strategic storage facilities at subsidized rate as a serious and matter of necessity. This will in no exaggeration contribute indirectly to the SDGs objectives and at the same time serve as source of revenue from informal sector within their territory.
- ii) Government should not only focus on the collection of tax from private storage operators but also ensure provision of adequate electricity supply to encourage more private investors in the business.
- iii) Adequate training and seminar on modern techniques on fish nourishing, aquaculture should also be regularly organized at Local Government Authority levels in order to empower the interested and lazy youths as a means of poverty alleviation and job creation toward reducing the rate of unemployment in the country.

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## Parameter Estimation of Single-Phase Induction Motor

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### ABSTRACT

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This paper presents a methodology to estimate the parameters of a single-phase induction motor (SPIM) equivalent circuit using a dc test, a locked-rotor test, and a no-load test. By neglecting the core-loss resistance, the SPIM parameters can be first directly calculated using a simplified equivalent circuit. However, an equivalent circuit using the resultant parameter values fail to match the power input measured at the motor terminals, especially for the active power under the no-load test. We include the core-loss resistance into the parameter estimation framework and use the Newton-Raphson (N-R) algorithm to improve the estimates obtained by the direct calculation method. Experimental results on a laboratory SPIM demonstrate the effectiveness of our proposed N-R based parameter estimation scheme, in terms of excellent match with the active and reactive power measurement data from the aforementioned tests, and mismatch reduction at other operating conditions.

**Keywords** : Induction Motor Faults, Motor Current Signature Analysis, Identification, Diagnosing Techniques, Arduino Uno, Embedded system, Tests, Voltage, current, speed, power, torque, efficiency.

### I. INTRODUCTION

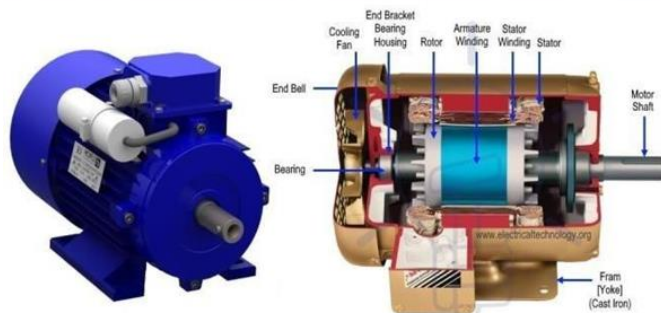
Industries of this modern era are mainly concerned with quality and quantity of production over a period of time. More than 300 million industrial electric motors are installed worldwide. AC motors are chosen prior to DC motors as it requires a single power source whereas DC machines require separate power sources to the rotor and stator of the motor. Apart from this, there are other factors which make induction motors well suited to industrial usage, like robust in construction, low maintenance cost, high

starting torque, efficiency and reliability makes difference from other motors.

Furthermore, motors are an essential machine and it also has a tendency to fail at some point in time. Taking industrial motors as an example, factors such as amount of lubrication, electrical considerations, motor ventilation, alignments and motor load are some possibilities that can be reason for motor failure. These factors result into motor vibrations or rise in motor temperature to critical levels or any other failure.

The health of an induction motor can be easily estimated by condition monitoring which overcomes the difficulties caused by the other method of maintaining motors condition on time basis. Maintenance of motors on time basis may cause shutdowns that are unexpected. On the other hand condition monitoring will provide information not only on motor status and performance but also the type of maintenance required. Condition monitoring has got a great significance these days since it helps to predict equipment health, to optimize equipment performance and reduces maintenance cost.

### Construction of Single-Phase Induction Motor



## II. METHODOLOGY

The block diagram shows the entire picture of the work. The objective of condition monitoring of induction motor is achieved by continuously recording the considered parameters using various sensors. Accelerometer is used to record vibrations; LM 135 temperature sensors are used to record winding and bearing temperature, ACS712 current sensor for current, and a Voltage sensing circuit to measure voltage. All the sensors are connected to Arduino microcontroller board which is to be installed at the motor site.



The sensors will sense the parameters and are analyzed by the micro controller board to the instruction coded. The data sensed by different sensors can be seen on the serial monitor of Arduino IDE. The power supply is turn ON the Arduino and all the interface components get the required supply. Sensor unit senses the corresponding motor parameters and feed to the Arduino . Arduino reads the data from various sensors and analyses according to the given instructions, Then sends the sensor information to LCD.

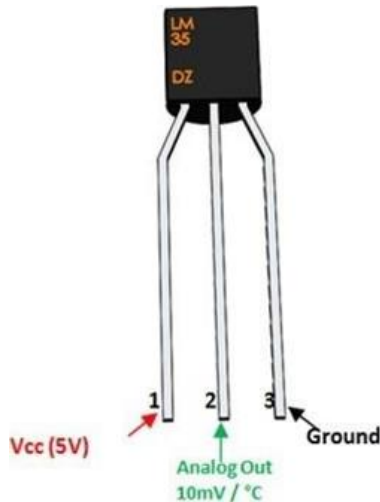


## COMPONENTS

### LM35 TEMPERATURE SENSOR

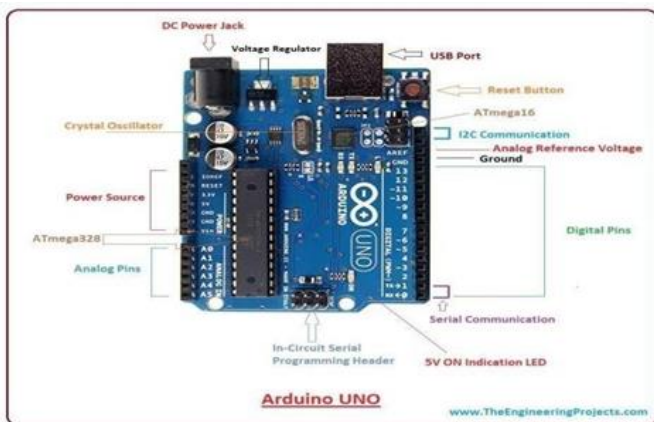
- LM35 is a temperature measuring device having an analog output voltage proportional to the temperature.
- It provides output voltage in Centigrade (Celsius). It does not require any external calibration circuitry.
- The sensitivity of LM35 is 10 mV/degree Celsius. As temperature increases, output voltage also increases. E.g. 250 mV means 25°C.

- It is a 3-terminal sensor used to measure surrounding temperature ranging from - 55 °C to 150 °C.
- LM35 gives temperature output which is more precise than thermistor output.



### ARDUINO UNO

The Arduino Uno R3 is a opensource microcontroller board based on the ATmega328 chip. This Board has 14 digital input/output pins, 6 analog input pins, Onboard 16 MHz ceramic resonator, Port for USB connection, Onboard DC power jack, An ICSP header and a microcontroller reset button. It contains everything needed to support the microcontroller. Using the board is also very easy, simply connect it to a computer with a USB cable or power it with DC adapter or battery to get started.



Features:-

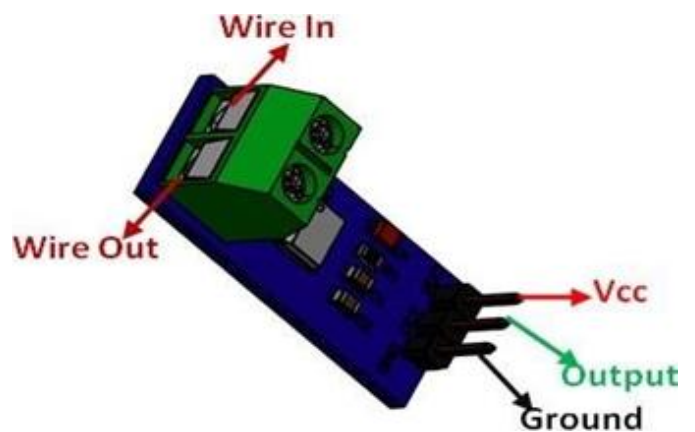
- Microcontroller: ATmega328P.

- Operating Voltage: 5V.
- Input Voltage: 7-12V.
- Digital I/O Pins: 14 (of which 6 provide PWM output)
- Analog Input Pins: 6
- DC Current: 40mA.
- Flash Memory: 32 KB.
- EEPROM: 1 KB. ;Clock Speed: 16 MHz.

### CURRENT SENSOR

Current sensors, also commonly referred as current transformers or CTs, are devices that measure the current running through a wire by using the magnetic field to detect the current and generate a proportional output. They are used with both AC and DC current.

- Can measure AC/DC current upto 30A
- Uses the popular ACS712 IC
- Easy to read analog output corresponding to the sensed current
- Requires 5.0 VDC for operation
- 66 mV/A output sensitivity



### VOLTAGE SENSOR

Single-phase ac active output voltage transformer module and voltage sensor module. ZMPT101B voltage sensor module is a voltage sensor made from the ZMPT101B voltage transformer. It has high accuracy, good consistency for voltage and power measurement and it can measure up to 250V AC. It is simple to use and comes with a multi turn trim potentiometer for adjusting the ADC output.

## Features

- within 250 V AC voltage can be measured.
- onboard micro-precision voltage transformer
- Installation : PCB mounting (Pin Length > 3mm)
- Operating temperature : 40°C ~ + 70°C

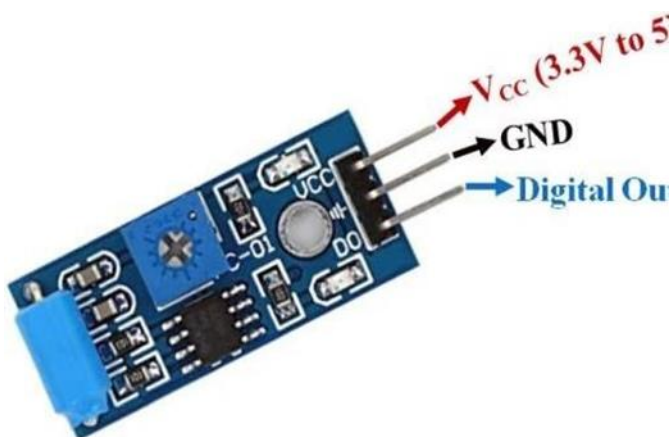


## VIBERATOR SENSOR

The vibration sensor is also called a piezoelectric sensor. These sensors are flexible devices which are used for measuring various processes. This sensor uses the piezoelectric effects while measuring the changes within acceleration, pressure, temperature, force otherwise strain by changing to an electrical charge.

Specification:-

- Voltage supply: 3.3V to 5.0V
- Type of sensor: ball rolling type
- The sensor used: SW-460D or SE-250D
- Comparator IC used: LM393
- Output type: Digital



## IR SENSOR

IR sensor is an electronic device that emits the light in order to sense some object of the surroundings. An

IR sensor can measure the heat of an object as well as detects the motion. Usually, in the infrared spectrum.

- The sensor module output port OUT can be directly connected with the microcontroller IO port can also be driven directly to a 5V relay; Connection: VCC-VCC; GND- GND; OUTIO.
- The comparator using LM393, stable.
- 3-5V DC power supply module can be used. When the power is turned on, the red power LED is lit.
- Each module in the delivery has threshold comparator voltage adjustable via potentiometer, special circumstances, please do not adjust the potentiometer.



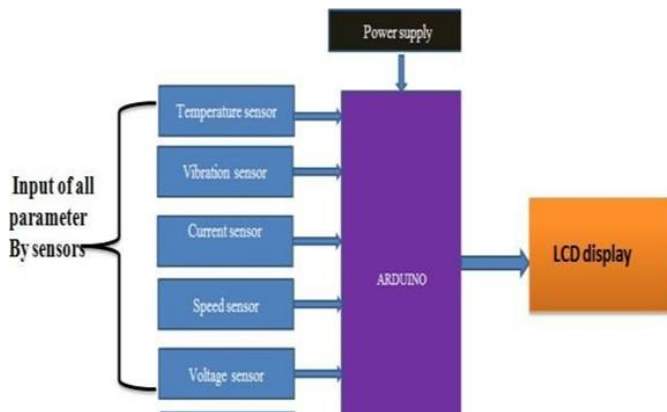
## LCD

This is LCD 1602 Parallel LCD Display that provides a simple and cost-effective solution for adding a 16x2 White on Liquid Crystal Display into your project. The display is 16 character by 2 line display has a very clear and high contrast white text upon a blue background/backlight.



Specifications & Features :-

- Arduino IIC/I2C interface was developed to reduce the IO port usage on Arduino board
- I2C Reduces the overall wirings.
- 16 characters wide, 2 rows
- White text on the Blue background
- Single LED backlight included can be dimmed easily with a resistor or PWM.
- Supply voltage: 5V



BLOCK DIAGRAM

OBJECTIVE OF THESIS

- Real time data monitoring of induction motor
- Time reduction in data collection
- Time reduction in parameter calculation like power factor , torque etc.
- Easy testing

III. LITERATURE REVIEW

Shyamala.D “Platform for condition monitoring of industrial motors” Numbers of things are efficiently interconnected, which leads to condition and controlled monitoring to increase productivity. Continuous monitoring of the equipment, receiving alerts and data availability for predictive maintenance. Motor is effectively and continuously monitored by using arduino. Kunthong, Jakkrit, et al. "IoT-based motor condition monitoring in electric machines: Part 1." Power Electronics and Drive Systems (PEDS), 2017 IEEE 12th International conference. In electric motor drive condition for traction was supervised by

applying the implementation of a motor health monitoring system. The design and testing of the prototype using an Atmega microcontroller module to acquire motor condition is presented. Prakash, Chetna, and Sanjeev Thakur. "Smart Shut-Down and Recovery Mechanism for Industrial Machines Using Internet of Things." 2018 8th International Conference on Cloud Computing, Data Science & Engineering (Confluence). IEEE, For predictive maintenance of motors in the industries, monitoring needs to be performed continuously so as to determine any degradation in performance or failure of the motors. The recovery mechanism provides a back-up machine which is started when the main motor is shut down. This helps in decreasing the loss that would occur during the downtime. This increases the reliability. Şen, Mehmet, and Basri Kul. "Controller based induction motor monitoring. " Scientific Conference Electronics (ET), 2017 XXVI International. IEEE, 2017. In this way, the production process is not impeded and the required maintenance or replacement can be performed with the least possible disruption. This study has provided statistics not only for creating mathematical models but also for enabling the CMS operator to establish a motor maintenance schedule. Xue.Xin ,V. Sundararajan and Wallace P. Brithinee. "The condition monitoring in three-phase induction motors." Electrical Insulation Conference and Electrical Manufacturing Expo, 2007. The most commonly used technique for the detection of faults in large three-phase induction motors is to measure the supply current fed into the motor and analyze the signal spectrum. This aspect allows companies to reduce downtime when repairing machinery and ensures that productivity does not suffer.

IV. PROPOSED WORK

It is understood from that the parameters of induction motor may vary due to several factors such as: machine internal temperature, machine aging,

magnetic saturation, the coupling effect between the internal system and external systems

#### PROGRESS

Firstly we decide a concept we start working on it we done all related concept and note it down after that we finalized the block diagram and components required for the project . Now we are start working on circuit diagram and the circuit fixing

#### V. CONCLUSION:

Thus the speed was sensed by the proximity sensor, voltage was measured by potential transformer and current was measured by current sensor. Input and output power of induction motor was calculated by sensed motor parameters and efficiency was calculated by input and output power of induction motor. All the parameters were displayed and whole process was controlled by arduino uno controller. In future, power factor of motor and temperature of motor are may measure.

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# A Privacy-Preserving Outsourcing Data Storage Scheme with Oruta Data Auditing

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## ABSTRACT

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Cloud Computing has been envisioned as the next generation architecture of IT Enterprise. In contrast to traditional solutions, where the IT services are under proper physical, logical and personnel controls, Cloud Computing moves the application software and databases to the large data centers, where the management of the data and services may not be fully trustworthy. With cloud computing and storage, users are able to access and to share resources offered by cloud service providers at a lower marginal cost. With cloud computing and storage services, data is not only stored in the cloud, but routinely shared among a large number of users in a group. In this project, we propose Oruta, a privacy-preserving auditing scheme for shared data with large groups in the cloud. We utilize ring signatures to compute verification information on shared data, so that the TPA is able to audit the correctness of shared data, but cannot reveal the identity of the signer on each block. We can implement the batch auditing scheme to perform efficient public auditing to protect both identity and data privacy in cloud environments.

**Keywords** : Cloud Computing, IT services, Storage, Privacy-Preserving Auditing Scheme.

## I. INTRODUCTION

Cloud computing is the long-dreamed vision of computing as a utility, where users can remotely store their data into the cloud so as to enjoy the on-demand high quality applications and services from a shared pool of configurable computing resources. By data outsourcing, users can be relieved from the burden of local data storage and maintenance. However, the fact that users no longer have physical possession of the possibly large size of outsourced data makes the data

integrity protection in Cloud Computing a very challenging and potentially formidable task, especially for users with constrained computing resources and capabilities. Thus, enabling public audit ability for cloud data storage security is of critical importance so that users can resort to an external audit party to check the integrity of outsourced data when needed. To securely introduce an effective third-party auditor (TPA), the following two fundamental requirements have to be met: 1) TPA should be able to efficiently audit the cloud data

storage without demanding the local copy of data, and introduce no additional on-line burden to the cloud user; 2) The third-party auditing process should bring in no new vulnerabilities towards user data privacy. In this paper, here utilize and uniquely combine the public key-based homomorphism authenticator with random masking to achieve the privacy-preserving public cloud data auditing system, which meets all above requirements. To support efficient handling of multiple auditing tasks, here further explore the technique of bilinear aggregate signature to extend our main result into a multi-user setting, where TPA can perform multiple auditing tasks simultaneously. Extensive security and performance analysis shows the proposed schemes are provably secure and highly efficient.

## II. PROPOSED SYSTEM

We propose a privacy-preserving and auditing-supporting outsourcing data storage scheme by using encryption and digital watermarking. Logistic map-based chaotic cryptography algorithm is used to preserve the privacy of outsourcing data, which has a fast operation speed and a good effect of encryption. Local histogram shifting digital watermark algorithm is used to protect the data integrity which has high payload and makes the original image restored listlessly if the data is verified to be integrated. Experiments show that our scheme is secure and feasible. We propose an outsourcing data storage scheme supporting privacy-preserving and auditing service.

## III. MODULES DESCRIPTION

### A. Cloud resource allocation

Cloud data storage service three different entities such as the cloud user, who has large amount of data files to be stored in the cloud; the cloud server, which is managed by the cloud service provider to provide data storage service and has significant storage space and computation resources; the third-party auditor,

who has expertise and capabilities that cloud users do not have and is trusted to assess the cloud storage service reliability on behalf of the user upon request. To provide a good, efficient method for hiding the data from hackers and sent to the destination in a safe manner.

### B. HARS scheme

HARS contains three algorithms: KeyGen, RingSign and RingVerify. In KeyGen, each user in the group generates his/her public key and private key. In RingSign, a user in the group is able to generate a signature on a block and its block identifier with his/her private key and all the group members' public keys. Block identifiers a string that can distinguish the corresponding block from others. A verifier is able to check whether a given block is signed by a group member in Ring Verify.

