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Mafia and FP-growth to detect cardiovascular problem

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Abstract: ***In recent years various software tools and various algorithms have been proposed by the researchers for budding successful medical decision support systems. Moreover, better algorithms and better tools are developed and represent day by day. Diagnosing of heart disease is one of the vital concern and many researchers investigated to widen intelligent medical decision support systems to improve the skill of the physicians. Such an automated system for medical diagnosis would perk up medical care and lessen expenditure [Ref 1]. However, perfect diagnosis at before time and appropriate consequent treatment can upshot in momentous life saving. Many authentic world tribulations in various fields such as business, science, industry and medicine can be getting to the bottom of by using classification approach. Neural Networks have emerged as an important tool for classification. The advantages of Neural Networks helps for efficient classification of given data. In cardiology, artificial neural networks have been successfully applied to problems in classification and detection Electrocardiographic. This study mainly focuses on the current status of artificial neural network technology in cardiovascular medical research.***

Keywords: artificial neural networks, medical diagnosis, cardiovascular, Electrocardiographic

1. INTRODUCTION

A quality service at affordable costs is considered as major challenge facing healthcare organizations such as hospitals, medical centres. Quality service means that diagnosing patients correctly and administering treatments that are effective. Clinical decisions that are poor can lead to disastrous consequences which are therefore unacceptable. The cost of clinical tests must be minimized by hospitals. The result can be obtained by employing appropriate computer-based information and decision support systems. Hospitals and clinics accumulate a huge amount of patient data over the years. These data provide a basis for the analysis of risk factors for many diseases. For example, we can predict the level of heart attack to find patterns associated with heart disease. Disease Diagnosis is usually based on signs, symptoms and physical examination of a patient. Almost all the doctors are predicting heart disease by learning and experience. The
diagnosis of disease is a difficult and tedious task in medical field. Diagnosis of Heart disease from various factors or symptoms is a multi-layered issue which may lead to false presumptions and unpredictable effects [Ref. 2] only human intelligence alone is not enough for proper diagnosis. A number of difficulties will arrive during diagnosis, such as less accurate results, less experience, time dependent performance, knowledge up gradation is difficult as shown in Fig. I

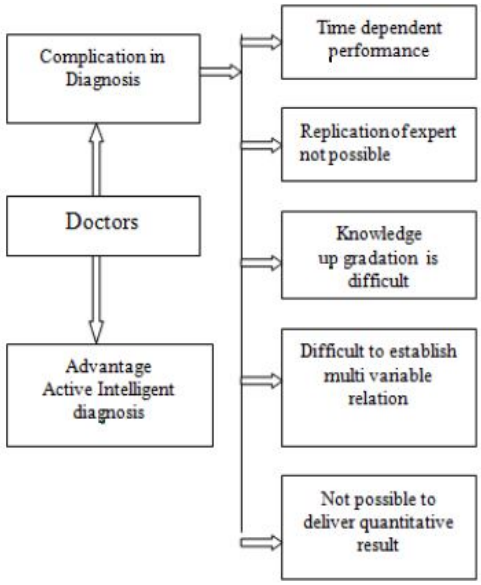

Figure 1 Types of diagnosis

2. Classification using Neural Networks

2.1. Back-Propagation Learning

The back-propagation (BP) algorithm has emerged as the workhorse for the design of a special class of layered feed-forward networks known as multilayer perceptrons (MLPs). A multilayer perceptron has an input layer of source nodes and an output layer of neurons (i.e., computation nodes); these two layers connect the network to the outside world.

In addition to these two layers, the multilayer perceptron usually has one or more layers of hidden neurons, which are so called because these neurons are not directly reachable from the input end or from the output end.

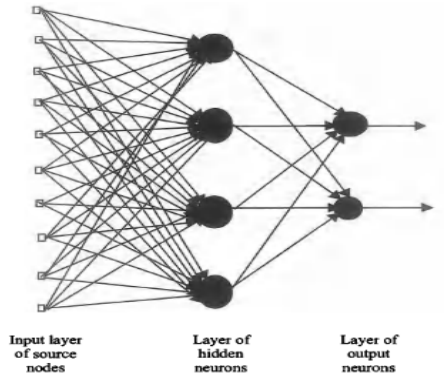

Figure 2 Back Propagation method

The training of an MLP is usually accomplished by using a BP algorithm that involves two phases [Ref 3].
•Forward phase: During this phase the free parameters of the network are fixed, and the input signal is propagated through the network layer by layer. The forward phase finishes with the computation of an error signal

$$ei = di - yi$$

Where d_i is the desired response and y_i is the actual output produced by the network in response to the x_i.

•Backward phase: During this second phase, the error signal e_i is propagated through the network in the backward direction, hence the name of the algorithm. It is during this phase that adjustments are applied to the free parameters of the network so as to minimize the error e_i in a statistical sense.

The Serious limitations of single-layer perceptrons are that it cannot learn non-linearly separable tasks and it cannot approximate non-linear functions. It is difficult to design learning algorithms for multi-layer networks of perceptrons. It is time-consuming and complex.

