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Classification Of Iris Plant Using Feedforward Neural Network

Shrikant Vyas[1], Dipti Upadhyay[2],
[1]*Faculty, Department of Cyber Law And Information Technology, Barkatullah University, Bhopal, Madhya Pradesh, India*
[2]*Faculty, Department of Biomedical Engineering, Barkatullah University, Bhopal, Madhya Pradesh, India*

Abstract:- The classification and recognition of type on the basis of individual features and behaviors constitute a preliminary measure and is an important target in the behavioral sciences. Current statistical methods do not always yield satisfactory answers. A Feed Forward Artificial Neural Network is the computer model inspired by the structure of the Human Brain. It views as in the set of artificial nerve cells that are interconnected with the other neurons. The primary aim of this paper is to demonstrate the process of developing the Artificial Neural network based classifier which classifies the Iris database. The problem concerns the identification of Iris plant species on the basis of plant attribute measurements. This paper is related to the use of feed forward neural networks towards the identification of iris plants on the basis of the following measurements: sepal length, sepal width, petal length, and petal width. Using this data set a Neural Network (NN) is used for the classification of iris data set. The EBPA is used for training of this ANN. The results of simulations illustrate the effectiveness of the neural system in iris class identification.

Keywords:- IRIS dataset, Feed Forword Artificial Neural Networks, EBPA

I. INTRODUCTION

An Artificial Neural Network (ANN) is an information paradigm that is inspired by the biological nervous system such as the brain. The key element of this paradigm is the novel structure of the information processing system. It is composed of a large number of highly interconnected processing elements (neurons) working as union to solve specific problems. Classification comes under supervised learning method as the classes are determined before examining the data. In behavioral sciences, as well as in most biological sciences, statistical analyses using traditional algorithms do not always lead to a satisfactory solution, particularly in classification analysis. Current classification methods rely on parametric or non-parametric multivariate analyses: Discriminate analysis, cluster analyses, etc.

All approaches to performing classification assume some knowledge of the data. Usually, a training set is used to develop the specific parameters required. Pattern classification aims to build a function that maps the input feature space to an output space of two or more than two classes.

II. LITERATURE REVIEW

Satchidananda Dehuri and Sung-Bae Cho [1] presented a new hybrid learning scheme for Chebyshev functional link neural network (CFLNN); and suggest possible remedies and guidelines for practical applications in data mining. The proposed learning scheme for CFLNN in classification is validated by an extensive simulation study. Comprehensive performance assessment comparisons with a number of existing methods are likewise introduced.

Mokriš I. And Turcaník M. [2] Focussed on analysis of multilayer feed forward neural network with sigmoidal activation function, which is used for invariant pattern recognition. Analyzed Invariance of multilayer perceptron is used for the recognition of translated, rotated, dilated, Destroyed and incomplete patterns. Parameters of analysis are the number of hidden layers, Number of neurons in the hidden layers and number of learning cycles due to Back-Propagation Learning algorithm of multilayer feed forward neural network. Results of analysis can be used for evaluation of quality of invariant pattern recognition by multilayer perceptron.

Dutta D., Roy A., Reddy k. [3] Proposed the adaptation of network weights using Particle Swarm Optimization (PSO) as a mechanism to improve the performance of Artificial Neural Network (ANN) in the classification of IRIS dataset.

Fernández-Redondo, M. And Hernández-Espinosa C. Reviewed two very dissimilar types of input selection methods: the first one is based on the analysis of a trained multilayer feed forward Neural network (MFNN) and the second ones is based on an analysis of the training set. They also expand present a methodology that allows experimentally evaluating and comparing feature selection methods.

III. METHODOLOGY

We have used a feed forward neural network in order to classify the iris data set. The Iris data set is one of the benchmark data sets used to demonstrate the approach for classification problems. We have taken this dataset from the UCI machine learning repository. We have used EBPA algorithm to train our ANN. Since the gradient decent methodology requires a differentiable activation function, we have used logistic function. Logistic function is an S – shaped function having a range between 0 to 1.
Because of it, we have modified the classes of target data set to 1.0,0.5 and 0.0 since it's a three class classification problem. Matlab neural network tool box (nntool) is used to do the necessary classification task.

