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Brain Tumor Recognition/Classification By Using Feed Forward Back Propagation Neural Network

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Abstract:

Brain tumor is a serious problem facing by most of the people today. According to survey many of medical researchers trying to find an early detection and classification of tumor. It is an uncontrolled growth of cells in any part of our body. The proposed system uses back propagation along with feed forward by using neural network techniques to detect earlier and quickly, which in turn helpful to doctors for curing disease perfectly. Also, our methodology helps to classify types of tumor i.e. normal (benign) or abnormal (malignant) by taking slices of different patient data sets. Here we used two layers feed forword is trained with back propagation for especially classification of tumors

1.INTRODUCTION:

Basically, brain tumors are divided into two classes, first one is the primary tumor and the second one is a secondary tumor. The tumor cell is located inside the skull and enlarge inside the skull is called the primary tumor. Malignant brain tumors come under primary brain tumors. The tumors locate outer the skull and enter into the skull zone called secondary tumor. Metastatic tumors are coming under secondary tumors [1]. It is one of the common and serious diseases in the world. At earlier stages if we recognize it, we can better cure to the patient. Further, it is broadly categorized as non-cancerous (benign) and cancerous (malignant) brain tumors (it depends on tumor behavior). Cancerous brain tumors enclose cancer cells that are commonly rapid growing and invade surrounding tissue. According to survey malignant type of tumors seldom extend through other parts of the body and occasionally reappear after having medical care and even non-cancerous tumor also behaves like malignant because if its size location and does damage to the frictions of the brain.

2.RELATED WORK:

Eltaher Mohamed Hussein, Dalia Mahmoud, Adam Mahmoud used an approach to detect brain tumors using Computer Aided Diagnosis (CAD) is one of the system using ANNs to classify brain tumors [2]. From each of the magnetic resonance Image a Harlick texture feature was obtained so that we make training data that was launched in the proposed neural network as an input and get targeted vectors. T. Purusothaman analyses different clustering methods to trace tumor bodies in Magnetic Resonance (MR) brain images.

The Clustering algorithms used are Kmeans, Self Organizing Maps (SOM), Hierarchical Clustering and Fuzzy C-Means Clustering [3]. Dina AboulDahab, Samy S.A.Ghoniemy, Gamal M.Selim developed a reorganized PNN (Probabilistic Neural Network) representation that is based on LVQ (learning vector quantization)

with images, statistical estimation and direction techniques is suggested to convey an automated BTC (brain tumor classification) employing MR image scans.

The good judgment of a reorganized PNN classifier performance is accurately quantified in terms of the instructing performance, diagnosis, classification exactness and its computation time.

The simulation result effectively shows that the reorganized PNN produces very quick and exact classification compared from the conventional PNN techniques to the image processing techniques [4].

Hence, according to recent information it is noticed that standards of neural networks have been extensively employed in the diagnosis of any lung cancer and brain cancer in medical magnetic resonance images.

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3.PROPOSED SYSTEM:

Tumor classification:

BPN (Back propagation neural network) classifier had been employed to overcome the classification problems. This classifier gives accurate output and extremely less training time. The learning rule of back propagation can be suitable to modify the required loads and effectively biases of arrangements (networks) to reduce the sum squared error of a specified network [6, 7]. The activation role what we believed for every node in the arrangement is the binary sigmoid function stated (escorted by s = 1) for instance output = 1/ (1+ (e-x)), here x is the sum of the loaded inputs to that specific node.

An appropriate ANN (artificial neural network) classifier is sketched in this report to recognize the various classes of brain tumors. ANN's are composed of uncomplicated components managed in equivalent (parallel). In these reports two layers FFNN (feed forward neural network) is taken. The two layer FFNN be made up of one input layer, one output layer, one secret layer and one output. In the secret layer 10 nodes are taken. In the case of two layers feed forward network two log sigmoid transfer functions are used.

These functions are influenced from biological nervous networks. The two layers FFNN with two log sigmoid functions are have been extensively employed in the classification, design identification. It produces fine results in these classifications. If the log sigmoid function is less than the sum of multiplication of loads and input values are then output value gets '1', or else the output value gets '0' shown in Fig.1.