### C. Data integrity analysis

TPA checks the correctness of data storage to ensure that there exists no cheating cloud server that can pass the TPA's audit without indeed storing users' data intact to ensure that the TPA cannot derive users' data content from the information collected during the auditing process. And implement the batch auditing scheme to enable TPA with secure and efficient auditing capability to cope with multiple auditing delegations from possibly large number of different users simultaneously.

### D. Batch auditing

To fully ensure the data integrity and save the cloud users' computation resources as well as online burden, it is of critical importance to enable public auditing service for cloud data storage, so that users may resort to an independent third-party auditor (TPA) to audit the outsourced data when needed. In this module, to allow TPA to verify the correctness of the cloud data on demand without retrieving a copy of the whole data or introducing additional online burden to the cloud users.

**E. Evaluation criteria**

Evaluating the performance and this project enables to support scalable and efficient privacy-preserving public storage auditing in cloud. Specifically, our scheme achieves batch auditing where multiple delegated auditing tasks from different users can be performed simultaneously by the TPA in a privacy-preserving manner and to perform the duplicate check upon receiving the duplicate request from users.

**IV. IMPLEMENTATION**

To achieve privacy-preserving public auditing, we propose to uniquely integrate the Homomorphic linear authenticator with random masking technique. In our protocol, the linear combination of sampled blocks in the server's response is masked with randomness generated by the server. With the establishment of privacy-preserving public auditing, the TPA may concurrently handle multiple auditing upon different users' delegation. The individual auditing of these tasks for the TPA can be tedious and very inefficient.

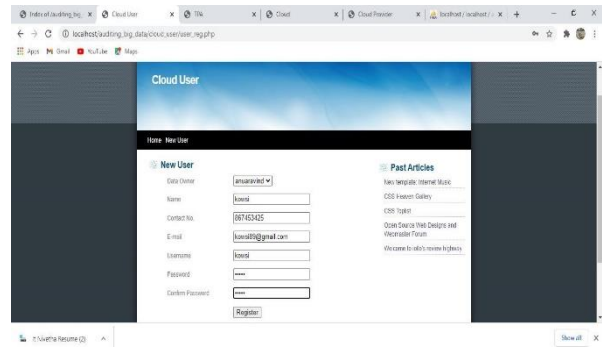


FIG 3: NEW USER REQUEST

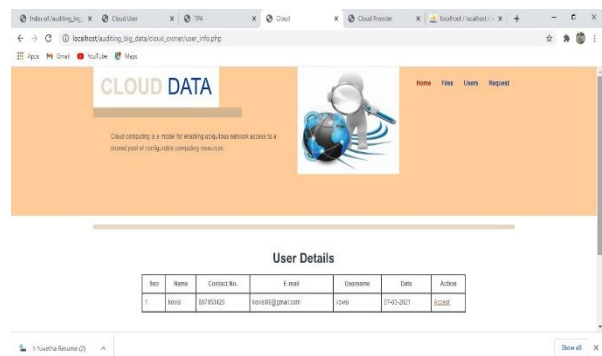


FIG 4: DATA OWNER APPROVES USER REQUEST

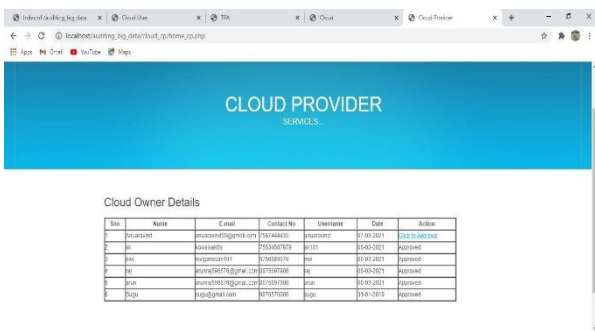


FIG 1: USER APPROVAL

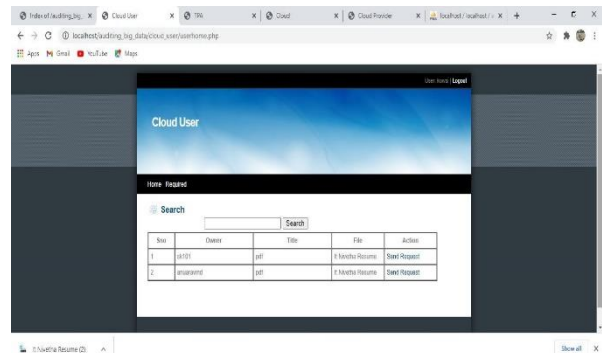


FIG 5: REQUESTING FILE TO DATA OWNER

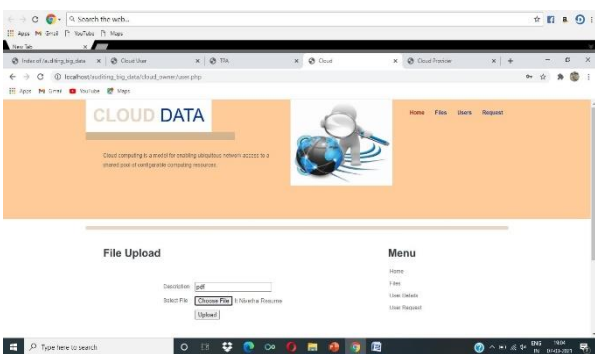


FIG 2: USER FILE UPLOAD

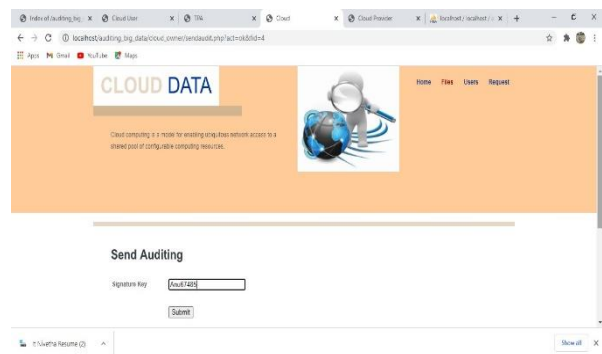


FIG 6: DATA OWNER SEND FILE FOR AUDITING

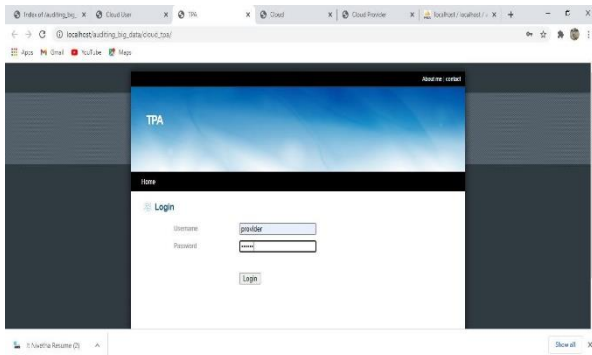


FIG 7: THIRD PARTY AUDITOR LOGIN

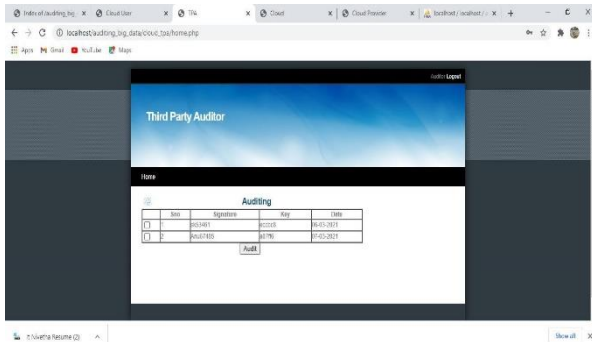


FIG 8: AUDITOR APPROVES THE FILE

## V. CONCLUSION

Cloud Computing is gaining popularity and advancement day-by-day. But still the security threat hinders the success of Cloud Computing. In this paper, some of the privacy threats are addressed and the techniques to overcome them are surveyed. While some approaches utilized traditional cryptographic methods to achieve privacy, some other approaches kept them away and focused on alternate methodologies in achieving privacy. Also, approaches to preserve privacy at the time of public auditing are also discussed. Thus, to conclude it is necessary that every cloud user must be guaranteed that his data is stored, processed, accessed and audited in a secured manner at any time. Data freshness is essential to protect against misconfiguration errors or rollbacks caused intentionally. We can develop an authenticated file system that supports the migration of an enterprise-class distributed file system into the cloud efficiently, transparently and in a scalable manner.

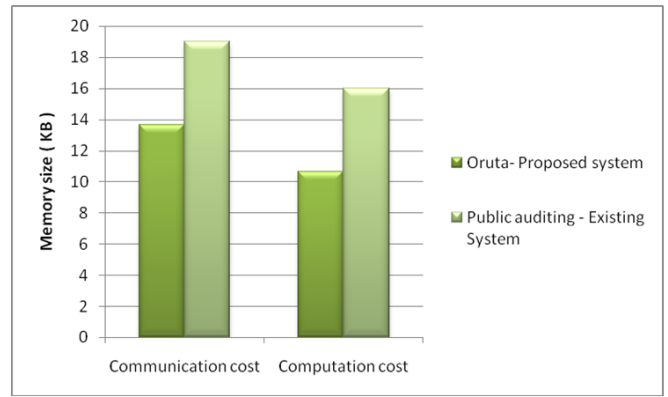


FIG 9: RESULT

## VI. FUTURE ENHANCEMENTS

In the future authenticated in the sense that enables an enterprise tenant to verify the freshness of retrieved data while performing the file system operations. The user must be given complete access control over the published data. Also, powerful security mechanisms must always supplement every cloud application. Attaining all these would end up in achieving the long-dreamt vision of secured Cloud Computing in the nearest future. In future, this proposed model could be used to get the secure cloud computing environment which would be a great enhancement in the privacy preservation.

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# Study of Epoxy Resin Modifies the Mechanical Performance of the Bituminous Material and Resin Modified Bituminous Mixture

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India has a road network of over 4,689,842 kilometers in 2015, the second largest road network in the world. It has primarily flexible pavement design which constitutes more than 98% of the total road network. India being a very vast country has widely varying climates, terrains, construction materials and mixed traffic conditions both in terms of loads and volumes. Increased traffic factors such as heavier loads, higher traffic volume and higher tire pressure demand higher performance pavements. So to minimize the damage of pavement surface and increase durability of flexible pavement, the conventional bitumen needs to be improved. Different types of additives are currently used in bitumen for asphalt modification. Such as

- I) Styrene – butadiene – styrene (SBS)
- II) Natural rubber
- III) Ethylene vinyl acetate (EVA)
- IV) Polyethylene (PE)
- V) Resin
  - a) Epoxy Resin
  - b) Polyurethane Resin
  - c) Acrylic Resin
  - d) Phenolic resin

**Keywords** : Epoxy Resin, Bitumen, Marshal Mix Design, Mechanical Properties, Stability

## I. INTRODUCTION

Resin is a sticky flammable organic substance insoluble in water exuded by some tree and other

plants. Asphalt and resin are sufficient compatible with each other and is produced by mixing under heat asphalt with a condensation product of an

asphalt and a non-thermo reactive phenol resin. By this resin modification has done.

The composition gives an excellent coating without separation of asphalt on slicking based on the incompatibility of asphalt and resin. From physical and chemical interaction of Resin with conventional bitumen Resin Modified Bitumen is made. Its advantages are: Better adhesion between aggregate & binder, higher fatigue life of mixes, Prevention of cracking & reflective cracking, and Overall improved performance in extreme climatic conditions & under heavy traffic condition. The use of resin in asphalt paving is gaining more attention in many parts of the world as this material gives better mechanical and functional performance of the mixture as well as being a proficient way of dealing with this economical product. Resin modified asphalt is a general type of modified asphalt that contains Epoxy resin. Modified asphalt paving products can be made with resin by wet process. In the wet process resin modified binders are produced when it is mixed with bitumen at elevated temperatures prior to mixing with the aggregate. Binder modification of this type is due to physical and compositional changes in an interaction process where the resin particles swell in the bitumen by absorbing a percentage of the lighter fraction of the bitumen, to form a viscous gel. Bituminous binders are widely used by paving industry.

**II. METHODS AND MATERIAL**

It is known from the studies that the degree of modification depends on the bitumen type and modifier type. Various studies have been done in the field of resin modification and there are several explanations for the need of using modifier in bitumen binder industry. The bitumen is available in a variety types and grades. To judge the suitability of these binders various physical tests conducted such as penetration test, ductility test, softening point test, specific gravity test, viscosity test, RTFO test, flash and fire point test. There are various reasons for using bitumen modifier in bitumen industry started with increase the service life of the pavement, improve the pavement performance, meet the heavy traffic demands, and finally saving the cost of maintenance. Marshall method of bituminous mix design is used in this study because it analyses mechanical properties such as strength and flow and volumetric properties of mix such as unit weight, air voids (VA), voids filled with bitumen (VFB) and voids in mineral aggregates (VMA).

**Mix Calculations**

Marshall Stability and flow values are obtained from the Marshall Stability test and the mix calculations such as VMA, VA and VFB are calculated by using formulae. The formulae used in the mix design are given below.

Bulk specific gravity of aggregate :

$$G_{sb} = \frac{M_{agg}}{\text{volume of the (agg.mass+air void in agg.+absorbed bitumen)}} \dots\dots\dots (1)$$

Theoretical maximum specific gravity of the mix:

$$G_{mm} = \frac{M_{mix}}{\text{volume of the (mix-air voids)}} \dots\dots\dots (2)$$

Bulk specific gravity of the mix:

$$G_{mb} = \frac{M_{mix}}{\text{bulk volume of the mix}} \dots\dots\dots (3)$$



Voids in mineral aggregates:

$$VMA = \left(1 - \left(\frac{G_{mb}}{G_{sb}}\right) \times P_s\right) \times 100 \dots\dots\dots (4)$$

Air Voids:

$$VA = \left(1 - \left(\frac{G_{mb}}{G_{mm}}\right) \times P_s\right) \times 100 \dots\dots\dots (5)$$

Voids Filled with Bitumen

$$VFB = \left(\frac{VMA-VA}{VMA}\right) \times 100 \dots\dots\dots (6)$$

### III. RESULTS AND DISCUSSION

Many properties of modified mix with Epoxy resin such as Marshall Properties, Tensile Strength characteristics, Resilience Modulus, Boiling test, Retained Stability, Wheel tracking and cost-benefit analysis have been studied in this dissertation. Only VG30 grade and Epoxy resin additives has been used in this dissertation. However, some of the properties such as dynamic creep properties, Indirect fatigue test can be further be investigated. Some other type of materials such as polythene, natural rubber, Nano materials etc. can be used and other binders can also be tried in mixes and compared. Moreover, to ensure the success of this new material, experimental stretches may be constructed and periodic performances should be monitored regularly.

Various experiments have been evaluated to know the change that occurred in bitumen when Epoxy Resin is added to bitumen. The specific gravity of the Epoxy resin varies from 1.50 to 1.75 (depending on the type of production). The property of Epoxy resin shown in below the table.

**Table 1.** Properties of Epoxy resin

Property	Epoxy resin
Viscosity at 25°C	12000-13000
Density (g.cm <sup>-3</sup> )	1.16
Modulus of elasticity E (GPa)	5.0
Specific Gravity	1.75

It has been reported that a valuable changes occur in bitumen’s properties like specific gravity, penetration, penetration index, softening point, viscosity and ductility when Epoxy resin is added to bitumen in 5%, 6%, 7%, 8%, 9% and 10% by weight of bitumen. The variation in bitumen properties with the addition of Epoxy Resin.

**Marshall Properties of Unmodified Bitumen**

Marshall Parameters of ERMB-0% are graphically represented from Fig.1 to 6 as below.

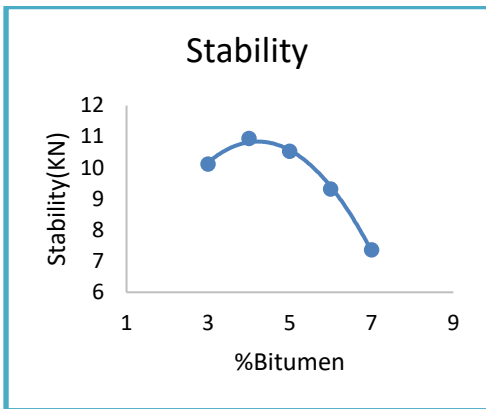


Fig. 1 Stability vs. Bitumen Content (0% Epoxy Resin)

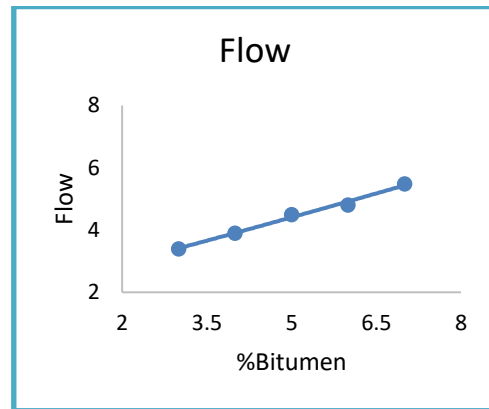


Fig. 2 Flow vs. Bitumen Content (0% Epoxy Resin)

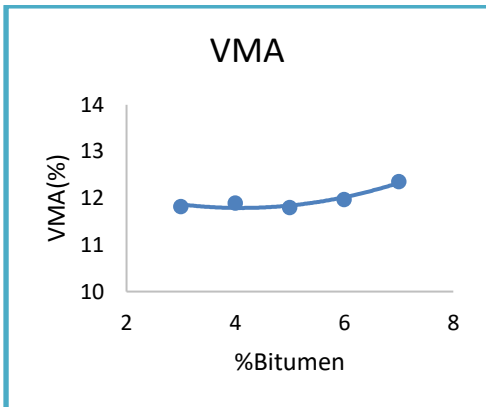


Fig. 3 VMA vs. Bitumen Content (0% Epoxy Resin)

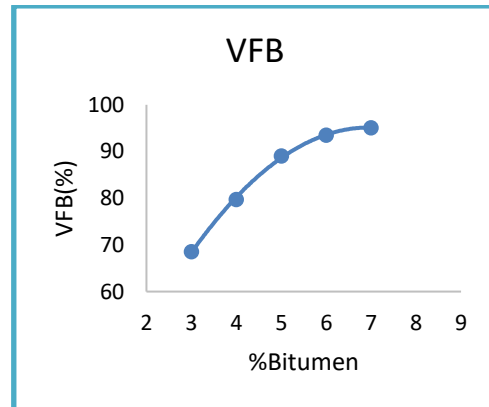


Fig. 4 VFB vs. Bitumen Content (0% Epoxy Resin)

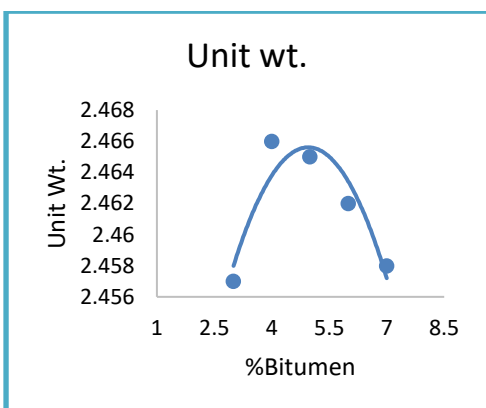


Fig. 5 Unit Wt. vs. Bitumen Content (0% Epoxy Resin)

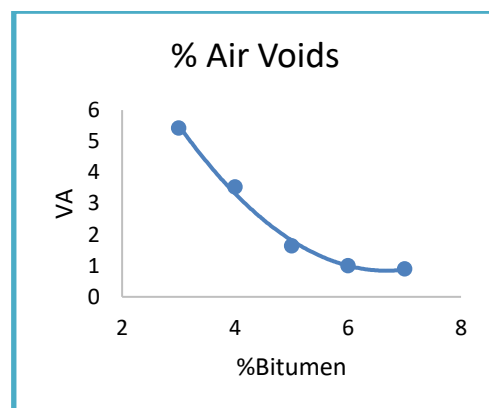


Fig. 6 VA vs. Bitumen Content (0% Epoxy Resin)

**Marshall Properties of ERMB-7%**

Marshall Parameters of ERMB-7% are graphically represented from Fig.7 to 12 as below.

