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A Novel Way to Predict Cardio Vascular Disease Using Artificial Intelligence

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Abstract
Cardio Vascular disease is one of the world's most deadly issues because it can't be seen by the naked eye and strikes suddenly.It will made a extensive hit once its limits are reached. As a result, it necessitates a precise diagnosis in a precise time. The health-care industry produced a massive amount of data daily about the patients and their illnesses. This information, however, needs a systemic algorithmic approach for finding a solution. In reality, researchers and medical practitioners have found that it is very effective. Today's health-care system Industry has a lot of data, but it doesn't have a lot of expertise. Due to the advancement in the field of computing there are several techniques and software related to the field of data mining and machine learning. It collects useful information from databases and to put the information to good use in order to make more correct diagnoses and decisions. It has become crucial to focus on heart disease prediction systems as it instantly made an attack and keep the patients hand closed.This research paper's important aim is to utilise recent results with the outcome of a novel method to predict the cardio vascular disease prediction as well as to draw analytical conclusions . According to the findings of the study, soft computing techniques plays a vital role in predicting the above said disease and in this paper it is implemented in a novel way.

Keywords: Cardio vascular disease, soft computing approach, heart disease, heart attack.

INTRODUCTION

To put it simply, heart failure means that the heart is not functioning as well as it should, which means that the heart is not supplying the body with the amount of blood it needs (AHA, 2017). CAD (coronary artery disease), hypertension (high blood pressure), and diabetes (which causes sudden cardiac issues) are the main factors in most heart failures.In 2020, 19.7 million people were died by cardiovascular diseases, according to World Health Organisation (WHO). This population is approximately 41% of all deaths. Coronary heart disease is estimated to be the cause of 10.4 million deaths (15 percent of all deaths) and stroke is estimated to be the cause of 8.7 million deaths.

Advances in medicine have made it possible to predict the occurrence of heart failure in patients later in life. All individuals, including those who seem to be in good health, shouldundergo various test twice a year to rule out the possibility of any evidence that could lead to heart failure. Most blood tests, chest X-rays, and MRIs are used in today's medical

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practise for the purpose of helping doctors to determine the underlying issue and devise a treatment plan.A person can subjected to severe heart attack by enormous factors. There are variables users can influence and variables users cannot control.However, smoking, diabetes, high cholesterol, extreme blood pressure, physical absence and obesity all are cardiovascular factors for heart irregularities. The implementation of technological process proves to be a necessity one for predicting the heart disease in a quick period of time. It also provides a variety of techniques so that the predictive accuracy can well be improved.More modern techniques include artificial neural networks (ANN), hybrid fuzzy logic, and neuro-fuzzy logic..

LITERATURE SURVEY

B.Venkatalakshmi, and M.V Shivsankar[1] ,introduced a novel predictive data mining technique for heart disease diagnosis . In this paper, the implementation of decision tree and naïve bayes algorithm were used. Abhishek Taneja[2], on her work utilises the power of data mining algorithm in predicting the heart diseases.Palaniappan and Awang[3] proposed the model Intelligent Heart Disease Prediction System based on data mining techniques such as Decision Trees, Naïve Bayes and the Neural Network. They built a mining model on a Cleveland Heart Disease dataset. The results showed everybody's strength to overcome the heart attack was well illustrated. The Intelligent Heart Disease Prediction System could answer inquiries which conventional systems could not support decisions. It facilitated the development of key knowledge, for example patterns, relationships between heart disease-related medical factors.Another research study used a reference database of medical records as a test subject. Age, Blood Pressure, Angiography Report, and other input variables are used to evaluate and train the Neural Network. For the diagnosis of heart diseases, the controlled network has been suggested.