3.1 IRIS PLANT DATASET

One of the most popular and best known databases of the neural network application is the IRIS Data set. The IRIS data set includes three classes of 50 objects each, where each class brings up to a type of IRIS plant. The attributed that already been predicted belongs to the division of IRIS plant. The list of attributes present in the IRIS can be described as categorical, nominal and continuous. The IRIS Database Contains the following properties:
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 constitutes the matrix of 150*3 and is applied in the course of study.

3.2 CLASSIFICATION

An ANN is an information-processing system that is based on the simulation the human cognition process. ANNs consist of many computational neural units connected to each other.

The advantages of Neural Networks for classification are:
- Neural Networks are more robust because of the weights
- The Neural Networks improve its performance by learning. This may continue even after the training set has been applied.
- The use of Neural Networks can be parallelized as specified above for better performance.
- There is a low error rate and thus a high degree of accuracy once the appropriate training has been performed.
- Neural Networks are more robust in noisy environment.

In ANN, knowledge about the problem is distributed in neurons and connection weights of links between neurons. The neural network has to be prepared to adjust the connection weights and biases in society to create the desired mapping. ANNs are particularly useful for complex pattern recognition and classification tasks. The capability of learning from examples, the ability to reproduce arbitrary non-linear functions of input, and the highly parallel and regular structure of ANNs make them especially suitable for pattern classification problems.

The most commonly used training algorithms is the back propagation (BP) algorithm with gradient descent, which is used in this work also. This algorithm is based on the adjustment of the weights of the connections of the network to minimize error. The error is calculated by comparing obtaining outputs with expected outputs of known inputs. This error is then backward propagated until the first layer and the weights are then adjusted. This process occurs over and over as the weights are continually adjusted. The set of data which enables the training is called "training set". During the training of a network, the same set of data is processed many times until reaching an acceptable error, or reaching the maximum number of iterations.

