International Conference on Advances in Materials, Computing and Communication Technologies
In Association with International Journal of Scientific Research in Science and Technology
Volume 9 | Issue 1 | Print ISSN: 2395-6011 | Online ISSN: 2395-602X (www.ijsrst.com)

A Deep CNN Model Approach for The Early Detection of Plant Diseases In Android

Nidhi Daniel[1], Sreeja S. S[2]
[1]Department of Computer Science and Engineering, Marthandam College of Engineering and Technology, Kuttakuzhi, Tamil Nadu, India
[2]Assistant Professor, Department of Computer Science and Engineering, Marthandam College of Engineering and Technology, Kuttakuzhi, Tamil Nadu, India

ABSTRACT

A deep CNN model approach for the early detection of plant diseases is to detect the plant diseases in advance and to detect the diseases with the help of modern computer technology. Automatic plant disease detection provides benefits in monitoring the large crop fields and helps in detecting the symptoms of the disease when they are found on the leaves. In this paper, the primarily focus on finding the plant diseases and which will reduce the crop loss and hence increases the production efficiency. The dataset used here consists of several varieties of plants of both affected and healthy, and all these images are collected from various freely available sources and manually. Deep learning with convolutional neural networks has achieved great success in the classification of various plant diseases. In this study, a variety of neuron-wise and layer-wise visualization methods were applied using a CNN, trained with a publicly available plant disease image dataset. The database obtained is properly segregated and the different plant species are identified and are renamed to form a proper database then obtain test-database which consists of various plant diseases that are used for checking the accuracy and confidence level of the project. Then using training data we will train our classifier and then output will be predicted with optimum accuracy. We use Convolution Neural Network (CNN) which comprises of different layers which are used for prediction. The dataset used here consists of several varieties of plants of both affected and healthy, and all these images are collected from various freely available sources and manually. A new CNN model was trained and tested. This paper is concerned with a new approach to the development of plant disease recognition model, based on leaf image classification, by the use of deep convolutional networks.

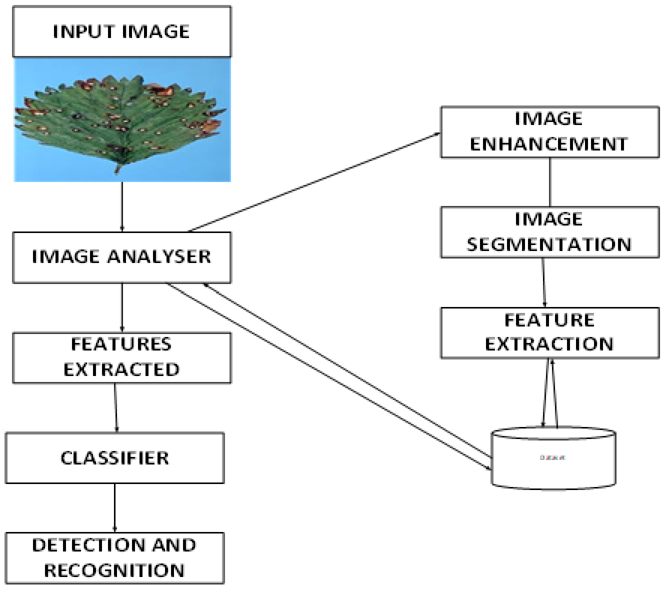
Keywords : CNN, Deep Learning

I. INTRODUCTION

With the rapid development of the mobile Internet, the widespread use of smart phones and the popularization of social media self-media, a large amount of picture information has accompanied.

