ISSN: 0975-766X
CODEN: IJPTFI
Available Online through *Research Article*
www.ijptonline.com

NEURAL NETWORK BASED FEATURE ANALYSIS OF MORTALITY RISK BY HEART FAILURE

Apurva Waghmare, Neetika Verma, Astha Gaur, R Jagadeesh Kannan*
Department of Computing Science & Engineering, VIT Chennai.
Email: jagadeeshkannan.r@vit.ac.in

Received on 02-08-2016 *Accepted on 25-09-2016*

Abstract

In today's world where heart diseases have become common, healthcare domain is focussing more on analysing the data to find the causes, predicting results on the basis of available data to take precautionary measures. Heart failure occurs due to many reasons such as. If a patient is admitted to hospital due to heart disease then the aim is to predict the chances of that patient getting discharge from the hospital alive or dead. Using Neural Network we are calculating chances of a patient admitted in the hospital to get discharge alive or dead. These results will be useful to take precautionary measures to avoid fatal casualties.

Keywords: Heart disease, Neural Network, Prediction.

1. Introduction

There are many reasons which contribute to the heart failure. Heart diseases are very common these days. Patients ranging from being a child to adults to old people are prone to heart diseases .Heart disease develops over a period of time. If proper medication and care is not taken then it may turn into fatal disease and may cause death due to heart failure. Due to records maintained in hospital there is a lot of data being generated. If this data is put to use properly then the rate of fatality due to heart failure can be reduced. Neural Network is a computer system modelled on human brain and nervous system. We will use Matlab Neural Network toolbox to analyse the data and predict the state of patient during discharge. The method of neural network is preferred because we can decide the number of neurons used to create a neural network, then train, visualize and simulate the network. The set of neurons will be trained with the available data so that we can get the desired results. Thus mortality risk of patient can be predicted.

2. Related Work

According to the World Health Organization (WHO), heart diseases have a great deal of attention in medical research due to its impact on human health . Cardiovascular disease is the number one cause of death in industrialized

countries and not only have a major impact on individuals and their quality of life in general, but also on public health costs and the countries' economies. Diagnosis of heart disease was more costly decision in diagnosis. Artificial Intelligence techniques were used vastly in medical diagnosis. With the advancement of science, the volume of accumulated data in various fields has been increased that it is well known the explosion of information . When analyzing the accumulated data they could reveal their hidden useful information. By performing data mining, which is a new science, we able to extract the hidden knowledge of the data. Performing data mining reveals useful relationship existed among data, and this rule can apply for right decision making. Classification is one of the subdivisions of data mining, which acts in accordance with If-Then rule. Its purpose is to predict a variable based on other features that are known as predictors. Neural Network, support vector machine and decision Tree are different form of classification algorithms.

Now a day's artificial neural network (ANN) has been widely used as a tool for solving many decision modeling problems. A multilayer perception is a feed forward ANN model that is used extensively for the solution of a no. of different problems. An ANN is the simulation of the human brain. It is a supervised learning technique used for non linear classification Coronary heart disease is major epidemic in India and Andhra Pradesh is in risk of Coronary Heart Disease. Clinical diagnosis is done mostly by doctor's expertise and patients were asked to take no. of diagnosis tests. But all the tests will not contribute towards effective diagnosis of disease. Feature subset selection is a preprocessing step used to reduce dimensionality, remove irrelevant data. A classification approach which uses ANN and feature subset selection for the classification of heart disease. PCA is used for preprocessing and to reduce no. Of attributes which indirectly reduces the no. of diagnosis tests which are needed to be taken by a patient. This approach applied on Andhra Pradesh heart disease data base. This system is feasible and faster and more accurate for diagnosis of heart disease. Data mining techniques are used to explore, analyze and extract data using complex algorithms in order to discover unknown patterns in the process of knowledge discovery []. The time taken to recover from heart disease depends on patient's severity. Nowadays, health care industry contain huge amount of health care data, which contain hidden information. Advanced data mining techniques along with computer generated information are used for appropriate results. Neural Network is widely used tool for predicting heart diseases diagnosis. A Heart Disease Prediction System is developed using Neural Network and Genetic Algorithm. This system calculates the number of hidden nodes for neural network which train the network with proper selection of neural network architecture and uses the global optimization of genetic algorithm for initialization of neural network. Heart disease is a major cause

of death across the world. We have medical facilities to treat heart disease still this count of death is increasing day by day. This research examines the early signs of heart disease and heart risk using proposed model. It aims to facilitate users to detect heart disease risk before time, independently. It will also try and suggest measures to decrease heart disease risk using Artificial Neural Network.