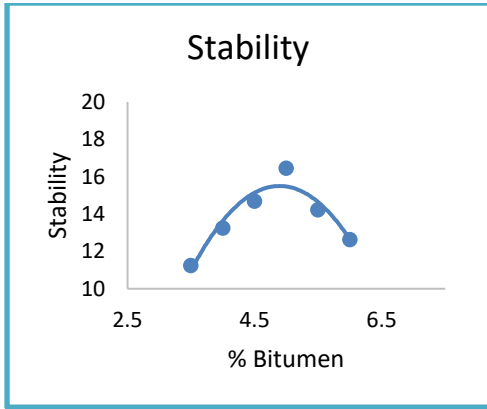


Fig.7 Stability vs. Bitumen Content (7% Epoxy Resin)

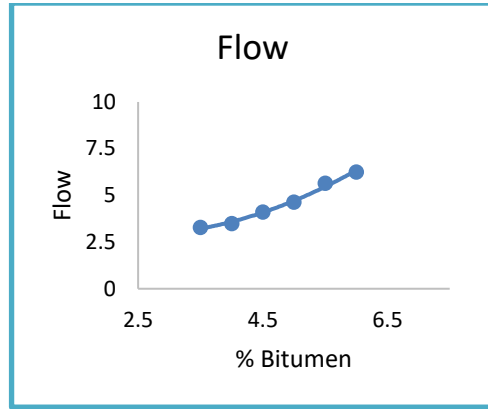


Fig. 8 Flow vs. Bitumen Content (7% Epoxy Resin)

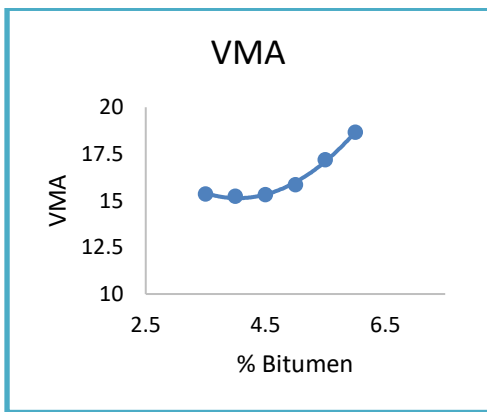


Fig. 9 VMA vs. Bitumen Content (7% Epoxy Resin)

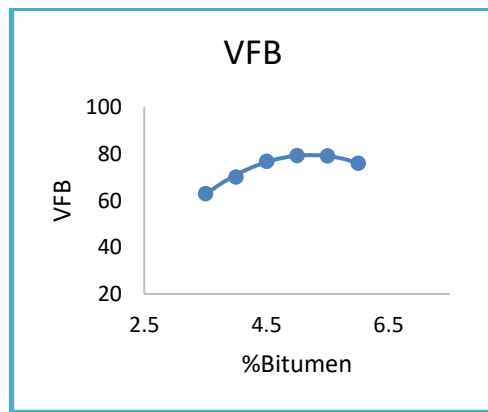


Fig. 10 VFB vs. Bitumen Content (7% Epoxy Resin)

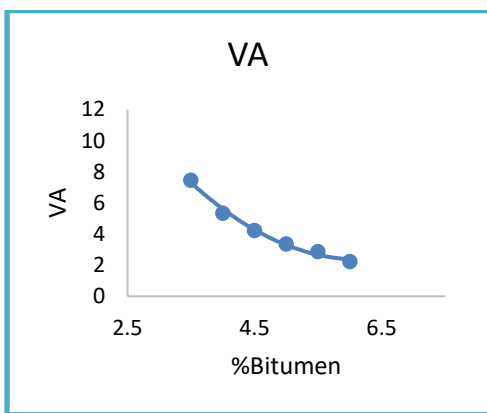


Fig. 11 VA vs. Bitumen Content (7% Epoxy Resin)

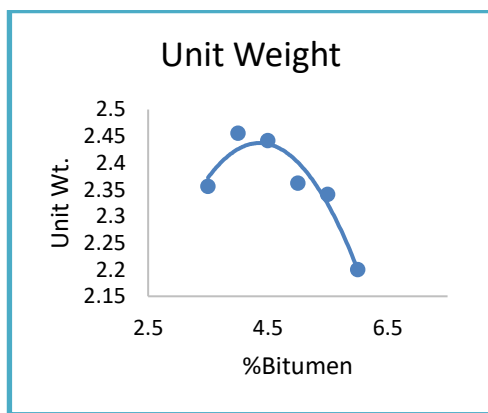


Fig.12 Unit Wt. vs. Bitumen Content (7% Epoxy Resin)

Rheological test on unmodified and modified bitumen with different epoxy resin content are conducted. Rheological test such as penetration, softening point, ductility, specific gravity and viscosity tests are conducted for modified and unmodified bitumen. Adding various percentages of Epoxy resin have positive effect on the Rheological properties of bitumen.

#### IV. CONCLUSION

From the study of the behavior of unmodified and modified bitumen with Epoxy resin it was found that the modifier mix process improved characteristics over unmodified mix. Some of them are listed below.

- Epoxy resin improves the physical as well as rheological behavior of binder.
- From the trends of penetration, softening point and penetration index shows that Epoxy resin modified bitumen results in improved the stiffness at lower and higher temperature. Due to the resin modified bitumen also reduces the susceptibility to temperature
- Epoxy resin modification of bitumen results in increased stiffness at lower as well as higher temperature. Temperature susceptibility of binders also gets reduced due to Epoxy resin modification.
- In the results of two RTFO procedures, lower level of aging is clearly observed at a temperature (135°C).
- It is observed that the Marshall Stability value increases with addition of Epoxy resin content to the bitumen up to 7% by weight of bitumen and then it decreases. We observe that the Marshall Flow value decreases upon addition of Epoxy resin i.e. deformations can be reduced. Due to the modification of bitumen with Epoxy resin the resistance to deformations under heavy wheel loads increases. Also the values of VMA,

VFB and VA are within the required specification.

- Epoxy resin modified mixes have better resistance to thermal cracking and moisture susceptibility.
- Epoxy resin modified mixes are economically feasible to implement.
- On the basis of bitumen optimization, mechanical and volumetric parameter ERMB 7% shows the best performance while UMB is showing as least performing mix.
- Addition of Epoxy resin to bitumen increases the retained stability.
- The resilience modulus value is increased due to addition of epoxy resin to bitumen.
- The moisture susceptibility has been increased by the addition of epoxy resin to the bitumen.
- Due to addition of epoxy resin to bitumen the cost of wearing course gets decreased. The reason behind the cost reduction is mainly due to the bitumen optimization.

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## A Review : Pedestrian Gait Features Analysis at Non Signalized Intersection

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### ABSTRACT

This paper analyzes engineering techniques that can enhance the safety of pedestrian crossing on a busy T-intersection. Non-Motorized mode of travel i.e. walking can be related as healthy, acceptable, and resource-efficient for the environment to boost up the walking, it is important to understand the walking behavior of pedestrians. This understanding must be a primary need for evaluating the measure of walking conditions such as comfort level and regularity. The principal motive of this analysis is to get thorough knowledge of pedestrian walking patterns through a look in spatio-temporal gait parameters (i.e. step length and step frequency). This nanoscopic level of analysis gives perception into pedestrian walking mechanisms and the effect of various aspects such as gender and age. A complete analysis depends on video-based data collection using computer vision techniques. Spatiotemporal Gait Parameters (i.e. step length and step Frequency) are calculated using oscillatory behavior in the walking speed profile. The analysis uses the real-time video data recorded in the main city road in Nagpur, Maharashtra, India (i.e. Gujrat Hotel Intersection, Near Vijay Talkies, Cotton Market-Ghat Road, Nagpur.

**Keywords :** Walking behavior of pedestrians, spatio-temporal gait parameters, nanoscopic level, oscillatory behavior

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## I. INTRODUCTION

In urban Planning, non-motorized active modes of travel such as walking are found to be healthy, acceptable, and resource-efficient environmental [1]. Not only walking has appreciated health benefits i.e. weight control, maintaining musculoskeletal & aerobic fitness, reduced cardiovascular and respiratory disease for air pollution but also a positive environmental impact [2],[3]. A recent study states that walking can result in an increase in breathing & heart rate can moderately reduce the mortality rate

by 43% [4]. Walking minimizes or delays the onset of dependence, disability & chronic diseases [5]. It is very unfortunate, every year deaths per year recorded due to physical inactivity are 3.2 million across the world. This death can reduce by encouraging active mode of transport i.e. walking.

But, According to WHO more than 270000 people lose their lives while crossing the road [6]. In this, India contributes as nearly 73000 pedestrian loses lives on-road [7] . India has a heterogeneous traffic system where no traffic separation according to the

vehicle type and size and also for a pedestrian while crossing the road. In the case of signalized intersection is comparatively safe than the non-signalized intersection. In India, there are many cities which has many non-signalized intersections.

Now communities are becoming more aware of the benefits of non-motorized modes of travel, a Pedestrian walking pattern is getting attention from policymakers, researchers, and practitioners. Gait analysis is a nanoscopic level of analysis that allows true estimates of objective walking measures such as strides frequency and length for different people segments. It is used to convert the walking distance into units i.e. no. of steps. Several applications are there for gait analysis such as estimating the impact of running a personal vehicle for walking (Morency et al.2007). Gait analysis is also used for demonstrating the walking cost to a different group of pedestrians i.e. elderly and obese. Gait analysis is the systematic study of human walking motion using the eye and brain of observers, augmented by computer vision techniques. In gait analysis, gait features like step frequency and a walking speed of a pedestrian are measured. In this study, step frequency is the number of times a foot touches the ground per unit time. Stride frequency is defined as the number of times the same foot touches the ground in a per unit time. Therefore stride frequency is twice the step frequency. Step frequency can be measured manually as well as automatically. And the second feature of gait analysis is walking speed is studied as the time required to covered the particular distance.

One of the people on foot's issues of traffic security is utilizing cell phones at the hour of going across the road. This examination showed that numerous people on foot (10-15%) utilized cell phones while going across the road. The correlation of the gathering with the benchmark groups broke down that the walkers who utilized portable while going across the road are less protected than the people on foot who didn't

utilize versatile while going across the road. This investigation brought up that chatting on the versatile outcomes in the hazardous furthest degree same for messaging or seeing while at the same time tuning in to music had the littlest impact. It is important that the presence of walkers expanded the risky conduct of people on foot and that more seasoned people on foot acted all the more securely in rush hour gridlock while going across the road. It is as yet not satisfactory which cycles can be influenced by interruption, which kinds of interruption impact which intellectual cycles, and how the contrasts between people can change the impact of the interruption. It is important to lead further exploration on this point to decide if and in what direction cell phone use while going across the road influences the well-being of people on foot, this is both a worldwide and public issue, it is important to begin settling it on the neighborhood level.

This study analyses the spatiotemporal gait parameter i.e. Step length and step frequency to upgrade the understanding of the walking pattern of a pedestrian in an outdoor urban environment. This nanoscopic stage of analysis gives perception into pedestrian walking mechanism effect of various aspects such as gender and age. The whole analysis depends upon the data collected by video sensors. The data recorded is in 1080 pixels and 30 frames per seconds (FPS). The analysis of walking speed, step frequency, and step length is extracted by using automated computer techniques. The software used for analysis is Kinovea and Seismogram.

## II. Literature Survey

**Pedestrian gait analysis using automated computer vision techniques.**

**Houman Hediye, Tarek Sayed, Mohamed H. Zaki and Greg Mori**

In this paper, the author has studied pedestrian walking behavior through the investigation of the spatio-temporal gait parameters (step length and step frequency). This nano microscopic level examination gives the walker strolling systems and different credits like sex and age. This depends on computerized video-based information assortment utilizing PC vision strategies. The step frequency and step length are assessed dependent on oscillatory examples in the strolling speed profile. It shows that the walk boundaries are affected by variables, for example, crosswalk grade, passer-by sexual orientation, age, and gathering size. The step length was found to have more impact on strolling speed than step frequency. It was found that compared to males; females increase their step frequency to increase their walking speed.

#### **Examining pedestrian evasive actions as a potential indicator for traffic conflicts**

**Ahmed Tageldin, Mohamed H. Zaki, Tarek Sayed**

The author presented a first step towards developing a more comprehensive and reliable measure for evaluating pedestrian safety. The examination to incorporate extra areas to guarantee a more careful approval on a bigger informational collection. Further investigation is to have an interpretation of the PE drop values and they vary among different scenarios of evasive actions. The characterize diverse pedestrian interactions represent a challenge adopting a single indicator to quantify the severity of traffic conflicts. It is required to examine the optimal approach for combining the indicators in this study with time-proximity measures and other road user evasive action parameters such as the action or Jerk. This is critical since the shifty activity can be applied by both of the distinctive street clients. This research can benefit many applications in the modern world of transportation infrastructure monitoring. One possible application investigates how vehicle and infrastructure communication in ITS infrastructure

benefits safety monitoring. In the future, the vehicle will become equipped with driving assistance systems and collision warning devices that will not only detect pedestrians but also analyze the potential conflicts and understand their behavior to guide the vehicle to take action accordingly. Pedestrian simulators can also benefit from the newly developed indicator to improve the modeling of pedestrian behavior.

#### **A novel framework to evaluate pedestrian safety at non-signalized locations**

**Ting Fu, Luis Miranda-Moreno", Nicolas Saunier**

This paper proposes pedestrian safety at non-signalized crosswalk locations. In the proposed system, the driver because of a person on foot is part of the response and slowing downtime, the relationship of the distance needed for a yielding move and the moving toward vehicle speed relies upon the response season of the driver and deceleration rate that the vehicle can accomplish. The proposed work is represented in the distance-velocity diagram and referred to as the distance-velocity model. In light of this, non-yielding moves are delegated "non-infraction non-yielding" moves, "questionable non-yielding" moves, and "non-yielding" infringement, individually. The time required to cross and the deceleration rate required for the vehicle to stop are used to measure the probability of collision. Finally, work is demonstrated through a case study in evaluating pedestrian safety at three different types of non-signalized crossings: a painted crosswalk, an unprotected crosswalk, and a crosswalk controlled by stop signs.

#### **Analyzing pedestrian crash injury severity at signalized and non-signalized locations**

**Kirolos Haleem, Priyanka Alluri, Albert Gan**

The author in this paper recognizes and looks at the huge elements influencing passer-by crash



injury seriousness at signalized and un-signalized crossing points. The factors include geometric predictors, traffic predictors, road user variables, environmental predictors, and vehicle-related predictors. The work was conducted using the mixed legit model, which allows the parameter estimates to randomly vary across the observations. The examination utilized three years of information from Florida, data that is inaccessible in the records, for example, to blame street client and person on foot move, was gathered. At crossing points, higher AADT, speed cut-off, and level of trucks; old walkers; to blame people on foot; blustery climate; and dim lighting conditions were related with higher passer-by seriousness hazard. For instance, a one-percent higher truck rate builds the likelihood of extreme wounds by 1.37%. A one-mile-per-hour higher speed limit builds the likelihood of extreme wounds by 1.22%. At un-signalized convergences, walkers strolling along the street, center, and extremely old people on foot, to blame walkers, vans, dim lighting conditions, and higher speed limit were related with higher passer-by seriousness hazard, standard crosswalks were associated with a 1.36% reduction in pedestrian severe injuries.

**The effects of mobile phone use on pedestrian crossing behavior at unsignalized intersections – Models for predicting unsafe pedestrians behavior**  
**Dalibor Pešić, Boris Antic, Drazenko Glavic, Marina Milenkovic**

In this paper, the author has discussed one of the pedestrians problems of traffic safety is using mobile phones at the time of crossing the street. This study showed that many pedestrians (10-15%) used mobile phones while crossing the street. Comparison of the group with the control groups analyzed that the pedestrians who used mobile while crossing the street are less safe than the pedestrians who did not use mobile while crossing the street. This study pointed out that talking on the mobile results in the

unsafe to the greatest extent same for texting/viewing while listening to music had the smallest influence. It is worth noting that the presence of pedestrians increased the unsafe behavior of pedestrians and that older pedestrians behaved more safely in traffic while crossing the street. It is still not clear which processes can be affected by distraction, which types of distraction influence which cognitive processes, and how the differences between individuals can change the influence of distraction. It is necessary to conduct further research on this topic to determine whether and in which way mobile phone use while crossing the street affects the safety of pedestrians, this is both a worldwide and public issue, it is important to begin settling it on the neighborhood level.

**Automated analysis of pedestrian walking behavior at a signalized intersection in China**  
**Yanyong Guo, Tarek Sayed, Mohamed H. Zaki**

This paper analysis of pedestrian walking behavior using gait parameters is presented; it uses automated video analysis to collect pedestrian data at a signalized intersection in Nanjing, China. Aspects of microscopic pedestrian behavior are the walking mechanism represented by pedestrian gait parameters. Secondly, the non-conforming crossing behavior of pedestrians. The effect of various pedestrian attributes is investigated. The results show the highest accuracy in automatically detecting pedestrian violations, with an 85.2% correct detection rate. The walking speed and gait parameters for violators are found to be higher compared to non-violators. It is additionally discovered that people on foot who enter the crosswalk during the phase of the green walker stage frequently have higher strolling speed. The gait shows that guys will in general have a higher strolling speed, walk proportion, and step length than females. Walkers are found to have higher speed and step recurrence contrasted with people on foot in gathering. The presence of bicycles on crosswalks fundamentally diminishes the walker strolling speed,

step length, and recurrence, prompting more stride inconstancy.