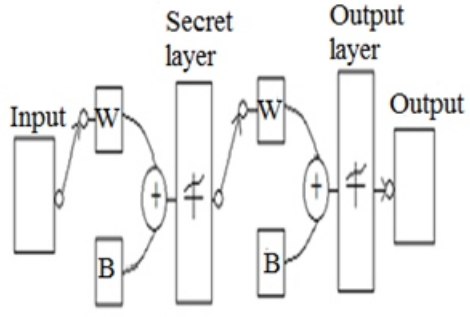

Fig 1: shows two layers FFNN networks.

The two layers FFNN is trained with back propagation learning technique. Generally, Standard back propagation method is a gradient descent technique, the design consideration of gradient descent technique having two phases, these are given below.

The neural network system is sketched in two things.

1) Training or Learning

2) Testing or Recognize

Apart from these two neural network phases training process involves four steps to train the back propagation algorithm. Those are given below.

1) In first stage training data are gathering.

2) In the second stage the two layers FFNN network is created.

3) In the third stage we give training to the network.

4) In final stage network Simulation is executed.

The recognized patterns are concerned with the two layers FFNN is instructed with back propagation algorithm. Training or Learning means changing the loads of the network. Change the loads until it produces the actual output. Once the training process is done the neural network parameters (specifications) are stable (fixed).

Methodology:

The above discussion can be processed in the following ways:

1. Capturing of the image .

2. Division of every image into two equal parts.

3. Binary conversion of images.

4. Finding out the histogram equivalent of giving binary numbers.

5. Training of each part individually using the neural network tool through Matlab.

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6. Collect output of all the parts and apply it as input.

7. All the above steps are used without dividing the image into different parts also.

8. Results obtained from steps 6 and 7 are compared to check the accuracy of this approach.

Then apply the different numbers of samples to train the networks. If the training phase of the network is completed the network is ready to perform, for this I apply various samples to test its performance. In the end matching is used to check whether the network is able to recognize any existing image.

All the experiments, results and discussion are shown in this section. A two layers FFNN network has been employed for complete research. Following diagram shows sigmoid model it is one type of neural network model, by using this we can check the performance of the network.

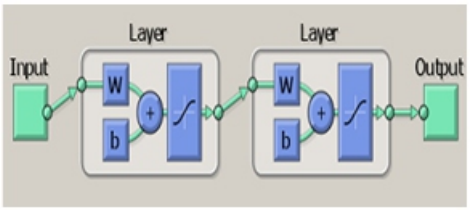

Fig 2: Sigmoid Model

Matlab10 (NN model) Neural Network tool had been currently employed to complete the work. To perform various activities we apply three different kinds of samples to the network, in this we get three activities those are given below.

Training-:

Training is a process in which preparation and coaching of the network are performed. Once the training phase of the network is completed the network is automatically modified in accordance with its error.

Validation-:

Here validation is also a process which is used to quantify network generalization, and to stop training when generalization ceases improving.

Testing-:

Testing is also a process which is basically used (especially) to test the final answer and to strengthen the genuine predictive power of the network. In our work we have conducted several training sessions. The training measures the performance on the basis of MSE (Mean Squared Error). Here MSE is the average squared dissimilarities between target and outputs. Smaller values of mean square errors are considered as better one while zero denotes no error.

4.RESULTS:

Several experiments were completed to analysis the classification; with the help of analysis of the classification accuracies the training and the testing sets were determined. Here data set was separated exclusively into two different data sets, one is testing data set and another one is training data set. Now in our project training data set was used to prepare, instruct and train (coaching) the network, on the other hand the testing data set were employed to check especially for accuracy and efficiency of the network (trained) for the brain tumor classification. The proposed method is carried out in the MATLAB 2010 working platform and it is valuated using fifteen medical brains MR (magnetic resonance) images that were collected from the open source database and some innovative research centers and hospitals. Among fifteen magnetic resonance images, five images are shows malignant tumor, five images are shows benign tumor and the remaining five images show normal stage.

