Heart Disease Prediction System using Binary Particle Swarm Optimization Algorithm

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Abstract— Diagnosing is the important task in medical field in order to find out the illness in the human system. It is an automatic process which scans the infected body part of human system and find out reason behind the sickness and disease. It is must that diagnosing system must generate accurate results so that proper treatment can be available for the patient. In earlier systems various techniques was used for predicting the reason behind the disease which lacks in accuracy of the output. To overcome this problem swarm intelligence was used, in proposed approach enhanced PSO is applied to get satisfactory results. Enhanced or advanced version of PSO is defined and named as BPSO i.e. Binary Particle Swarm Optimization. The proposed work divides proposed system in two parts such as performance model and prediction model. Performance model is designed to evaluate the overall performance of the application. Prediction Model is used to predict the condition of the patient after evaluation on the basis of various parameters like heart beat rate, blood pressure, cholesterol etc. The accuracy of the system is proved after simulation in Matlab.

Keywords— *Diagnosing, Artificial Neural Network, PSO, Binary Particle Swarm Optimization,*

I. INTRODUCTION

In medical field diagnosis is an important task to perform in order to find disease in human system. Diagnosing is a process which is done by automated systems or machines in human system to find out the nature of the disease by monitoring the various symptoms of the illness. Diagnosing is a most complicated task to perform. Diagnosing machines or systems are quiet helpful in this process because not every doctor must have the knowledge of each and every kind of disease. Thus diagnosing manually by doctors can lead to inaccurate results some times. Thus an automated diagnosing machine is used by them to diagnose the problem accurately. The WHO consortium has shared this information that 12 millions of deaths occur in this world is just because of heart disease. Most of the heart diseases are found in adults and thus it leads to death. Heart disease a illness or disease which envelop the various disease that directly target the heart. Heart disease is the main reason behind the deaths in various countries of the world and even in India also. In case of USA one person is dying every 34 seconds just because of some kind of heart disease. There are many types of heart disease such as coronary heart disease, cardiovascular disease and cardiomyopathy disease. Cardiovascular disease is that disease which directly effects the blood circulation in the body and blood vessels which are connected to the heart.

Cardiovascular disease leads to various illnesses in the body like high BP, coronary artery disease, stroke etc. Cardiovascular disease can also leads to the death of the person also. Cardiomyopathy disease is a type of coronary disease in which oxygen and blood is not properly is not supplied to the heart because of reduction in the size of coronary arteries. Coronary heart disease also includes heart attacks and chest pain. When coronary arteries are blocked all of sudden then it will lead to the heart attacks and arteries are blocked because of blood clots. Heart attacks and chest pain is also kind of myocardial disease. Heart attack is just because of blood clots in the coronary arteries which leads to the blockage in arteries. Reason behind chest pain is in sufficient blood circulation to heart muscles. Increase in heart disease is because of many facts like high BP, smoking, Family history etc. some other factors that also causes heart diseases are high cholesterol level, hyper tension, improper diet etc. Symptoms of heart disease are like:

- Fainting fits
- Discomfort in having meals
- Shortness in breathing
- Fatigue
- Pain in chest
- Palpitation
- Pain in the middle of chest (Heart)

II. ARTIFICIAL NEURAL NETWORKS

An Artificial neural Network is abbreviated as ANN. It is a type of black box technology which is used as predictive model in various scenarios. In this all the variables or characters used to describe the unrevealed environment should be used in trained Artificial Neural Network and then on this basis prediction is done by the ANN. Various types of neural networks are used under ANN to solve the different kind of issues like generalization, data reduction, monitoring, controlling and prediction etc. in various scenarios such as architecture etc. [1]

III. LEARNING IN ANN

Learning in artificial neural network is also known as Training in neural networks. It can only accomplished by using any example related to the real environment. In this learning is observed by adjusting the weights in Artificial Neural Networks iteratively in order to perform some

specific task. Learning in ANN can be of three types as follows: [4]

- Supervised learning
- Unsupervised learning
- Reinforcement learning

Supervised Learning is that in which the actual output of the neural network is compared by the desired correct output of the system or target output. In this error mean square is also used for actual output and target output by summed all available information. Back propagation is an algorithm which is further used in ANN to adjust the connection weights. Back propagation is used iteratively to reduce the error rate in ANN [6].

Reinforcement is a learning approach which is based on the idea of supervised learning. In this target output is unknown.

Unsupervised learning is a type of learning which is based on correlation between inputted data. In this the information or idea regarding the correct output is not available or known. The nature of the training or learning algorithm [3] is learning rule such as weight updating rule which is used to describe how connection weights are vary. There are some examples of learning rules like delta rule, Hebbian Rule, antiHebbian rule etc. [2].

