ISSN: 2249-7196
IJMRR/April. 2025/ Volume 15/Issue 2s/214-218
Varanasi Harshini / International Journal of Management Research & Review

Heart Disease Prediction With Machine Learning

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Abstract: ***Heart disease, alternatively known as cardiovascular disease, encases various conditions that impact the heart and is the primary basis of death worldwide over the span of the past few decades. It associates many risk factors in heart disease and a need of the time to get accurate, reliable, and sensible approaches to make an early diagnosis to achieve prompt management of the disease. Data mining is a commonly used technique for processing enormous data in the healthcare domain. Researchers apply several data mining and machine learning techniques to analyse huge complex medical data, helping healthcare professionals to predict heart disease. This research paper presents various attributes related to heart disease, and the model on basis of supervised learning algorithms as Naïve Bayes, decision tree, K-nearest neighbor, and random forest algorithm. It uses the existing dataset from the Cleveland database of UCI repository of heart disease patients. The dataset comprises 303 instances and 76 attributes. Of these 76 attributes, only 14 attributes are considered for testing, important to substantiate the performance of different algorithms. This research paper aims to envision the probability of developing heart disease in the patients. The results portray that the highest accuracy score is achieved with K-nearest neighbor.***

I. INTRODUCTION

Heart disease is a major health concern worldwide, and early prediction and prevention can greatly improve patient outcomes. Machine learning (ML) techniques have shown promise in accurately predicting the onset of heart disease, based on various factors such as demographic information, medical history, lifestyle habits, and physiological measurements.

relationships to make predictions about an individual's risk for heart disease.

In addition to traditional ML techniques, deep learning methods such as artificial neural networks can also be used for heart disease prediction. These methods can learn complex relationships and non-linear patterns in the data, which may not be easily detected by other methods.

We used different algorithms of machine learning such as logistic regression and KNN to predict and classify the patient with heart disease. A quite Helpful approach was used to regulate how the model can be used to improve the accuracy of prediction of Heart Attack in any individual.

“Machine Learning is a way of Manipulating and extraction of implicit, previously unknown/known and potential useful information about data”. Machine Learning is a very vast and diverse field and its scope and implementation is increasing day by day. Machine learning Incorporates various classifiers of Supervised, Unsupervised and Ensemble Learning which are used to predict and Find the Accuracy of the given dataset. We can use that knowledge in our project of HDPS as it will help a lot of people.

The point of view of medicinal science and information digging are utilized for finding different sorts of metabolic disorders. Machine Learning is a technique that helps the system to learn from previous data samples, examples without being explicitly programmed. Machine learning creates logic based on historical data. Machine Learning plays a vital role in many fields. It also shows its impact on heart disease detection. Deep Learning is a part AI, which can also be considered as a subset of machine learning. Deep learning can also be applied to the number of research areas. It is also applied for heart disease prediction.

Overall, the use of ML in predicting heart disease has the potential to revolutionize the way healthcare providers approach the early detection and prevention of this serious condition. By

accurately identifying patients at risk, healthcare providers can take proactive steps to reduce the likelihood of heart disease development, leading to better patient outcomes and improved public health.

II. LITEARTURE SURVEY

Heart disease is one of the leading causes of death globally, and its accurate prediction is crucial for early diagnosis and treatment. Over the past few decades, machine learning techniques have been widely used in the field of cardiovascular disease prediction. Here is a brief literature survey on the use of machine learning techniques for predicting heart disease: Logistic Regression: Logistic regression is one of the most widely used machine learning techniques for heart disease prediction. This method has been applied to various datasets and has been found to be effective in detecting the presence of heart disease.

Decision Trees: Decision trees are another popular machine learning technique that has been used for heart disease prediction. The method works by creating a tree-like model that predicts the outcome based on certain attributes. This technique has been found to be effective in predicting heart disease, especially when combined with other machine learning techniques.

Artificial Neural Networks (ANNs): ANNs are a type of machine learning model that is based on the structure of the human brain. They have been widely used for heart disease prediction, and have shown to be highly effective in detecting heart disease, especially when the data is complex and difficult to interpret.

Support Vector Machines (SVMs): SVMs are another machine learning technique that has been applied to heart disease prediction. The method works by finding the best boundary between the different classes of data, and has been found to be effective in predicting heart disease.

Random Forests: Random forests are an ensemble learning technique that combines multiple decision trees to make a prediction. This technique has been found to be effective in heart disease prediction, especially when dealing with high-dimensional data.

