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An Efficient Classifier using Multilayer Perceptron for Classification of Liver patient

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Abstract--In medical science, Liver patients have been continuously increasing due to excessive consumption of alcohol, inhale of harmful gases, intake of contaminated food and drugs. Classification is one of the important techniques for classification of any type of data. This research work focus on the development of efficient model for classification of liver patient disease. These classifiers are very helpful for doctors to identify such types of diseases. In this research work, we will use MLP to develop the robust classifier which can classify data as lover or non liver. We have applied ILPD data set on MLP with different learning and different hidden layers. Our proposed model MLP achieved 77.77% of accuracy in case of hidden layer 2 and learning rate 0.7 as robust model.

Keywords: Classification, Multilayer Perceptron (MLP), Learning rate.

I. INTRODUCTION

Diagnosis of health condition is a very critical task faced by medical science. There are various researchers are working to diagnosis of various types of diseases that is faced by patients. Classification is also important techniques that can classify the diseases which can greatly benefit all parties involved in the health care industry. The main aim of this work is to detection of liver patient and classifies the data as liver or non liver patient. There are various authors have worked in the field of classification of classification of liver patient. **A. Gulia et.al,(2014)** [4] have proposed and compared C4.5, Multilayer Perceptron classifier, Random Forest classifier, Support Vector Machine classifier and Bayesian Network classifier for classification of liver patient data.The propsed random forest given highest 71.86% accuracy. **B. V. Ramana et. al, (2012) [5]** have proposed MLP for classification for liver patient data and compared to other classification techniques. The proposed MLP with Random subset gives highest accuracy of 74.7826% in case of BUPA liver disorder dataset and nearest neighbour with CFS gives highest accuracy of 73.0703% for ILPD dataset. **S. Dhamodharan (2014)** [6] have used Naïve Bayes and Forest Tree (FT) techniques to classify the liver patient data.Results show that Naïve Bayes gives better performance than Forest tree which given 75.54% of accuracy while FT tree given 72.66% of accuracy.

II. METHODOLOGY

Classification technique can be used in many fields like health care, information security, E-commerce, etc. In this research work, we have used MLP techniques as classifier to classify the liver patient.

LP (Pujari, A. K., 2001) [1] is a development from the simple perceptron in which extra hidden layers (layers additional to the input and output layers, not connected externally) are added. More than on hidden layer can be used. The network topology is constrained to be feed forward, i.e., loop-free. Generally, connections are allowed from the input layer to the first (and possible only) hidden layer, from the first hidden layer to the second and so on, until the last hidden layer to the output layer. The presence of these layers allows an ANN to approximate a variety of non-linear unctions. The actual construction of network, as well as the determination of the number of hidden layers and determination of the overall number of units, is sometimes of a trial-and-error process, determined by the nature of the problem at hand. The transfer function generally a sigmoid function.

This research work has used one of the important parameter that is learning which controls how much the weights are adjusted at each update.

III. PERFORMANCE MEASURES

The robustness of model can be evaluated using various performance measures like accuracy, sensitivity and specificity. These measures can be calculated using confusion matrix that contains true positive (TP), true negative (TN), false positive (FP) and false negative (FN).

TABLE I

Performance Measures	
Accuracy	(TP+TN)/(TP+TN+FP+FN)
Sensitivity	TP/(TP+FN)
Sepecificity	TN/ (TN +FP)

IV. DATA DESCRIPTION

The Indian Liver Patient Dataset (ILPD) data set is collected from UCI repository [2] which contains 10 attributes and 1 class. This data set is binary classification problem. The data set is also consists of 583 instances in which 416 are liver patient records and 167 non liver patient records.

V. EXPERIMENTAL WORK

This experiment work is focus on the classification of liver patient data. In this experiment we have used open source WEKA [3] data mining tools with5i machine. We have applied the ILPD data set to the MLP with different number of hidden layer and different learning rate in case of 80-20% training-testing partition. The learning rate range from o to 1. The proposed MLLP model gives accuracy with different learnig rate and different hidden layers as in TABLE II. The proposed model gives 77.77% of accuracy in case of hidden layer two and learning rate 0.7 as robust model. The robustness of model can be evaluated using other performance measures like sensitivity and specificity. These measures can be calculated with the help of confusion matrix which consists TP, TN, FP and FN. The specific formula shown in TABLE I. TABLE III shows that confusion matrix of best accuracy in each hidden layer where 84 samples are correctly classified and 1 sample is misclassified with liver patient while 25 samples are incorrectly classified and 1 sample is correctly classified with non liver patient in case of single hidden layer. Similarly confusion matrix shows for hidden layer two and three also. TABLE IV shows that other performance measures like sensitivity, specificity as well as accuracy.

