Heart Disease Prediction using Machine Learning

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ABSTRACT

The correct prediction of cardiovascular disease can prevent life threats, and incorrect prediction can prove to be fatal at the same time. Heart disease, also known as cardiovascular disease is one of the complex diseases and globally many people suffered from this disease. It is one of the major causes of mortality worldwide, can be mitigated by early heart disease diagnosis.

However, the mortality rate can be drastically controlled if the disease is detected at early stage and preventive measures are adopted as soon as possible. In the modern world, there are some revolutionary advancements within the field of medical science and research and this can be no totally different for ECG. Electrocardiogram (ECG) gives useful information about morphological and functional details of heart which is used to predict various cardiac diseases. In this article, we proposed an efficient and accurate system to diagnosis heart disease which is based on machine learning techniques. Raw ECG signal contains useful features which can be used to detect different heart diseases. The various ECG parameters like heart rate, age, sex, cholesterol level, blood pressure, ST interval of ECG signal are used for analysis. Several machine learning (ML) algorithms have been used for cardiovascular disease prediction. Machine Learning is employed across several ranges around the world. The

healthcare business isn't any exclusion.

I. INTRODUCTION

Heart disease is a general term that includes many types of heart problems. It's also called cardiovascular disease, which means heart and blood vessel disease. Heart disease has a global impact and has garnered a great deal of attention in medical research. But there are ways to prevent and manage many types of heart disease. The nature of heart disease is complex and

Hence, the disease must be handled carefully. By adopting healthy lifestyle habits early, anyone can potentially live longer with a healthier heart. There are many different types of heart diseases. Some may be born with, called congenital heart disease. Other types develop during your lifetime. Coronary artery disease (also called coronary heart disease) is the most common type of heart disease. It happens slowly over time when a sticky substance called plaque builds up in the arteries that supply your heart muscle with blood. The plaque narrows or blocks blood flow to the heart muscle and can lead to other heart problems:

1. Angina - chest pain from lack of blood flow
2. Heart attacks - when part of the heart muscle dies from loss of blood flow

3. Heart failure - when your heart can't pump enough blood to meet your body's needs
4. Arrhythmia - a problem with the rate or rhythm of your heartbeat
5. Congenital heart defects- These are heart irregularities that are present at birth.
6. Coronary artery disease (CAD)- It is caused by the build-up of plaque in the heart's arteries. It's sometimes called ischemic heart disease.
7. Heart infections- Heart infections may be caused by bacteria, viruses, or parasites.
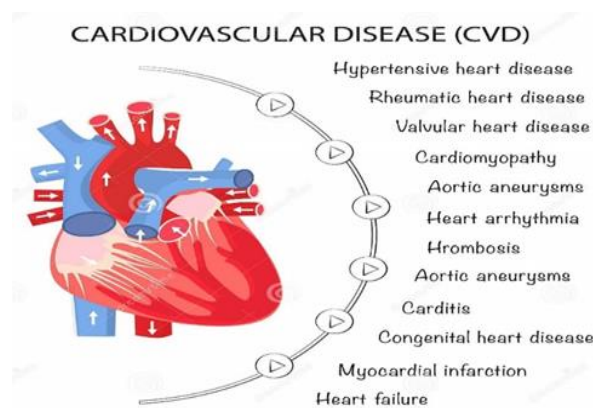

Fig 1. Types of heart diseases

The causes of heart disease depend on the type of disease. Heart disease develops when there is damage to all or part of the heart, a problem with the blood

vessels leading to or from the heart, a low supply of oxygen and nutrients to the heart, a problem with the rhythm of the heart In some cases, there is a genetic cause. However, some lifestyle factors and medical conditions can also increase the risk. These include high blood pressure, high cholesterol, Smoking, a high intake of alcohol, overweight and obesity.

II. LITERATURE SURVEY

With growing development in the field of medical science alongside machine learning various experiments and researches has been carried out in these recent years releasing the relevant significant papers.

Aadar Pandita, Sarita Yadav proposed a paper "Prediction of Heart Disease using Machine Learning Algorithms" using machine learning algorithms. .They used Several Machine Learning algorithms such as Naïve Bayes, K-Nearest Neighbor, Decision Tree and Random Forest are correlated to find the most precise model. In this project the algorithm is given with input variables and actual output obtained then algorithm compares between the actual and predicted output to identify errors and modifies the model precisely. The heart disease database is from the UCI repository. The accuracy of their model is 0.9907. And they conclude it with the statement that with the help of KNN algorithm we can know the patients who are suffering from heart diseases.

M.Snehith Raja, M.Anurag, Ch.Prachetan Reddy proposed a paper "Machine learning based heart disease prediction system". This study is based on the analysis data collected in SAQ. They used Several Machine Learning algorithms such as KNN, Random forest, K-mean clustering, Decision Trees. The algorithm constructs N of Decision trees and outputs the class that is the average of all decision trees output. So accuracy of prediction at early stages was achieved effectively

Aditi Gavhane, Gouthami Kokkula, Isha Pandya, Prof. Kailas Devadkar (PhD) proposed a paper "Prediction of Heart Disease Using Machine Learning" to develop an application which can predict the vulnerability of a heart disease given basic symptoms like age, sex, pulse rate etc. They used ANN, multi-layer perceptron (MLP) to train and test the dataset. The system was developed using python code using PyCharm IDE.

With the help of python library sci-kit learn, the system was implemented successfully.

Baban.U. Rindhe, Nikita Ahire, Rupali Patil, Shweta Gagare, Manisha Darade proposed a paper "Heart Disease Prediction Using Machine Learning". They used some machine learning algorithms such as Artificial Neural Network (ANN), Random Forest, and Support Vector Machine (SVM). This project aims to know whether the patient has heart disease or not. The records in the dataset are divided into the training set and test sets. After preprocessing the data.