The back propagation algorithm was used to carry out the training. When the doctor fed the system with unknown data, the system classified the unknown data by comparing it to the trained data and produced a list of possible diseases to which the patient is susceptible. The success rate for retrieving the desired output from imprecise inputs is close to 98%.Polat [4]used hybrid fuzzy weighted values and artificial immunity monitoring system to predict the heart diseases. Das[5] proposed SAS based software to fortell heart diseases.Başçiftçi and Incekara [6] proposed a novel web based decision support system with bi boolean functions to diagnose cardio vascular diseases.Kim[7] came up with a rule-based prediction system for coronary heart disease. With the help of Particle Swam Optimization, the two researchers, Hedeshi and Abadeh[8], were able to retrieve rules for classifying the patient's coronary artery disease. To improve the accuracy of the prediction, Hidayet [9] used feature selection methods. An ensemble machine learning approach for diagnosing heart diseases was proposed by Miao[10]. A Rule-Based Fuzzy Logic heart disease prediction system, developed by Reddy and Khare[11], was created. Samuel[12] employs a novel system based on artificial neural networks and fuzzy logic to analyse the likelihood of a cardiac arrest.

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Materials and Methods

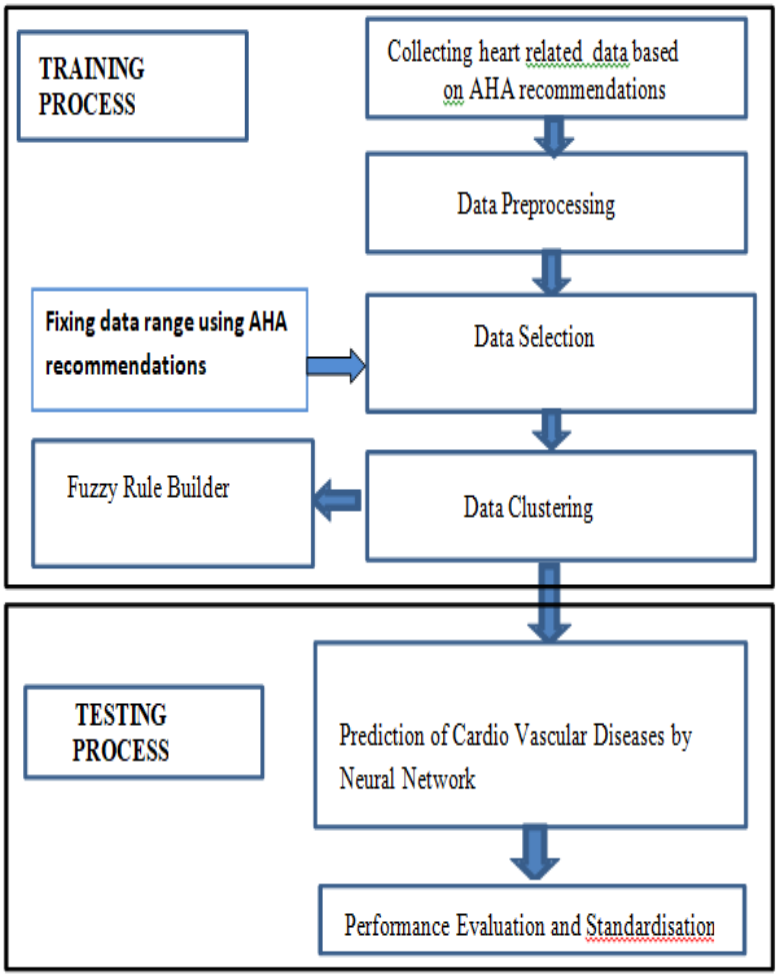

Fig 1.0 Heart Disease Prediction system using soft computing technique

In this model, system is divided into training process and testing process.

Training Process

In this Process, first the data collection was done from a UCI source and it is preprocessed for its validity. The required data parameters according to AHA standards are selected and the data here are further clustered with the help of a fuzzy rule builder. The fuzzy rule builder frames a list of rules for the data against the possible cardio vascular disease.

Testing Process

In this Process, the performance of neural network to validate the unknown data against the standard was utilised and the resultant value is compared against the standard values of cardio vascular disease risks.

