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Neural Network Based Classifier (Pattern recognition) for Classification of Iris Data Set

Labhya Sharma[1], Utsav Sharma[2]
[1,2]*Zakir Hussain College of Engineering and Technology, AMU, Aligarh-202001, UP, INDIA*

***Abstract*— In this paper we are working on the Neural Network based classifier that solves the classification problem. The paper describes the multilayer perception approach to describe the neural network architecture. For this classifier we use the Fisher's Iris Database (Fisher, 1936) available in MATLAB and on the Internet. This database is the pre-processed and is the best database in the pattern recognition literature. It contains 3 different classes of 50 objects each, where each class is an iris plant. Classes are named as Iris Setosa, Iris Versicolour, Iris Virginica. We finally describe the result of this classifier.**

***Keywords*—Artificial Neural Network, Pattern recognition, Multilayer Perceptron, IRIS Database, Confusion Matrix.**

I. INTRODUCTION

Pattern recognition is the study of how a computer can read the things and learn to distinguish between the different things in the environment and then make right decisions about the categories of pattern. The best pattern recognizers are the humans. Different classifiers are used now a days for pattern recognition. Pattern recognition is important to detect various medical diseases(arrhythmia detection[1], seizure detection etc.) and image processing in this electronic era. So, here we design an automatic classifier based on quasi Newton method proposed by sir Newton. Artificial Neural Networks [2] is the Artificial Intelligence technique commonly used because it is able to capture and represent complex input and output relationships among data. Neural Networks (NN) [3] are an effective tool in the field of pattern classification. This paper demonstrates the process of developing classifier based on Artificial Neural Network which classify the Fisher's iris database [4], Fisher's iris database is the best known database available in the pattern recognition literature.

An Artificial Neural Network [3] is the computer model inspired by the functioning of the Human Brain. It contains the set of artificial Neurons that are interconnected with the other neurons. The first model of artificial neurons was given by the McCulloch and Pitts in 1943.

The main purpose of this paper is to demonstrate the process of developing the Artificial Neural network based classifier which classifies the Iris database. This classifier uses the Multilayer perceptron [5] neural network to solve the classification problem.

II. PATTERN RECOGNITION

Automatic(machine) recognition, classification, description of pattern are the important problems in various engineering and technology disciplines such as medicine, biology, psychology, artificial intelligence, remote sensing, computer vision. A pattern could be a finger print image, hand written words, human or animal face, or a sound signal. The best known approaches for the pattern recognition are template matching, statistical classification, syntactical or structural matching, Neural network. Here in our case we use the neural network approach to classify the data. The design of pattern recognition system involves the following processes: 1) data acquisition and pre-processing 2) data representation 3) decision making.

III. METHODOLOGY

In this paper we develop the classifier and solve the classification problem with the use of multi-layer perceptron neural network. They are mostly used in pattern classification [4] and they give the best results.

A. Artificial Neural Network (ANN)

The most important part of the artificial neural network[12] is that they are able to remember the complex non-linear input output relationships, use sequential training procedures, and adapt themselves to the data. The most commonly used neural network for the pattern recognition [6] is the feed forward network, which includes multilayer perceptron and radial basis function (RBF) networks. The learning process involves updating network architecture and connection weights so that the network can efficiently perform classification task.

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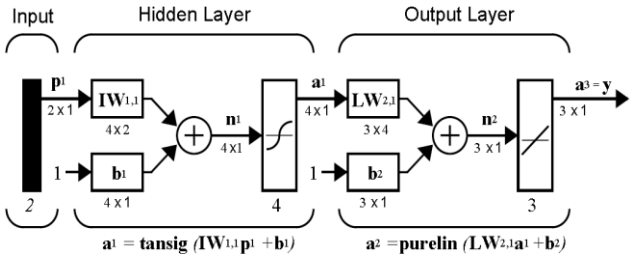
Artificial neural network gives the new type of non-linear relationship for feature extraction and classification. ANN is inspired by the biological neural system and it is the information processing unit like the brain. We here use the Multilayer perceptron neural network for the classification of the data. Multilayer perceptron is very popular and efficient in the pattern recognition.

Multilayer Perceptron: Multilayer perceptron is also known as multilayer feedforward network [2, 5]. They allow signals to travel one way only i.e. from input to the output and they don't have any feedback, This means that the output of any layer does not affect the same layer. They tend to be straight forward networks i.e. input and output is associated with each other. Feedforward networks often have one or more hidden layers of sigmoid neurons [7] followed by an output layer of linear neurons. Multiple layers of neurons with some non-linear transfer characteristics allow the network to learn non-linear and linear relationship between input and output vectors. This neural network is made up of multiple layers. It has two input and output layers and have some hidden layers in between. The working computational unit of the hidden layers are also called as hidden neurons or hidden units. The hidden unist helps in performing computations before producing the output from the input. The input layer neurons are linked to the hidden layer and the hidden layer neurons are linked to the output layers [8, 9].



1.Model of Multilayer Perceptron Neural Netwok

The linear output layer produces the result outside the range -1 to +1. In this paper the transfer characteristics of hidden layers are hyperbolic tangent sigmoid function. The Network architecture of neural network is computed by the number of hidden layers and by the number of neurons in each hidden layer. We use the propagation learning rule to train the network. As soon as the architecture and performance of multilayer perceptron are determined by the number of hidden layers and by the neurons that are present in each hidden layer thes, the network design parameters are adjusted.

The correct classification is the ratio of number of correctly classified inputs to the total number of inputs.