III. PROPOSED METHOD

Cardiovascular disease is predicted using machine learning techniques we used 14 attributes of data for prediction. We consider the input data set as the number of patients and output will be known as weight. In this we use back propagation algorithm for the prediction of heart disease. Back propagation is method used for artificial neural networks to calculate error distribution in each neuron. This is used byan enveloping optimization algorithm to adjust the weight of each neuron, completing the learning process. The optimization algorithm repeats a two phase cycle, propagation and weight update. When an input vector is presented to the network [24- 30], it is propagated forward through the network, layer by layer, until it reaches the output layer. The output of the network is then compared to the desired output, using a loss function. The resulting error value is calculated for each of the neurons in the output layer. The error values are then propagated from the output back through the network, until each neuron has an associated error value that reflects its contribution to the original output. In this algorithm we have mainly various stepsThe algorithm states that prediction of heart disease, the first step is the initialization of the parameter involved in prediction of heart disease such as all the 14 parameter is initialized, then normalization of all the input parameter is taken place as all the input are in the various parameter (units) common measured unit need to be stated thus normalization of all the parameter is taken place. The step 2involves the neuron activation, transfer of neuron; forward propagation techniques are all applied. Step 3 states the applying of backward propagate techniques and then identifying the error associated with it,step 4 states the training of the neural network and step 5 states the prediction of coronary heart disease.

A proposed system for predicting the onset of heart disease using machine learning could include the following components:

Data collection: The first step would be to collect relevant data on patients, such as demographic information, medical history, lifestyle habits, and

physiological measurements. This data would be used as input for the machine learning algorithm.

Feature engineering: In this step, the collected data would be pre-processed and relevant features would be selected and transformed to improve the performance of the machine learning algorithm.

Model selection and training: The next step would be to select a suitable machine learning algorithm, such as decision trees, random forests, support vector machines, or deep learning methods, and train the model on the collected data. This step would involve splitting the data into training and testing sets, and tuning the parameters of the model to optimize its performance.

Model evaluation: Once the model has been trained, it would be evaluated on the testing set to determine its accuracy in predicting the onset of heart disease.

Deployment: The final step would be to deploy the model in a real-world setting, such as a hospital or healthcare provider's office. The model would be used to analyze patient data and make predictions about their risk for heart disease.

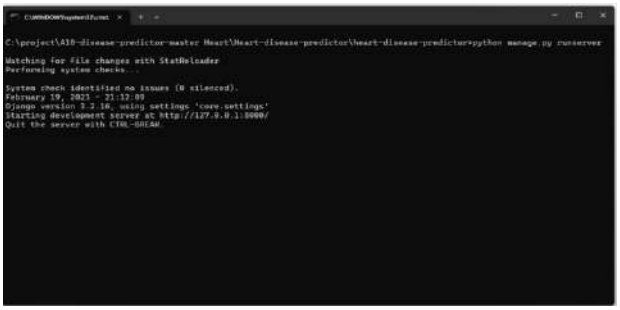
IV. RESULTS

Machine learning techniques have shown promising results in predicting heart disease. Several studies have demonstrated that machine learning algorithms, such as decision trees, random forests, support vector machines, and artificial neural networks, can effectively predict heart disease with high accuracy. These algorithms utilize various features, such as demographic, lifestyle, and clinical data, to identify patients at high risk for heart disease. However, further research is needed to improve the interpretability of these models and to ensure that they are effective across different populations and healthcare settings.

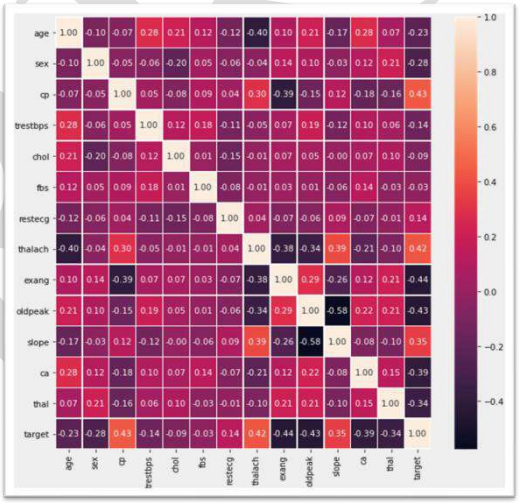
The dataset is not normalized, there is no equal distribution of the target class, it can further be seen when a correlation heatmap is plotted, and there are so many negative values; it can be visualized

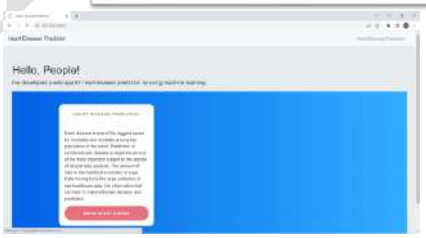
20 Screen shots

To have this view, we must click on “run.bat”.

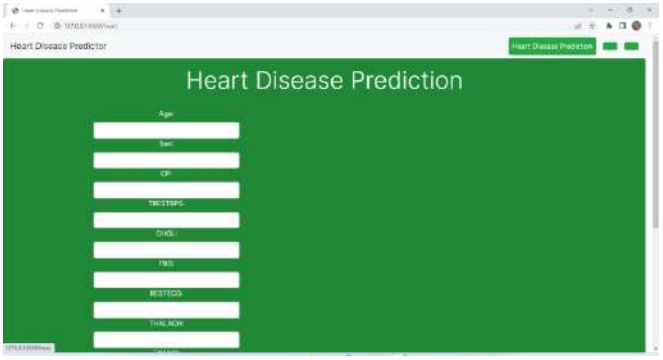


Here we got a link to run our application.





