

Prediction of Coronary Heart Disease with Machine Learning Techniques

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Abstract- At the end of the day, its our health what matters. Being proactive is the best solution when it comes to taking care of health. With this objective, as we know mostly “Heart Related problems” are the ones that occur all of a sudden , Sometimes they might be serve. Various factors of our health contribute to the disease occurrence. Our project is that which predicts the probability of coronary heart disease occurrence. Dataset with valuable attributes that contribute to heart problem has been considered. Various supervised ML models that is logistic regression and support vector support vector classifier are applied to train and test pre-processed data and comparative analysis of algorithms has been made. ML model is implemented at the backend. Input features in this model are selected based on their impact on the accuracy of the model. An Application like this keeps us updated about our health condition and helps us change our lifestyle and habits that improve our health. Many diseases get severe when it is not properly medicated before it starts to spread/grow. Heart disease can be controlled and sustained more effectively with proper food habits, lifestyle, medicine and exercise. Predicting the like hood for diseases like these, would be very much helpful in taking precautionary steps and also to cure them. Predicting the like hood for diseases like these, would be very much helpful in taking precautionary steps and also to cure them. The predicted outcome can be used to prevent/control these diseases and prove to be a great system in the field of medical science.

Index Terms- Chronic Diseases, Food Habits, Heart disease, Life Style, Machine Learning, Prediction.

I

INTRODUCTION

Many diseases get severe when it is not properly medicated before it starts to spread/grow. Heart disease can be controlled and sustained more effectively with proper food habits, lifestyle, medicine and exercise. Predicting the like hood or diseases like these, would be very much helpful in taking precautionary steps and also to cure them. The predicted outcome can be used to prevent/control these diseases and prove to be a great system in the field of medical science. Being proactive is the best solution when it comes to taking care of health. With this objective, as we know mostly “Heart-related problems” are the ones that occur all of a sudden, sometimes they might be severe. Various factors of our health contribute to the disease occurrence. Our project is a website that predicts the probability of Coronary Heart disease occurrence. Machine Learning, an integral part of Artificial Intelligence, has begun penetrating various industries, amongst which healthcare stands an obvious one. Currently, this field is working on algorithms [15-46] that reliably predict the presence or absence of lung cancer, HD, and other ailments.

In this paper [1], there is clear explanation of pre-processing of unbalanced dataset and training the dataset with machine learning models and predicted the risk of occurrence of coronary heart disease. Random Forest algorithm acquired 96.80 % which is highest of others. After comparative analysis of three supervised ML algorithms, to create randomness in data K-Fold cross validation technique is carried out.

In this paper [2], at first Support vector classifier and KNN classifier applied together 85% accuracy. Following this neural network & Naïve bayes classifier combination is applied. To acquire more accuracy of model, Associate classification is applied as the output is association of various models. It is proven that, Associate classification along with Naïve bayes classifier, Decision tree & neural network is more reliable & will also handle unstructured data. Classifiers applied together 85% accuracy. Following this neural network & Naïve bayes classifier combination is applied. To acquire more accuracy of model, Associate classification is applied as the output is association of various models. It is proven that, Associate

classification along with Naïve bayes classifier, Decision tree & neural network is more reliable & will also handle unstructured data. To make sure that the model works for all diverse datasets, it should be trained & tested over high dimensional datasets.

In this paper [3], survey of several research papers involving prediction of Cardio vascular diseases by Data Mining, ML and DL techniques. Feature selection is used to increase accuracy in many of the classification algorithms. When feature selection applied, to decrease the search space, greedy based sequential forward & backward selection is used. They also mentioned the algorithms and their accuracies in a tabular column. Artificial Neural Network, regression classification & clustering techniques are discussed. In this paper they applied Machine Learning to predict cardio vascular disease for the patients who are undergoing dialysis. Amongst American and Italian datasets, many ML algorithms are trained & tested. But as Italian dataset is biased, prediction results might differ in accuracy.

In this paper [4], they proposed an idea for occurrence which analyzes various optimization algorithms, weight initialization techniques and their accuracy levels are compared. In neural network, activation functions like ReLU is used. Comparative analysis of combination of ReLU and various optimization algorithms like Adam, Adagrad is carried out. Adagrad optimizing algorithm along with ReLu has shown 85% accuracy which is the highest, when compared to other algorithms

In this paper [5], limited dataset is used. Discussed the functioning of every algorithm used and why they used them for this dataset. Artificial Neural Network consists of 3 layers and in hidden layer Activation function is applied. To predict targeted label, ReLU activation function is applied. ANN acquired highest accuracy of 85% when compared to other algorithms.