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The data classification technique namely support vector machine, artificial neural network, random forest were applied. The project involved analysis of the heart disease patient dataset with proper data processing. Then, 3 models were trained and tested with maximum scores as follows: Support Vector Classifier: 84.0 % , Neural Network: 83.5 % , Random Forest Classifier: 80.0 %

III. METHODOLOGY

This paper shows the prediction of heart disease using an interface based on ECG and the analysis of various machine learning algorithms. The use of Django and Bootstrap is done to make the interface. It can be used to know if a person has heart diseases or not. The ECG image is to be uploaded on the webpage and with the use of Machine learning algorithms like Naïve Bayes, Random forest, Decision tree, kNN, the prediction of heart disease is done.
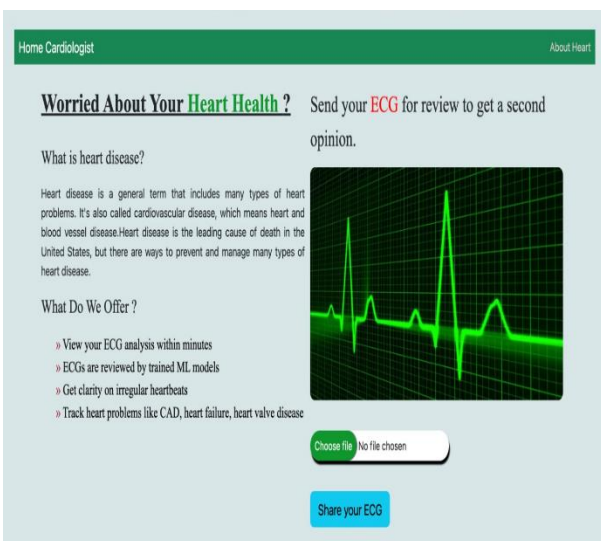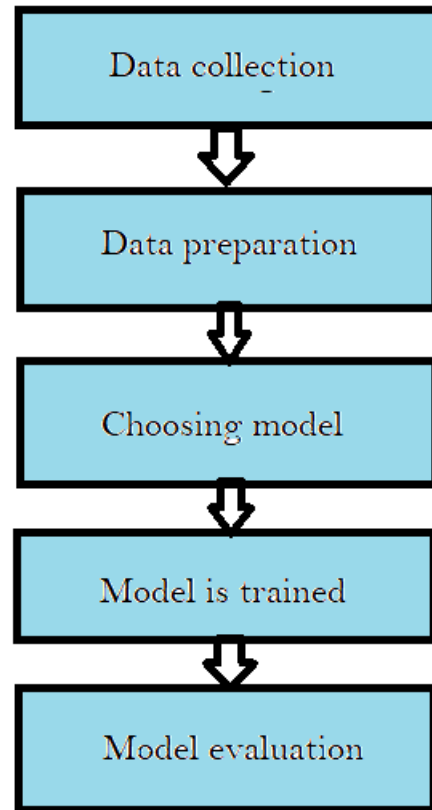
Fig 2. Interface based on ECG

The steps that are needed to implement this are as follows:

1) Collecting Data:

Data assembling is that the opening move of the machine learning life cycle. The goal of this can be to spot all data-related issues. Identification of the various information sources is finished, as information may be collected from varied sources like files, database, internet, or mobile devices. it's one in every of the foremost necessary steps of the life cycle. the amount and quality of the collected information can confirm the potency of the output. There is a lot of are going to be the information, there is a lot of correct are going to be the prediction.

2) Preparing the Data:

After grouping the info, it's required to be ready for more steps. Information preparation may be a step wherever the info is place into an appropriate place and prepare it to use in our machine learning coaching. during this step, first, we have a tendency to place all information along, then randomise the ordering of information.

3) Choosing a Model:

A machine learning model determines the output you get when running a machine learning rule on the collected information. it's vital to decide on a model that has relevancy to the task at hand. Over the years, scientists and engineers developed numerous models suited to totally different tasks like speech recognition, image recognition, prediction, etc. excluding this, you furthermore may have to be compelled to see if your model is suited to numerical or categorical information and select consequently.

4) Training the Model:

Training is that the most significant step in machine learning. In coaching, you pass the ready knowledge to your machine learning model to seek out patterns and build predictions. It leads to the model learning from the information in order that it will accomplish the task set. Over time, with coaching, the model gets higher at predicting.

5) Evaluating the Model:

After coaching your model, you have got to visualize to ascertain however it's acting. this is often done by testing the performance of the model on antecedently unseen information. The unseen information used is that the testing set that you just split our information into earlier. If testing was done on a similar information that is employed for coaching, you'll not get AN correct live, because the model is already wont to the info, and finds similar patterns in it, because it antecedently did. this may offer you disproportionately high accuracy.

Some of the algorithms that are used are Random forest, Naïve Bayes, k nearest neighbor, decision tree which can be helpful for medial analysts and people to diagnose the heart disease accurately in less time.

IV. CONCLUSION

Since in laboratories, heart diseases are detected by continuous monitoring of the ECG signals which is very time consuming, this paper presents a method in detecting heart diseases in an automatic manner. In this project, the accuracy is the most important factor. Different Machine learning algorithms can be used to predict if a person has heart diseases or not.

By adopting this method, the heart disease is detected more precisely with high contribution to the clinical

practice. It can be used in medical institutions, hospitals to study about heart diseases. If the patient is aware of the disease, he can follow up by uploading the ECG image frequently.

V. REFERENCES

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