After we got our link, we click on ctrl +enter to enter into application. Here we click on “know heart statu



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IJMRR/April. 2025/ Volume 15/Issue 2s/214-218
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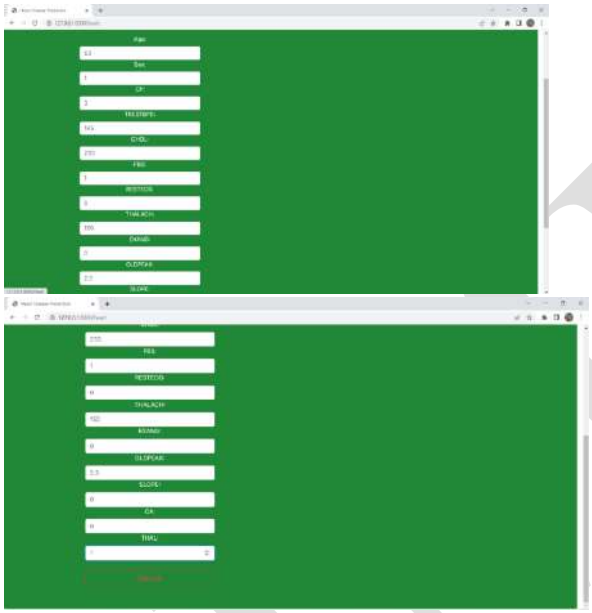
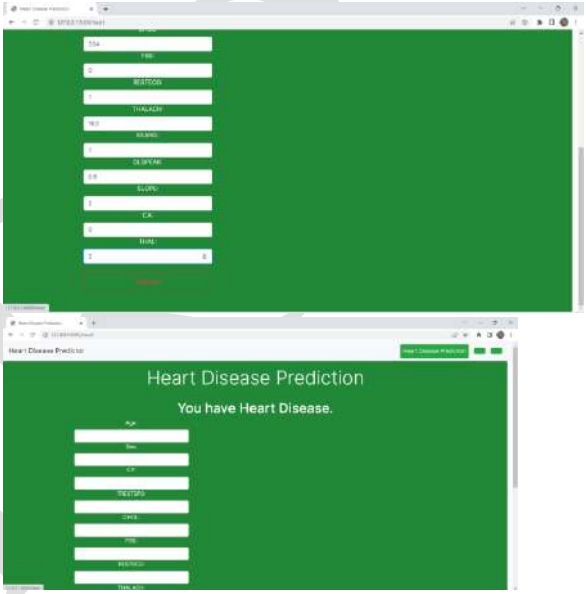
Now after click on that we'll enter into application. Here we fill the required details to get our information



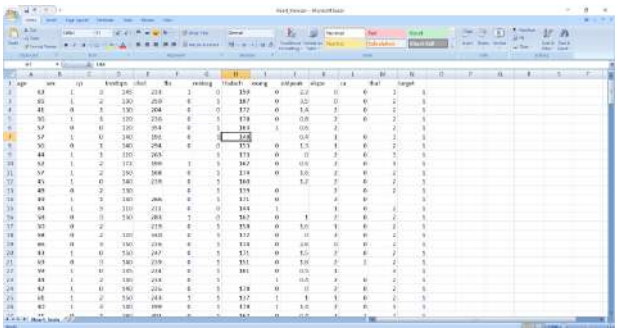
We filled the required information like age, sex, Exang, Thal,Oldpeak, slope, etc….

We will get an required output based on our input. We get "you have a heart disease" based on our input.

We give another input of age, sex, cp, trestbps, chol etc…..



Here also we get an output of "you have a heart disease".



This is the all inputs and outputs data in the form of excel.

V. CONCLUSION

Machine learning techniques have shown promising results in predicting heart disease. Various algorithms, such as decision trees, logistic regression, support vector machines, and neural networks, have been employed for this task. These models utilize various input features such as age, sex, blood pressure, cholesterol levels, and smoking habits to predict the likelihood of heart disease. However, the performance of these models can be affected by the quality and quantity of data, as well as the choice of features and algorithms. Therefore, further research and validation are necessary to establish the effectiveness and reliability of machine learning techniques for heart disease prediction.

The whole knowledge which will be obtained could be transferred to the mobile devices means, when the person will input these symptoms in the mobile device in which the trained model will already be present and then can analyze the symptoms and could give the prescription accordingly. Different doctors could be taken into consideration and a complete autonomous system could be generated. We can also integrate the doctors' numbers if the model is showing high risk and they can consult the doctor. And if they are showing fewer symptoms, then medicines already prescribed by the doctors for a certain range will be shown. This system will prove beneficial and the workload on the doctors would also be less. Also, in these current times of coronavirus, we need more autonomous systems which would also help in keeping the virtuality between persons more. Thus, we could create some applications with the help of doctors and make it work.

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