Heart Disease Prediction Using Artificial Intelligence

P. Kishoreraja¹, S. Palanivel Rajan², Aagnay Kariyal³, T. Palani Raja⁴
¹,²,³Final Year UG Student, Department of Computer Science and Engineering, Nehru Institute of Technology, Coimbatore, India
⁴Assistant Professor, Department of Computer Science and Engineering, Nehru Institute of Technology, Coimbatore, India

Abstract: Heart disease is one of the most major causes of mortality in the world today. Predicting cardiovascular disease is a critical challenge in the area of clinical analysis. Artificial intelligence with Machine Learning (ML) has been shown to be effective in assisting in making decisions and predictions from the large quantity of data produced by the healthcare industry. We have also seen ML techniques being used in recent developments in different areas of Internet of Things (IoT). Various studies give only a glimpse into predicting heart disease with ML techniques. In this paper, we propose a completely unique method that aims at finding significant features by applying machine learning techniques leading to improving the accuracy within the prediction of disorder. The prediction model is introducing with different combinations of features and several known classification techniques. We are able to produce a better performance level with an accurate result of 88.7% through the prediction model for heart condition with hybrid random forest with a linear model (HRFLM).

Keywords: Artificial intelligence.

1. Introduction

It is difficult to identify heart diseases because of several risk factors that contribute to them such as diabetes, high blood pressure, high cholesterol, abnormal pulse and many other factors. Various techniques in data mining and neural networks have been done to find out the severity of heart disease amongst humans. The severity of the disease is found and classified based on various methods like K-Nearest Neighbor Algorithm (KNN), Decision Trees (DT), Generic algorithm (GA), and Naïve Bayes (NB). The nature of heart diseases is complex and hence, the disease must be handled carefully. Not doing so may affect the heart or cause premature death. The perspective of medical science and data mining are used for discovering various sorts of metabolic syndromes. Data mining with classification plays a big role within the prediction of heart condition and data investigation.

We have also seen decision tree be used in predicting the accuracy and specificity of events related to heart disease. Various methods have been used for knowledge abstraction by using known methods of data mining for prediction of heart disease. In this work, numerous readings, are administered to supply a prediction model using not only distinct techniques but also by relating two or more techniques. These amalgamated new techniques are commonly known as hybrid methods. We introduce neural networks using pulse statistic. This method uses various clinical records for prediction such as Left bundle branch block (LBBB), Right bundle branch block (RBBB), Atrial fibrillation (AFIB), Normal Sinus Rhythm (NSR), Sinus bradycardia (SBR), Atrial flutter (AFL), Premature Ventricular Contraction (PVC)), and second degree block (BII) to find out the exact condition of the patient in relation to heart disease. The dataset with a radial basis function network (RBFN) is employed for classification, where 70% of the info is employed for training and therefore the remaining 30% is employed for classification.

We also introduce Computer Aided Decision Support System (CADSS) in the field of machine and research. In previous work, the usage of data mining techniques in the healthcare industry has been shown to take less time for the prediction of disease with more accurate results. We propose the diagnosis of heart condition using the GA. This method uses effective association rules inferred with the GA for tournament selection, crossover and the mutation which results in the new proposed fitness function. For the experimental validation, we use the extremely well-known Cleveland dataset which is collected from a UCI machine learning repository or is known as the UCI dataset. We will see later how our results prove to be prominent when compared to some of the known supervised learning techniques. The most powerful evolutionary algorithm Particle Swarm Optimization (PSO) is introduced and some rules are generated for heart disease. The rules have been applied randomly with encoding techniques which result in improvement of the accuracy overall. Heart disease is predicted supported symptoms namely, pulse, sex, age, and lots of others. The ML algorithm with Neural Networks is introduced, whose results are more accurate and reliable.

Neural networks are generally regarded as the best tool for prediction of diseases like heart disease and brain disease. The proposed method which we use has attributes for heart disease prediction. The results show an enhanced level of performance compared to the existing methods in works like...
The Carotid Artery Stenting (CAS) has also become a prevalent treatment mode in the medical field during these recent years. The CAS prompts the occurrence of major adverse cardiovascular events (MACE) of heart disease patients that are elderly. Their evaluation becomes very important. We generate results using an Artificial Neural Network ANN, which produces good performance in the prediction of heart disease. Neural network methods are introduced, which combine not only posterior probabilities but also predicts values from multiple predecessor techniques. This model achieves an accuracy level of up to 89.01% which is a strong result compared to previous works. For all experiments, the Cleveland heart dataset is employed with a Neural Network NN to enhance the performance of heart condition.

2. Related work

There is ample related add the fields directly associated with this paper. ANN has been introduced to supply the very best accuracy prediction within the medical field. the rear propagation multilayer perception (MLP) of ANN is employed to predict heart condition. The obtained results are compared with the results of existing models within an equivalent domain and located to be improved. the info of heart condition patients collected from the UCI laboratory is employed to get patterns with NN, DT, Support Vector machines SVM, and Naive Bayes. The results are compared for performance and accuracy with these algorithms. The proposed hybrid method returns results of 86.8% for F-measure, competing with the opposite existing methods. The classification without segmentation of Convolutional Neural Networks (CNN) is introduced. This method considers the guts cycles with various start positions from the Electrocardiogram (ECG) signals within the training phase. CNN can generate features with various positions within the testing phase of the patient. an outsized amount of knowledge generated by the medical industry has not been used effectively previously. The new approaches presented here decrease the value and improve the prediction of heart condition in a simple and effective way. the varied research techniques considered during this work for prediction and classification of heart condition using ML and deep learning (DL) techniques are highly accurate in establishing the efficacy of those methods.