TABLE II

Accuracy of MLP in case of 80-20% training- testing partitions					
Hidden Layer=1		Hidden Layer=2		Hidden Layer=3	
Learning rate(α)	Accuracy	Learning rate(α)	Accuracy	Learning rate(α)	Accuracy
0.1	70.94	0.1	74.35	0.1	73.50
0.2	72.64	0.2	73.50	0.2	71.79
0.3	72.64	0.3	72.64	0.3	71.79
0.4	72.64	0.4	72.64	0.4	73.50
0.5	72.64	0.5	72.64	0.5	73.50
0.6	72.64	0.6	72.64	0.6	72.64
0.7	72.64	0.7	77.77	0.7	72.64
0.8	72.64	0.8	72.64	0.8	72.64
0.9	72.64	0.9	72.64	0.9	72.64

TABLE III

Confusion matrix of best accuracy in each hidden layer						
Actual Vs Predicted	Hidden Layer=1		Hidden Layer=2		Hidden Layer=3	
	Liver	Non-Liver	Liver	Non-Liver	Liver	Non-Liver
Liver	85	0	84	1	85	0
Non-Liver	32	0	25	7	31	1

TABLE IV

Performance measures			
Performance Measures	Hidden Layer=1	Hidden Layer=2	Hidden Layer=3
Accuracy	72.64	77.77	73.50
Sensitivity	100	98.82	100
Specificity	0	21.87	3.12

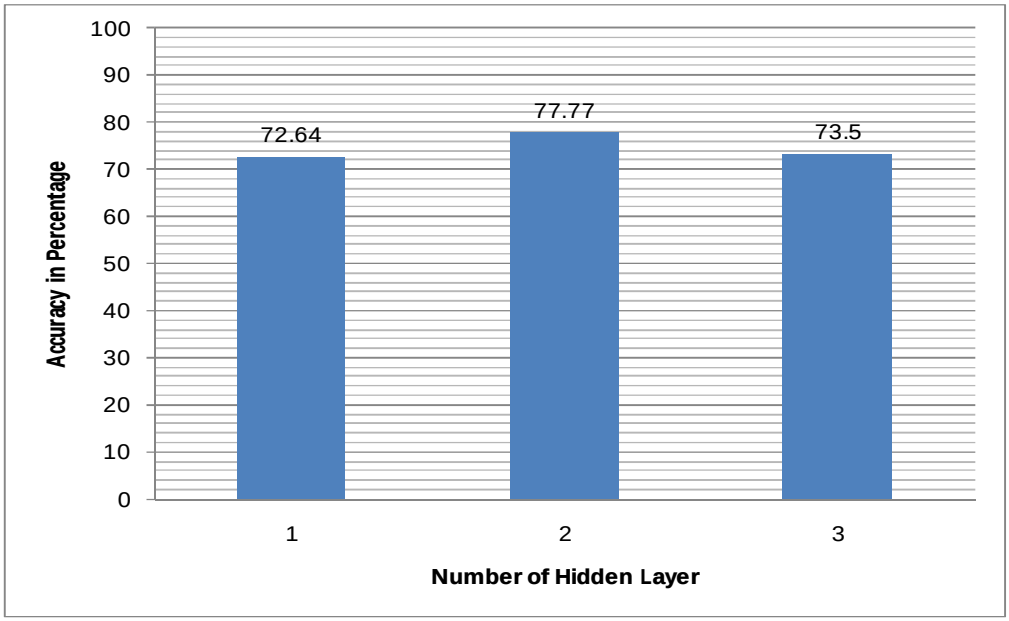

Fig. 1 Accuracy of MLP with best learning rate and different hidden layer

VI. CONCLUSION

Classification technique plays very important role and helpful for diagnosis of diseases in field of medical science. In medical science, diagnosis of diseases is very important to treatment of patient because health is directly related to human life. In this research work, we have used MLP techniques to classify the liver patient data. In this classification model , the specific parameter like learning rate and hidden layer is very important. The model gives 77.77% of accuracy with hidden layer two in case of learning rate 0.7 as robust model.