Multilayer perceptron with one or two hidden layers are investigated. Grid search is the adjustment of number of neurons in the hidden layer. Multilayer perceptron is trained on the train set with each group of number of neurons in the hidden layer, the value of classification function for the train set is stored. For the standard early stopping procedure we used validation set and the correct classification function for the validation set is also stored. The number of neurons that verifies the best generalization is picked. In this paper the training of the multilayer perceptron is done by BFGS algorithm. For the small networks quasi-Newton algorithms are used.

B. Data Used

One of the best and most popular data set of the neural network application is the IRIS plant dataset.Iris database contains 3 different classes of iris plant, each class have 50 instances each, where every class refer to a type of Iris plant named as Iris Setosa, Iris Versicolour, Iris Virginica. Iris dataset [10, 11] is obtained from UCI Machine Learning Repository and created by R.A. Fisher while donated by Michael Marshall (MARSHALL%PLU@io.arc.nasa.gov) on July, 1988. This Fisher's Iris data is the pre-processed data so, popularly used in the pattern recognition literature.

C. Features Used

The IRIS Database Contains the following attributes:

1. Sepal Length in cm
2. Sepal Width in cm
3. Petal Length in cm
4. Petal width in cm

The fifth attribute can be predicted which is the class attribute this means that each instance also includes an identifying class name, which are as follows: IRIS Setosa, IRIS Versicolour, IRIS Virginica.This forms the matrix of 150*3 and is used in the program. By examining the Sepal and Petal, The program can classify the IRIS plant. Sepal width has positive relationship with Sepal length and petal width has positive relationship with petal length. In this paper, Data is partitioned into two parts, first is to train the neural network and second for the test set for the cross validation. The three classes of Iris allocated bit string representation are Iris-Setosa (1 0 0), Iris-versicolour (0 1 0), Iris-virginica (0 0 1).

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This bit string representation is the expected result of the program of the output neurons in regard to a pattern, and are used in training and validation of the network. The MATLAB code of this classifier is developed by us.

IV. Result

The selected features can be applied to the linear and the non-linear classifier. Efficiency of features and classifier combination for pattern recognition has been tested. This method yields the perfect results. The data was partitioned into the training (80%) and validation (20%) sets using cross validation.

A normally used statistical measure to evaluate classifiers performance is the confusion matrix, defined below:

$$\begin{bmatrix} \text{True positive} & \text{False positive} \\ \text{False negative} & \text{True negative} \end{bmatrix}$$

Here, true positive and true negative are the classification of positive patterns and negative patterns respectively. False negative are the true positive that were wrongly classified as true negative where as false positive are the true negative that were wrongly classified as true positive.

TABLE I
Result

I. Sets	II. Efficiency
Training set	99.2%
Validation set	100%

V. Conclusion

A method for the analysis of non stationary signals as well as stationary signals using neural network method gives good results. After passing the features of data from the classifier, weights of nodes and links update their value and remain fixed for test pattern. Classification was done using the simple BFGS Quasi Newton algorithm into classifiers. By using this for classification between different dataset the accuracy achieved was 100%.

As perfect data was used 100 % accuracy was achieved otherwise accuracy may vary. Comparing to the earlier works done on the same dataset, this method yields better results.

REFERENCES

[1] Chusak Thanawattano and Surapol Tan-a-ram, ―Cardiac Arrhythmia Detection based on Signal Variation Characteristic‖ International Conference on BioMedical Engineering and Informatics, 2008, pp. 367-370

[2] Aqel, M.M., Jena, R.K., Mahanti, P.K. and Srivastava (2009) 'Soft Computing Methodologies in Bioinformatics', European Journal of Scientific Research, vol.26, no 2, pp.189-203.

[3] Pai, G. V and Rajasekaran, S, (2006), 'Neural Networks, Fuzzy Logic and Genetic Algorithms Synthesis and Applications', 6th ed, Prentice Hall of India Pvt. Ltd

[4] Kavitha Kannan 'Data Mining Report on IRIS and Australian Credit Card Dataset', School of Computer Science and Information Technology, University Putra Malaysia, Serdang, Selangor, Malaysia.

[5] Dr.Hapudeniya, Muditha M. MBBS(2010),'Artificial Neural Networks in Bioinformatics' Medical Officer and Postgraduate Trainee in Biomedical Informatics , Postgraduate Institute of Medicine , University of Colombo ,Sri Lanka, vol.1, no 2,pp.104-111.

[6] A.K. Jain, J. Mao, and K.M. Mohiuddin, "Artificial Neural Networks: A Tutorial", Computer, pp. 31-44, Mar, 1996.

[7] Joe Kilian, Hava T. Siegelmann, The Dynamic Universality of Sigmoidal Neural Networks, information and computation 128, 48-56 (1996)

[8] M. Avcı, T. Yıldırım, Classification of Escherichia Coli Bacteria by Artificial Neural Networks, IEEE Conferance on Intelligent Systems,

[9] S. Haykin, Neural Networks: A Comprehensive Foundation, Macmillan College Publishing, New York 1994.

[10] Avcı Mutlu, Tülay Yıldırım(2003) 'Microcontroller based neural network realization and IRIS plant classifier application', International XII. Turkish Symposium on Artificial Intelligence and Neural Network

[11] Fisher, A. W., Fujimoto, R. J. and Smithson, R. C.A. (1991) 'A Programmable Analog Neural Network Processor', IEEE Transactions on Neural Networks, Vol. 2, No. 2, pp. 222-229.

[12] Rath, Santanu and Vipsita, Swati (2010) 'An Evolutionary Approach for Protein Classification Using Feature Extraction by Artificial Neural Network', Int'l Conf. on Computer & Communication TechnologyıICCCT'10.