This Paper presents the intelligent system for prediction of Cardiovascular Disease. The diagnosis of Cardiovascular Disease is tedious task for a Medical Practitioner. The correct presumptions are most important for detection of heart disease which is caused due to various factors or symptoms. In order to make it effective and reliable this system automatically learns and extracts the significant patterns of the heart disease using the Novel approach of Quantum Neural Network. Our System can predict the Cardiovascular Disease at its primary stage using the Physical, physiological and clinical risk Factors, very efficiently by Quantum Neural Network (QNN). The prediction with QNN shows better results than other available algorithms using same parameters.

3. Methodology

3.1. Experimental Setup

The basic component in a neural network is neuron. Number of neurons connected together form a neural network. A Neuron is fed with one or more number of inputs, it sums the inputs with their respective weights and give the output to the transfer function. The output of the transfer function is the output of the network [10.11].

Neural network can consist of more number of layers. The neural network formed in matlab for this project looks as in the following fig. 1, where 6 input parameters are the input to the neurons. We selected 50 neurons for the network and they belong to hidden layer. The neurons sum the inputs with respective weights and give the sum as input to a transfer function. The output of the transfer function is given as input to the output layer. The input from hidden layer is again added with respective weights and finally output is generated which is binary that is either zero or one [12-14].

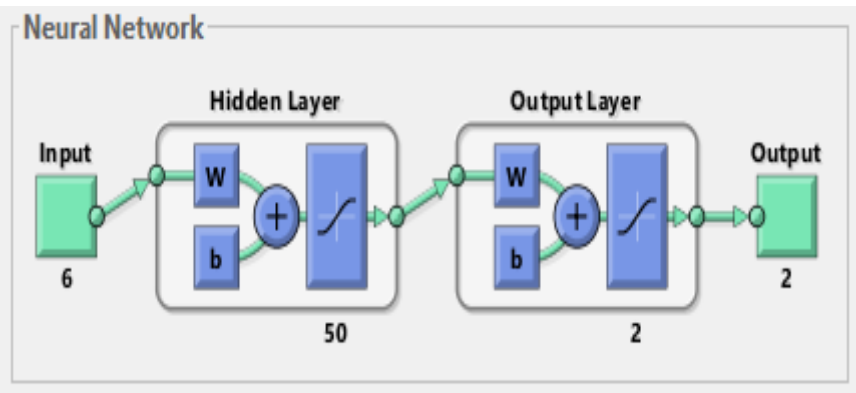


Fig 1

The data set is taken from NICOR that is National Institute for Cardiovascular outcomes research. The heart failure dataset is particularly from Central collection of NICOR audit and registry datasets.

There are six attributes which are given as input, they are as follows:

1. The patient is enrolled in Medicare fee-for-service and is over age 65.

2. The patient is alive at discharge.

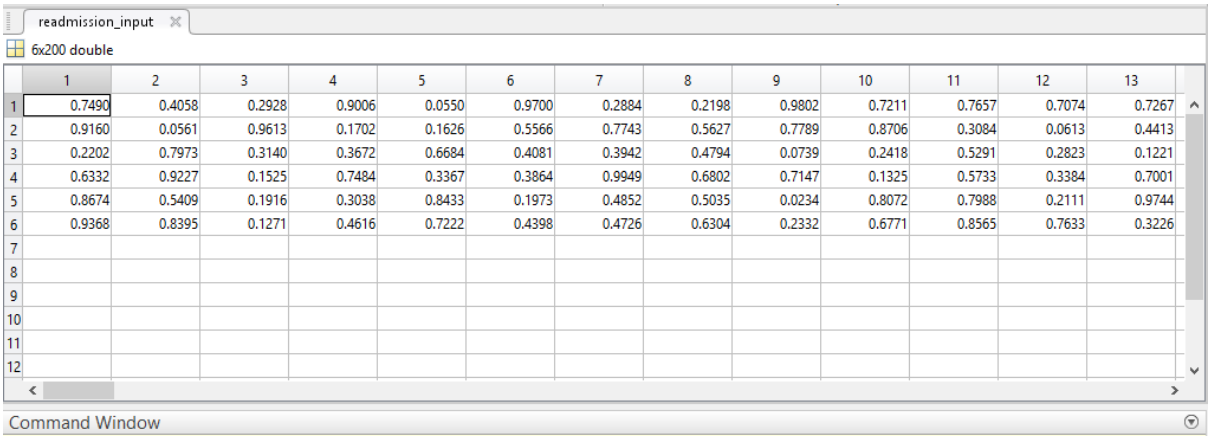
3. The patient has enrolment information in Medicare for at least 30 days after discharge (this is necessary so that readmissions within 30 days can be tracked).