Attribute Data

S.No	Attribute	Description	Range
1	Age	Patients age	26 to 80
2	Sex	Gender	1-Male, 0-Female

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3	CP	Chest Pain	1,2,3,4 types
4	Trestbps	Resting Blood Pressure in mm Hg	94 to 200
5	Chol	Serum Cholesterol in mg/dl	126 to 564
6	Fbs	Fasting blood sugar in mg/dl	0,1
7	Restecg	Resting electro cardiographic results	0,1,2
8	Thalach	Maximum heart rate achieved	71 to 202
9	Exang	Exercise induced angina	0,1
10	Old Peak	ST depression induced by exercise related to rest	1 to 3
11	Slope	Slope of the peak exercise ST segment	1,2,3
12	Ca	Number of major vessels coloured by fluoroscopy	0 to 3
13	Thal	Normal, Fixed defect, reversible defect	3,6,7

Fig 2.0 Shows the various values for the selected attribute to fix the risks

This dataset contains patients who are 26 to 80 years of age. The first gender value indicates that male patients are the subject, while the second gender value denotes that female patients are the subject. A form of chest pain may indicate heart failure in the following ways:Angina due to narrowed coronary arteries is known as type 1 angina.. Chest pain caused by stress and anxiety is known as Angina Type 1. Non-angina chest pain is often unrelated to heart failure, but a variety of factors can contribute to it. Symptomatic, the fourth type, could either be a sign of heart disease or completely asymptomatic. After that, you'll have the reading of the resting blood pressure, which is the next attribute to master.

When talking about cholesterol, people use the phrase "the amount of cholesterol in the body." The abbreviation FBS refers to the level of sugar in the blood. A reading of 1 represents a blood sugar level that is less than 120 mg/dl, and a reading of 0 represents a blood sugar level that is higher than 120 mg/dl. This is also known as exercise-induced angina, and if there is pain, it's 1; if there is no pain, it's 0. Resting EKG, which is called 'resting EKG' in everyday language, is known as 'the resting EKG result' while thalach, which is the maximum heart rate, is called 'the maximum heart rate' and 'exang' (meaning 'pain-free'), is referred to as 'pain-free angina,' which is recorded as '1' if there is pain and '0' if there is no pain. The exercise-induced ST depression is known as oldpeak, and the exercise-induced ST section is known as slope. Slope: Peak Slope, Cai is the number of major vessels

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that have fluoroscopy that is coloured, Thal is the duration of the exercise test in minutes, and Num is the attribute class.

Neural Network Model for Training the data:

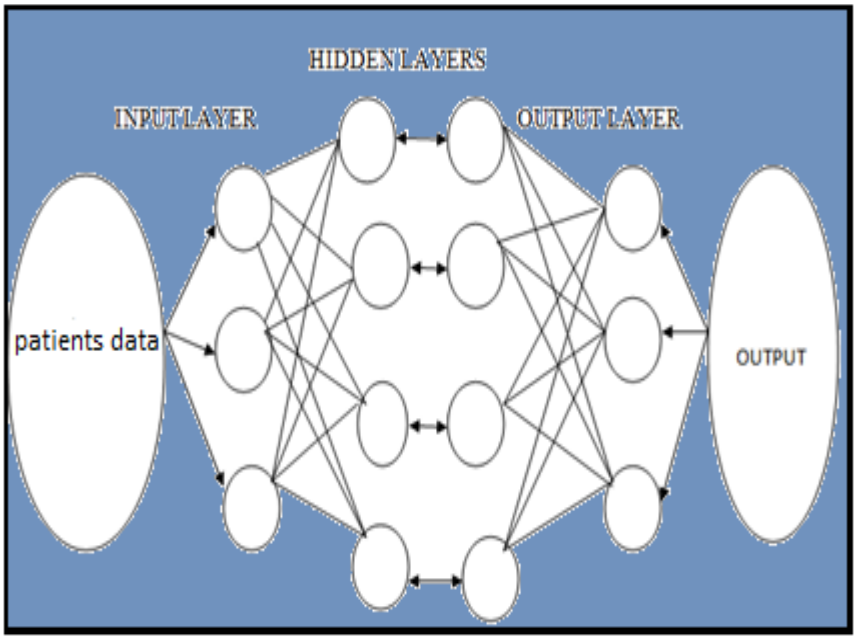

Fig 3.0 show the simple neural network model to train the heart dataset

Algorithm

The following algorithm will describe the prediction of heart attack in patients data

