

Hriday Jatan - A Web Application To Predict Heart Diseases & Suggest Remedial Measures

¹Aniket Naik, ²Sakshi Joshi, ³Pranav Kavishwar, ⁴Harshada Shirondkar

^{1,2,3,4} Students of Dept of Computer Engineering, Dr. D.Y. Patil Institute of Engineering, Management and Research.
Akurdi, Pune

¹86aniketnaik@gmail.com, ²sakshijoshi886@gmail.com, ³pranavgk99@gmail.com, ⁴harshada.ds6@gmail.com

Abstract

The heart plays a vital role in humans. Diagnosis and prognosis of heart-related diseases require clarity, completeness and accuracy because a small error can cause fatigue or death, there are many cases of heart-related deaths and their number is increasing day by day. Dealing with this problem is an important requirement for a predictable disease awareness program. Machine learning by the Artificial Intelligence (AI) branch, provides reputable support in predicting any type of event that takes training at natural events. In this paper, we calculate the accuracy of the cardiovascular predictor learning algorithms, because these algorithms are the nearest neighbour, tree decision, line deviation and support vector machine (SVM) using UCI's final training and testing database. Python programming Anaconda (jupyter) notebook is a great tool, with a wide range of library, title file, performance and precision. Heart disease is one of the most common diseases. The disease is now more common nowadays using a variety of traits that can be closely related to this heart disease to better determine the best way to predict and use algorithms to predict.

Keywords

Heart Disease Prediction, Machine learning, Logistic regression, Naïve Bayes, Support Vector Machine, Random Forest, Decision tree, Neural Network, Jupyter Notebook.

Introduction

The health sector can be modernized using the latest technology that will extend the life span of all people. Leading diseases such as heart disease, cancer are causing major deaths worldwide. The mortality rate that includes cardiovascular disease

is rising at an alarming rate every year. A 2018 World Health Organization report states that, 31% of deaths worldwide are associated with cardiovascular disease of which 85% were caused by heart disease and stroke. The increasing popularity of alcohol, tobacco in developing and developing countries contributes to the risk of heart disease. Rising rates of obesity in developed countries such as the United States, England, Canada, New Zealand lead to an increased risk of heart problems.

If you look at the impact of heart disease on people of the world, the learning model of early detection equipment becomes very useful. Ongoing efforts are being made using various technological advances to address this growing problem. A variety of synthetic chemicals have been developed in recent years to address growing health problems. Further research in the area shows that it helps to reduce the rate of reduction. The heart is one of the most important and important organs in the human body and so heart care is important. Many diseases are related to the heart so predicting heart disease is necessary and for this reason a comparative study is needed in this field, today most patients die because their diseases are finally diagnosed due to lack of iron precision so there is a need to know about algorithms that work best.

As a result of technological advances, data collection and storage from various medical institutions and hospitals around the world has become possible. Data collected is then analyze using different machine learning algorithms that find specific patterns, combinations, and similarities between each attribute in the database. Machine learning is one of the most effective testing technologies, based on training and testing. Artificial Intelligence (AI) branch, which is one of the largest learning centers in which machines

generate human skills, machine learning is a specific branch of AI. On the other hand, machine learning systems are trained to learn the processing and use of data which is why the combination of both technologies is also called Machine Intelligence. In the description of machine learning, it learns from a natural phenomenon so in this project we use the natural parameter as test data such as cholesterol, blood pressure, gender, age, etc. and as a result, comparisons are made in terms of algorithms' accuracy.

Machine learning is used in many institutions around the world. The use of machine learning in health care sector does exist. Machine learning can play an important role in predicting the presence / absence of cardiovascular disease, heart disease and more. Such information, if predicted in advance, can provide valuable information for physicians who can adjust their diagnosis and treatment on an individual basis. Heart disease or stroke remains the leading cause of death worldwide. According to the World Health Organization, more than 17.9 million people worldwide die each year from heart disease, and 80% of these deaths are from coronary heart disease and stroke . High mortality rates are common in low- and middle-income countries , as well as existing cardiovascular conditions are factors that cause heart disease . Effective and accurate diagnosis and early treatment of heart disease play a very important role in taking preventative measures.

Literature Survey

Detailed research on the early diagnosis and classification of Heart diseases has been suggested by many researchers. There are number of contributions that has been done related to disease prediction systems using different machine learning algorithms in medical Centres.