### **The use of gait parameters to evaluate pedestrian behavior at scramble phase signalized intersections**

**Houman Hediye, Tarek Sayed and Mohamed H. Zaki**

The author depicted pedestrian scramble staging as generally use to diminish pedestrian-vehicle clashes and increment the wellbeing of the convergence. To satisfactorily decide the scramble staging, it is important to see how people on foot respond to a particularly whimsical plan. This study investigates changes in pedestrian crossing following the implementation of a scramble phase by examining the spatiotemporal gait parameters. This microscopic-level examination gives an understanding of changes in common strolling systems and the impact of different passer-by and convergence qualities. The investigation utilized video information gathered at a scramble stage signalized convergence in Oakland, California. Boundaries were discovered to be impacted by common sex, age, bunch size, crosswalk length, and person on foot signal signs. Normal advance length and strolling speed were fundamentally higher for a corner to corner crossing walkers contrasted and people on foot crossing on the traditional crosswalks. People on foot were found to will in general expand their progression length more than their progression recurrence to speed up. It was additionally discovered that contrasted and men, ladies, for the most part, speed up by expanding their progression recurrence more than step length.

### **III.CONCLUSION**

This article inspected the spatial-transient boundaries of stride (step length and step frequency) to improve the comprehension of the person on foot strolling conduct across various attributes, for example, crosswalk grade, and passer-by sexual orientation,

age, bunch size, and tallness. The examination utilized a computerized strategy to gauge the progression recurrence and step length dependent on motions in walking speed profile brought about by common making forward strides. Gathering solid person-on-foot information is frequently directed by manual checks or estimations. Notwithstanding, the manual field perception of the person on foot information, particularly minuscule information, is labor-intensive, tedious, and subject to high mistakes. The utilization of pc vision procedures for estimating stride boundaries has a few benefits, for example, catching the common development of walkers and limiting the danger of upsetting the conduct of noticed subjects, the extravagance of the information that can be separated, and the overall higher precision and consistency. Strolling speed was demonstrated to be directly connected with both advance length and step recurrence. The investigation affirmed before examines which guessed that to speed up, people on foot will, in general, build their progression lengths more than they increment their progression frequencies.

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# Analysis of Cloud Forensics : Review and Impact on Digital Forensics Aspects

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## ABSTRACT

Digital forensics is the science of finding evidence to digital crimes and attacks. Cloud Forensics is a part of Digital Forensics that watches over the crime that has taken place over the cloud and carries out an investigation on it. Cloud computing is an evolutionary technology based on a huge network, which spreads globally. Hence, Cloud Forensics is a part of Network Forensics, which in turn is a part of Digital Forensics. Cloud organizations along with the providers of cloud service and customers that uses cloud service, are still awaiting the establishment of an explicit forensic revolution. Without the much-needed forensic capability, they will not be able to safeguard the robustness of their system and suitability of their services that assist criminal and cybercrime investigations. In this paper, we review the forensic process, challenges in cloud forensics, and its impact on digital forensics.

**Keywords :** Cyber Crime, Digital Forensic, Network Forensic, Cloud Forensics.

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## I. INTRODUCTION

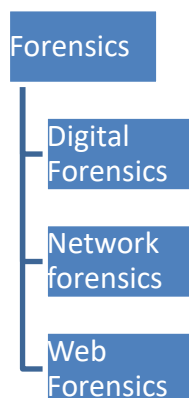
In today's world, the Internet and other developments in the digital world have become broadly fragmented regarding how it is used. Browsing the web for information, watching videos and listening to music or using tools like e-mail, instant messaging or social platforms like Twitter or Facebook are nowadays some of the core uses of people across the globe[1]. The "dark side" of the Internet is apparent in everyday news. Spam, underground marketplaces, identity theft, password breaches, phishing and many other attack vectors as well as exploitation techniques are active trends in web-based interaction. Users give more and more of their private data to companies that use them to

generate revenue, although many of these companies struggle to adequately protect their users' data. There are trust and confidentiality issues because of malicious methods and tools used to extract private information. Under such circumstances, digital forensics is used by entities like law enforcement, investigators and system administrators that help in restructuring the order of events and identifying traces of evidence left behind. Digital forensics as defined is the application of science to the law, in particular, "the identification, collection, examination, and analysis of data while preserving the integrity of the information and maintaining a strict chain of custody for the data." Digital forensics has received significant attention in recent years because of the vast increase in digital crimes. The

increased cyber-attacks in today’s technology-driven society have also increased the need for digital evidence in courts. Crime offenders should be held liable on a priority basis. The process used to solicit this digital evidence to be represented in courts is digital forensics. This process help courts, law enforcement agencies and investigators to obtain valuable evidence that can withstand the rigors of a courtroom. The current approach of obtaining evidences has two major shortcomings: a) the suspect’s device, which is seized, has to be made available to the investigators and b) the traditional methods of data storage, information sharing and communication have been extended by the latest emerging online services. Law enforcement agencies can ask service operators to release certain information, but they are usually not obliged to request answers from other countries. As such, Digital forensics is a new field still developing in its infancy stage[2].

### TYPES OF FOREnSICS

The forensic process is a process that is initiated after the crime occurs. It includes a series of investigation methods [12], procedures and techniques related to various crimes and the acquisition of evidence. Let us dive into the classification of forensics:



**Types of Forensics (Figure 1) 1**

**Dig** Standards and Technology (NIST) standards, it is the application of science to the identification, collection,

examination, and analysis of data while preserving the integrity of the information and maintaining a strict chain of custody for the data. “Digital Forensics is the application of science to the identification, examination, collection, and analysis of data while preserving the information and maintaining a strict chain of custody for the data.” NIST 2011 – The NIST Definition of Cloud Computing [3].

### Types of Digital Forensics

- 1) **Static forensics:** It is a traditional and most widely used approach to digital forensics[4]. It has defined procedures and the evidence collected has legal validity. Here, forensically-approved copies of the storage media are made. Various media analysis tools are further used to locate files and search their content for evidence. File creation and modification times can be established. Deleted files, browsing history, e-mail and other installed programs can be recovered. Here, forensic evidence is obtained by using different external devices like USBs, external hard drives, etc. or CD, DVDs and then the evidentiary data collected is brought into the forensic laboratory for investigators to perform various operations/steps forensically. But the biggest limitation is that it does not provide an entire picture of events.
- 2) **Live Forensics:**It is that approach to digital forensics which examines and analyse a case related to a live scenario. In live digital forensics, information is collected, examined, analysed and reports are generated. The tools used for live forensics can provide very clear pictures of knowledge such as memory dumps, various running processes, and open network connections. Thus, live forensics keeps the consistency and integrity of forensic data intact. It maintains the originality of evidentiary data without any tampering or losses. The problem with live

forensics is, by its temporal nature, it will not be able to reproduce the same results if required [5].

- 3) Network forensics: It is that approach to digital forensics related to monitoring, capturing, storing and analysis of LAN or WAN to extract crucial information and legal evidence to present in the court, identify the source of intrusion and security attacks. It fetches information on which network ports are used to access the information.
- 4) Web forensics: It is that approach to digital forensics [6] related to monitoring, capturing, storing and analysis of LAN or WAN to extract crucial information and legal evidence to present in the court, identify the source of intrusion and security attacks. It fetches information on which network ports are used to access the information.
- 5) Cloud forensics: Cloud Forensics is a part of Digital Forensics that watches over the crime that has taken place over the cloud and carries out an investigation on it. It gathers and preserves evidence in a way that can be presented in a court of law. Since the evidence is located in different geographical areas, it is harder to identify the data in cloud infrastructure. System log, user authentication log, database log, application log are few instances of evidence sources.
- 6) Mobile forensics: This branch deals with the recovery of electronic evidence from mobile phones, smartphones, SIM cards, call logs, SMS/MMS, Audios and Videos, GPS devices, tablets and game consoles. Nowadays, mobile phones are the most common source of digital evidence found at crime scenes. The information retrieved from mobile phones helps in the forensic investigation mainly to establish a connection between crime and criminal.

### Cloud forensics

In recent years, Cloud Computing has received major importance [7]. It has been introduced to provide optimum help to forensic experts as it offers massive pool resources, cost-effective solutions, dynamicity and wide access for storage. Hybrid, private, and public models of cloud computing exists, in addition to multiple services, such as security as service, database as service, integration as service, and software as service. Cloud forensics is also helpful to optimize the general usage of IT infrastructures [8]. Most companies and organizations transfer their products and services across the cloud every day due to multiple benefits, including high scalability, reduced cost of IT infrastructure, business continuity, and access to automatic updates. As a result, cloud computing has been accepted with open hands in both public and private companies [9]. However, the number of crimes has substantially increased across the globe. According to NIST [10], **“Cloud forensics is the application of digital forensics in cloud computing as a subset of network forensics to gather and preserve evidence in a way that is suitable for presentation in a court of law.”** They have servers across the globe to host customer data. When a cybercrime occurs, legal jurisdiction and the laws governing the region throw unique challenges [11]. A court order issued in a jurisdiction where a data centre is residing likely will not apply to the jurisdiction for a different host in another country. In modern CSP environments, the customer can choose the region in which the data will reside, and this should be chosen carefully. The main concern for an investigator is to ensure the originality and integrity of digital evidence so it can be presented in a court of law. In some cases, CSPs will deliberately not disclose the details of the logs from customers. In other cases, CSPs have protocols where they cannot provide services to collect logs. The security team has no control as to whom the CSP will choose to collect digital evidence. If they are not trained according to a forensic standard, the chain of custody may not be eligible for admission in a court of law. Cloud

computing is a well-defined technology based on a huge network, which spreads globally[14]. Hence, Cloud Forensics is a segment of Network Forensics, which in turn is a part of Digital Forensics [15]. Cloud organizations along with the providers of cloud service and customers that uses cloud service, are still awaiting the establishment of an explicit forensic revolution. Without the much-needed forensic capability, they will not be able to safeguard the robustness of their system and suitability of their services that assist criminal and cybercrime investigations. Cloud computing is the future. Cloud computing has become a new battlefield for cyber-crime where every day new challenges emerge to safeguard the cyber-attacks [13].

Cloud Forensics is considered a cross-discipline between Cloud Computing and Digital Forensics [16]. It is necessary to understand that it is a multi-dimensional issue. There are three main dimensions involved in Cloud Forensics: Technical, Organizational and Legal. The technical dimension presents various methods, procedures and tools, which are used to carry out the digital forensics process in cloud environments. The organizational dimension states that Cloud Computing consists of two entities: CSPs and cloud customers. There is a possibility that CSPs may outsource their services to other CSPs. The legal dimension stresses on multi-jurisdiction and multi-tenancy challenges. Existing regulations have to be followed for forensics activities to not breach any confidentiality measures. Cloud Computing is a new dimension in computing that is just as amusing to some as it is exciting to so many.

### Cloud forensic process flow

The cloud forensic process flow is shown in [Figure 1](#), which is described as follows:



**Cloud Forensic Process(Figure-2)**

**Identification:** The investigator identifies potential criminal activities if they have taken place or not. The crimes may include complaints filed by individuals, audit trails, suspicious events detected by IDS, etc.

**Evidence collection:** The investigator collects shreds of evidence from cloud service models like SaaS, IaaS and PaaS without jeopardising its integrity as per the forensic standards [17]. The SaaS service model examines the data of each user through log files such as access log, application log, error log, data volumes, transaction log, etc. The IaaS service model examines the data such as system-level logs, raw machine files, backups, storage logs, etc. The PaaS service model examines the data of application-specific logs through API, malware software warnings, operating system exceptions, etc. All the collected evidence has to be preserved safely without it being tampered with for further investigation that can be done through a legal order to the cloud service providers. It is possible that data preservation will require large volumes of storage. The investigator addresses data preservation and privacy rules on the stored evidence [18].

**Examination and analysis:** the analyst examines the evidence information collected in the previous step by some forensic tools. The criminal data is merged, correlated and assimilated to produce a reasonable

conclusion. The analyst analyses the data from the physical as well as logical files wherever they reside. There might be a need to share the testimony with the Law enforcement agencies or the victim organisation or an individual.

**Preservation:** All the collected evidence has to be preserved safely without it being tampered with for further investigation. All the log files need to be preserved since the information is located in different geographical areas.

**Presentation and reporting:** Finally, the investigator prepares a formal organised report about the findings of the case to be presented in the court of law.

## II. LITERATURE REVIEW

Ruan et al. revealed, **“A procedure and a set of toolkits to proactively collect forensic-relevant data in the cloud are important”**. It clearly shows that cloud forensic is advantageous to cloud environments in terms of an enhanced security level. An additional organizational dimension was discussed by Ruan et al. (2011) has discussed the possibility of integrating digital forensics in an organization to respond to cloud-based incidents [17].

Marco et al., Pangalos and Katos, Alenezi, et al., agree that **“cloud forensics help organisations improve their security strategies, be prepared for any attack, and reduce the number of security incidents”**.

Moussa et al. proposed a study that states, **“IaaS consumers can utilize the framework to establish how they should gather the necessary digital evidence without having to rely on cloud providers”**. However, the study is to be verified.

Ab Rahman et al. proposed a forensic-by-design framework for cyber-physical cloud systems (CPCSs). It demonstrated **“the design of a CPCS is based on the goal of simplifying and increasing the efficiency of forensic investigations.”** The forensic-by-design

framework is supposed to assist in digital investigations[19].

Dykstra et al. stressed on the importance of trust in cloud services so that a judge in the court of law can decide the trustworthiness of the evidentiary data.

Trenwith and Venter presented a noteworthy approach that helps reach digital forensic readiness in a cloud environment. This model proposed that a central logging facility that speeds up data gathering should be used.

Ezz El-Din Hemdan and D. H. Manjaiah proposed a Digital Forensic accession for probe of Cybercrimes in a Private Cloud Environment. They came up with an experimental environment to introduce the forensic process in the private cloud. The most essential steps in the cloud forensic process are Data acquisition and collection from the Virtual machines [20]. They popularized live forensics and a dead forensics approach to investigate virtual machines in the private cloud environment.

M. Edington Alex, R. Kishore et.al. Highlighted some challenges faced by an investigator. In most of the research work, investigators need to rely on CSP so CSP can modify data and this can affects the complete investigation process. After securing permission from the international telecommunication union (ITU), they proposed a solution called forensic monitoring plane (FMP) implemented outside of the cloud premises to mitigate the dependency on CSP.

## III. ISSUES AND CHALLENGES IN CLOUD FORENSICS

- Physical inaccessibility: Different jurisdiction distribution is an issue because data resides in different geographical locations.
- Lack of international collaboration in cross-nation data exchange.
- Lack of law advisory and regulations.



- Decreased accessibility and control over forensic data at all levels. System administrators require relevant logs to troubleshoot the system and fix up the errors. Investigators need relevant logs for their concerned investigation.
- There is a chance that the evidence might be deleted in Cloud Forensics. It becomes a challenge to recover the deleted data and reconstruct it for evidence usage.
- Lack of forensic expertise.
- Each cloud server contains files from many users. It becomes hard to separate an individual user's data from the others.
- Dependence on CSP: Investigators depend on CSP to acquire logs. There is no evidence other than CSPs that links a given information file to a particular suspect.
- CSPs are into an agreement with other CSPs to use their services; this leads to loss of integrity and confidentiality of data in some cases.
- Integrity of the collected evidence has to be maintained to present it in an admissible manner in the court of law.
- Strong encryption methods are required to store evidence safely [21]

#### IV. RESEARCH AND OBJECTIVES

New problems are arising every day in the area of digital forensics. Many researchers have proposed various new solutions to test the attacks in real-time situations to deal with the issues and challenges of cloud forensics. CSPs have not yet accepted those proposed solutions. Hence it becomes necessary to propose immediate research in the area of digital forensics. Investigators solely depend on CSP to collect evidence in the form of hard disk, log files, etc. because of inaccessibility. Cloud computing services enable few vendors like Amazon and Google to provide on-demand services to the users by renting out physical machines or by allocating software services. These issues concern both the public and private sectors. This paper aims to provide a better awareness of several areas of cloud forensics like analysis of cloud service usage, the effectiveness of acquisition methods, understanding of commercial cloud environments and investigation of cloud forensic management under the large umbrella of digital forensics. The research gaps and challenges are identified and explained.

#### V. CONCLUSION

Cloud forensics is becoming the need based on the alarming rise in cyber-attacks hence leading to growing concerns of security. Security is the most significant factor in computing. In cloud forensics, services are provided by virtual machines by some live forensics and dead forensics. Security mechanism is needed as cloud logs are spread across different virtual machines that the customer is not aware of. Cybercriminals exploit these sources to exhaust all the cloud resources. This paper presents forensic processes, techniques of evidence collection, various issues and challenges in cloud forensics during an investigation. The field of cloud forensics will continue to evolve as technology changes in the ever-changing areas of digital and multimedia sciences.



Challenges in cloud Forensic (figure 3)

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# The Foliar Spray Application of Selected Organic Fertilizers and Their Effects on Selected Plants

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## ABSTRACT

Fertilizers are any organic or inorganic natural or synthetic materials [other than liming materials], which is applied to a soil to provide one or more plant nutrients necessary for plant growth. One of the most extreme conditions that have a detrimental impact on the climate is sandy soil. The use of different organic amendments is a tool for developing sustainable development that is both economically and environmentally viable. The aim of this study is to see how milk tea waste extract, banana peel extract and coconut peat extract affect the growth of coriander and spinach plants when applied as a foliar spray. Different pots for various organic fertilizers were used. In this study we discussed how they affected plant growth and how they improved the biochemical properties of sandy soil. The different concentration (2g, 4g, 6g) of banana peel powder, milk tea waste powder and coconut peat were used in this study. The result showed that the highest plant height, root height, number of leaves and shoot height was found in 4g milk tea waste powder in both plants spinach and coriander compared to other fertilizers and control plant. This observation is suggested that the use of milk tea waste is feasible amendment strategy for improving the growth and soil fertility quality of sediments.

**Keywords :** - Banana Peel, Coconut Peat, Waste Milk Tea, Fertilizer, Plants Growth, Soil Analysis.

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## I. INTRODUCTION

The world's population continues to grow, putting enormous strain on the environment, food, and vegetable production. Vegetable crop production would place a strain on soil and water resource protection in the coming decades to meet leafy plant

production. Fertilizer is any natural or synthetic organic or inorganic substance that is applied to a soil to supply one or more plant. Fertility is necessary for good plant development and fertilizer and organic fertilizer application is an important chromatic aberration act operation. For healthy plant growth, adequate nutrient levels in the soil must be

maintained. By determining current soil nutrient concentrations, soil analysis may help avoid over application. Soil analysis is recommended when nutrient-hungry crops are regularly cultivated, a new area is being established, or after a long time without cultivation. For plant growth, the cheapest and safest materials can be used. The current research looks at how fruit peel, milk tea waste, and coconut peat can be used to improve efficacy.

