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# Prediction of Heart Disease for Diabetic Patients using Genetic Neural Network

Poonam Ramesh Pawar
Lecturer, Computer Engineering,
Viva College of Diploma Engg& Technology
Virar, Maharashtra, India

Mrs. Deepali Vora
Asst. Prof, Information Technology
Vidyalankar Institute of Technology
Wadala, Maharashtra, India

*Abstract-* The aim of our paper is to predict the risks of diabetic patient getting heart disease. Diabetes is a serious and chronic disease which causes serious health issues including heart disease, kidney failure and blindness, stroke. One of the most important applications of systems is in diagnosis of heart diseases because it is one of the leading causes of deaths all over the world. The proposed system presents a technique for prediction of heart disease for diabetic patients using major risk factors. This technique involves genetic algorithms and neural networks. The proposed system is implemented as a web based application, where Diabetic patient will give answers to the predefined questions. Then dataset is preprocessed in order to make suitabledata and compares the user data using Multilayer perceptron neural network. Back propagation algorithm will be used to train the network using the weights optimized by Genetic algorithm.

*keywords:- Multilayer perceptron neural network,Back propagation algorithm,Genetic algorithm.*

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## I. INTRODUCTION

Diabetes is a serious disease which can affect the entire body.Diabetes can be managed well but the potential complications areIncreases the risk of heart attacks by up to 4 times.Heart disease is a disease that affects on the operation of heart.Heart diseases are the number one cause of death globally: more people die annually from Heart diseases than from any other cause [1][3][4].Proposed System aims at developing andata mining system by using genetic algorithm optimized neural networks for the prediction of heart disease based on risk factors. Theproposed system was implemented using MATLAB R2012a.

## II. IMPLEMENTATION

The proposed system using data mining for converting the data into proper form and system predict more perfectly heart disease for diabetic patient by using number of attributes. Heart Attackpredicting system have the 12 risk factors or attribute and give the weights high valuerandomly,it will adjust the weight for the use of reduce errorfor the prediction. Weight Optimized dataset create by genetic algorithm and then it will be process on the neural network multi-layer feedforward network.
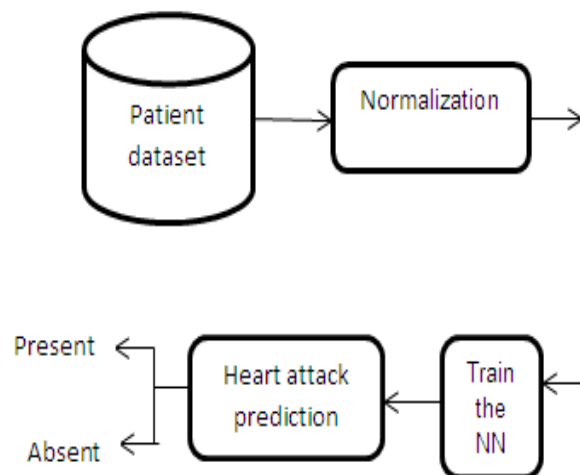


Fig 2.1: Proposed System for the Heart Attack Prediction

for diabetic patient

The patient dataset consists of patient information like age, sex, BP, physical activity, cholesterol, ECG which contains the symptoms of Heart disease. Thensystem performs the Min-max normalization on given dataset value, So that negative values are removed. Then train the Neural Network by using theBack propagation algorithm. Then byusing genetic algorithm system can predict whether the heartdisease present in diabetic patient or not.

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### III. RESULTS and DISCUSSION

The Propose system was developed using MATLAB R2012a. The Neural Network Toolbox wasused for implementing the algorithm [1]. The data for riskfactors related to heart diseases for diabetic patient collected from 128 people are provided by UCI (University of California, Irvine C.A) center for machinelearning and intelligent systems [2].