IV.   PROBLEM FORMULATION

The term heart disease meant for different complications that affect the normal functioning of circulatory system, which consists of heart and blood vessels. Heart is the most important part that supports life in an organism so its functioning is important and so important is the correct prediction of heart diseases so that proper medical aid can be provided to the patient. Since, the heart diseases are computed using the collected data set, the conventional method used for heart disease prediction is called as multilayer perception

. This method consists of multiple layers. In this method the technique of color histogram is used for extracting color information from the image. For computing results neural networks are trained by giving certain input sets and the outputs for these sets. The disadvantage of this conventional technique for heart disease prediction is that if the obtained input sets do not match the trained input set of the neural networks, then the output obtained is using the probabilistic theory. It is not essential that the obtained results will be desired & accurate. A more precise technique needs to be developed that could produce more accurate & efficient results.

V.   PROPOSED WORK

The life of any organism is totally dependent of the proper functioning of the heart and if there is some problem in the pumping action of the heart, the main organs of the body like the brain and kidneys are adversely affected. The proper & exact diagnosis of heart disease is important so that right treatment could be given to the patient and his/her life can be saved. The diagnoses of the heart diseases were earlier done using fuzzy logics, Neural Networks etc. the trained data set was provided and the outputs were generated accordingly. Probabilistic theory was applied in case obtained input sets do not matches the defined input sets. In the proposed technique optimized PSO algorithm is employed for optimizing the results. The optimization algorithms generate results with high accuracy and efficiency as before final results the results are optimized and only best results are evaluated.

Objectives:

1. To diagnose heart diseases.
2. Training data sets.
3. Applying optimized PSO algorithm
4. Computing optimized results

VI.   METHODOLOGY

There are two models in this proposed technique. The methodology of proposed system is as follows:
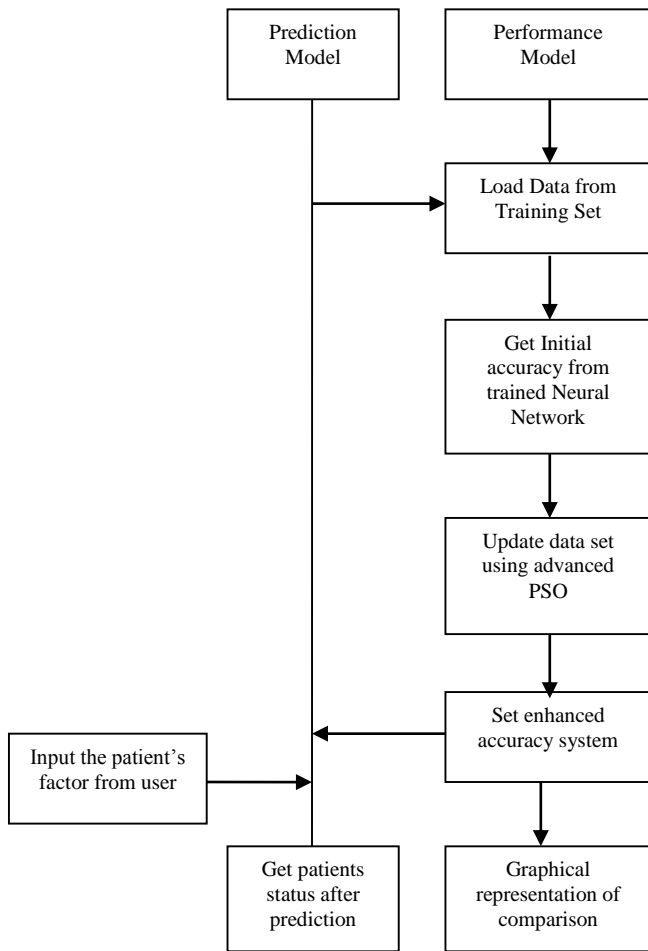
Performance Model

This model is used for evaluating the performance of the application which we are going to use for prediction.

1. First step is to load data from training set
2. Perform classification on data and get initial accuracy from trained neural network.
3. In third step apply advance PSO and update the data set with new values.
4. Set enhanced accuracy of the system.
5. Patient's status is obtained and generates graphical presentation for comparison of earlier and proposed technique.

Prediction Model

1. Load data from data set
2. Prepare prediction model by using data sets.
3. Generate input from the user about patient on the basis of various factors after setting enhanced accuracy of the system
4. Generates patient's status after predictions.

Published by :
http://www.ijert.org

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 5 Issue 08, August-2016

The block diagram of the proposed technique is as follows:
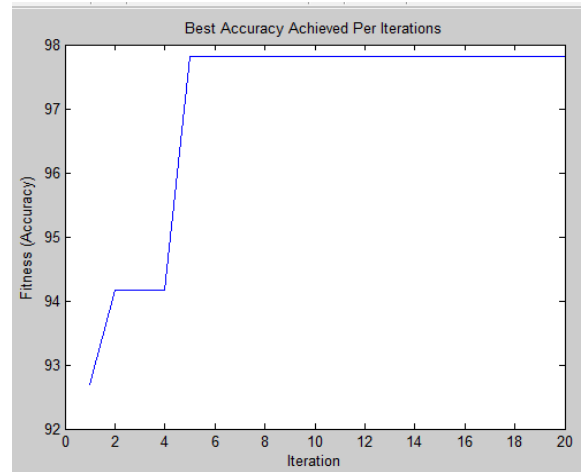