2.2 Radial Basis Function (RBF) Networks

Another popular layered feed-forward network is the radial basis function (RBF) network. RBF networks use memory-based learning for their design. Specifically, learning is viewed as a curve-fitting problem in high-dimensional space.

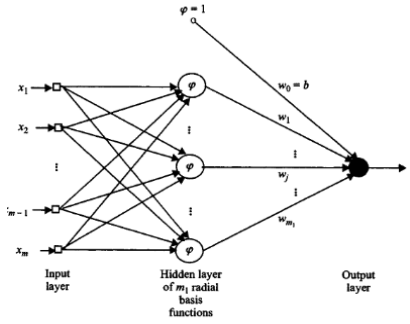

Figure 3 Radial Basis Function (RBF) Networks

1. Learning is equivalent to finding a surface in a multidimensional space that provides a best fit to the training data.

2. Generalization (i.e., response of the network to input data not seen before) is equivalent to the use of this multidimensional surface to interpolate the test data.

Although the RBF is quick to train, when training is finished and it is being used it is slower than the others, so the speed is the main drawback of RBF.

2.3 Support Vector Machines

Support vector machines (SVM) theory provides the most principled approach to the design of neural networks, eliminating the need for domain knowledge. SVM theory applies to pattern classification, regression, or density estimation using an RBF network or an MLP with a single hidden layer [Ref 4].

$$K(Xi, Xj) = \Phi^T(Xi)\Phi(Xj)$$

Where x_i and x_j are input vectors for examples i and j. $\Phi(Xi)$ is the vector of hidden unit outputs for inputs x_i. Perhaps the biggest limitation of the support vector approach lies in choice of the kernel and second limitation is speed and size, both in training and testing. Discrete data presents another problem.

2.4 Algorithm

The proposed algorithm is the effective algorithm which combines diverse old and new algorithmic ideas to form a practical algorithm [Ref 5].

The depth first traversal of the itemset, fp growth, effective purning mechanism and mafia are incorporated in the search strategy of the proposed algorithm [Ref 6].

Step 1: Database is read and the count of items is found.
Step 2: Generate all nonempty subsets for each frequent itemset I.
Step 3: For every non empty set S of I output the rule.
S -> (I – S)
Step 4: frequent sets are selected and sorted.
Step 5: Initialization of the tree is done from the frequent items a node list is created which will be connected to the nodes of the tree.
Step 6: After initialization the database is read again.
Step 7: This time if an item in a transaction is selected as frequent then it is added to the tree structure.
Step 8: Or check if suppose it is in the set of all maximum frequent itemset then stop generation of children and return.
Step 9: And also check node and the candidate expressions is frequent then all nodes right hand side sibiling maybe pruned.
Step 10: Goto step 6 and proceed.

3. Experiment Result

The outcome of our experimental analysis in finding momentous patterns for heart prediction is presented in this section. We have put into operation our proposed approach in Angular JS. The detailed description of the dataset and the results are given in the following subsections.

3.1 Heart Disease Dataset Description

The dataset used in our approach contains the parameters like blood pressure, cholesterol, chest pain, heart beat and more. The detailed description of the parameters and their ranges are given as follows:

1. Age: age in years

2. Sex: (1=male ; 2=female)

3. Chest pain type

   If (pain==”regular”)then T1=”typical angina”
   Else

   If (pain==”irregular”) then T1 =”atypical angina”
   Else

   If (pain==”unknown pain”) then T1= “non-anginal pain”

   ElseIf (pain==”no pain”) then T1= “asymptomatic”

   Endif

4. Resting blood sugar
   S1: systolic: 120
   S2: diastolic: 80

5. Cholestoral in mg/dl: chol

6. Resting electrocardiographic
   If (hbeat1<=80 || hbeat1>=70) and (hbeat2<=80 || hbeat2>70) then
   ER1: normal

   Elseif (hbeat1>=80 && hbeat2>=80) then
   ER2==true

   Elseif (hbeat1<=72 || hbeat1>=60) and (hbeat2<=72 ||hbeat2>60) then
   ER3==true

   Elseif (hbeat1<=59 || hbeat1>=40) and (hbeat2<=59 || hbeat2>40) then
   ER4==true

   Elseif (hbeat1<=40 && hbeat2<=40) then
   ER5==true

   Elseif (hbeat1>60 || hbeat1<80) and (hbeat2>60 || hbeat2<80) then
   ER6==true

   Elseif (hbeat1=0 && hbeat2=0) then
   ER7==true

   Elseif (hbeat1>50 || hbeat1<60) and (hbeat2>50 || hbeat2<60) then
   ER8==true

7. Exercise induced angina (2=yes; 0=no)

8. If res<=3 then “normal”
   Elseif res=6 then “fixed defect”
   else
   res>=7 then “reversable defect”

9. Diagnosis of the heart: (dia= res*10)

   If (dia<=50 then “normal problem”)

   Elseif (dia>=50) then “cardioticproblem”)

   Display res

   If ER2==true then
   Display cardioticproblem=”Artial fibrillation”
   Display T1
   Display P Wave absent

   Else If ER3==true then
   Display cardioticproblem=”1 degree heart block”
   Display T1
   Display PR long

