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Research paper

A Novel Approach for Prediction of Heart Disease: Machine Learning Techniques

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Abstract

Heart disease and machine learning are the two different words where one is related to medical field and another one to artificial intelligence. In medical filed most of them are facing the problems with the heart disease and machine learning is developing area in computer science. Heart disease is general called cardiac disease where it gives the more data or information, it is to be collected to give the reports for the patients and the machine learning also requires the data for predicting and to solve the problems. Machine learning techniques are used in prediction of heart diseases where it gives the faster prediction with less computation time and better accuracy to progress their health. Heart disease prediction requires lot of data for predicting and in cloud computing also we have more data and the data available in cloud it is difficult to analyze. So we use machine learning algorithms or techniques to predict the heart disease and the in the similar way we can apply these algorithms or techniques to predict or analyze the data that is available in cloud. In this paper we are going to use machine learning algorithms called Backpropagation Algorithm and later we use optimization algorithm later. Backpropagation algorithm deals with the artificial neural networks. Backpropagation is a method used to calculate the error contribution of each neuron after a batch of data (in image recognition, multiple images) is processed. This is used by an enveloping optimization algorithm to adjust the weight of each neuron, completing the learning process for that case. Machine learning algorithms and techniques are used for recognize the intensity of risk issues in humans and it helps the patients to take safety measures in well advances to save the patient's life.

Keywords: *Machine learning, Cloud computing, Cardiac, Backpropagation, Optimization*

1. Introduction

From last 100 years many of them are facing heart disease problems in their life. Heart disease is also called as cardiovascular disease (CVD) the disease is mainly involve the heart or blood vessels. Cardiovascular disease is commonly known as heart attack and it involves all other heart diseases like stroke, heart failure etc. Heart disease is mainly because of high blood pleasure, smoking diabetes, alcohol consumption, lack of exercises to the body. Heart disease results more in high blood pressure it is 13% tobacco results in 9%, diabetes results in 6%, lack of exercises results in 6%. Heart disease are leading to cause of death as results made in 2015 more over 17millon died because of heart disease where it was 12millon in 1990s this show the increase in the death rate due to heart diseases. Heart failure and stroke count 80% of deaths in male and 75% in females. Genetic says age group between 45-50 years in male and 60-65 in females are mostly affected among all other ages. There are many types of Heart diseases namely Coronary Artery Disease, Angina, Heart Attack, Heart Failure, High blood pressure, Cardiac Arrest, Arrhythmia, Peripheral Artery Disease. Cardiovascular disease can be prevented by doing regular exercises to the body, don't use tobacco or smoke by seconds hand, eat healthy food daily and don't drink of alcohol these are the general precautions that should be taken to prevent Cardiovascular disease and there are many other treatments also to cure the some of heart diseases.

2. Proposed Work

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 by an 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 steps as shown in figure 1.

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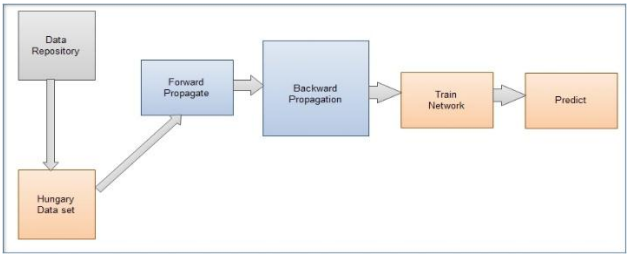


Figure 1 Stages of Coronary Heart Disease Prediction

Algorithm_Heart_Disease_Prediction

Step 1: Initialize network
Input all the 14 parameters.
Step 2: Forward propagate
- *layer size = 16;*
- *Normalize the value*
- *neuron activation*
  Activate all the neuron
- *neuron transfer*
- *Transfer all the neuron*
- *forward propagation*
- *Apply forward propagation techniques*

Step 3: Backward propagate error
Apply backward propagation techniques
Identify the error associated with it
Step 4: Train network
Train all the neuron associated
Step 5: Predict

The 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 2 involves 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 diseases.

4. Experimental Evaluation and Analysis

The experiment is performed using the matlab 2107b using the machine learning tool box and the heart disease is taken from the standard data set (UC Irvine machine learining storage respository, among the four available dataset Long Beach VA, Cleveland, Hungary and Switzerland is taken. Health care is extremely producing volume of data that need to be mined. The 14 attributes of data for the prediction of heart disease is used they are: Age, Gender (male =0, female =1), Chest pain type(CP), Trestbps(testing blood pressure), Chol(serum cholesterol in mg/dl), Fbs(fasting blood sugar), Restecg(testing electrocardiographic results), Thalach(maximum heart rate achieved), Exang(exercise induced angina), Old peak(ST depression induced by exercise related to rest), Slope(the peak exercise ST segment), Ca(number of major vessels), Thal and Num(diagnosis of heart disease). Using these attributes heart disease prediction is identified based gender and the angina.

The figure 2 shows the patient who are all affected by the CHD based on the sex ratio thus 58.62% of male is affected by disease where as 41.37% are not affected by the disease, in case of female affected is 29.85% and not affected 70.14% with disease. The figure 3 show the number of person affected by CHD with respect to angina thus, 23.07 percent as got affected by typical angina and 82.35 is not affected by the disease. In terms of Non angina 25% is affected by disease and 75 % is not affected by the disease in regards to asymptotic angina 71.15% is affected by CHD where as 28.84 is not affected by disease.

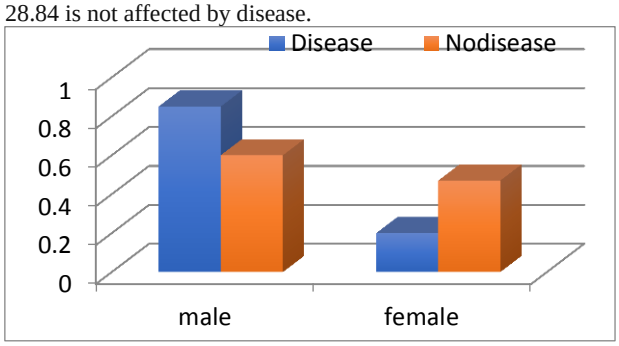


Figure 2. Prediction Disease based on sex

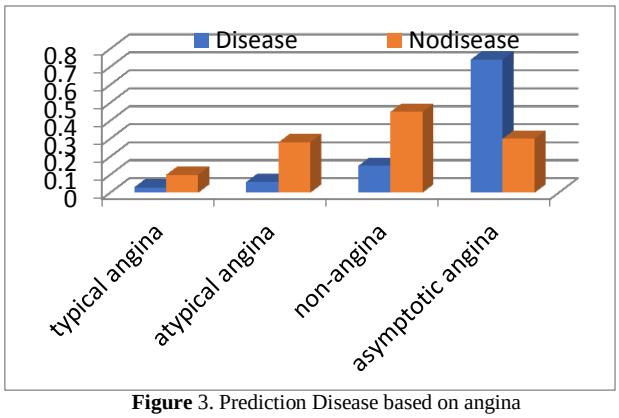


Figure 3. Prediction Disease based on angina

5. Conclusion

Machine learning techniques are used for predicting much need information in decision making process with very high accuracy this technique process the data more faster and the time taken for prediction is also considerably minimum. Symptoms of heart disease in your blood vessels (atherosclerotic disease) Cardio vascular disease symptoms may be different for men and women. When an input vector is presented to the network, 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 14 attributes of data for the prediction of heart disease is used, patients who are all affected by the CHD based on the sex ratio is predicted and person affected by CHD with respect to angina is also predicted. In future we plan to apply this technique for brain tumor prediction.

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