4. The patient was enrolled in Medicare Part A for 12 months prior to the date of the index admission (this is necessary to gather clinical information for accurate risk adjustment).

5. The patient was discharged against medical advice (AMA).

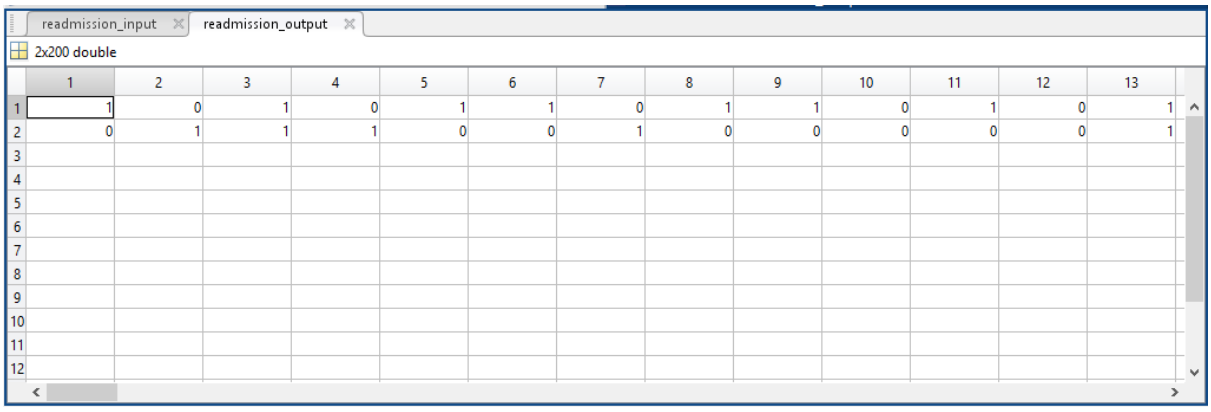
6. The patient was admitted for a primary psychiatric diagnosis, for rehabilitation, or for medical treatment of cancer.

Input Data sample



	1	2	3	4	5	6	7	8	9	10	11	12	13
1	0.7490	0.4058	0.2928	0.9006	0.0550	0.9700	0.2884	0.2198	0.9802	0.7211	0.7657	0.7074	0.7267
2	0.9160	0.0561	0.9613	0.1702	0.1626	0.5566	0.7743	0.5627	0.7789	0.8706	0.3084	0.0613	0.4413
3	0.2202	0.7973	0.3140	0.3672	0.6684	0.4081	0.3942	0.4794	0.0739	0.2418	0.5291	0.2823	0.1221
4	0.6332	0.9227	0.1525	0.7484	0.3367	0.3864	0.9949	0.6802	0.7147	0.1325	0.5733	0.3384	0.7001
5	0.8674	0.5409	0.1916	0.3038	0.8433	0.1973	0.4852	0.5035	0.0234	0.8072	0.7988	0.2111	0.9744
6	0.9368	0.8395	0.1271	0.4616	0.7222	0.4398	0.4726	0.6304	0.2332	0.6771	0.8565	0.7633	0.3226
7													
8													
9													
10													
11													
12													

Output Data sample



	1	2	3	4	5	6	7	8	9	10	11	12	13
1	1	0	1	0	1	1	0	1	1	0	1	0	1
2	0	1	1	1	0	0	1	0	0	0	0	0	1
3													
4													
5													
6													
7													
8													
9													
10													
11													
12													