The banana peel is a significant contributor to agricultural produce. Banana peel waste is commonly disposed of in urban landfills, contributing to existing environmental issues. You can, however, resolve this problem. People use bananas for a variety of purposes, such as making banana chips and eating fruit, but banana peels are a waste product that no one uses, which is why peels are discarded. Bananas are plentiful in our country because they grow every year, so we get a lot of banana peel. We may use the banana peel powder for plant growth because banana peels are readily available. Waste peels can be used instead of genomics film as a novel product. Since a commercial tilling film is required, production of such a product is required. It is a valuable bio-product that is both helpful and environmentally friendly. For root traits, plant development, soil quality, and nutrient content throughout sandy soil, milk tea waste is a better choice. Milk tea was used as a source of nutrients for the plants, and the sandy soil was fertilized with chemical fertilizer. As compared to other organic amendments, milk tea waste contains nutrients such as nitrogen, potassium, and phosphorus, and has a low ratio. For sandy and low-fertility soils, it might be a stronger amendment. The TW decomposes the soil by breaking it down. In sandy soil, there are high N, P, K loss due to leaching and other environment effect. Nitrogen (N) is the element required by crops in greatest amount because the nitrogen is helpful to improvement of chlorophyll. So milk tea waste is the best option for crop production.

Coconut coir dust, also known as coco peat in the commercial world, is a commonly available soil material in the tropics. Coco peat is a by-product of the coconut husk fiber extraction process. Coco peat produces a variety of crop species, and it improves crop quality in terms of crop height, fruit, root, stem, and flower, among other things. Coco peat has been shown to be a less cost-effective production substrate than industrial substrates. Coco peat has a high capacity for retaining water and chemical fertilizer components, as well as neutralizing soil acidity. Coco peat also aids in the improvement of soil's chemical and physical properties, as well as its moisture content. It aids in the improvement of soil nutrient content, infiltration rate, total porosity, and hydraulic conductivity. Potassium, phosphorus, calcium, magnesium, and sodium are among the macro and micro nutrients found in coco peat.

## II. METHODS AND MATERIAL

### 2.1 Study area

This research was carried out in Chandkheda, Ahmadabad, from February 11 to March 4, 2021. Combinations of treatments (selected different natural organic fertilizers- banana peel, milk waste, and coconut peat) with different concentrations at doses were used in a pot experiment (2, 4, 6 g.pot<sup>-1</sup>). Foliar spray treatment was used as the tool of application. Ten treatments were provided in three replications using this process, with 20 pots and two plants (coriander and spinach) chosen for the application. Power, banana peel powder (2, 4, 6 g. pot<sup>-1</sup>), milk tea waste (2, 4, 6 g. pot<sup>-1</sup>), and coconut peat were used in the coriander plant experiment (2, 4, 6 g. pot<sup>-1</sup>). Similarly, banana peel powder (2, 4, 6 g. pot<sup>-1</sup>), milk tea waste (2, 4, 6 g. pot<sup>-1</sup>), and coconut peat powder (2, 4, 6 g. pot<sup>-1</sup>) were used in spinach plant experiment.

## 2.2 Collection of Soil and pot

Plastic pots were used for the coriander plant and terra cotta pots were used for the spinach plant in this experiment. The coriander plant grows well in plastic pots, but the spinach plant does not. It takes longer to develop in plastic pots, so terracotta pots were chosen for the spinach plant. In this experiment, sandy soil was used, which had poor soil quality, low soil fertility, low organic matter, and lacked nutrients. There were 20 pots used, each filled with 300gm of dried chandkheda sandy loam soil. Three seeds were sown in each pot, and one plant was removed every week for compared to untreated plant.

## 2.3 Collection of banana peel, milk tea waste, coconut peat

The banana peel came from a nearby fruit market, the milk tea waste came from home, and the waste coco peel came from a nearby grocery store. Banana peels were collected and washed thoroughly with tap water to remove any dust or unwanted stuff, and then cut into small pieces (1-4cm) and air dried for 20 days at room temperature. The milk tea waste was air dried for 20 days at room temperature. The banana peels and milk tea waste was grinded after 20 days, resulting in banana peel powder and milk tea waste powders were prepared.

Here's how to make coco peat at home: - Coconut peel was used to make coco peat. First, a small volume of water was collected in a bucket or other container. After that, some soil was added to the bath, followed by the coconut peels. This training took at least 20-25 days to complete. Separation of the water from the container was completed after 20 days. The coconut peel was cut down and ground at this stage, and coconut peat was prepared for the experiment as well.



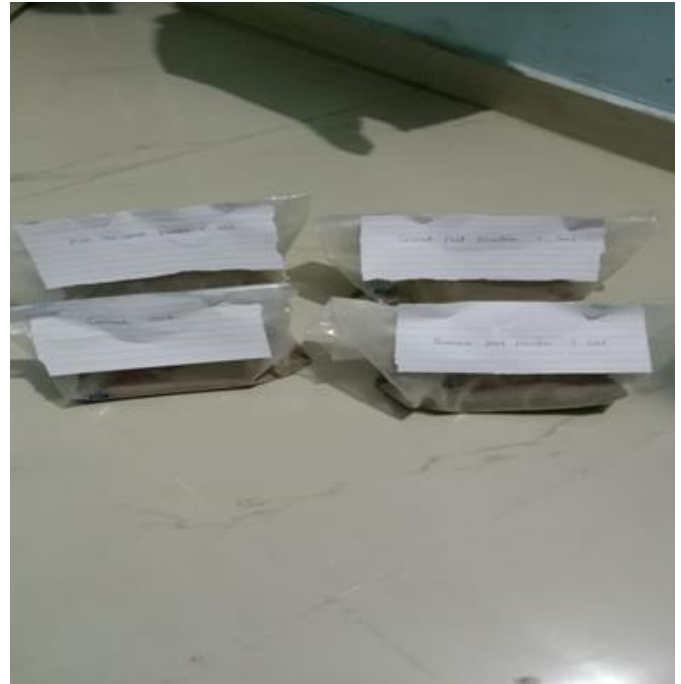
**Figure 1:-** Shows the dried powder of (a) Banana peel, (b) Milk tea waste (c) Coconut peat

## 2.4 Preparation of organic fertilizer:-

The plant growth was compared to that of a control plant using various organic fertilizers such as banana peels, milk tea waste, and coconut peat powder. Water was added to each formulation in various amounts. 2g banana peel powder, milk tea waste powder, and coconut peat were combined in 100 ml distilled water to make a total volume of 100 ml, from which extracts were produced. In 100 ml distilled water, 4g banana peel powder, milk tea waste powder, and coconut peat were combined to make a total volume of 100ml. In 100 ml distilled water, 6g banana peel powder, milk tea waste, and coconut peat were combined to make a total volume of 100ml. The control plant was maintained without the use of any fertilizer.

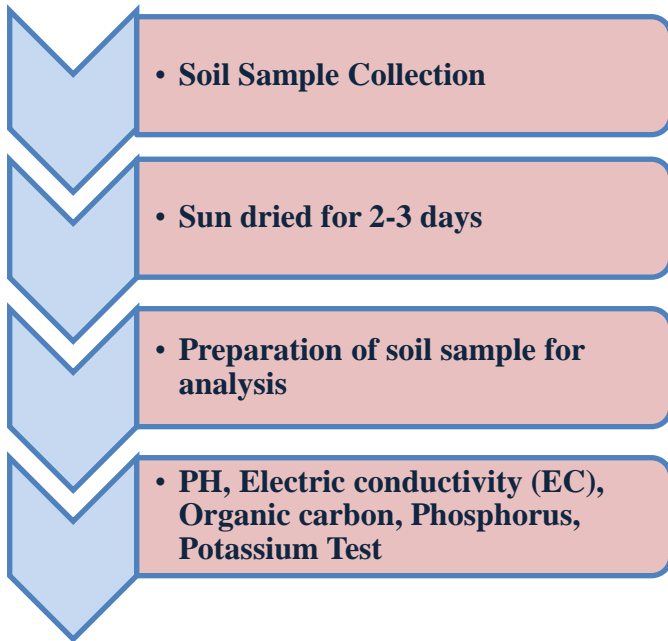
**Table 1:-** Preparation of selected organic fertilizers

No.	Organic fertilizer	F1	F2	F3
1.	Banana peel powder	2g powder Total vol.=100ml	4g powder Total vol.=100ml	6g powder+ Total vol.=100ml
2.	Milk tea waste powder	2g powder Total vol.=100ml	4g powder+ Total vol.=100ml	6g powder+ Total vol.=100ml
3.	Coconut peat	2g powder+ Total vol.=100ml	4g powder+ Total vol.=100ml	6g powder+ Total vol.=100ml



**Figure 3 :** Method of soil analysis

### 2.5 Soil Analysis



**Figure 2 :-** Soil sample (applied with banana peel powder, milk tea waste, coconut peat)

### III. RESULT AND DISCUSSION

#### 3.1 After 7 day's spinach plant growth:-

In control plant there was no result found in first week. Not a single seed found to be germinated in control plant. After 7 days we had extracted one plant from every pot and noted readings for the crop height, root height and shoot height etc. Different concentrations of selected organic fertilizer banana peel powder, milk tea waste powder, coconut peat powder were used, such as 2, 4 and 6gmspot-1. After 7 days, we removed one plant. From each pot and reported measurements for crop height, Root height, shoot height, among other items. In 2gm pot (B1) and 6gm pot (B3) of banana peel powder no result were found but 4gm pot(B2) seed was sprouting and plant growth in 1st week. In 4gm pot (T2) and 6gm pot (T3) of milk tea waste powder seed germinate and small size plant growth but in 2gm pot (T1) no seed germinate and no result found in first week. In coconut powder pot only 6gm pot was sprouting the seed and germinated the small plant.

### 3.2 After 14 day's spinach plant growth:-

In Control plant, the result presented increasing height in small amount after 14 days. In second week, B1 pot exhibited sprouting of the seed and the size of the plant found to be very small. In B2 pot increasing shoot of plant, root of plant and 2 leaves were growths. In B3 pot sprouting of the seed and one leaf growth was seen in second week. The seed sprouted in the T1 pot in the second week, and the plant was found to be small. The shoot of the plant increased in T2 pot, the root of the plants also increased in second week. In T3 pot, the plant grew slowly and the roots grew slowly, with a red and long stem and two leaf growth. The C1 pot grew slowly in the second week, with a very small plant. The leaves had an oval shape and 2 leaves growth, C2 pot was exhibited increasing shoot of the plant. The entire plant measured 4.8cm. Root of the C2 pot plant is well formed, small and stem was thin, long and reddish in color. In C3 pot, was increasing the leaves number. The color of the leaves gradually changed from green to yellow, indicating that the chlorophyll content was gradually decreasing and the total plant measured 5.1 cm.

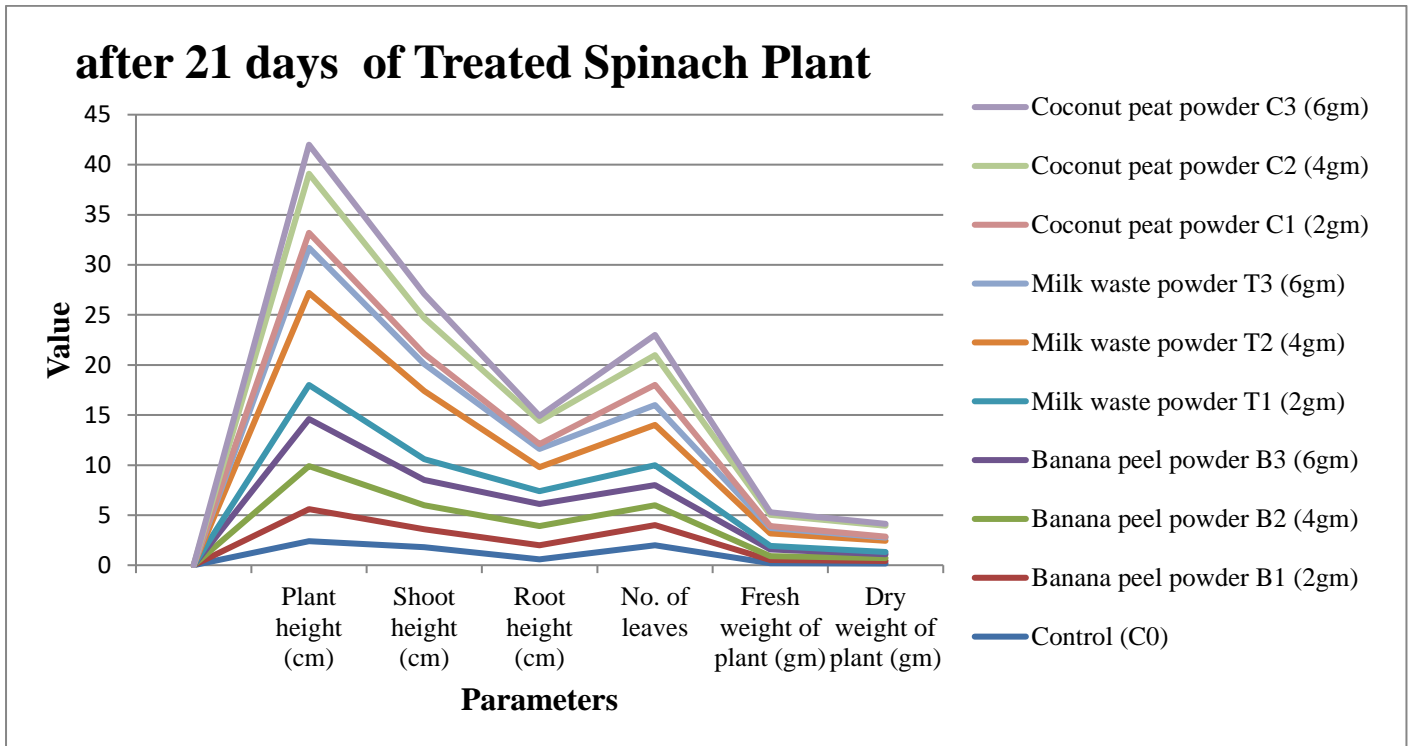
### 3.4 After 21 day's spinach plant growth:-

There was no impact in plant only number of leaves was found two to three and the plant started to wither. The leaves of the crop were seen shrieked. Plant growth was found to have increased, In the B1 pot, there were two leaves, and in the B2 pot, there were four leaves. The leaves were oval in shape and green in color, but in the B2 pot, one or two of the green leaves turned yellow. Only the number of leaves has been increased in B3, which has been increased from two to three. The number of leaves in T1 pot had increased from two to four, with one of them changing color from green to brown. Plant growth was highest in a 4gm pot (T2) of Milk tea waste powder. Two large and two small leaves appeared in the T3 pot. The number of leaves did not rise in the third week, In the C1 pot, the plant began to wither and the crop leaves shrank. Two large and one small leaves appeared in the C2 pot, and two large and two small leaves appeared in the C3 pot, but the tiny yellowish leaves shrank as the season continued.

**Table 2 :- After 21 days spinach plant growth result**

Name of Parameters	Control (C0)	Banana peel powder			Milk tea waste powder			Coconut peat powder		
		B1 2 gm.	B2 4 gm.	B3 6 gm.	T1 2gm.	T2 4gm	T3 6 gm.	C1 2gm.	C2 4gm	C3 6gm.
Plant height(cm)	4.3	3.2	5.2	3.0	3.3	9.2	5.9	3.1	5.1	6.5
Shoot Height(cm)	3.5	2.0	3.7	1.8	2.7	6.8	4.1	2.1	2.9	4.5
Root Height(cm)	0.6	1.2	1.5	1.2	0.6	2.4	1.8	1	2.2	2
No. of leave	3	2	4	3	4	5	4	2	3	4
Fresh weight of plant(gm)	0.76	0.18	1.35	0.28	0.89	2.14	1.68	0.58	0.63	1.80
Dry weight of whole plant(cm)	0.30	0.11	1.29	0.11	0.30	1.89	1.33	0.39	0.52	1.43





**Figure 4 :-** Effects of Treatments on spinach plant growth

**3.5. After 7 days Coriander plant growth**

In the first week, the seeds sprouted, and the control plant's tiny shoot had risen up. Seeds of banana peel powder were sprouting in a 2gm pot (B1), and small leaves, shoots, and roots were discovered. In the first week, germination of the seed was observed in a 4gm pot of banana peel powder, and an increase in the height of the tip, the height of the shoot, the height of the entire plant, and two leaf growth was observed in a 4gm pot (B2) of banana peel powder. In the first week, small leaves, shoots, and roots were discovered in a 6gm banana peel pot (B3). In 2gm pot (T1) of milk tea waste powder seeds were not sprouting but small size shoot, root were found, in 4gm pot (T2) milk tea waste powder, seed germination was found of seed and there was very good plant growth. The shoots, roots and 2 leaves were well growth in first week. In T3 pot germination was found of the seed and observed increment in height of root, shoot, the height of whole plant etc. In 2gm pot (C1) of coconut peat powder seeds were not sprouting but small leaves, shoot, and root were found and In C2

pot, germination was found of the seed and observed increment in height of root, the height of shoot, the height of the whole plant and 2 leaf growth was in 1<sup>st</sup> week. In 6gm pot of coconut peat powder seed were not sprouting but compare to 2gm pot well growth shoots and root in first week.

**3.6 After 14 day's coriander plant growth**

In Control plant, 2 leaves, small root, shoot were growth in second week. In B1 pot, the whole plant size was found merely 3.2 cm and 2 leaves were growth, In B2 pot was presented sprouting of the seed, one leaf growth was seen and the whole plant size was reached up to 4.3cm. B3 pot was exhibited increasing shoot of the plant, the root of plant was also found to be increased in second week and 2 leaves growth was found and whole plant size was 4.7cm. In T1 pot was presented sprouting, one leaf growth was seen and the whole plant size was reached up to 3.4cm. In T2 pot, the root of the plant, 2 new branches were growth, old leaves converted to yellow color and the whole plant size was 9.2 in diameter. T3 pot was exhibited increasing shoot of

the plant. The size of the whole plant was found nearby 4.5 cm. After 14 days, the seeds in the C1 pot had sprouted and had grown in height by a slight amount. In a 4gm pot of coconut peat powder, there was a rise in the height of the root, shoot, entire plant, and two leaf development. The total height of the plant was 5.9cm. After 14 days, seeds in the C3 pot sprouted and grew taller than those in the C1 pot.

### 3.7 After 21 days Coriander plant growth

The consequence in the control plant was an increase in the height of the plant root, shoot but leaves number were not increased. In 2g banana powder or B1 pot, two leaves were found. Plant growth was observed to have improved in the third week. In 4g banana powder or B2 pot, there were also two leaves visible. In the b3 pot, the old leaves

fell off and new leaves sprouted; two branches emerged, and one of the branch leaves began to turn yellowish in colour, indicating that the chlorophyll content was steadily decreasing. Old leaves were withering and new leaves and branches were sprouting in T1 pot. Three new branches with new leaves emerged from the T2 pot. The consequence in T3 was an increase in the height of the plant root, shoot, and leaves. The effect of the C1 pot was an increase in plant height, root, and shoot but no reduction of the number of leaves. The consequence in the C2 pot was an increase in the number of leaves and branches, but not in the height of the plant root or shoot. The plant increases gradually in a C3 pot, but the whole plant vanishes and dries out. There is no influence.