Step1: Start
Step 2: Collect the data for the prime attributes for a particular patient
Step 3: Preprocess the data for normalisation.
Step 4: Select the required data according to AHA range specification.
Step 5: Apply fuzzy rule to the selected heart data
Step 6: Cluster the heart data using fuzzy C-means
Step 7: Transformed input given to multilayer neural network model.
Step 8: Neural Network Learnt the incoming sequences and produce results.
Step 9: Goto step 3
Step 10: End

Results and Discussion

Based on the above experiments, more patients data were trained and it is found that m the system provides an accuracy 95% in predicting the heart disease.The following are the graphs related to the experiments.The accuracy of the system further improves by means of applying the computational intelligence methods and it was left for future enhancement.

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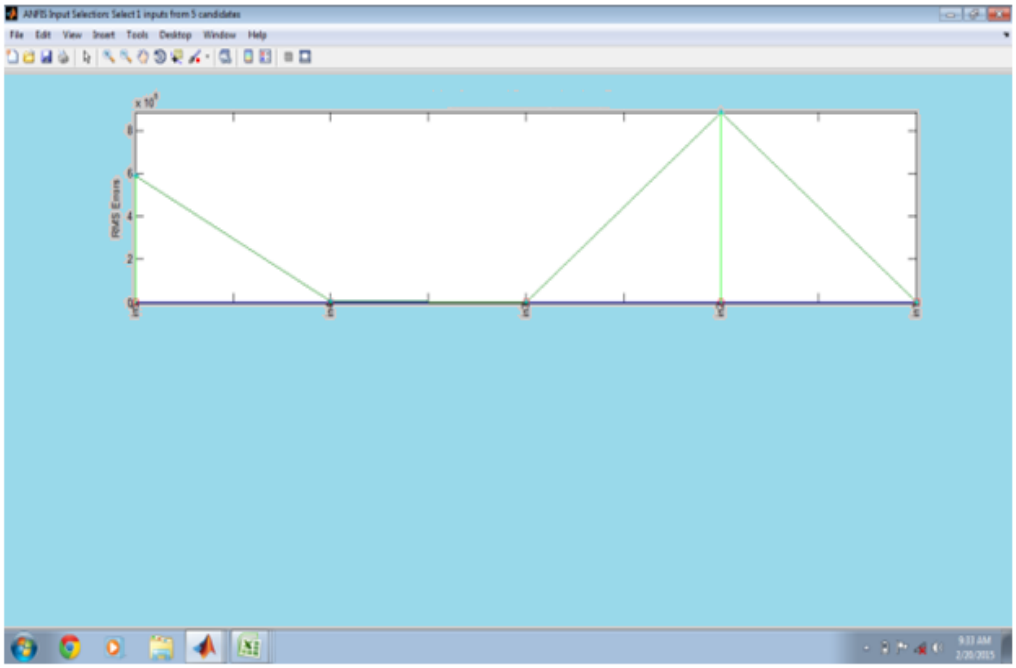