3.2. Model

Code:

clc,clearall;

loadreadmission.mat

prnet=newpr(readmission_input,readmission_output,50);

trainedprnet= train(prnet,readmission_input,readmission_output);

newinput=rand(6,1);

output=sim(trainedprnet,newinput)

output=trainedprnet(newinput)

-algorithms mathematical model etc..with detailed description (2 page at least)

4. Results & Discussion

The Diagram below shows the neural network created

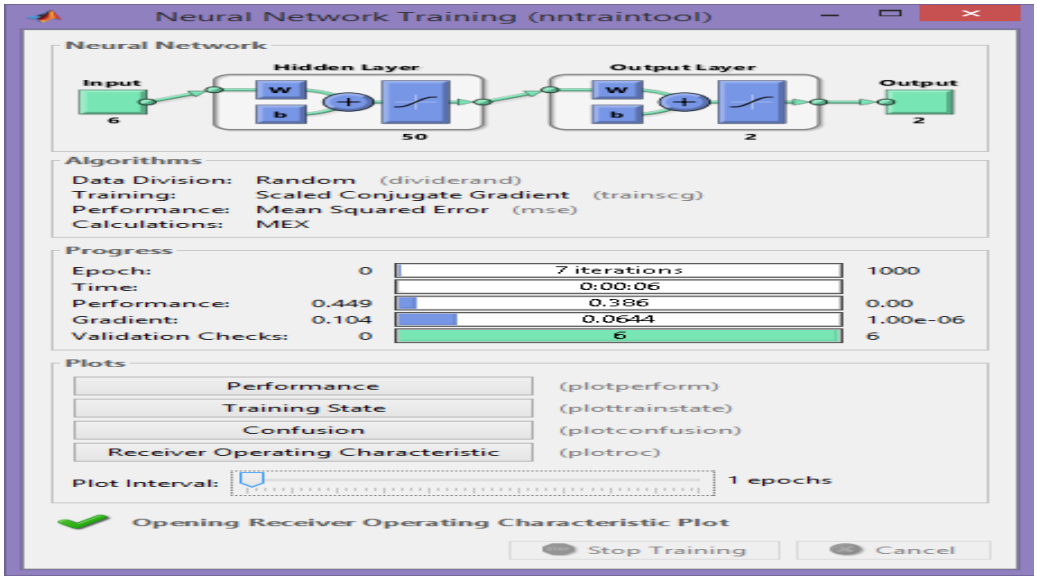


Fig. 2

As in the above figure we can see that in Epoch 7 iterations altogether took place. Time taken is 6 sec , Performance is .386, gradient is 0.104.

Validation check is 6.

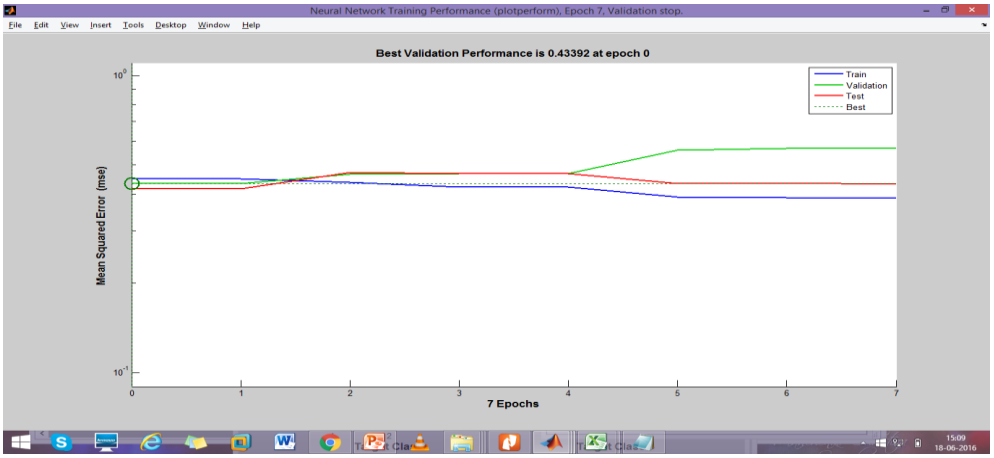


Fig.3 Performance Plot.