Figure 2.shows the graph of best accuracy achieved after per iteration.
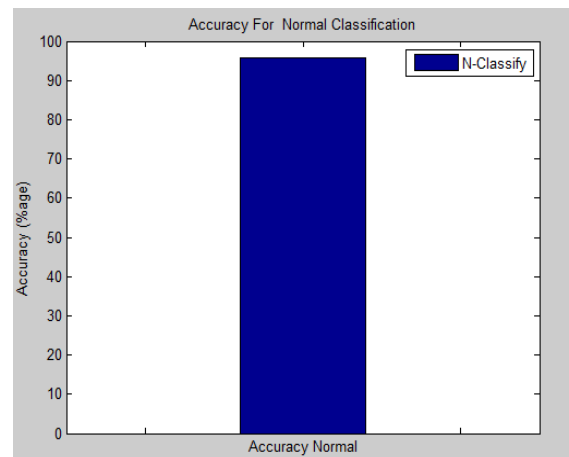
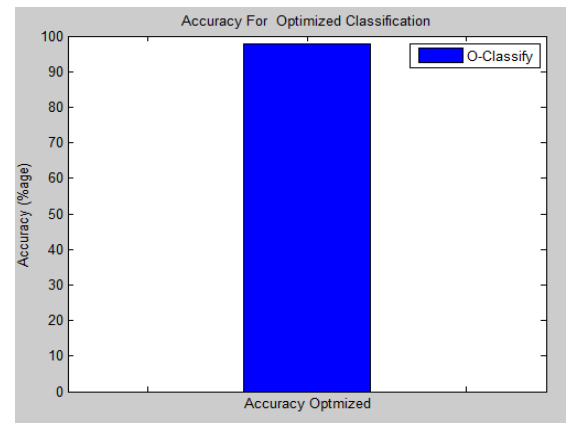Figure 3.Shows the accuracy graph for Normal classification.

VII. RESULT ANALYSIS

In this section of the paper, results are evaluated by taking some percentage of data set for training and rest of the data set for prediction. As a result, comparison has also been performed to show the performance of the system with the existing system. Thus, proposed work results have shown in this section.

Figure 4. Shows the graph of accuracy for optimized classification.

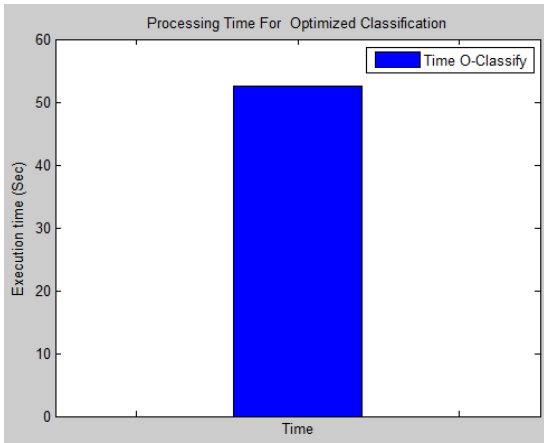Figure 1.shows the accuracy graph obtained after each iteration

Figure 5.shows the graph for processing time for optimized classification.
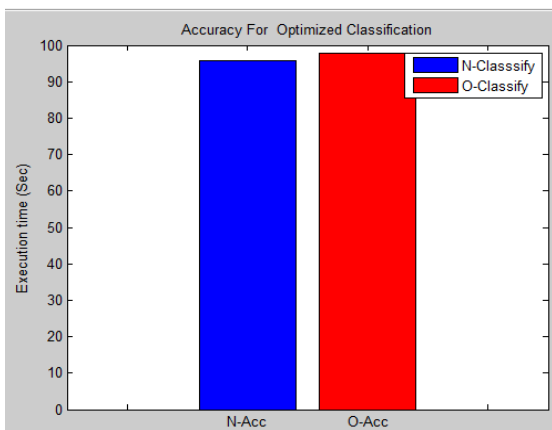
Figure 6. Shows the accuracy graph between traditional and proposed classification.

Figure 7. Shows the GUI of prediction model of proposed technique.

VIII. CONCLUSION

Heart disease diagnosing is a difficult and important task in order to get patient's exact condition with respect to any disease or illness which is directly related to heart. Various heart diseases like heart attacks, chest pain etc. has some causes and reasons. In earlier diagnosing system various techniques was used. It has various disadvantages like inefficiency and inaccurate result generation. To overcome this problem in proposed technique we use BPSO i.e. Binary PSO which is the advanced version of PSO it divides the working of the system in two parts i.e. prediction model and performance model respectively. After simulation in MATLAB the accuracy and efficiency of the proposed technique is proved that it is better than the traditional one. In future various parameters can be used to increase the performance accuracy of the system. Various trending techniques can also be introduced in the system in future

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