This section includes brief reviews of related work in the field. Some researchers in University of Technology Gorakhpur have done some work in the field , according to their research paper, they have used four algorithms which are decision tree, linear regression, k-neighbour, SVM. They calculate the accuracy of four different machine learning approaches and on the basis of calculation conclude that which one is best among them. Processing of system start with the data collection for this they use the UCI repository dataset which is well verified by

number of researchers and authority of the UCI. First step for predication system is data collection and deciding about the training and testing dataset. In the project they have used 73% training dataset and 37% dataset is used as testing dataset the system. Attribute of dataset are property of dataset which are used for system and for heart many attributes are like heart bit rate of person, gender of the person, age of the person and many more for predication system. Preprocessing needed for achieving prestigious result from the machine learning algorithms. For example Random forest algorithm does not support null values dataset and for this have to manage null values from original raw data. In their project they had to convert some categorized value by dummy value means in the form of "0"and "1" . Data balancing is essential for accurate result because by data balancing graph they could see that both the target classes are equal. Finally histogram of attributes shows the range of dataset attributes and code which is used to create it.

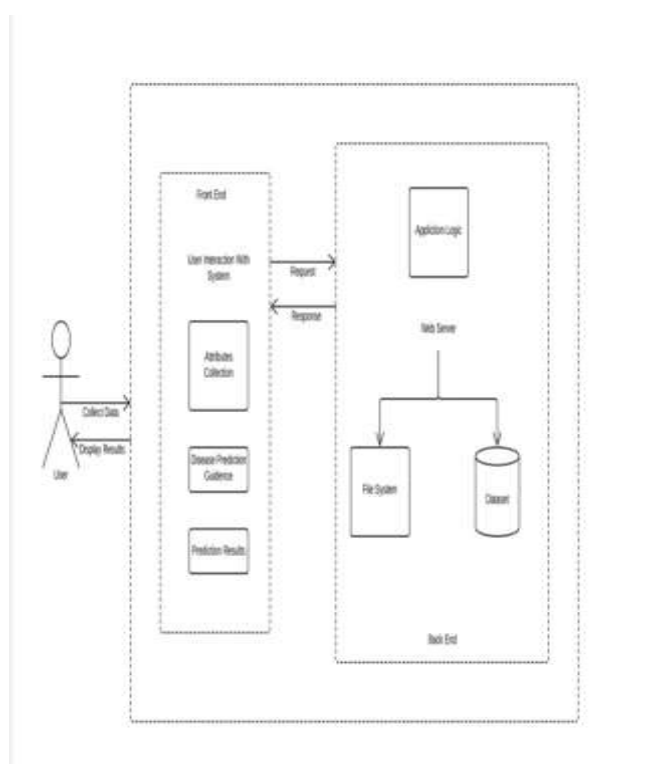
Ashir Javeed developed a model to improve the prediction of heart disease by overcoming the problem of overfitting; overfitting means the proposed model performs and gives better accuracy on testing data and gives unfortunate accuracy result for training data while predicting the heart disease. To solve this problem, they have developed a model that will give the best accuracy on both training and testing data. That model consists of two algorithms one is RAS(Random search algorithm) other one is a random forest algorithm that is used to predict the model. This proposed model gave them better results in training data as well as testing data.

Dr.Kanak developed a data mining model to predict heart disease efficiently. It mainly helps the medical practitioners to make efficient decisions way based on the given parameters. The author has used Cleveland dataset from UCI, and they have used age, sex, resting blood pressure, chest pain, serum cholesterol, fasting blood sugar, etc. as attributes. Furthermore, they have divided the datasets into two parts one is for testing, and the other one is for training. They have used a 10-fold method to find accuracy.

Awais Nimat proposed an expert system based on two support vector machines(SVM) to predict heart disease efficiently. These two SVM's have their purpose; first, one is used to remove the unnecessary features, and the second one is used

for prediction. Moreover, they have used the HGSA (hybrid grid search algorithm) to optimize the two methods. By using this model, they have achieved 3.3% better accuracy than the conventional SVM models that are present earlier.