Fig 4.0 shows the network training approach for the heart dataset

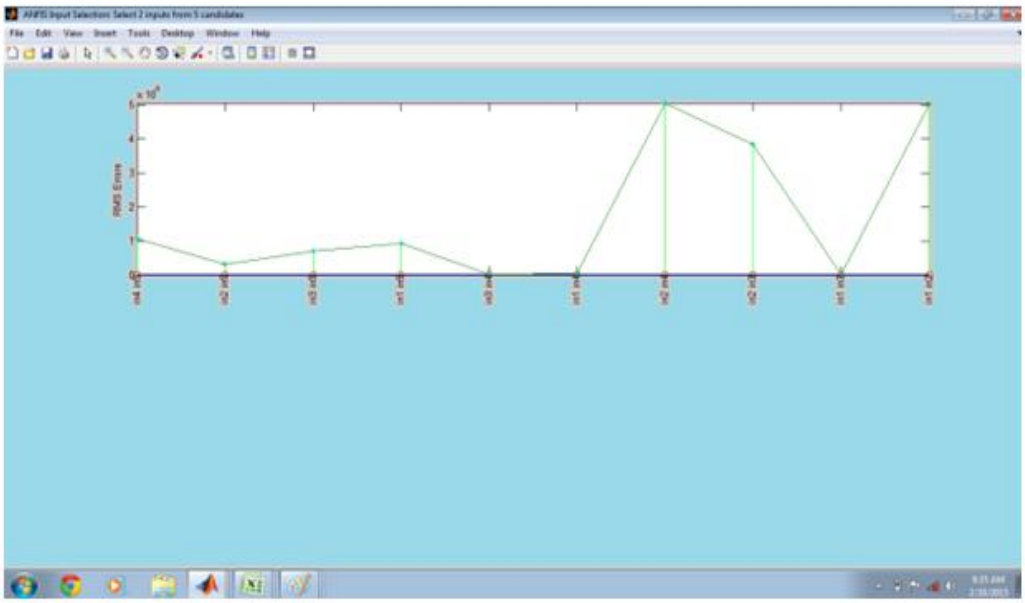

Fig 5.0 shows the neural testing approach for the heart dataset

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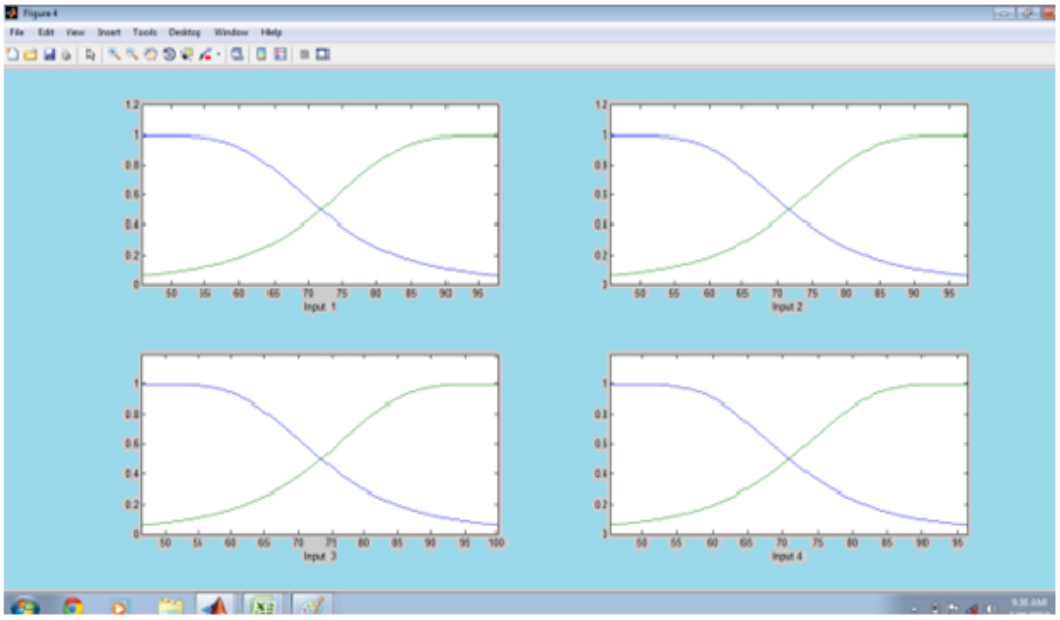