**Table 3 :-** After 21 days coriander plant growth result

Name of Parameters	Control (C0)	Banana peel powder			Milk tea waste powder			Coconut peat powder		
		B1	B2	B3	T1	T2	T3	C1	C2	C3
		2 gm.	4 gm.	6 gm.	2gm.	4gm	6 gm.	2gm.	4gm	6gm.
Plant height(cm)	5.0	6.3	7.6	8	5.1	11.0	6.5	3.7	10.5	8.3
Shoot Height(cm)	2.2	3.2	4.9	4.8	3.6	8.1	3.5	2.5	6.3	5
Root Height(cm)	2.8	3.1	2.7	3.2	1.5	1.9	3	1.2	4.2	3.3
No. of leave	2	2	2	4	3	5	3	2	4	2
Fresh weight of plant(gm)	1.09	1.18	1.35	1.58	1.29	2.28	1.25	0.58	2.13	1.23
Dry weight of whole plant(cm)	0.89	1.11	1.29	1.39	1.20	1.94	1.13	0.39	2.02	0.93

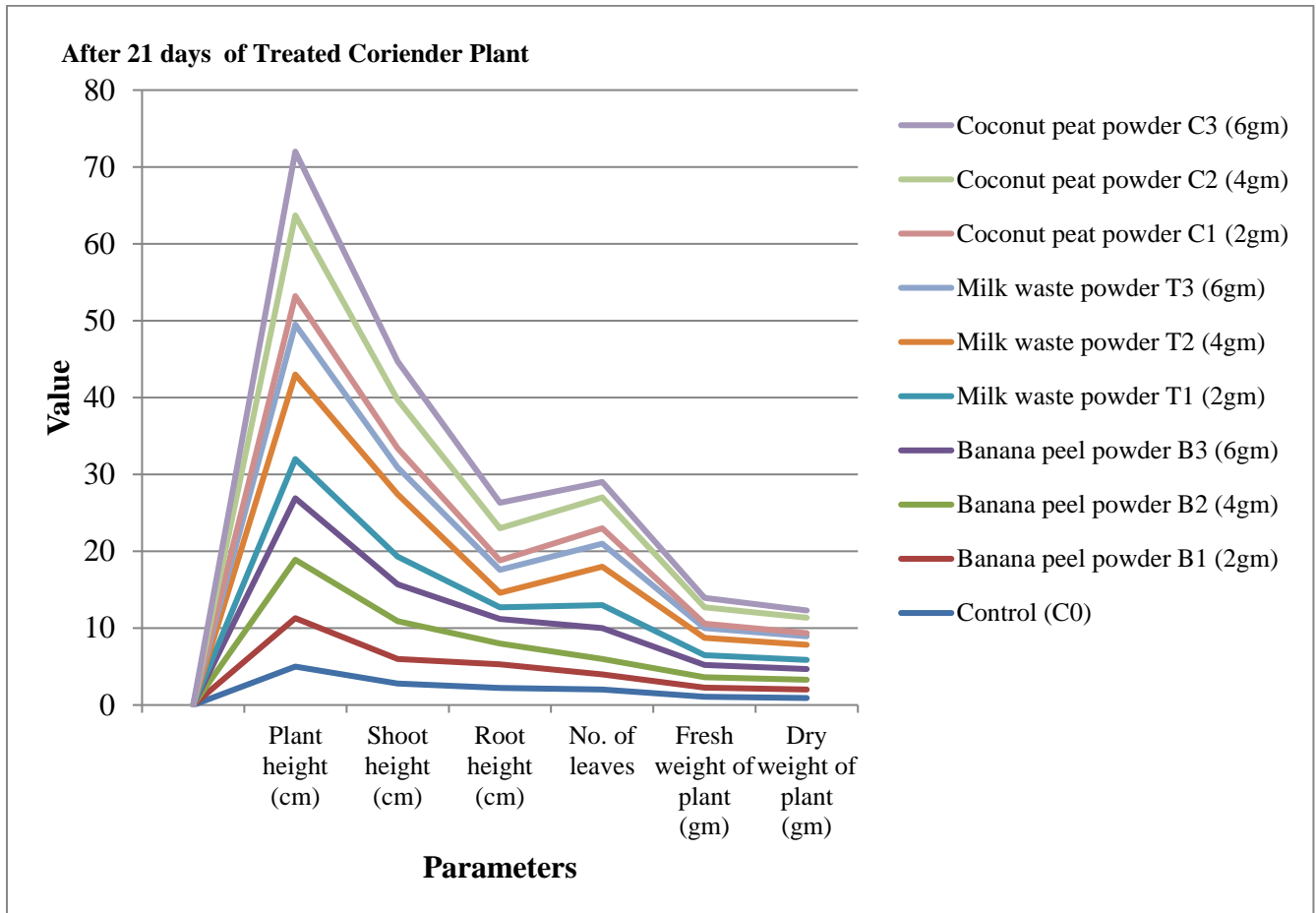


Figure 5 :- Effects of Treatments on Coriander plant growth

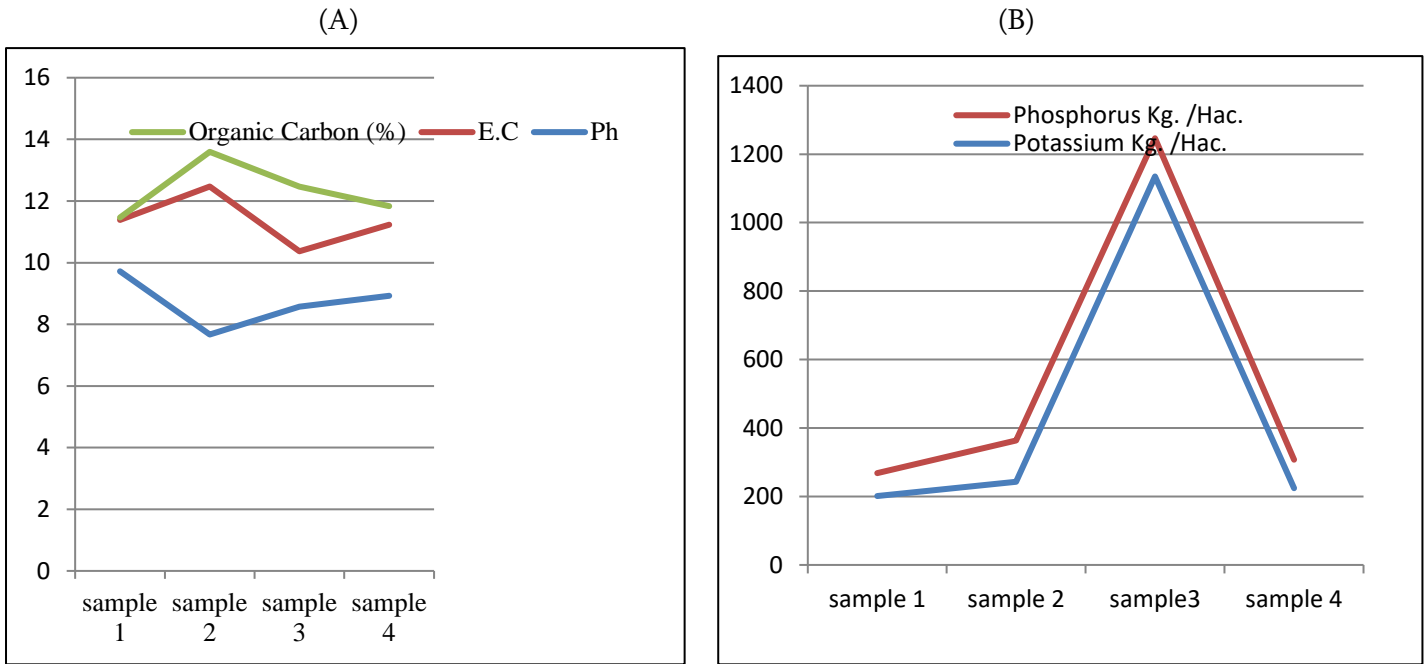
3.8 Soil Analysis Result

Table 4 :- Observation table of soil with different organic fertilizer

Organic fertilizer + soil	PH	E.C	% Carbon	Potassium	Phosphorus
Blank	-	-	20 ml	-	0
Control	9.72	1.67	19.5	14.98	24
Banana peel	7.67	4.8	12.5	18.11	43
Milk tea waste	8.57	1.80	6.0	84.44	40
Coconut peat	8.93	2.3	16.0	16.68	30

Table 5 :- result of soil analysis

Soil + organic fertilizer	PH	E.C (milli.moh/cm)	Organic Carbon (%)	Potassium Kg. /Hac.	Phosphorus Kg. /Hac.
Control	9.72	1.67	0.075	201.33	66.96
Banana peel powder	7.67	4.8	1.125	243.40	119.97
Milk tea waste powder	8.57	1.80	2.1	1,134.87	111.6
Coconut peat powder	8.93	2.3	0.6	224.18	83.7



**Figure 6 :-** Influences of application different organic fertilizer soil chemical properties, Soil, Ph, E.C, Organic carbon (A), and Potassium, phosphorus (B) after plant growth. Without amended (sample 1), Banana peel powder mixed soil (sample 2), Milk tea waste powder mixed soil (sample 3), coconut peat mixed soil (sample 4).

### Discussion

Sail, T. A. et al., 2019 presented the treatment including practical usage of milk tea waste (TW) combined with chemical fertilizer. The highest root total length, root surface area, root volume and diameter were recorded for T4 among all treatments. They were used milk tea waste and inorganic fertilizer but in this study same result as that paper but not used the inorganic fertilizer.

Mercy, S. et al., 2014 studied the effect of the fruit peels for the effective growth of plants and higher yield. The result length of the plant was observed as lower in control and size of the leaves was increased in the plants which were grown on the soil having applied formulation. And they were used different fruit peel. But in this study only banana peel powder used and the result was different as that paper.

Khan, M. Z., Era, M. D., et al., 2019 presented the effect on the coconut peat on growth and yield

responses of ipomoea aquatic. T4 treatment was shown highest response of plant growth. In this study different concentration used and result was different as that paper.

### IV. CONCLUSION

This project focuses on the use of organic fertilizers such as banana peel powder, milk tea waste powder, and coconut peat powder in practical applications. The 4gm powder of milk tea waste and 6gm powder of coconut peat were found to be the most effective treatments for spinach plant growth and overall improvement. When compared to the control plant, the treatments resulted in spinach plant growth (plant height, shoot height, root height, and leaf number). The best organic fertilizers for coriander plants were 4gm milk tea waste and 4gm coconut peat powder, which were found to aid plant production and enhance soil

nutrient content. Of all of the therapies, milk tea powder was found as being the most effective.

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## Security and Privacy of Sensitive Data in Cloud Computing Using RSA

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### ABSTRACT

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Today's world internet is being used by almost everyone. Numerous file exchanges take place online including many official documents. These files require some sort of security mechanisms while being transmitted over the Internet. Technology has done a great deal for changing the way we live and do business today. In the fast-moving world we need something essential for fast computation. Along with the popular use of computer, Information security has also become one of the problems which need to be solved. Many security issues like the malware authors, information leakage, endangerment and unauthorized exploitation need to be taken into account. To control those issues, crypto-security is necessary. More Applications started to use Rivest-Shamir-Adleman (RSA). However, Since RSA on large blocks is computationally intensive and largely byte-parallel. System will parallel perform the encryption and decryption process in a distributed environment and the performance analysis shows improvement in terms of execution time and provides the security.

Keywords : Cloud Computing, Security, Advanced Encryption Standards (AES), Rivest-Shamir-Adleman(RSA), Heroku cloud.

### I. INTRODUCTION

Cloud computing is a computing paradigm, where a large pool of systems are connected in private or public networks, to provide dynamically scalable infrastructure for application, data and file storage. The idea of cloud computing is based on a very fundamental principal of reusability of IT capabilities. The difference that cloud computing brings compared to traditional concepts of "grid computing", "distributed computing", "utility computing", or "autonomic computing" is to broaden horizons across

organizational boundaries. Forrester defines cloud computing as: "A pool of abstracted, highly scalable, and managed compute infrastructure capable of hosting end customer applications and billed by consumption." Cloud Computing is a technology that uses the internet and central remote servers to maintain data and applications. A simple example of cloud computing is Yahoo email, Gmail, or Hotmail etc. Enterprises can choose to deploy applications on Public, Private or Hybrid clouds. Cloud Integrators can play a vital part in determining the right cloud path for each organization. Enterprises can choose to

deploy applications on Public, Private or Hybrid clouds. Cloud Integrators can play a vital part in determining the right cloud path for each organization.

## II. PROPOSED SYSTEM

Cryptography is one of the most notable and desired techniques to protect the data from attackers by using two essential processes. These processes are listed as Encryption and Decryption. Encryption is the process of converting the data to stop it from attackers to read the original data clearly. Encryption involves conversion of plain text to unreadable format. It is known as cipher text. The user cannot read the above format. Hence, the next process that is carried out by the user is Decryption. In the world of computing, there exist security issues for storing the data in cloud. In order to secure data in cloud RSA encryption technique is used in it. RSA is a block cipher with a block length of 128 bits. It permits three different key lengths: 256, 192, 128 or bits.

## III. ALGORITHM

Rivest-Shamir-Adleman (RSA)

RSA is an algorithm used by modern computers to encrypt and decrypt messages. It is an asymmetric cryptographic algorithm. Asymmetric means that there are two different Keys. It is also called public key cryptography, because one of the keys can be given to anyone.

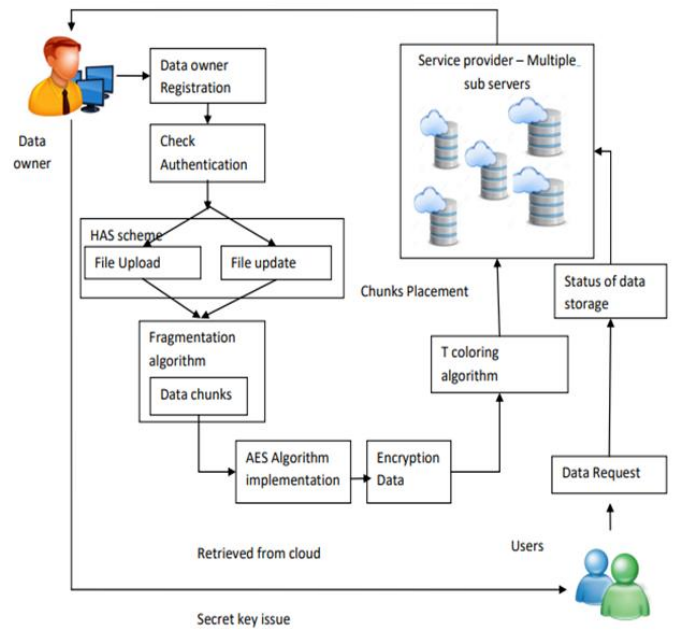


Fig. 1 SYSTEM ARCHITECTURE

## IV. MODULES DESCRIPTION

### A. Data Owner Module

Data owner has legitimate rights and complete control over a single piece of data or collection of data elements of the cloud. In It module, data owner has the authority to edit, modify, create, share and restrict access to the cloud data. Data owner is the one who wants to spread his business with the help of website then he/she has to set up the servers and maintenance of servers which leads to the high cost. In it system, the owner of data can access and archive the data stored by the Cloud Service Provider. The data user has to be given authority by data owner to access, manipulate or perform any action on cloud data user sends a key request to data owner and intern to the cloud. File upload section is where the user uploads files either of .txt, .jpg, and .png format. The file then is encrypted using the key generated by RSA algorithm in the cloud administrator module.

### B. Data User Module

Data user uses the cloud to store data and access it at any point of time. The data user just wants to use the application software such as MS Office, Paint Brush,

and Image Processing Software etc. It sort of service is provided by Software as a Service model of cloud computing which gives freedom to the user from getting license of software Registration module is present for new users to register by providing details such as username and password. Log-in module allows user to log in to one's cloud data segment. The user can search for required files present in the cloud storage. These files are uploaded by the data owner. The request for key can be sent in the key request page of it module. Using the key sent by data owner, the data user can decrypt the file and download it.

**C. Cloud Administrator Module**

The cloud administrator module depicts the cloud service providers in the system. There are various cloud service providers which includes Microsoft azure, cisco, Google, Verizon, etc. In It module, cloud administrators have two main responsibilities i.e. It configures the Cloud Management service and it supervises and manages the services. The features of cloud administrator module include the following: The cloud administrators can outlook pending requests for cloud resources it accepts to change requests linked with moderations to cloud resource. It can view and examine the data on cloud resource deployments it supervises key metrics and requests for cloud resources it helps to run Discovery on the cloud resources.

**V. IMPLEMETATION**

System implementation is the important stage of project when the theoretical design is tuned into practical system. The main stages in the implementation are as follows: Planning, Training, System testing and Changeover Planning. Planning is the first task in the system implementation. Planning means deciding on the method and the time scale to be adopted. At the time of implementation of any system people from different departments and system analysis involve. They are confirmed to practical

problem of controlling various activities of people outside their own data processing departments.