The performance plot shows the best values at the point of circle in the plot. As we can see the best validation performance is 0.43392 at epoch 0.

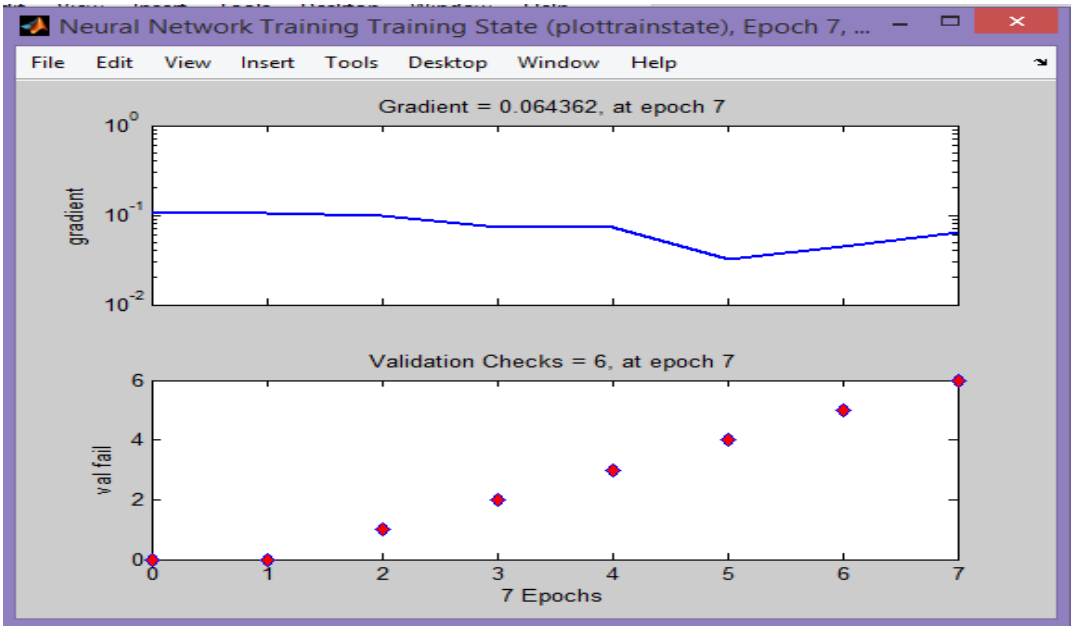


Fig. 4 Training Set

As shown in the above plot of training set we can see that on the gradient scale the gradient is 0.064362 at epoch 7. Validation checks are equal to 6 at epoch 7