   Else If ER4==true then
   Display cardioticproblem=”2 degree heart block”
   Display T1
   Display PR dropped

   Else If ER5==true then
   Display cardioticproblem=”3 degree heart block”
   Display T1
   Display P dropped

   Else If ER6==true then
   Display cardioticproblem=” Minor abnormality”
   Display T1
   Display R is ¼ of Q

   Else If ER7==true then
   Display cardioticproblem=” myocardial infaution”
   Display T1
   Display ST Elevation

Else If ER8==true then
Display cardioticproblem=" ischemic heart disease"
Display T1
Display Biphasic T

Endif

3.2 Result:

With the help of the dataset, heart attack predictions are extracted. The heart disease data set is preprocessed successfully by removing duplicate records and supplying missing values. The values corresponding to the each attribute in the algorithm is as follows: Chest pain type, Sugar range is systolic means greater than 120 and diastolic is greater than 80, Cholestoral must be inbetween 80 and 100 and heart beat must be 72. These are the main cause for the heart attack disease. This information is very much to predict the heart attack using artificial intelligent technique. Here the results are given with the help of MATLAB. Figure 4 refers the electrocardiographic of artial fibrillation, figure 5 refers the electrocardiographic of 1 degree heart block, figure 6 refers the electrocardiographic of 2 degree heart block, figure 7 refers the electrocardiographic of Minor abnormality and figure 8 refers the electrocardiographic of myocardial infaution.

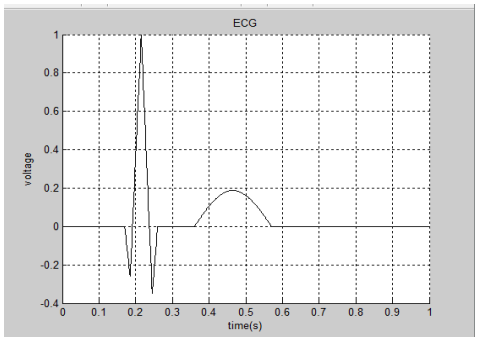

Figure 4 refers the electrocardiographic of artial fibrillation

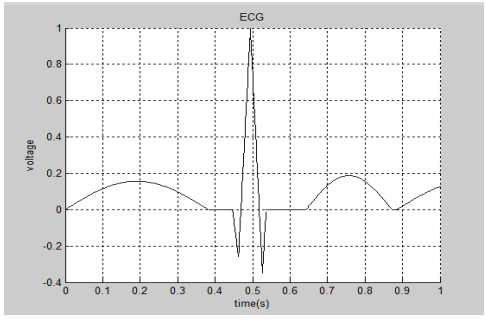

Figure 5 refers the electrocardiographic of 1 degree heart block

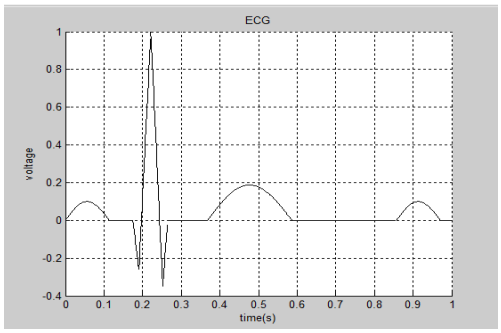

Figure 6 refers the electrocardiographic of 2 degree heart block

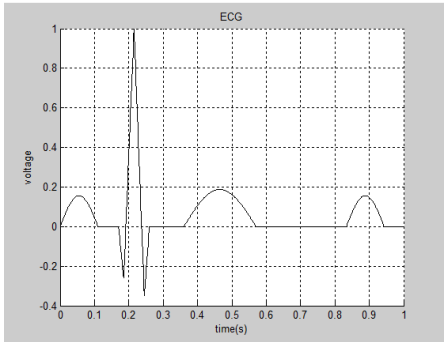

Figure 7 refers the electrocardiographic of Minor abnormality

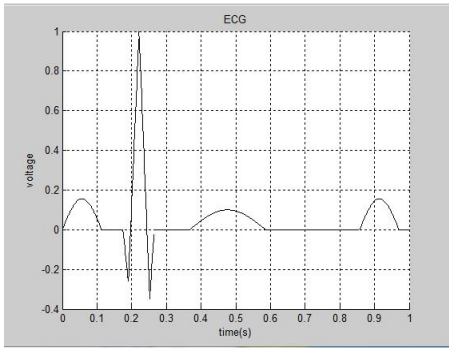

Figure 8 refers the electrocardiographic of myocardial infaution

4. Conclusion

Artificial Intelligence plays a main role in Problem solving, Recreational, Computer Programming, Psychology and medical diagnosis. Health care related data are voluminous in nature and they arrive from diverse sources all of them not entirely correct in structure or quality. These days, the exploitation of knowledge and experience of numerous specialists and clinical screening data of patients gathered in a database during the diagnosis procedure. In this paper we have presented a method to predict cardioticproblem. The results thus obtained have illustrated that the designed diagnostic system is capable of predicting the risk level of heart disease effectively and also displaying the type of cardioticproblem. This system acts as promising tool for diagnosis of heart disease.

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