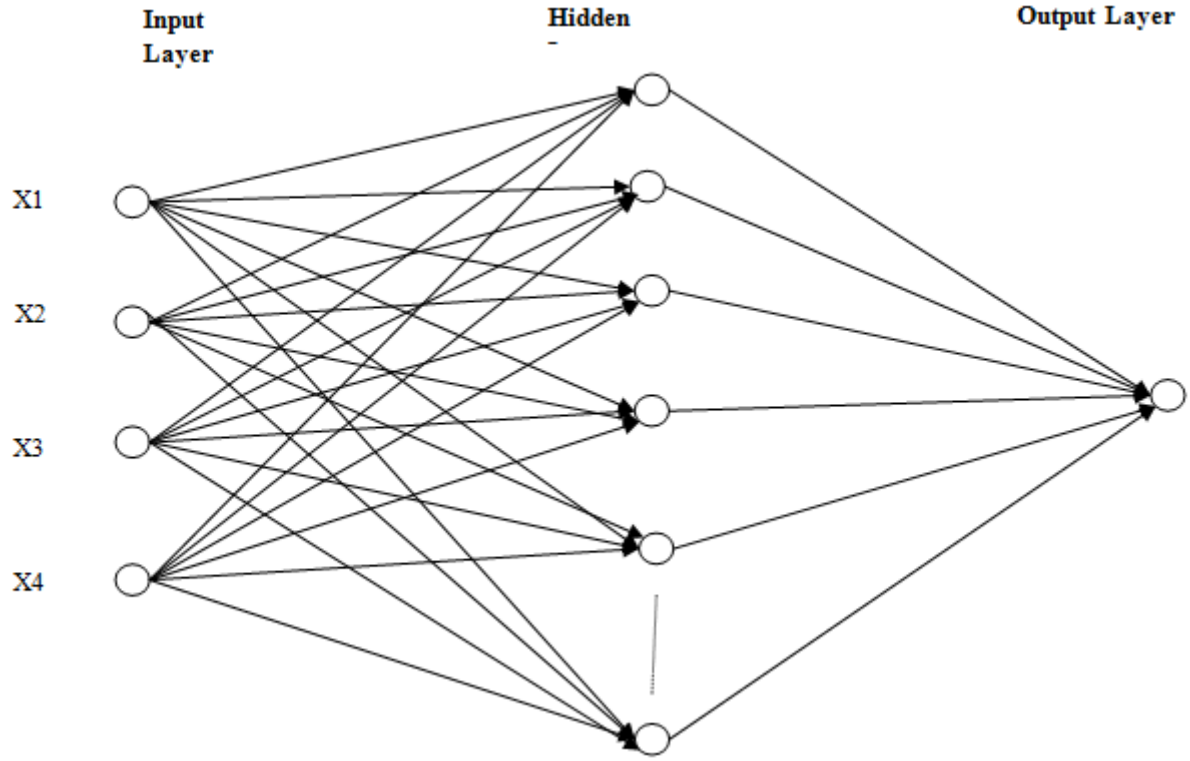

Figure 1: Proposed ANN Architecture

IV. RESULTS

The MATLAB version used is R2013a. The IRIS dataset (downloaded from the UCI repository, www.ics.uci.edu, which is a 150×4 matrix, is taken as the input data. Out of these 150 samples, 70% sample were used for training, 15% for validation and 15% for testing. Under supervised learning, the target of the first 25 instances is taken as 0, for the next 25 instances as 0.5 and for the last 25 instances as 1.The network architecture taken was 4×65×1, i.e, the input layer has 4 nodes, the hidden layer has 65 nodes and the output layer has 1 node.