Fig 6.0 shows thefuzzy approach for heart data set

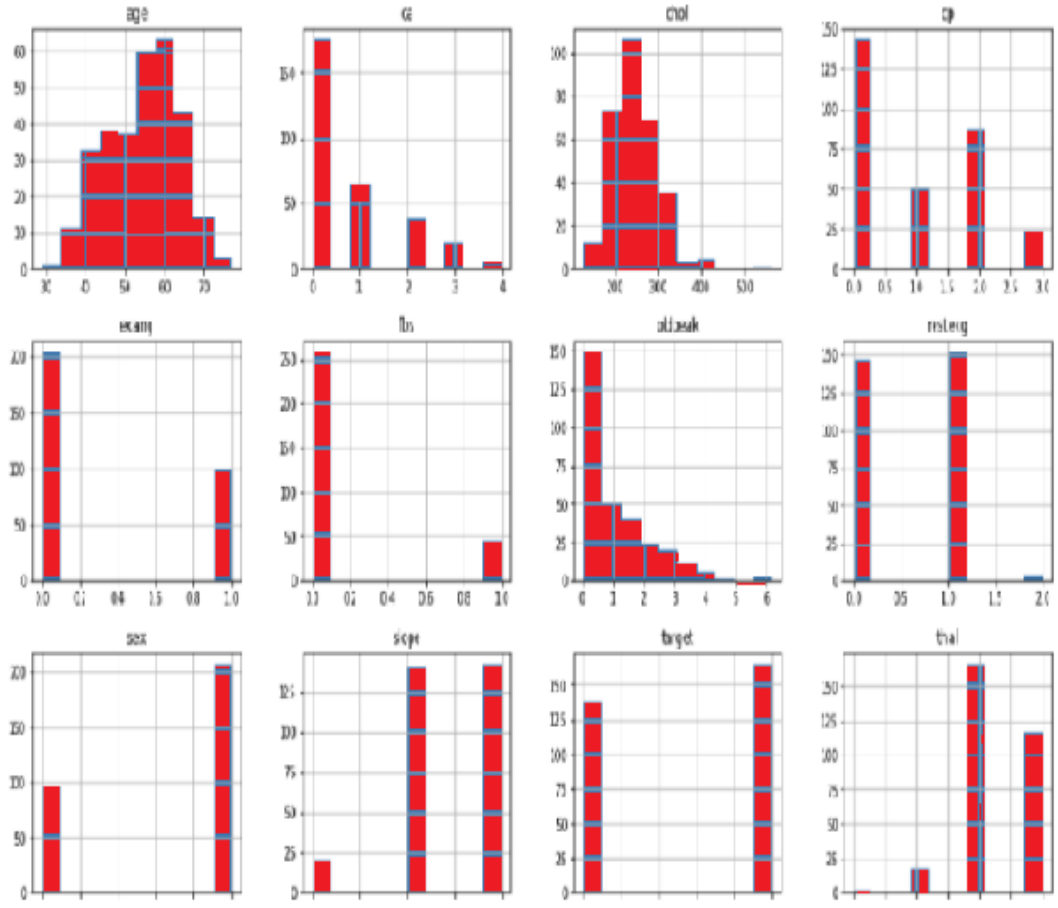

Fig 7.0 shows the study of heart risk for various categorical variables

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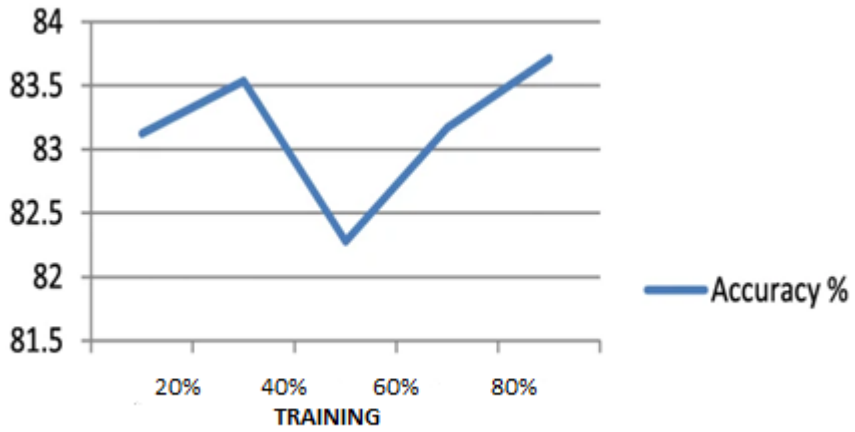

Fig 8.0 shows the accuracy percentage Vs training strategy

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