In this paper [6], they performed Classification techniques of Machine Learning for accurate results which in return helps medical industry for faster detection of heart disease. They implemented “Deep Neural Network” classifiers which analyzes various optimization algorithms, weight initialization techniques and their accuracy levels are compared. In neural network, activation functions like ReLU is used. Comparative analysis of combination of ReLU and various optimization algorithms like Adam, Adagrad is carried out. Adagrad optimizing algorithm along with ReLu has shown 85% accuracy which is the highest, when compared to other algorithms. Coronary artery disease (CAD) is correlated with many preventable risk factors. Early diagnosis of CAD allows for prevention of worsening of CAD and its complications. This study aims to utilize machine learning (ML) algorithms to predict for CAD in patients. Our results indicate that ML algorithms can accurately predict for CAD. Furthermore, by providing our code publicly, we hope to improve the ability for ML algorithms as a diagnostic tool for CAD.

II.

PROPOSED METHOD

Our work is to design a website that predicts the probability of Coronary Heart disease occurrence. The prior discovery of common diseases like diabetes, heart disease and pulmonary cancer may control and reduce the likelihood of patient being fatal. As the machine education and the artificial intelligence progresses, this is achieved by using several classifiers and clustering algorithms. This paper presents an algorithm for machine learning for prevention of coronary heart disease, which for many people is the leading cause of death

Machine Learning, an integral part of Artificial Intelligence, has begun penetrating various industries, amongst which healthcare stands an obvious one. Currently, this field is working on algorithms that reliably predict the presence or absence of lung cancer, HD, and other ailments. Such data, if predicted ahead of time, can provide valuable insights to clinicians, allowing them to tailor their diagnosis and treatment to the individual patient. The current situation is that the healthcare business collects vast amounts of data, but not all of it is mined in order to uncover hidden patterns and make effective decisions. As a result, the projections have huge variations from the true value.

In United States and many other developed countries, 50% of deaths are caused due to cardio vascular diseases. Similarly, in many countries leading cause for deaths is heart disease. Among many types of heart disease, coronary heart disease led to the highest number of deaths. As these diseases occur all of a sudden or in most of the cases they are diagnosed at the last stages, where the patients and doctors are helpless to cure the disease. So, we came up with this project idea of creating a website with good UI and more accurate prediction of these diseases so that they can recognize the disease in the starting stage itself and take measures accordingly. Technology should be used not only for business but also for the better living of the people. The flow chart of proposed system is shown in Fig.1 and Fig.2