**A. Data Owner Module**



Fig 2: LOGIN

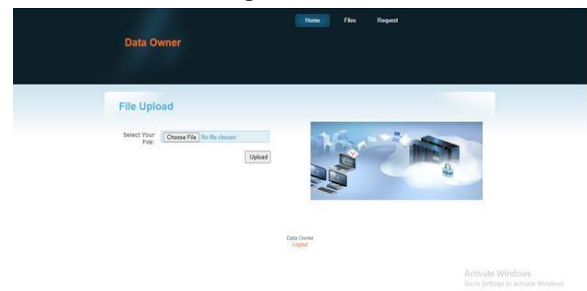


Fig 3:FILE UPLOAD

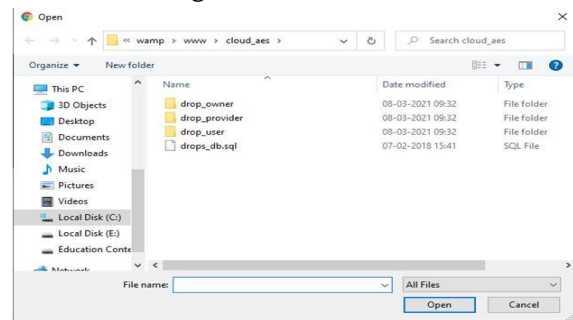


Fig 4: FILE SEARCH

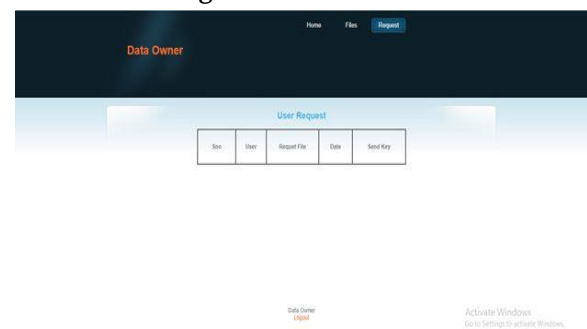


Fig 5: FILE STATUS



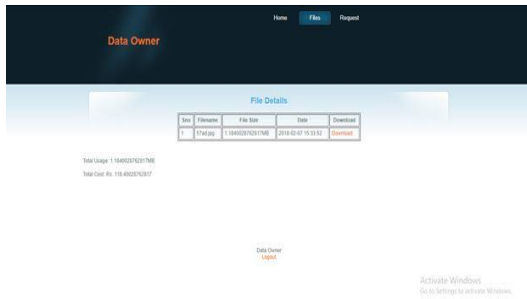


Fig 6: USER REQUEST



Fig 10: FILE SEARCH

B. Data User Module



Fig 7: USER LOGIN

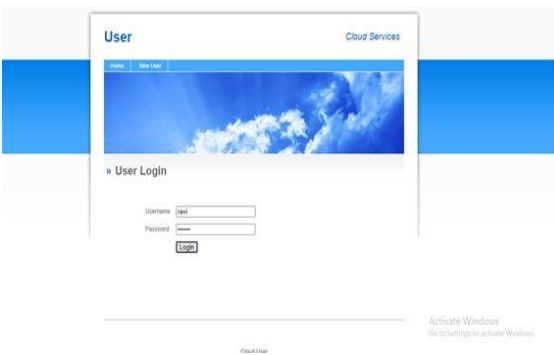


Fig 8: USER REGISTER



Fig 9: FILE STATUS

C. Cloud Administrator Module

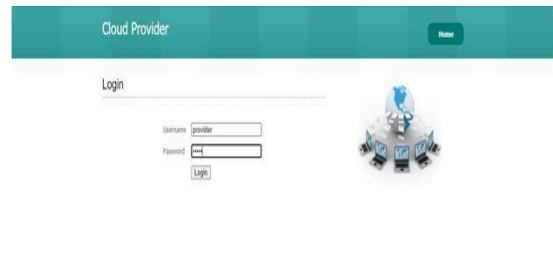


Fig 11: CLOUD USER LOGI



Fig 12: SERVER DETAILS

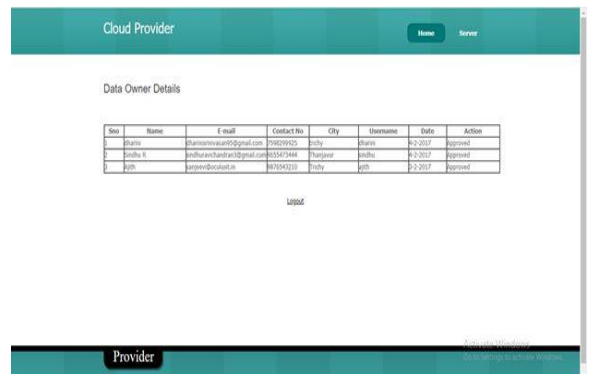


Fig 13: OWNER DETAILS

## VI. CONCLUSION

Cloud computing is a promising and emerging technology for the next generation of IT applications. Cryptography is one of the most important and prominent skill to secure the data from hackers by using the essential processes that is Encryption and Decryption. RSA encryption is the speedy method that has the flexibility and is easy to implement. Data can also protect against future attacks such as smash attacks. RSA encryption algorithm has high performance and very little storage space without any restrictions while other symmetric algorithms have some restrictions and differences in storage space and performance. The implementation of RIVEST SHAMIR ADLEMAN for securing data bestows benefits of less computation time and less memory consumption in contrast to other algorithms.

## VII. FUTURE ENHANCEMENT

Security is an important aspect of cloud computing. The strength of cloud computing is the ability to manage risks in particular to security issues. Security algorithms can be used for implementing encryption and decryption techniques to secure data. In future, the key length can be expanded using any other key generation algorithm. The RSA algorithm uses 128 bits. It includes ten rounds or cycles of RSA algorithm. In future it can be extended to 192 or 256 bits. If 192bit key is used, the number of cycles will be 12.

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# Synthesis and Characterization of Silver Nanoparticles Using Curry (*Murraya Koenigii*) Leaf Extract

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## ABSTRACT

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In this study simple method was applied for the synthesis of silver nanoparticles using Curry (*Murraya koenigii*) leaf extract. The plant extract acts as reducing agent as well as capping agent. Characterization of synthesized nanoparticles was done by different techniques like SEM, TEM and UV-Visible spectrophotometer. UV-Visible spectrophotometer showed absorbance peak in range of 430-440 nm. The silver nanoparticles showed sole detection of Cd(II) ions in the aqueous systems with good selectivity, sensitivity. Results showed simple and eco-friendly, nontoxic and an alternative conventional physical/chemical methods. Only 30 min were required for the conversion of silver ions into silver nanoparticles at room temperature.

**Keywords** : Silver nanoparticles, Green synthesis, Cd(II), Curry (*Murraya koenigii*) leaf

## I. INTRODUCTION

As we know that water one of the very important natural resources in the world. It is very important to survive living part and the development of human beings. Heavy metals pollution inside water is a global environmental issue now a days. Heavy metals are releasing into water mainly through the mining, electroplating, metallurgy, chemical plants, agriculture and household wastewater etc. Heavy metals like Cr, Al, Pb, Zn, Cu, Hg, Cd are very harmful for human's health [1]. Moreover, heavy metals can also exert adverse effects on the environment and are highly toxic [2]. Therefore, the removal of heavy metals from wastewater is of great

importance and has drawn great attention during last decade.

During this last decades, nanomaterials have gained a lot of attention. Nanomaterials properties contribute to their extraordinary adsorption capacity and reactivity, which are favourable for the removal of heavy metal ions. Therefore, studies on nanomaterials have been carried out to investigate their applications on heavy metal removal from water warter and they have shown great potential as good alternative for absorbance of heavy metals from wastewater [3,4]. On the basis of the above concept, this work reviews the latest development of nanomaterials which are used to remove heavy metals from wastewater.

In this work synthesis and characterization of the silver nanoparticles were discussed. In this work, a systematic and short overview of the following the zero-valent metal nanoparticles, metal oxide materials have been presented. The perspective of silver nanoparticles in heavy metal containing water treatment has been discussed.

Generally the high levels of cadmium in water can be seen in the plating and coating of pipes and fittings, soldering with silver-coated tubes places [5]. Literature reveals that Cadmium is toxic for human and animals. Therefore, the attention has been made to study the removal of cadmium in contaminated water and its methods at low concentrations.

## II. Materials and Methods

### Preparation of Curry tree leaf extract

Silver nanoparticles were prepared by using Curry tree (*Murraya koenigii*) leaf extract on the basis of cost effectiveness, ease of availability and its medicinal property. Fresh leaves were collected from college campus in month of January-February. They were surface cleaned with running tap water and then washed with distilled water to remove debris and other contaminated contents. Then air dried at room temperature crushed in Mixture. About 30 gm of finely crushed leaves were kept in a beaker containing 500 mL double distilled water and boiled for 30 min. Then cooled down it and filtered with Whatman filter paper no.42 and then extract was stored at 4°C for further use.

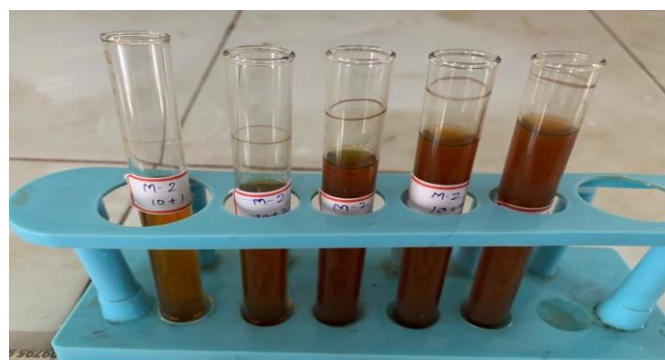
### Preparation of AgNPs

Silver nitrate GR used as such (purchased from Merck, India). 100 mL, 1 mM solution of silver nitrate was prepared in 100 ml beaker. Then 1, 2, 3, 4 and 5 mL of extract was added separately to 10 mL of AgNO<sub>3</sub> solution of containing the con 1 mM. Silver nanoparticles were also synthesized by varying concentration of AgNO<sub>3</sub> (1-5 mM) keeping extract

concentration constant (5 mL). This setup was kept in a dark cupboard to minimize photoreduction of silver nitrate at room temperature. Reduction of Ag<sup>+</sup> was confirmed by the colour change of solution. The formation silver nanoparticles was confirmed by using UV-Visible spectroscopy.

### Characterization of synthesised silver nanoparticles

Spectral analysis was reported by using Shimadzu UV-visible spectrophotometer (UV-1800, Japan). UV-Vis spectrophotometer with a resolution of 1 nm between 200 and 800 nm was used this spectral analysis. 1ml of sample was taken into a cell and subsequently analysed at room temperature. The determination of average size of synthesized silver nanoparticles by Dynamic light scattering (Spectroscatter-201). The particle size and surface morphology was analysed by Transmission electron microscopy (TEM), operated at an accelerated voltage of 120 kV.



**Fig. 1** Image of synthesised silver nanoparticles with different Concentrations (1-5) of CLE

### Fixation of different parameters

The reaction was monitored at different time intervals. Different concentration of silver nitrate has been taken to monitor this reaction (1 mM, 2 mM, 3 mM, 4 mM and 5 mM) and it was also done by varying leaf extract solution (1-5 mL) and then absorbance was measured.

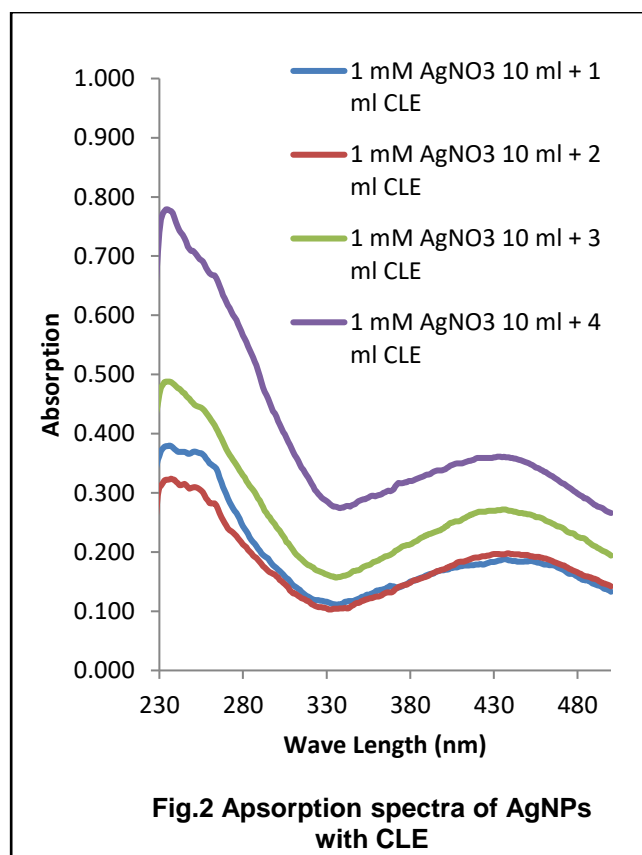
### III. Results and discussion

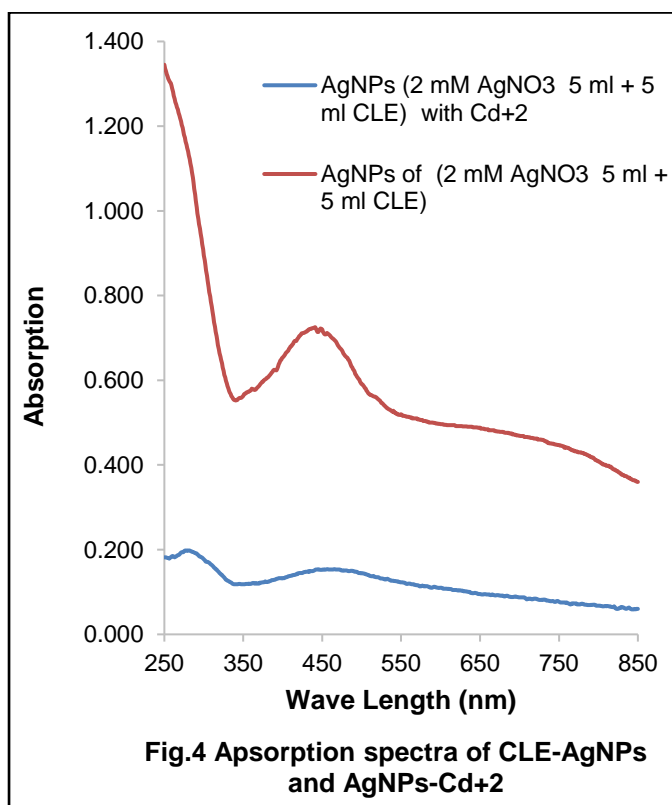
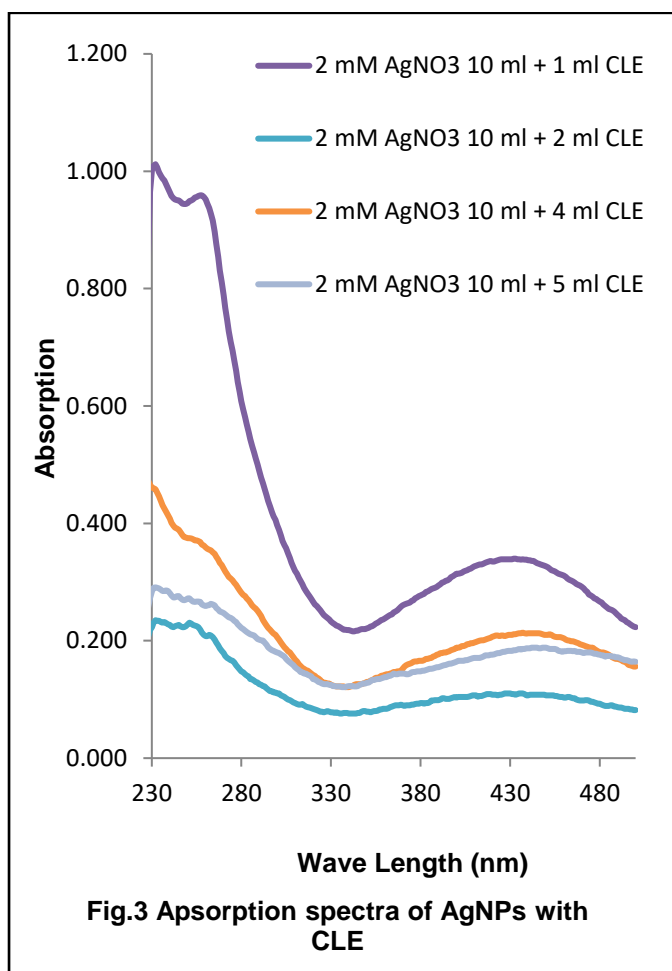
#### Visual observation and UV-Vis spectroscopy

All experiments were carried out by addition of plant extract of Curry tree into the beakers containing aqueous solution of silver nitrate led to the change in the colour of the solution to yellowish to reddish brown within reaction duration due to excitation of surface plasmon vibrations in silver nanoparticles [11]. On addition of different concentration (1-5 mL) of leaf extracts to aqueous silver nitrate solution keeping its concentration 5 mL (1 mM) constant, the colour of the solution changed from light yellow to brown indicating formation of silver nanoparticles. Different parameters were optimized including concentration of silver nitrate and Curry tree leaf extract, and time which had been identified as factors affecting the yields of silver nanoparticles. Silver nanoparticles were synthesized at different concentrations of leaf extract such as 1-5 mL using 1 mM of silver nitrate were analysed by UV spectra of Plasmon resonance band observed at 436-446 nm similar to those reported in literature [7]. If we increase the leaf extract concentration to 4 mL, there is increase in wavelength up to 448 nm as presented in Fig. 3. The slight variations in the values of absorbance signifies that the changes are the particle size [10]. On increasing concentration of extract there is increase in intensity of absorption. UV-Vis spectroscopy is used for examination of size and shape of nanoparticles in aqueous solutions. Regular changes in colour was observed when different concentrations of AgNO<sub>3</sub> was used by keeping Neem extract (1 mL) constant. The brown colour appeared due to the excitation of the Surface Plasmon Resonance, typical of AgNPs having absorbance values which were reported earlier in the visible range of 446-448 nm [6]. There is increase in intensity of absorption peaks after regular intervals of time and the colour intensity increased with the duration of incubation. It was also observed from Fig. 2 that the intensity of absorption peaks increases with increase in the concentration of the

silver nitrate salt. All the results are very close already reported in literature showing absorbance at 445 nm of silver nanoparticles synthesized by *Cochlospermum religiosum* extract [8] and by *Pithophorae dogonia* extract [9]. The UV-vis spectra recorded, implied that most rapid bio reduction was achieved using *A. indica* leaf extract as reducing agent. The UV-vis spectra and visual observation revealed that formation of silver nanoparticles occurred rapidly within 15 min. Fig.2 exhibits the plasmonic absorption bands of Cd-AgNPs synthesized. The absorption bands overlap at 440 nm with the same intensities. This confirms the synthetic reproducibility of our prepared probe. The synthetic reproducibility was further confirmed by TEM images of Cd-AgNPs (Fig. 4)

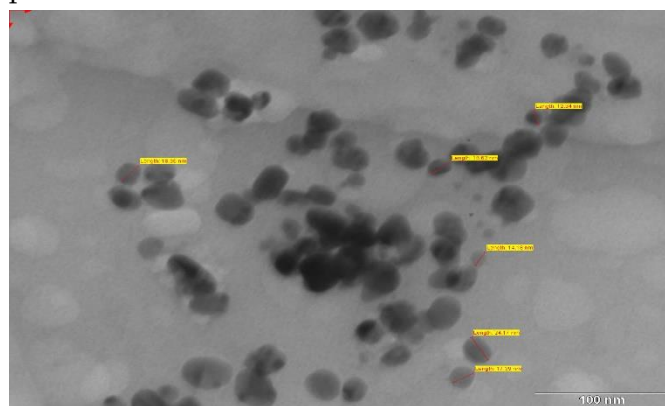
Confirm the high selectivity of the prepared NPs for the Cd ions in the aqueous systems that lead to the aggregation of Cd-Ag NPs.