This system helps in identification of plant disease and provides remedies that can be used as a defense mechanism against the disease. Inexperienced pesticide usage can cause the development of long-term resistance of the pathogens, severely reducing the ability to fight back. Timely and accurate diagnosis of plant diseases is one of the pillars of precision agriculture .It is crucial to prevent unnecessary waste of financial and other resources, thus achieving healthier production, by addressing the long-term pathogen resistance development problem and mitigating the negative effects of climate change. Nevertheless, as pictures become important carrier of network information, problems also arise. Traditional information materials are recorded by words, and we can retrieve and process the required content by searching keywords. However, when pictures express the information, we cannot retrieve or process the information expressed in the pictures. The picture brings us a convenient way of information recording and sharing, but it is difficult for us to use the information expressed by the image. Deep learning with convolutional neural networks has achieved great success in the classification of various plant diseases. In this study, a variety of neuron-wise and layer-wise visualization methods were applied using a CNN, trained with a publicly available plant disease image dataset. The database obtained is properly segregated and the different plant species are identified and are renamed to form a proper database then obtain test-database which consists of various plant diseases that are used for checking the accuracy and confidence level of the project .Then using training data we will train our classifier and then output will be predicted with optimum accuracy. We use Convolution Neural Network (CNN) which comprises of different layers which are used for prediction. The dataset used here consists of several varieties of plants of both affected and healthy, and all these images are collected from various freely available sources and manually. A new CNN model was trained and tested. We showed that neural networks can capture the colors and textures of lesions specific to respective diseases upon diagnosis, which resembles human decision-making. While several visualization methods were used as they are, others had to be optimized to target a specific layer that fully captures the features to generate consequential outputs. Moreover, by interpreting the generated attention maps, several layers were identified that were not contributing to inference and removed such layers inside the network, decreasing the number of parameters by 75% without affecting the classification accuracy. Finally, this proposed model has given very good accuracy when tested in field conditions.

II. ARCHITECTURAL DESIGN



III. RELATED WORK

Convolutional Neural Networks (CNNs) have been established as a powerful class of models for image classification and related tasks. Detection And Classification Technique Of Yellow Vein Mosaic Virus. Authors:Dipak K.Kole,Arya Ghosh and Soumya Mitra[1].In this paper presents classification and detection techniques that can be used for plant leaf disease classification. Here preprocess is done before feature extraction. RGB images are converted into white and then converted into grey level image to extract the image of vein from each leaf. Then basic Morphological functions are applied on the image.

Then the image is converted into binary image. After that if binary pixel value is 0 it's converted to corresponding RGB image value. Finally by using pearson correlation and Dominating feature set and Naïve Bayesian classifier dis-ease is detected.

Second part is applying Gaussian filter is used to remove all the noise and thresholding is done to get the all green color component. K-means clustering is used for segmentation. All RGB images are converted into HSV for extracting feature.

Drawback is It is not suitable for large data sets. Detecting jute plant disease using image processing and machine learning byZarren Naowal Reza,Faiza Nuzhat,Nuzhat Ashraf Mahsa,Md.Haider Ali The paper [3] presents the technique of detecting jute plant disease using image processing. Image is captured and then it is realized to match the size of the image to be stored in the database. Then the image is enhanced in quality and noises are removed. Hue based segmentation is applied on the image with customized thresholding formula. Then the image is con-verted into HSV from RGB as it helps extracting region of interest. This approach proposed can significantly support detecting stem oriented diseases for jute plant.

Drawback

This system does not contain disease detection technique for the leaves

Plant disease analysis using histogram matching based on bhattacharaya's dis-tance calculation

Authors:M.RTejonidhi,B.R,Najesh,Jagadeesh Gujarnuru Math,Ashwin Geet Dsa[4] they have proposed for a technique that can be used for detecting paddy plant disease by comparing it with 100 healthy images and 100 sample of disease1 and another 100 sample of disease2. It's not sufficient enough to detect disease or classify it training data is not linearly separable.

Detection of unhealthy plant leaves using image processing and genetic algo-rithm with arduino by MS Arya,K Anjali,Divya Unni

In paper [5] detection of unhealthy plant leaves include some steps are RGB image acquisition. Converting the input image from RGB to HSI format. Masking and removing the green pixels. Segment the components using Otsu's method. Computing the texture features using color-co-occurrence methodology and finally classifying the disease using Genetic Algorithm.

Maturity and disease detection in toma-to using computer vision by MS Arya,K Anjali,Divya Unni

Paper [6] includes tomato disease detection using computer vision. A gray scale image is turned into binary image depending on threshold value. The threshold algorithm is used for image segmentation. The threshold values are given color indices like red, green, blue. But the thresholding is not a reliable method as this technique only distinguishes red tomatoes from other colors. It becomes difficult to distinguish ripe and unripe tomatoes. For this K-means clustering algorithm is used to overcome the draw-backs. K-means create a particular number of non-hierarchical clusters. This method is numerical, unsupervised, non-deterministic and iterative. Then separating the infected parts from the leaf the RGB image was converted into YcbCr to enhance the feature of the image. The final step is the calculation of the percentage of infection and distinguishing the ripe and unripe tomatoes. The methodology for cucumber disease detection is presented.