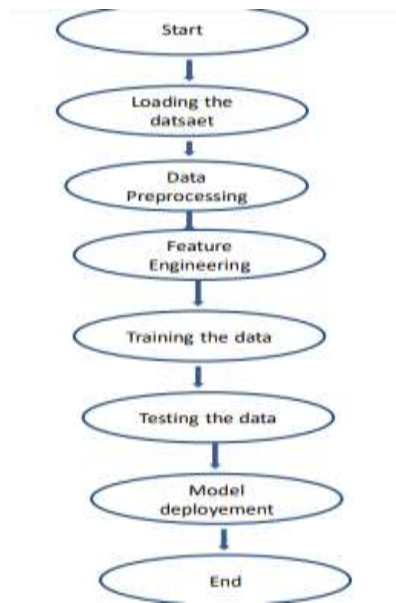


Fig.1 Suggested Methodology

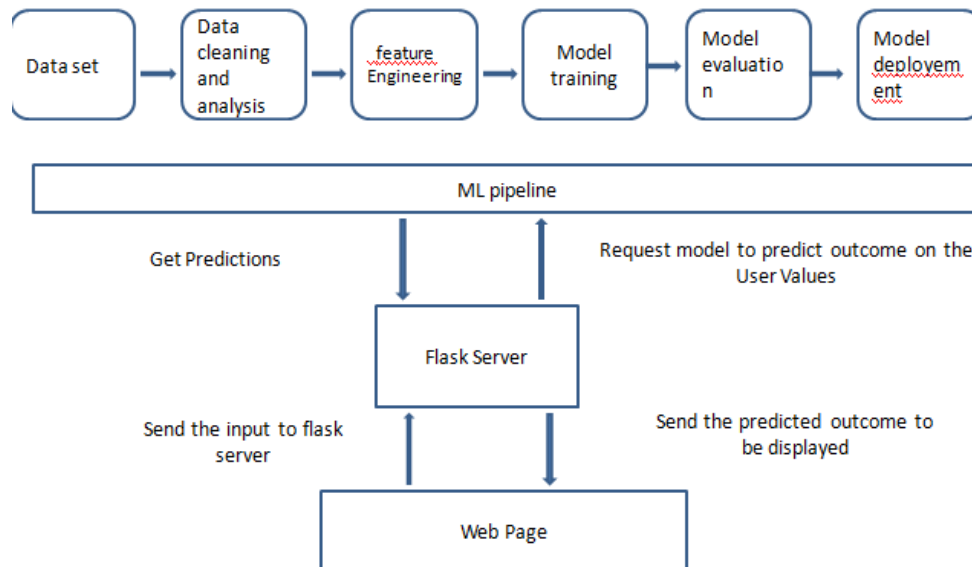


Fig.2 Block diagram of proposed system model

Algorithm

Step 1 : load the dataset of heart related feature values from kaggle .The dataset contains the values of 4238 records . This project uses “pandas” a machine learning library in our project for further processing. This loads the dataset.

Step 2 : The above dataset is preprocessed by using feature scaling . This project does the ‘features scaling’ using ‘standardization’ technique. This technique rescales the value such that it has distribution with zero mean value and variance equal to one.

Step 3 : The feature extraction is happening in this step .This is used to select particular features which are more impactful on result and which improves the performance. In this it also shows us how one feature is correlate with each feature.

Step 4 : In this project the model is trained with a dataset of 4238 records and supervise ML algorithms are used to train the model and their respective F1 scores are recorded. 80 percent of dataset is used for training the model.

Step 5 : The testing uses of 20 percent of dataset . After applying each algorithm, accuracy of test-data is recorded.

Step 6 : Here the best accuracy model is Random forest model. This project saves that model into a pickle file . This is extracted to into the html file through flask server . By using this model it predicts the output. Data collected is passed t to the trained model as input and the result predicted by the model is displayed to the uses.

III. RESULTS

The results obtained are represented in Table 1. From the below table in this project the highest f1 score is for Random forest algorithm and this is considered as best algorithm for this model.

Table 1. comparison table of scores of all models

	score	models
0	0.744860	Decision Tree
1	0.796311	Decision Tree 2
2	0.849422	Random Forest
3	0.848242	Gradient Boosting Classifier
4	0.848715	XG Boost Classifier

Web Interface :

fig .3 Web Interface with user's inputs

you are healthy. probability of developing heart disease is 0.559842

First Name Your Name	Last Name Your Name	Mobile
Age 	Education 10th	Gender Male <input type="radio"/> Female <input type="radio"/>
Do you smoke? Yes <input type="radio"/> No <input type="radio"/>	Number of Cigars/Day 	Undergoing BP Medication? Yes <input type="radio"/> No <input type="radio"/>
Heart Stroke in the past? Yes <input type="radio"/> No <input type="radio"/>	BP/Hypertension? Yes <input type="radio"/> No <input type="radio"/>	Have Diabetes? Yes <input type="radio"/> No <input type="radio"/>
Enter your total cholesterol level Your Name	Enter your systolic blood pressure Your Name	Enter your diastolic blood pressure
Enter your Body Mass Index 	Enter your heart rate 	Enter your glucose level
<input type="button" value="Submit"/>		

Fig.4 Probability of heart disease occurrence predicted by Website

IV.CONCLUSION

In this project it predicts the probability of occurring coronary heart disease . After giving the values from the user it predicts the probability if the probability is less than 0.6 the model says that you are healthy and the probability is greater than 0.6 the models says that you have a risk of developing coronary heart disease. As we know mostly “Heart related problem” are the ones that occur all of a sudden. An application like this keeps us updated about our health condition and also helps us change in our lifestyle and habits that improve our health. Heart disease can be controlled and sustained more effectively with proper food habits, lifestyle, medicine and exercise. Predicting the like hood for diseases like these, would be very much helpful in taking precautionary steps and also to cure them. The predicted outcome can be used to prevent/control these diseases and prove to be a great system in the field of medical science.

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