3. Overview of method and results

In HRFLM, we use a computational approach with the three association rules of mining namely, apriori, predictive and Tertius to find the factors of heart disease on the UCI Cleveland dataset. The available information points to the deduction that females have less of a chance for heart disease compared to males. In heart diseases, accurate diagnosis is primary. But the traditional approaches are inadequate for accurate prediction and diagnosis.

HRFLM makes use of ANN with back propagation alongside 13 clinical features because the input. The obtained results are comparatively analyzed against traditional methods. the danger levels become very high and a number of other attributes are used for accuracy within the diagnosis of the disease. the character and complexity of heart condition require an efficacious treatment plan. data processing methods help in remedial situations within the medical field. the info mining methods are further used considering DT, NN, SVM, and KNN. Among several employed methods, the results from SVM convince be useful in enhancing accuracy within the prediction of disease. The nonlinear method with a module for monitoring heart function is introduced to detect the arrhythmias like bradycardia, tachycardia, atrial, atrial ventricular flutters, and lots of others. The performance efficacy of this method are often estimated from the accuracy within the outcome results supported ECG data. ANN training is employed for the accurate diagnosis of disease and therefore the prediction of possible abnormalities within the patient.

Diverse data mining approaches and prediction methods, like KNN, LR, SVM, NN, and Vote are rather popular lately to spot and predict heart condition. The novel method choose conjunction with a hybrid approach using LR and NB is proposed during this paper. The UCI dataset is employed for conducting the experiments of the proposed method, which resulted in 87.4% accuracies within the prediction of heart condition. The Probabilistic Principal Component Analysis (PPCA) method is proposed for evaluation, supported three data sets of Cleveland, Switzerland, and Hungarian in UCI respectively. the tactic extracts the vectors with high covariance and vector projection used for minimizing the feature dimension. The feature selection with minimizing dimension is provided to a radial basis function, which supports kernel based SVM. The progressive results of the methods are predicted to be 82.18%, 85.82% and 91.30% of UCI data sets of Cleveland, Switzerland and Hungarian respectively. The hybrid method combining rectilinear regression (LR), Multivariate Adaptive Regression Splines (MARS) and ANN is introduced with rough set techniques and is that the main novel contribution of this paper. The proposed method effectively reduced the set of critical attributes. The remaining attributes are in put for ANN subsequently. the guts disease data sets are wont to demonstrate the efficacy of the event of the hybrid approach. the guts disease prediction with multilayer perception of NN is proposed. This method uses 13 clinical attribute features because the input and trained by back propagation are very accurate leads to identifying whether the patient has heart condition or not.

We also introduce the Apriori algorithm with SVM and compare it with nine other classification methods to predict heart condition more accurately. The results of the classification method have proved a better degree of accuracy and performance within the prediction of heart condition compared to the opposite existing methods. The feature selection plays a prominent role within the prediction of heart condition. ANN with back propagation is then introduced for enhanced prediction of the disease. The results obtained from the
appliance of ANN are highly accurate and precise. The genetic algorithm with fuzzy NN referred to as Recurrent Fuzzy Neural Network (RFNN) is introduced for the diagnosis of heart condition.

In the UCI dataset 297 instances of patient records, in total, are considered of which 252 records are used for training and the remaining for testing. The results have been located to be satisfying based on the assessment. Heart disease prediction with SVM and ANN is then proposed. In this approach, two methods are used for the premise of the accuracy and time of testing. The proposed model arranges the data records into two classes in SVM as well as ANN for further analysis. The Back Propagation Neural Network (BPNN) with classification method is introduced, where the hypertension gene sequence is generated and then, thereafter the exact gene sequence. The performance of the BPNN techniques has been measured in the training phase as well as the testing phase with the various numbers of samples. The accuracy of this technique has improved in correspondence to the number of records.

4. Results

The data is then entered and the MER file or the UCI database is then processed through the ensemble to process and predict if heart disease is present or not.

5. Conclusion

Identifying the processing of raw healthcare data of heart information will help within the future saving of human lives and early detection of abnormalities in heart conditions. Machine learning techniques were utilized in this work to process data and supply a replacement and novel discernment towards heart condition. heart condition prediction is challenging and really important within the medical field. However, the death rate is often drastically controlled if the disease is detected at the first stages and preventative measures are adopted as soon as possible. Further extension of this study is very desirable to direct the investigations to real-world datasets rather than just theoretical approaches and simulations. The proposed hybrid HRFLM approach is employed combining the characteristics of Random Forest (RF) and Linear Method (LM). HRFLM proved to be quite accurate within the prediction of heart condition. The longer-term course of this research are often performed with diverse mixtures of machine learning techniques to raised prediction techniques. Furthermore, new feature selection methods are often developed to urge a broader perception of the significant features to extend the performance of heart condition prediction.

References