### TEM analysis

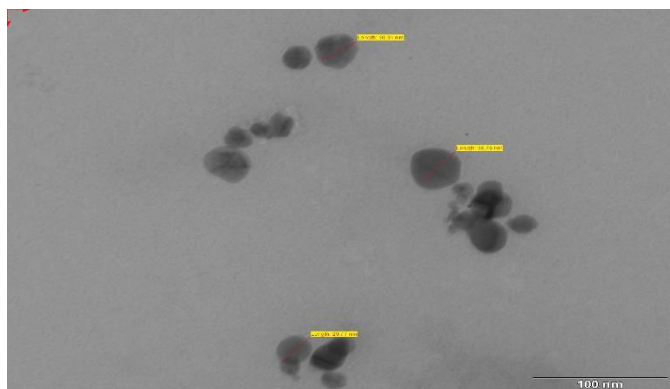
Transmission electron microscopy (TEM) has been used to identify the size, shape and morphology of nanoparticles. It reveals that the silver nanoparticles are well dispersed and predominantly spherical in shape, while some of the NPs were found to be having structures of irregular shape as shown in Fig. 5. The nanoparticles are homogeneous and spherical which conforms to the shape of SPR band in the UV-visible spectrum. These indicates that the size of these silver nanoparticles is 10 to 24 nm. Some distribution at lower range of particle size indicates that the synthesized particles are also in lower range of particle size.



**Fig. 5** TEM image of AgNPs with CLE

After the addition of the Cd(II), a redshift from 404 to 432 nm along with a decrease in the plasmonic peak intensity of CLE-AgNPs was observed while the rest of the metal ions did not induce any such change after the addition of CLE-AgNPs. These results confirm the excellent selectivity of the prepared NPs for Cd(II) ions over the rest of the metal ions. Cd(II) is a hard acid; therefore, according to HSAB principle, it prefers to bind with hard base [12]. The Curry tree extract collected from the Pilvai college campus has polyphenolic contents, thus Cd(II) forms a bond with the oxygen atom present in the extract. Therefore, metal-ligand interaction between the Cd(II) and oxygen atom causes the aggregation of NPs. This interaction was confirmed with TEM, analysis. Figure

6 shows the TEM images after the addition of the Cd(II) ions onto prepared NPs solution. The enhanced selectivity of the prepared CLE-AgNPs was further determined in the presence of other reactive cations.



**Fig. 6** TEM image of CLE-AgNPs-Cd<sup>2+</sup>

#### IV. Conclusion

A very simple green synthesis of silver nanoparticles using Curry tree (*Murraya koenigii*) leaf extract at room temperature was reported in the present study. Curry tree leaves were collected from our college campus. It is observed that the synthesis was efficient in terms of reaction time and stability of the synthesized nanoparticles which exclude extra stabilizers or reducing agents. It proves that eco-friendly, rapid green synthesis providing a cheap and efficient route for the synthesis of silver nanoparticles. Therefore, this reaction pathway satisfies all the conditions of a green chemical process. Moreover, an attempt has been made to bind a metal like Chromium with Silver Nanoparticles. It is observed that the synthesised silver nanoparticles showed sufficient detection of Cd(II). The prepared Cd(II)-AgNPs also displayed long term stability against aggregation which could be useful for environmental applications. The Cd(II) ions assisted aggregation of AgNPs can be determined by the UV-Vis spectrophotometer. The prepared probe can be successfully used in the real water samples too. It can also be easily applied for the detection of Cd(II) ions

and does not require costly chemicals and instrumentation. Thus, the present method is user-friendly, as well as suitable for onsite detection tests.

#### V. Acknowledgement

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## An Analysis of Profitability of Selected Public Sector Banks

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### ABSTRACT

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The purpose of this paper is to determine and compare financial performance of banks based on banks' profitability ratios. The objective is to rank a sample of 12 banks which comprise the National Stock Index's PSU Bank Nifty index for a period of five years from 2015 to 2019. The study uses ANOVA analysis to compare various banks based on their profitability ratios. Based on ANOVA analysis the study tests various hypothesis regarding significance of difference in profitability ratios of the sample banks. The study reveals that for the period the banks have heterogeneous performance indicators although the population group is homogeneous during sample selection. The conclusions part also discusses importance of well-functioning public sector banks in India.

**Keywords :** National Stock Exchange (NSE), NIFTY PSU Bank Index, ANOVA, Profitability Ratios.

### I. INTRODUCTION

Public Sector Banks play very important and crucial role in resource mobilization in any economy. It fulfills the need of all sectors of the economy specially developing economy like India. Financial ratios are standard tool for analyzing an enterprise and its financial performance over a period of time. Researchers combine key financial ratios across the industries whether of any type with qualitative and quantitative to analyze the firms (Barnes, 1987). The financial performance of a firm is assessed by the comparison of different ratios (Benishay, 1971). The Banking industries financial reporting is prominently different from other industries. The foremost task of any bank is to attract funds at a reasonably lower cost

and reinvest them at higher return on investment. Therefore, measures of several types of financial ratios are critical. The maximum number of financial ratios published in different sources may create confusion in understanding the actual financial health of an enterprise (Gombola and Ketz, 1983). In the recent report of RBI it said that the ability of public sector banks to sustain credit growth in consonance with the financing requirements will led by recapitalization. Public sector banks were recapitalized with Rs. 90,000 crore in Financial Year 18 and another Rs 1.6 trillion was also infused into these banks in Financial Year 19. This will support to maintain their capital position. The report revealed that in January 2019, there were 11 Public Sector Banks and one Private Bank under the Prompt Corrective Action (PCA) framework.

In this paper, we measure banks financial performance on the basis of profitability ratios i.e. ROA, NIM and ROE. This procedure can determine best and worst public sector bank in the given set of PSU BANK Nifty Index. In the practice, stock market investor used to analyze banks' liquidity, solvency and overall performance to predict the prices. We propose to use profitability ratios to determine the performance of banks on stock market returns. The data used in the empirical study is obtained from National Stock Exchange, a regular financial database of Moneycontrol.com. The sample includes annual financial data of 12 PSU Banks of India comprising PSU Bank Nifty observed over the period 2015 to 2019.

## II. REVIEW OF LITERATURE

Lartey, V. C., Antwi, S., & Boadi, E. K. (2013). The research was to find out the association between the liquidity and the profitability of listed banks on GSE (Ghana Stock Exchange). Total seven banks was taken for the study. In the descriptive study it panel data method. The study regressed liquidity ratio on profitability ratio and found very weak relationship between them. Kemal, M. U. (2011). They used accounting ratios to assess the financial performance. They assessed the performance of Royal bank of Scotland in their study for the period of 2006 to 2009. They used 20 ratios to assess the profitability, liquidity, asset management, leverage and cash flows. Alam, H. M., Raza, A., & Akram, M. (2011). They studied the banks mainly private and public

sector banks between the period 2006 to 2009 and assess financial performance with the help of ratios. Arora and Kaur (2006) on the basis of ROA, NPA, Business per Employee ration they assessed that banks should upgrade the technology and training to enhance the performance of the selected banks. Prasad, K. V. N., & Ravinder, G. (2011) With the help of Fundamental analysis they assessed the performance of the selected banks. Ratios were used OPM, GPM, NPM, EPS, Dividend Payout Ratio, ROE, ROA, PE ratios and they were applied SBI, PNB, ICICI and HDFC four major banks of India. Ganesan, P. (2003) paper investigates the priority sector banks advances and its relationships between the profitability of the selected banks. Padma, D., & Arulmathi, V. (2013) study attempts to investigate profitability of State Bank of India (SBI) and ICICI bank. Profitability ratios, Solvency ratios and Management efficiency ratios were applied on SBI and ICICI Bank to assess the efficiency and solvency position. Saini, N. (2014) their study attempts to analyze Banks and considered the backbone of the economy. SBI, PNB, ICICI and HDFC. banks were analyzed to assess the profitability and productivity.

### Objective of the Study

1. To study the Profitability ratios of constituent Bank of NIFTY PSU Bank Index.
2. To make a comparison of Stock Market performance of constituent Bank of NIFTY PSU Bank Index for the entire study period.

## III. Research Methodology

Three most important measures of bank profitability are recognized as the "Return on Assets" (ROA), "Return on Equity" (ROE) and the "Net Interest Margin" (NIM). Ratios are comparisons of various quantities. Used these formulas to determine the profitability ratio of a bank

1)

$$ROA = \frac{\text{Net Income}}{\text{Average Total Assets}}$$

2)

$$ROE = \frac{\text{Net Income}}{\text{Shareholder's Equity}}$$

3)

$$NIM = \frac{\text{Investment Returns} - \text{Interest Expenses}}{\text{Average Earning Assets}}$$

To analyze the profitability ratio of the selected PSU Banks F test or ANOVA (Analysis of Variance), means analysis of variances is applied. ANOVA is a statistical model which analyzes the variation among and between the selected groups. In the present study the group of banks (constituent Bank of NIFTY PSU Bank Index) was selected. Analysis of variance (ANOVA) is a collection of statistical models and their associated estimation procedures (such as the "variation" among and between groups) used to analyze the differences among group means in a sample. ANOVA was developed by statistician and evolutionary biologist Ronald Fisher. The ANOVA is based on the law of total variance. ANOVA provides a statistical test of whether two or more population means are equal, and therefore generalizes the t-test beyond two means.

The formula used for the study is

$$F = \frac{MSB}{MSW}$$

MSB = Mean Square between Groups

MSW = Mean Square within Groups

**Data Analysis, Hypothesis Testing and Interpretation**

**ROA %**

Before applying any parametric test it is inevitable to check whether the selected data for the test are normally distributed or not. To check the normality Jarque-Bera test were applied with the help of EVIEWS version 10 and following hypothesis were formed.

H0 :the selected ratios for the banks are normally distributed

H1= the selected ratios for the banks are not normally distributed

Descriptive/Banks	Mean	Jarque-Bera	Probability	Rank as Per Mean
INDIAN_BANK	0.42	0.462	0.794	1
SBI	0.254	0.459	0.795	2
J_K	-0.03	1.697	0.428	3
BOB	-0.084	0.397	0.82	4
CANARA	-0.092	0.484	0.785	5
UBI	-0.15	0.611	0.737	6
SYNDBANK	-0.346	0.565	0.754	7
OBC	-0.53	1.507	0.471	8
PNB	-0.558	0.533	0.766	9
BNKOFINDIA	-0.566	0.693	0.707	10
CENTRAL_B	-0.852	0.417	0.812	11

ALL_BK	-1.072	0.651	0.722	12
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As per the above table the probability value of the each bank for the corresponding Jarque-Bera test is more than 5%. Hence we cannot reject thy null hypothesis rather we accept the null hypothesis and can infer that all the banks ROA ratio is normally distributed and further can go for ANOVA test. Along with the test above table shows the different descriptive of the selected banks. And as per the value of the mean of the ROA ratio rank has been given to the selected banks. According to the rank Indian Bank is having the best ROA ratio and Allahabad Bank is having the worst.

As abasic condition to apply ANOVA test there is a need to check the homogeneity of variances. following hypothesis were formed and Leven's test were applied with the help of EVIEWS version 10.

H0 : Variances arehomogeneous of the selected banks

H1= Variances are not t homogeneous of the selected banks

Method	Df	Value	Probability
Bartlett	11	20.91308	0.0343
Leven	(11,48)	2.452495	0.0160
Brown-Forsythe	(11,48)	0.695656	0.7360

The probability value of Leven's test is less than 5% so that we can reject the null hypothesis and can assume that variances of the selected banks are not homogeneous and cannot apply the ANOVA test. To check the significance valueWelch test is applied tocheck the mean value of ROA ratio of the selected banks.

Following hypothesis were formed to analyze the differences of ROA ratio among the selected banks.

H0= There is no significant difference between ROA Ratio in selected banks under the study

H1= There is significant difference between ROA Ratio in selected banks under the study

To test the above hypothesis Welch test was applied on the above table with the help of EVIEWS version 10 and the following results were shown.

Method	df	Value	Probability
AnovaF-test	(11,48)	1.437240	0.1876
Welch F-test	(11,18.611)	2.661309	0.0303

The Probability value of the corresponding test is less than 5%. Therefore we can reject the null hypothesis that there is no significant difference between the ROA Ratio in selected banks under the study rather we accept the alternate hypothesis that There is significant difference between ROA Ratio in selected banks under the study.

ROE (%)

Before applying any parametric test it is inevitable to check whether the selected data for the test are normally distributed or not. To check the normality Jarque-Bera test were applied with the help of EVIEWS version 10 and following hypothesis were formed.

H0 :the selected ratios for the banks are normally distributed

H1= the selected ratios for the banks are not normally distributed

Descriptive/ Banks	Mean	Jarque-Bera	Probability	Rank As per Mean
ALL_BK	6.582	0.523	0.770	1
BNKOFINDIA	4.160	0.498	0.780	2
BOB	-0.518	1.767	0.413	3
CANARA	-1.224	0.373	0.830	4
CENTRAL_B	-1.986	0.502	0.778	5
INDIAN_BANK	-2.866	0.607	0.738	6
J_K	-8.278	0.579	0.749	7
OBC	-10.542	0.542	0.763	8
PNB	-11.332	0.512	0.774	9
SBI	-11.988	1.589	0.452	10
SYNDBANK	-15.654	0.392	0.822	11
UBI	-39.848	0.824	0.662	12

As per the above table the probability value of the each bank for the corresponding Jarque-Bera test is more than 5%. Hence we cannot reject thy null hypothesis rather we accept the null hypothesis and can infer that all the banks ROE ratio is normally distributed and further can go for ANOVA test. Above table shows the different descriptives of the selected banks. And as per the value of the mean of the ROE ratio rank has been given to the selected banks. According to the rank Allahabad Bank is having the best ROE ratio and Union Bank of India is having the worst.

As a basic condition to apply ANOVA test there is a need to check the homogeneity of variances. following hypothesis were formed and Leven’s test were applied with the help of EVIEWS version 10.

H0 : Variances arehomogeneous of the selected banks

H1= Variances are not t homogeneous of the selected banks

Method	Df	Value	Probability
Bartlett	11	46.61718	0.0000
Leven	(11,48)	5.507016	0.0000
Brown-Forsythe	(11,48)	1.304772	0.2510

The probability value of Leven’s test is less than 5% so that we can reject the null hypothesis and can assume that variances of the selected banks are not homogeneous and cannot apply the ANOVA test. To check the significance value Welch test is applied to check the mean value of ROE ratio of the selected banks.

Following hypothesis were formed to analyze the differences of ROE ratio among the selected banks.

H0= There is no significant difference between ROE Ratio in selected banks under the study

H1= There is significant difference between ROERatio in selected banks under the study

To test the above hypothesis Welch test was applied on the above table with the help of EVIEWS version 10 and the following results were shown.

Method df	Df	Value	Probability
AnovaF-test	(11,48)	1.580800	0.1351
Welch F-test	(11,18.4355)	2.534106	0.0376

The Probability value of the corresponding test is less than 5%. Therefore we can reject the null hypothesis that there is no significant difference between the ROE Ratio in selected banks under the study rather we accept the alternate hypothesis that There is significant difference between ROERatio in selected banks under the study.

**NIM%**

Before applying any parametric test it is inevitable to check whether the selected data for the test are normally distributed or not. To check the normality Jarque-Bera test were applied with the help of EVIEWS version 10 and following hypothesis were formed.

H0 :the selected ratios for the banks are normally distributed

H1= the selected ratios for the banks are not normally distributed

Descriptive/ Banks	Mean	Jarque-Bera	Probability	Rank as Per Mean
J_K	3.288	0.341	0.843	1
SBI	2.388	0.291	0.864	2
INDIAN_BANK	2.362	0.372	0.830	3
ALL_BK	2.306	0.230	0.892	4
PNB	2.252	0.602	0.740	5
CENTRAL_B	2.126	0.776	0.678	6
OBC	2.070	0.661	0.719	7
BOB	2.042	0.649	0.723	8
UBI	2.036	0.298	0.862	9
SYNDBANK	2.000	0.438	0.803	10
BNKOFINDIA	1.906	0.540	0.763	11
CANARA	1.852	0.618	0.734	12

As per the above table the probability value of the each bank for the corresponding Jarque-Bera test is more than 5%. Hence we cannot reject thy null hypothesis rather we accept the null hypothesis and can infer that all the banks NIM ratio is normally distributed and further can go for ANOVA test. Above table shows the different descriptives of the selected banks. And as per the value of the mean of the NIM ratio rank has been given to the selected banks. According to the rank J&K Bank is having the best NIM ratio and CANARA Bank is having the worst.

As a basic condition to apply ANOVA test there is a need to check the homogeneity of variances. following hypothesis were formed and Leven’s test were applied with the help of EVIEWS version 10.

H0 : Variances arehomogeneous of the selected banks

H1= Variances are not t homogeneous of the selected banks

Method	Df	Value	Probability
Bartlett	11	9.285059	0.5956
Leven	(11,48)	1.045807	0.4232
Brown-Forsythe	(11,48)	0.519759	0.8804

The probability value of Leven’s test is more than 5% so that we cannot reject the null hypothesis and can assume that variances of the selected banks are homogeneous and can apply the ANOVA test. To check the significance value ANOVA test is applied to check the mean value of NIIM ratio of the selected banks.

Following hypothesis were formed to analyze the differences of NIM ratio among the selected banks.

H0= There is no significant difference between ROE Ratio in selected banks under the study

H1= There is significant difference between ROE Ratio in selected banks under the study

To test the above hypothesis ANOVA test was applied on the above table with the help of EVIEWS version 10 and the following results were shown.

Method df	Df	Value	Probability
AnovaF-test	(11,48)	18.42428	0.0000
Welch F-test	(11,18.8676)	20.51246	0.0000

The Probability value of the corresponding test is less than 5%. Therefore we can reject the null hypothesis that there is no significant difference between the NIM Ratio in selected banks under the study rather we accept the alternate hypothesis that There is significant difference between NIM Ratio in selected banks under the study.

#### IV. CONCLUSION

Return on Asset ratio of all selected banks among all, Indian Bank is having highest mean that is 0.42 if we consider the five year data of the ratio where as Allahabad Bank is having the worst average mean of ROA ratio. The ROA ratio gives the idea to the investors that how effectively bank is able to convert its investment into income. On this front Indian Bank is performing better where Allahabad Bank were not able to earn on its investments. Return on Equity ratio of all selected banks among all Allahabad bank is having highest mean that is 6.582 if we consider five year data of the ratio where as Union Bank of India is having the worst average mean of ROE ratio. ROE is other than a measure of profit; it's to calculate the efficiency. An increasing ROE suggests that a

company is growing its capability to make profit without extra much capital. It is also a measure that how well a management is using shareholders capital to earn profit. Net Interest Margin Ratio of all selected banks among all Jammu and Kashmir Bank 3.288 having highest if we consider five year data of the ratio where Canara Bank is having the worst average mean of NIM Ratio. NIM gives consideration towards the effectiveness of a Bank’s investment decisions. NIM is an important indicator of financial consistency however NIM of two banks should not be compared as their behavior may be different due to asset sizes, and customer base, priority sector lending and other factors. Profitability positions of Public sector banks in India play most important function in banking. A physically powerful financial organization attracts investment and provides business opportunities also

helps in mobilizing savings. To conclude that there is difference among the mean value of ROA, ROE and NIM. It suggested that management of the banks should take effective steps to improve the profitability positions of the banks.

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