Cucumber disease detection using artifi-cial neural network by Pooja Pawar,Varsha Turkar,Pravin Patil

In paper [7]. The methodology includes image acquisition, image preprocessing, feature ex-traction with Gray level co-occurrence matrix (GLCM) and finally classified with two types: Unsupervised classification and supervised classification.

Detection and measurement of paddy leaf disease symptomsusingimageprocessing.byR.P.Narmadha,G.a rulvadivu

In paper [8] RGB images are converted into gray scale image using color conversion. Various enhancement techniques like histogram equalization and contrast adjustment are used for image quality enhancement. Different types of classification features like SVM, ANN, FUZZY classification are used here. Feature extract6ion uses different types of feature values like texture feature, structure feature and geo-metric feature. By using ANN and FUZZY classification, it can identify the disease of the paddy plant.

Recent machine learning based ap-proaches for disease detection and classi-fication of agricultural products by Mukesh Kumar Tripathi,Dhananjay D.Maktedar

In paper [9] popular methods have been utilizes machine learning, image processing and classification based approaches to identify and detect the disease of agricultural product.

Detection of leaf disease and classifi-cation using digital image processing.

R.Meenaprakash,G.P.Saraswathy,G.Ramalakshmi,K.H .Mangaleshwari,T.Kaviya

In paper [10] image processing technique are used to detect the citrus leaf disease. This system includes: Image preprocessing, segmentation of the leaf using K-means clustering to determine the diseased areas, feature extraction and classification of disease. Uses Gray-Level Co-Occurrence matrix (GLCM) for feature extraction and classification is done using sup-port vector machine (SVM).

IV. METHODS AND MATERIAL

This paper first introduces Image preprocessing

Image pre-processing

The image acquired is pre-processed. The pre-processing starts by converting the RGB image to L*a*b* color space. The L*a*b* color space consists of Luminosity layer L*, chromacity layer a* and b*. All of the color information is stored in the layers a* and b*. It requires to make color form so that the RGB colored image is converted to L*a*b* space. The function is makecform(), later the format is applied to the image that was acquired.

Segmentation

There are several algorithms used for segmentation but one of the best methods used for detection of disease is k- means clustering. *k*-means clustering is a method of vector quantization, originally from signal processing, that is popular for cluster analysis in data mining. k-means clustering aims to partition *n* observations into *k* clusters in which each observation belongs to the cluster with the nearest mean, serving as a prototype of the cluster. This result in a partitioning of the data space into Voronoi cells.*k*-means clustering tends to find clusters of comparable spatial extent, while the expectation-maximization mechanism allows clusters to have different shapes.

The algorithm has a loose relationship to the *k*-nearest neighbor classifier, a popular machine learning technique for classification that is often confused with *k*-means because of the *k* in the name. One can apply the 1-nearest neighbor classifier on the cluster centers obtained by *k*-means to classify new data into the existing clusters.

Classify the colors a*b* color space using k-means clustering. Since the image has 3 colors we create three clusters. Measure the distance Euclidean Distance Metric. Label every pixel in that image using results from K means.

Given a set of observations ($\mathbf{x}_1$, $\mathbf{x}_2$, …, $\mathbf{x}_n$), where each observation is a d-dimensional real vector, *k*-means clustering aims to partition the *n* observations into k ($\leq$ n) sets$\mathbf{S} = \{S_1, S_2, \ldots, S_k\}$ so as to minimize the within-cluster sum of squares (WCSS) (sum of distance functions of each point in the cluster to the K center). In other words, its objective is to find:

$$\underset{\mathbf{S}}{\arg\min} \sum_{i=1}^{k} \sum_{\mathbf{x} \in S_i} \|\mathbf{x} - \boldsymbol{\mu}_i\|^2$$

where μ_i is the mean of points in S_i.