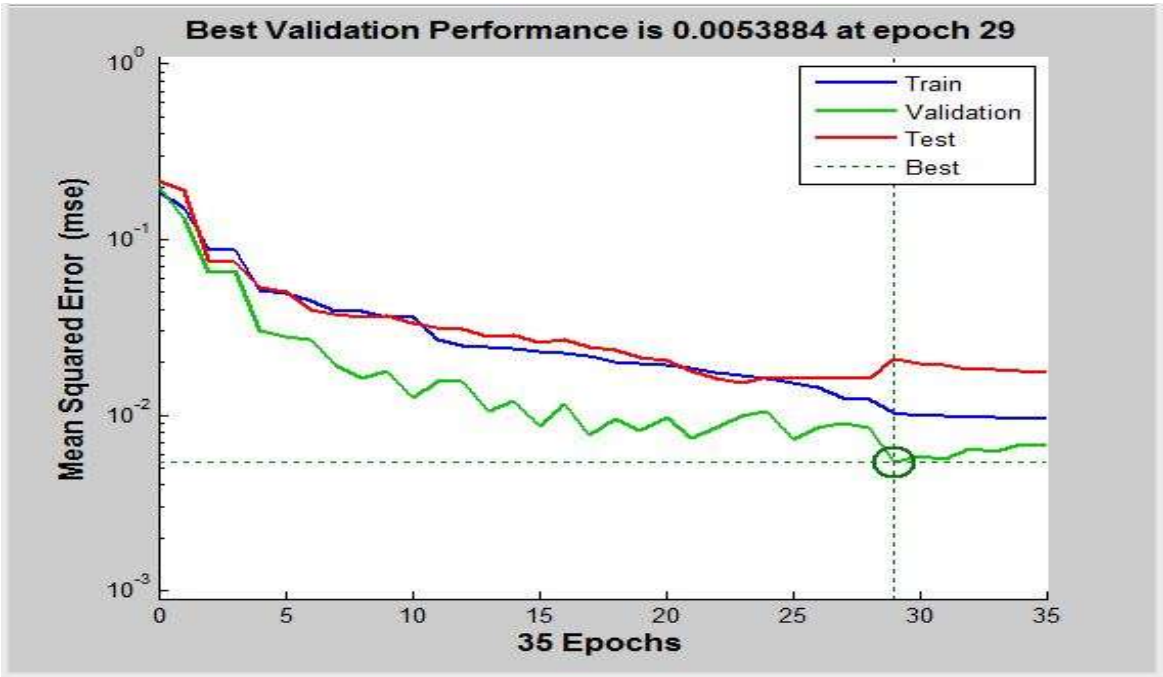

Figure 2.1

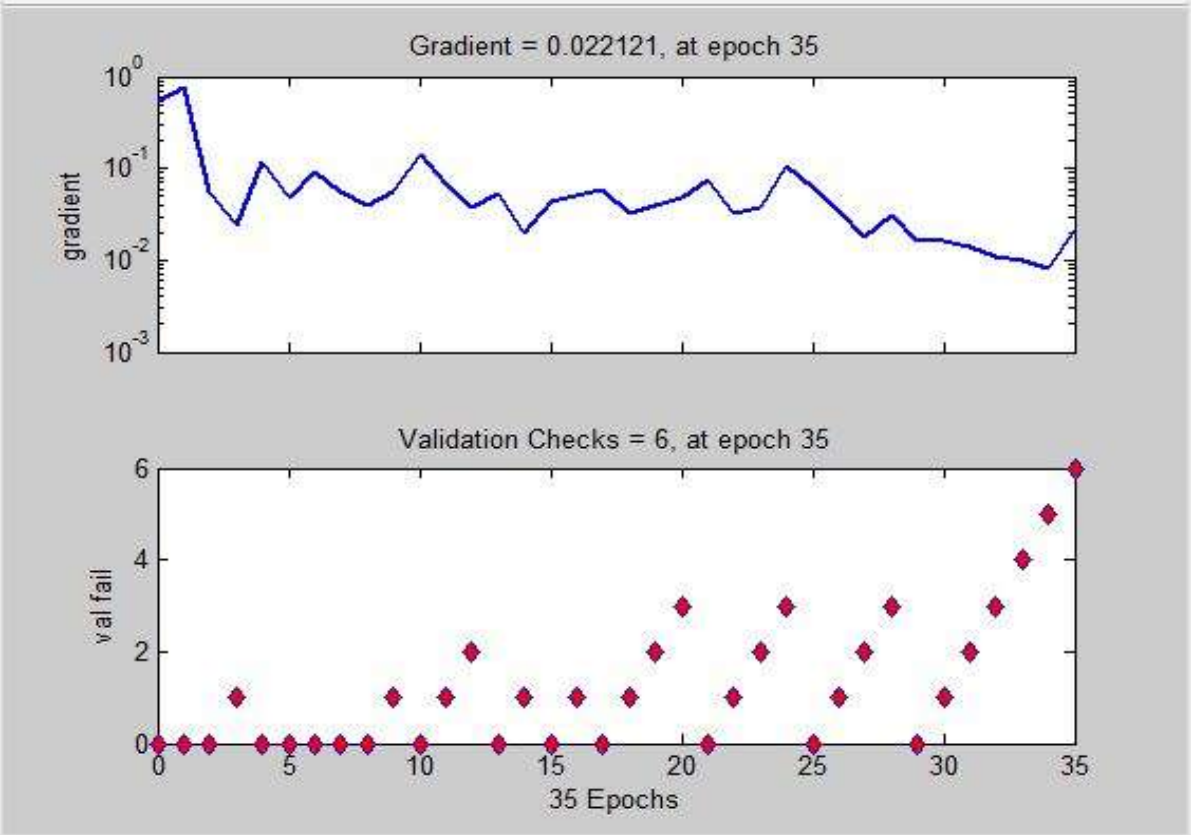

Figure 2.2

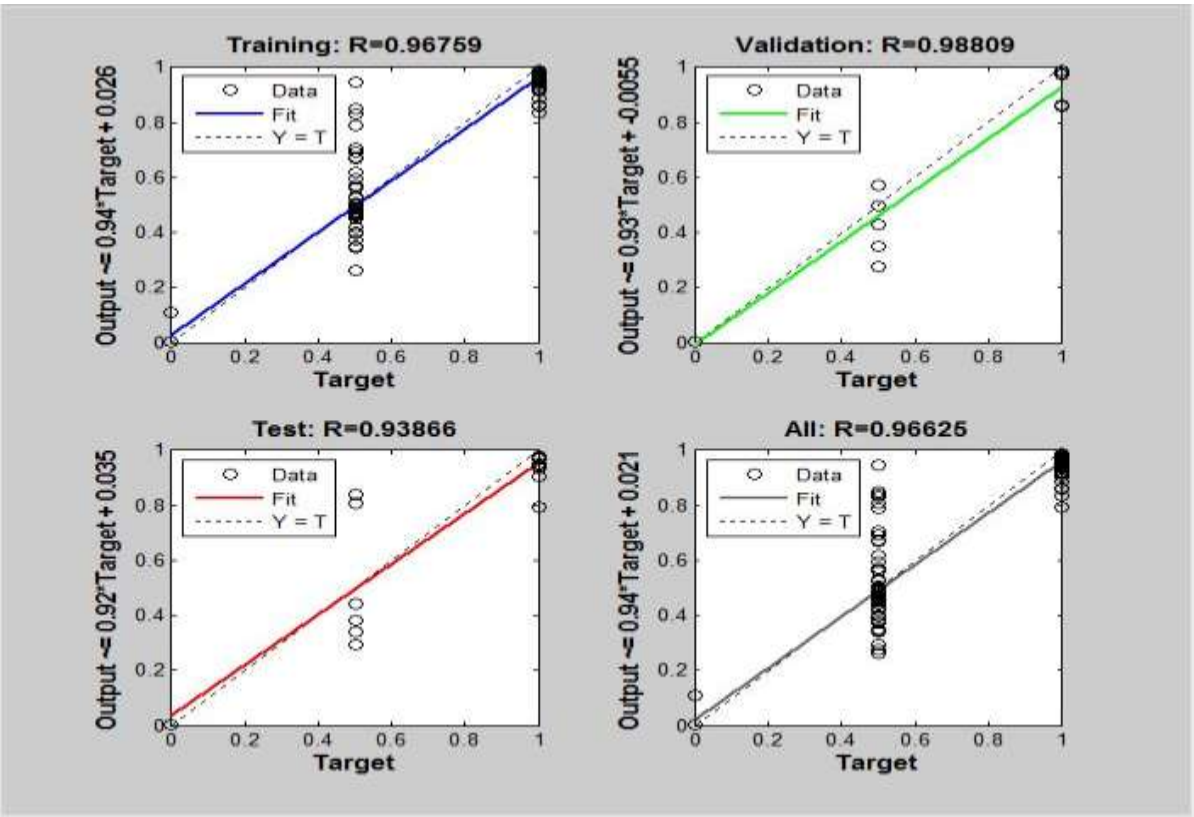

Figure 2.3

Figure 2: PERFORMANCE OF NEURAL NETWORK

2.1: validation performance, 2.2: gradient check,

2.3: regression analysis

VI. CONCLUSIONS

The Multi Layer Feed Forward Neural network gives us a satisfactory result, because it is able to classify the three different types of IRIS of 150 instances with just few errors for the other one. From the graphs we observe that Back propagation Algorithm gives the best accuracy. Best performance was obtained on 29^{th} epoch as on validity cheack graph it shows less generelization after 29^{th} epoch. From the above results, graphs and discussion, it is concluded that Multi Layer Feed Forward Neural Network (MLFF) is faster in terms of learning speed and gave a good accuracy, i.e., has the best trade-off between speed and accuracy. So, for faster and accurate classification, Multi Layer Feed Forward Neural Networks can be used in many pattern classification problems.

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