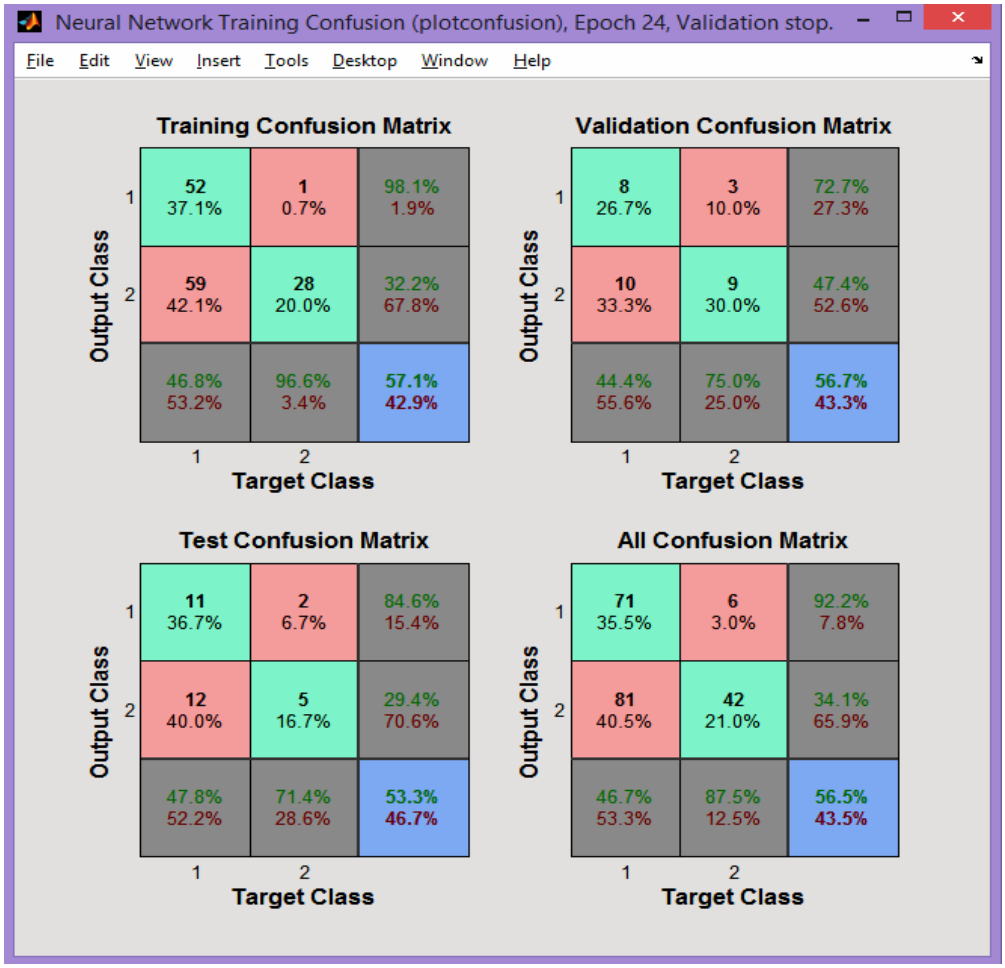


Fig.5 Confusion Matrix

The above diagram is the confusion matrix whish shows the training confusion matrix, Validation Confusion Matrix, Test Confusion Matrix and All Confusion Matrix for all of them we calculate Target class vs Output Class.