| Name of risk factor | value |
|---|---|
| Sex | Male(1), Female(0) |
| Age | 20-34(-2),35-50(-1),51-60(0),61-79(1),>79(2) |
| Chest Pain | --Value 1:typical angina 1,2,3,4<br>--Value 2: atypical anginal<br>--Value 3: non-anginal pain<br>--Value 4: asymptotic |
| Blood Cholesterol | Below 200 mg/dL - Low (-1),<br>200-239 mg/dL - Normal (0),<br>240 mg/dL and above - High (1) |
| Blood Pressure | Below 120 mm Hg- Low (-1)<br>120 to 139 mm Hg- Normal (0),<br>Above 139 mm Hg- High (-1) |
| Diabetes | Yes (1) |
| ECG | Below 100 mm Hg- Low (-1)<br>100 to 150 mm Hg- Normal (0),<br>Above 150 mm Hg- High (-1) |
| Heart Rate | Below 100 mm Hg- Low (-1)<br>100 to 150 mm Hg- Normal (0),<br>Above 150 mm Hg- High (-1) |
| Physical Activity | Low (-1) , Normal (0) or High (1) |
| slop | Value 1: up sloping<br>Value 2: flat<br>Value 3:down sloping |
| | (0-3)Colored by fluoroscopy |
| | Normal=3, fixed defect=6, reversible defect =7 |
| Heart Disease | Yes (1) or No (0) |

**Table 3.1: Name of Risk Factor and their Values**

The dataset was collected of 12 important risk factors which were sex, age, Chest Pain, Blood Cholesterol, Blood Pressure, Diabetes, ECG, Heart Rate, Physical Activity, slop, Noof majorvessels, Thal. The system indicates whether the patient had risk of heart disease or not. The Table 3.1 shows name of risk factors and the corresponding values and their encoded values in brackets, which were used as input to the system [1][2].

Neural Network is initialized with the 'configure'function, with each weigh being between -1.0 to +1.0. Theseweights are then passed to the genetic algorithm which usesthe mean square error as the fitness function and thentrained neuralnetwork are passed to the genetic algorithm.The Multi-Layer Feed forward Neural Network is constructed by calculating the number of nodes in input, hidden and output layers. The input nodes are taken as 12 equals to the number of risk factor. Weights adjustment using GA is done with'population size =20' so that each chromosome in the population represents the weight and biasvalues of the network. Fitness function is calculated for eachchromosome based on mean square error, which is calculated as below:

$$mse = \sum k (O_k - T_k)^2 / n$$

In this method GA ,the initial population is randomly generated. By selectingsuitable parameters, likeGenerations=100, Crossover Fraction=0.8000, Migration Interval= 20,Migration Fraction = 0.2000,EliteCount= 2,TolFun= 1.0000e etc., to the GA, high performance can be achieved and to get accurate prediction of heart disease for diabetic patient.



Figure3. 1. GUI for Heart Disease Prediction System

Above screen shot showsthat this diabetic patienthave heart disease.



Figure3. 2. GUI for Heart Disease Prediction System

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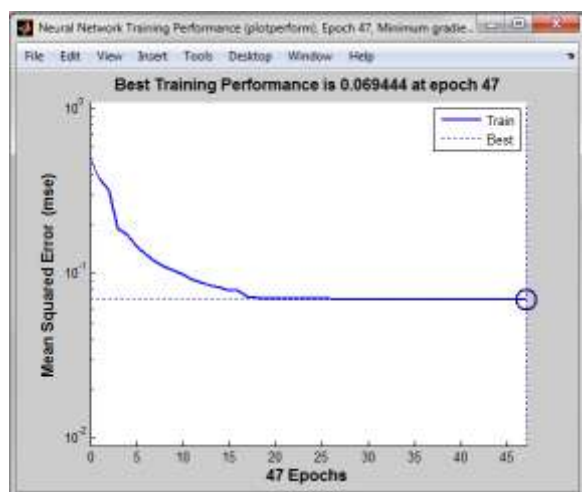Above screen shot shows that this diabetic patient does not have heart disease.



Figure 3.3: Performance Graph

Figure 3.3. showsResult of the least mean square error (MSE) achieved was 0.068444 after 47 epochs. The genetic algorithm and neural network approach gives better prediction accuracy.

## IV. CONCLUSION

In this study, a experiment is conducted with Heart Disease for diabetic patient dataset by considering the Multi-Layer Neural Network along with Back propagation Algorithm used to train the network. Genetic Algorithm is used to optimize the initialization of neural network weights. This work demonstrates about Genetic Neural Network based prediction of heart disease for diabetic patientby improving the performance using optimize neural network architecture and predicts whether the patient is suffering from heart disease or not.

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