Cluster analysis or clustering is the task of grouping a set of objects in such a way that objects in the same group (called a cluster) are more similar (in some sense or another) to each other than to those in other groups (clusters).

In cluster analysis, the *k*-means algorithm can be used to partition the input data set into *k* partitions.

Label every pixel in the image using results from K means. Then a blank cell array is created to store the results of clustering. Followed by create RGB label using pixel_labels. Selection of appropriate cluster is another important aspect. The cluster which displays the maximum disease affected part is to be selected. In the next step of feature extraction, the features of the selected cluster are extracted.

V. FEATURE EXTRACTION

The features of the selected cluster are extracted. The selected image is converted to grayscale since the image is in RGB format. At the next step the Gray Level Cooccurance Matrices (GLCM). The required statistics are derived from Gray level cooccurance Matrices (GLCM). The following 13 features that is extracted and evaluated:

Contrast, Corelation, Energy, Homogenity, Mean, Standard Deviation, Entopy, RMS. Variance, Smoothness, Kurtosis, Skewness. The thirteen features are stored in an array.

VI. CLASSIFICATION

Support Vector Machines are based on the concept of decision planes that define decision boundaries. A decision plane is one that separates between a set of objects having different class memberships.

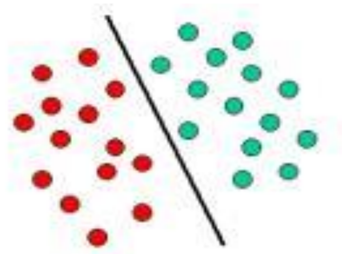


Fig 1.1 A classic example of a linear classifier

The above is a classic example of a linear classifier, i.e., a classifier that separates a set of objects into their respective groups (GREEN and RED in this case) with a line. Most classification tasks, however, are not that simple, and often more complex structures are needed in order to make an optimal separation, i.e., correctly classify new objects (test cases) on the basis of the examples that are available (train cases). This situation is depicted in the illustration below. Compared to the previous schematic, it is clear that a full separation of the GREEN and RED objects would require a curve (which is more complex than a line).

VII. CONCLUSION

It focused how image from given data set (trained data set) in field and past data set used predict the pattern of plant diseases using CNN model. This brings some of the following insights about plant leaf disease prediction. As maximum types of plant leaves will be covered under this system, farmer may get to know about the leaf which may never have been cultivated and lists out all possible plant leaves, it helps the farmer in decision making of which crop to cultivate. Also, this system takes in to consideration the past production of data which will help the farmer get in sight in to the demand and the cost of various plants in market. Agricultural department wants to automate the detecting the yield crops from eligibility process (real-time). To automate this process by show the prediction result in web application or desktop application. To optimize the work to implement in Artificial Intelligence environment.

VIII. REFERENCES

[1]. Anand H. Kulkarni, R.K. Ashwin Patil Applying image processing technique to detect plant diseases Int J Mod Eng Res, 2 (5) (2012), pp. 3661-3664

[2]. Arti N. Rathod, Bhavesh Tanawal, Vatsal Shah Image processing techniques for detection of leaf disease Int J Adv Res Comput Sci Softw Eng, 3 (11) (2013)

[3]. S. Arivazhagan, R. Newlin Shebiah, S. Ananthi, S. Vishnu Varthini Detection of unhealthy region of plant leaves and classification of plant leaf diseases using texture features

[4]. R. Badnakhe Mrunalini, Prashant R. Deshmukh An application of K- means clustering and artificial intelligence in pattern recognition for crop diseases.

[5]. Piyush Chaudhary, et al .Color transform based approach for disease spot detection on plant leaf Int Comput Sci Telecommun, 3 (6) (2012) Int Conf Adv Inf Technol, 20 (2011) 2011 IPCSIT

[6]. Sabah Bashir, Navdeep Sharma Remote area plant disease detection using image processing

[7]. IOSR J Electron Commun Eng, 2 (6) (2012), pp. 31-34 ISSN: 2278-2834

[8]. Sanjay B. Dhaygude, Nitin P. Kumbhar Agricultural plant leaf disease detection using image processing Int J Adv Res Electr Electron Instrum Eng, 2 (1) (2013)

[9]. Sanjay B. Patil,Leaf disease severity measurement using image processing.