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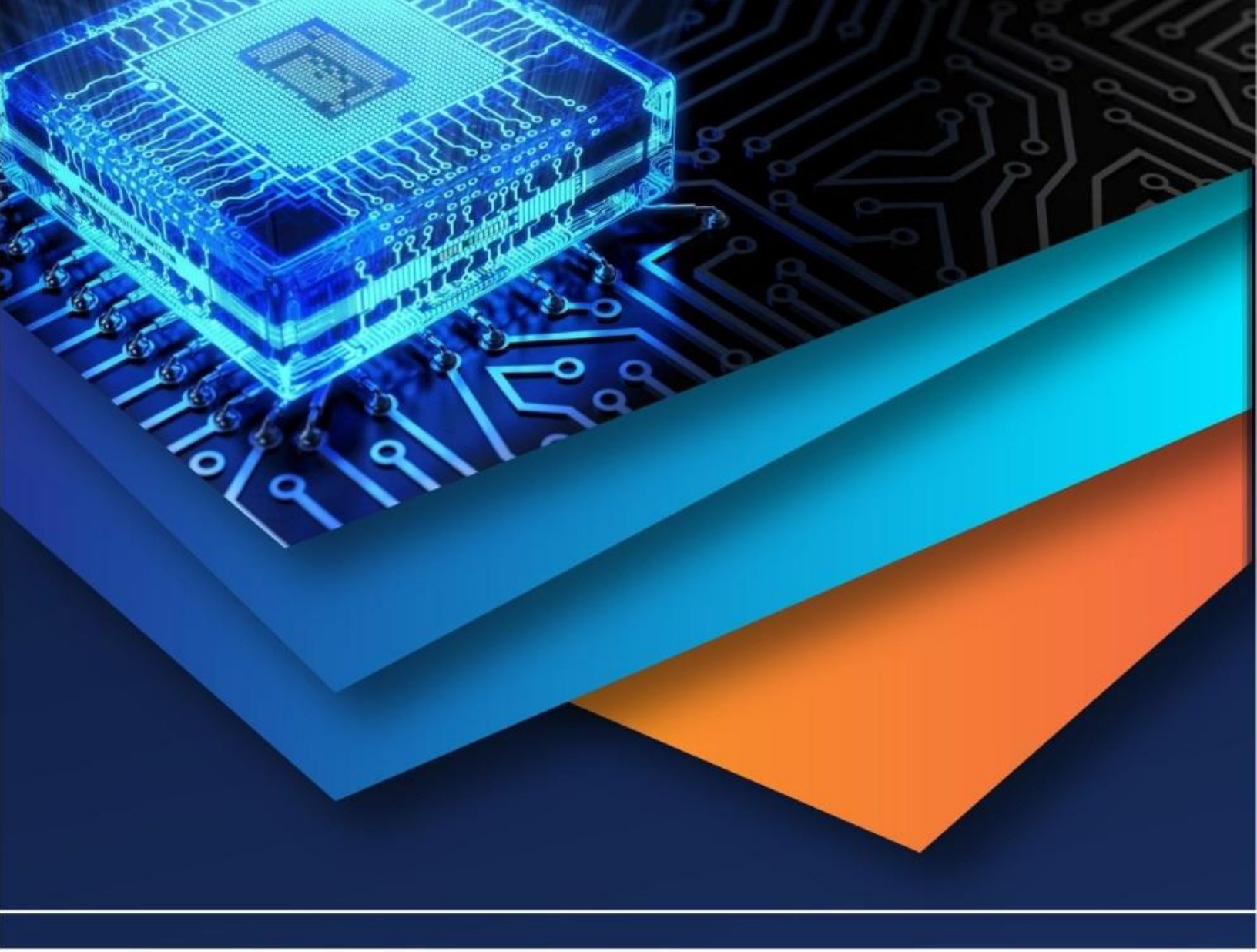

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