Proposed Methodology



To Develop a Web based Application which will predict heart related diseases considering various cardiovascular attributes. Using technology stacks HTML, CSS Animations, Python Flask, Data Science ,Machine Learning. The aim is the system developed will be a web application which will take input the Heart measures of the user and based on that conditions and predict whether the user may suffer from heart disease or not. The main objectives are to predict heart disease through a web app, analyze all different attributes related to cardiac body parts and check how they affect heart system and to visualize different parameters associated with heart disease. This proposed method is a web application which will input the attributes of Heart of the patient and predict whether it may develop any heart syndrome or not. The Dataset used here contains the age, gender, chest pain types, cholestrol, resting ecg results, fasting blood pressure, maximum heart rate achieved etc. Data pre-processing is done and analysis is made on which of these parameters affects the heart more. Several Machine Learning algorithms are used to predict the output and best algorithm with maximum accuracy is selected. The Frontend application of the system consist of the

attributes of the dataset which the user has to input based on is/her current cardiac conditions. The Frontend is developed using HTML and CSS Animations and has been designed in a user-friendly manner. The Backend of the system is designed using Python Flask module and it contains the saved file of the best working ML algorithm in the dataset. The prediction is done by applying the selected algorithm and on the data entered by the user. The designed Web Application will help users in estimating future heart diseases based on their current cardiac conditions.

Result and Conclusion

In the implemented model we have created a web page which allows the user to give their input on age, gender, chest pain types, cholestrol, resting ecg results, fasting blood pressure, maximum heart rate achieved . As soon as receiving the input of these data and clicking for prediction, the user gets and result whether they may be suffering from any heart disease. Following images show the working of the model.

1] User is welcomed to the web application before entering further medical reports.



2] Hereupon data related to prediction are entered as specified in the attributes like the age, gender, chest pain types, cholestrol, resting ecg results, fasting blood pressure, maximum heart rate achieved etc.

The screenshot displays a user interface for a heart disease prediction system. It consists of six input fields, each with a green 'Predict' button and a corresponding text area providing information about the parameter:

- Age:** Input field with 'Predict' button. Text area: 'Age is the most important risk factor for heart disease. The risk of heart disease increases with age. The risk of heart disease is higher for people who are 65 years old or older.' (Note: The text in the image is partially obscured and difficult to read).
- Gender:** Input field with 'Predict' button. Text area: 'Gender is an important risk factor for heart disease. The risk of heart disease is higher for men than for women.' (Note: The text in the image is partially obscured and difficult to read).
- Chest Pain:** Input field with 'Predict' button. Text area: 'Chest pain is a common symptom of heart disease. It is caused by a lack of blood flow to the heart muscle. Chest pain can be a sign of a heart attack or other serious heart condition.' (Note: The text in the image is partially obscured and difficult to read).
- Cholesterol:** Input field with 'Predict' button. Text area: 'Cholesterol is a waxy substance found in the blood. It is essential for the body, but too much cholesterol can lead to heart disease. High cholesterol is a major risk factor for heart disease.' (Note: The text in the image is partially obscured and difficult to read).
- Vessels Colored By Fluoroscopy:** Input field with 'Predict' button. Text area: 'Vessels colored by fluoroscopy is a measure of the amount of blood flow to the heart muscle. It is used to diagnose heart disease. A low score indicates a high risk of heart disease.' (Note: The text in the image is partially obscured and difficult to read).
- Thal:** Input field with 'Predict' button. Text area: 'Thal is a measure of the amount of blood flow to the heart muscle. It is used to diagnose heart disease. A low score indicates a high risk of heart disease.' (Note: The text in the image is partially obscured and difficult to read).

3] After entering the details user can get results by clicking predict and the further consultation will be suggested.

Heart is one of the crucial and all-important organ in us humans and prediction regarding heart diseases is additionally vital concern for the humans so that the accuracy for algorithm is one of parameter for analysis of performance of algorithms. Accuracy of the algorithms in machine learning are based on the dataset which is being used for training and testing purpose. The prime purpose of this paper is to predict possibilities of heart related disease more accurately. We used techniques like Gaussian NB, SVM, Random Forest, Decision Tree for effective prediction and hence to increase and boost the accuracy. The performance of each algorithm was analyzed on the dataset and results were compared with respect to the accuracy. For the long run several other machine learning approach will be used for best analysis of the heart diseases and for earlier prediction of diseases so that the rate of the death cases can be minimized by the awareness about the diseases.

As mentioned in the earlier part of the project, the proposed system will not only predict whether the user may have a heart disease or not but also suggest some preventive measures if

detected positive. Based on the data sent by the user we'll suggest some exercises do's and don'ts. For example, if the cholesterol mentioned by the user is higher than the threshold value, we will suggest that he/she should avoid oily food. If someone has exercise induced angina, we'll suggest some immunity drinks or appetizers. So on the basis of the current cardiac conditions of the user he/she will be advised precautionary standards and measures so the user can take remedies as soon as possible.

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