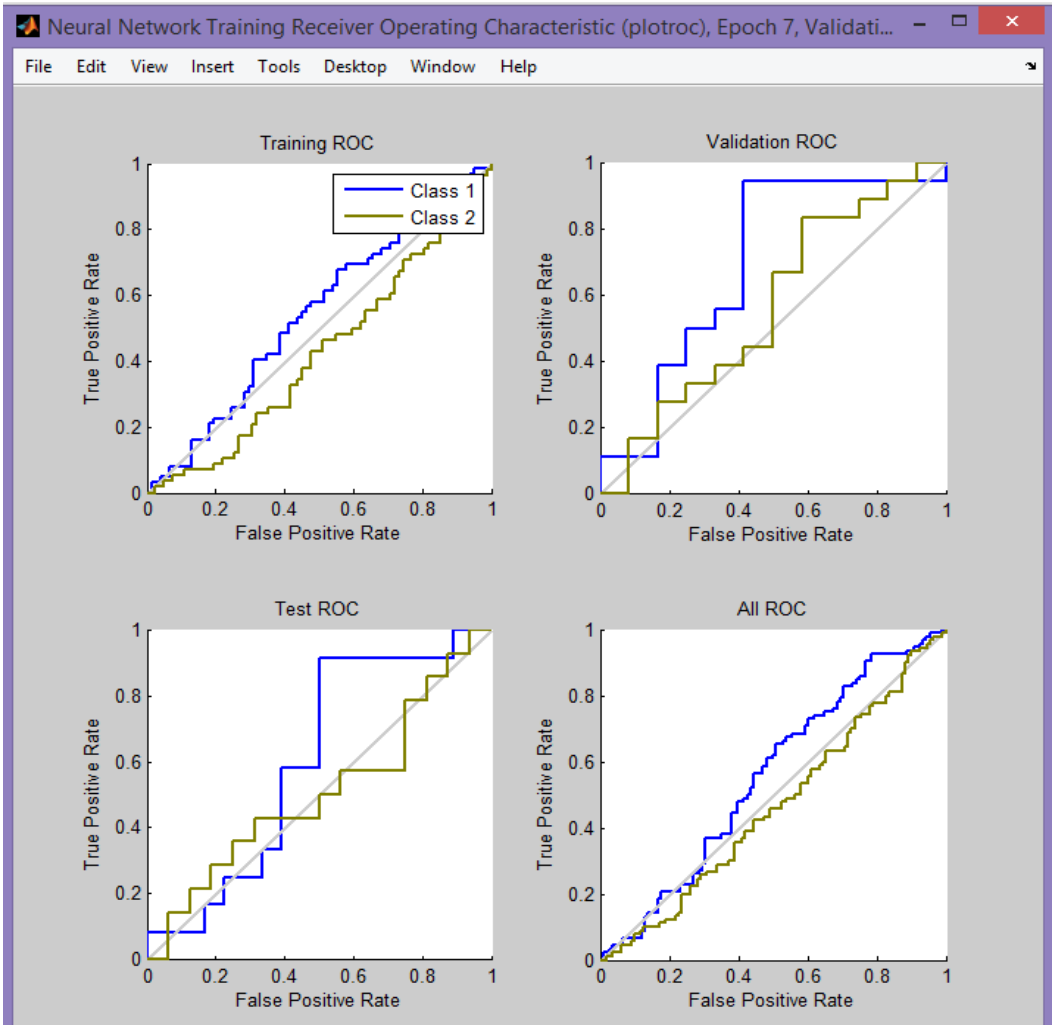


Fig. 6 Receiver Operating Characteristic plot.

5. Conclusion

This analysis is very useful to take precautionary measure for patients admitted in the hospital.As per the confusion matrix the accuracy in prediction of mortality of the patient is 57.1%. By predicting results for people within a range of age where mortalities are observed more, then special attention and care can be taken for them. In this way number of deaths due to heart failure can be reduced. In future more specifications should be worked upon to be more precise on the actions being taken to prevent death by heart failure.

References:

1. Cox DR. Regression models and life tables. J Roy Statist Soc 34, Series B, 1972: 187-220.
2. Cox DR, Oakes D. Analysis of Survival Data. London: Chapman and Hall; 1984.
3. Senni M, Tribouilloy CM, Rodeheffer RJ, et al. Congestive heart failure in the community: trends in incidence and survival in a 10-year period. Arch Intern Med 1999; 159: 29-34.

4. Cowie MR, Wood DA, Coats AJ, et al. Incidence and aetiology of heart failure; a population-based study. Eur Heart J 1999; 20: 421-8.
5. Mercuro G, Zoncu S, Dragoni F. Gender differences in cardiovascular risk factors. Ital Heart J 2003; 4: 363-6. (Review)
6. Van Veldhuisen DJ, van den Heuvel AF, Blanksma PK, Crijns HJ. Ischemia and left ventricular dysfunction: a reciprocal relation? J Cardiovasc Pharmacol 1998; 32 (Suppl 1): S46-S51.
7. Schocken DD. Epidemiology and risk factors for heart failure in the elderly. Clin Geriatr Med 2000; 16: 407- 18. (Review)
8. Go AS, Rao RK, Dauterman KW, Massie BM. A systematic review of the effects of physician specialty on the treatment of coronary disease and heart failure in the United States. Am J Med 2000; 108: 216-26.
9. Verdecchia P, Schillaci G, Borgioni C, Ciucci A, Pede S, Porcellati C. Ambulatory pulse pressure: a potent predictor of total cardiovascular risk in hypertension. Hypertension 1998; 32: 983-8.
10. Ankush Rai, A Comorbid Algorithm to Significantly Compress Contents of Several Web Pages In Conformational Dynamics Over Linux Integrated System, Journal of Multimedia Technology & Recent Advancements,Volume 1, Issue 2, 2014.
11. Ankush Rai, Automation In Computation, Journal of Advances in Shell Programming, Volume 1, Issue 2 2014.
12. Ankush Rai,Automation of Community from Cloud Computing, Journal of Advances in Shell Programming, Volume 1, Issue 2 2014.
13. Ankush Rai,Dynamic Pagination for Efficient Memory Management Over Distributed Computational Architecture for Swarm Robotics, Journal of Advances in Shell Programming, Volume 1, Issue 2 2014.
14. Ankush Rai, A Parallely Turing Kernel For Swarm Operations, Journal of Advances in Shell Programming, Volume 1, Issue 3 2014.

Corresponding Author:

R Jagdeesh Kanan*

Email: jagadeeshkannan.r@vit.ac.in