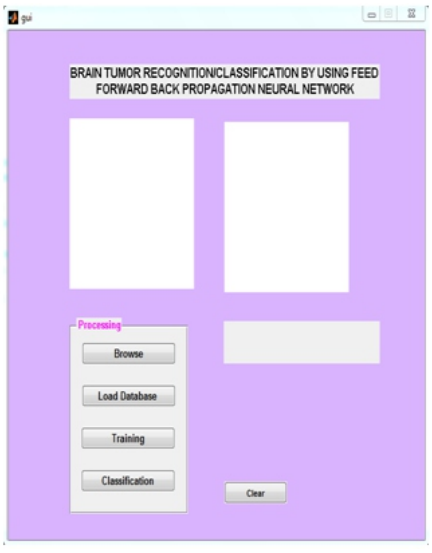

Fig 3: Basic GUI of system

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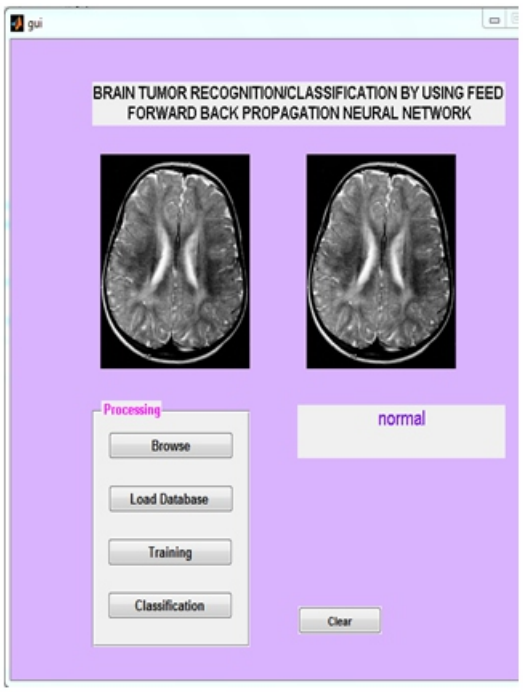

Fig 4: Classification result shows normal image.

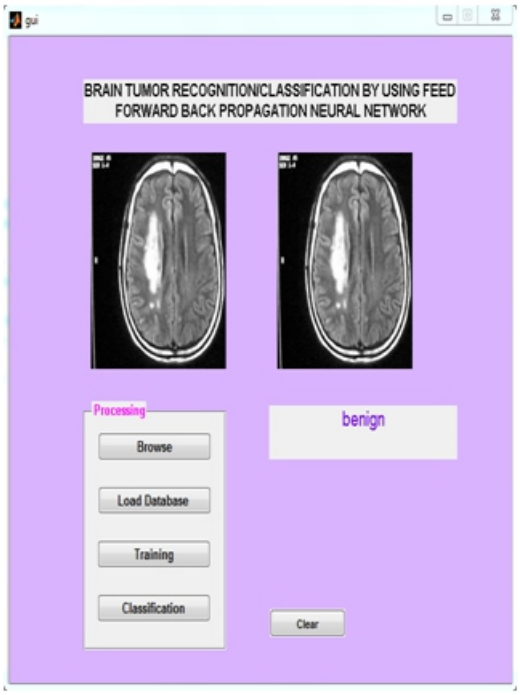

Fig 5: Classification result shows the benign image

Fig 6: Classification result shows malignant image.

From the above results of FFBPN network is estimated by unknown testing images. The feed forward back propagation neural networks of tumor classification results are shown in figures 4, 5 and 6. The tumor classification result accuracy was limits from 90% to 95% of the testing data set brain images. Here a three layer neural network was accompanied by input layer, secret layer and the output layer.

These three layers are created individually with 15 nodes in the input (first) layer, 1 to 20 nodes in the secret (hidden) layer and one node as the output layer. In order to influence the ideal number of hidden nodes we differentiate the number of nodes in the secret layer in the simulation environment. Since the input layer nodes can take in a large range of values, before transmitting it to the hidden layer a transfer function was employed to make over (change) data first and then it was remodeled with additional transfer function before transmitting it to the output layer.

The training data were used to feed into the neural networks as inputs and then by this the output calculated. The loads on the secret (hidden) nodes were calculated with the help of BPA (back propagation algorithm).

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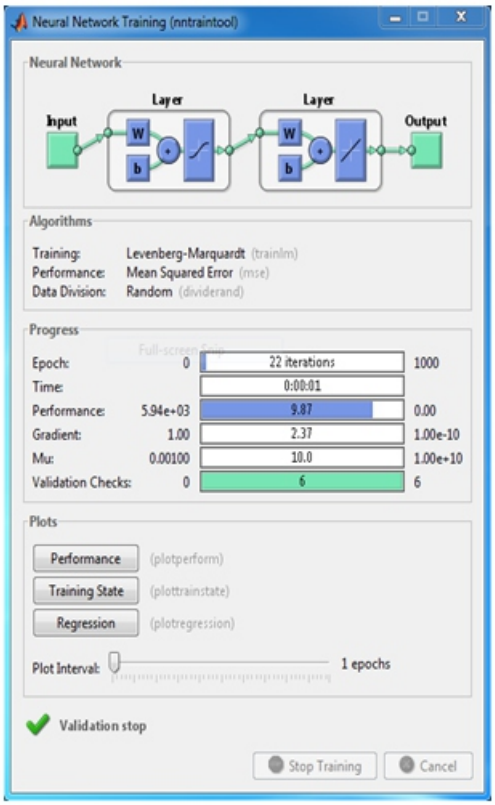
EXPERIMENT:

In my proposed work I am going to use one network training tool which is called as neural network training tool, which is in order to analysis the proposed work and by using this analysis I am going to increase the accuracy of the proposed work.

The analysis of tool can delivered with three parameters, those are performance, training state and regression. These are explained in given below.



Epoch- making externally important, gradient- degree of slope, regression- backward movement.

Fig 7: Network training result

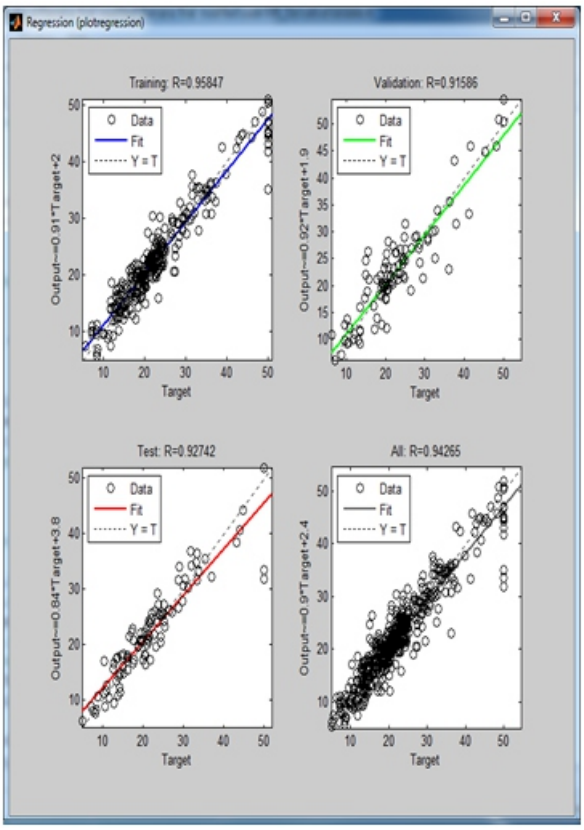


Fig 8: shows the regression analysis of the simulation result

In this experiment we have taken 1000 epochs and the training was completed in 10 iterations. The network is trained through FFBP (feed forward back propagation) algorithm. Figure displays the training progress of the network.

From the above figure, it seems clear that the total number of iterations to train the network is 10. The performance in terms of mean squared errors and the value of the gradient and validation checks is also shown in the above figure.

Where as in the case of regression plot shows the simulation result analysis of the proposed work, by this analysis, we state that our proposed work gives approximately 95% accuracy.

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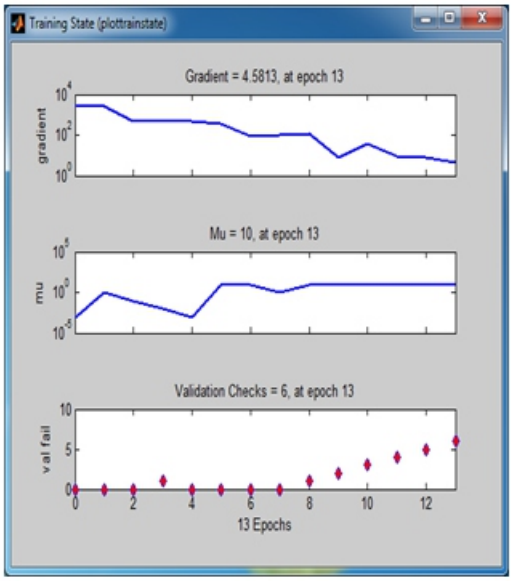

Fig 9: shows the training state analysis of the simulation result.

The above figure's shows the training state plot and performance curve produced while training, testing and validation of the network. We get the Best Validation Performance 12.515 at 4 epochs, in this point our proposed work gives hundred percent result accuracy. The above analysis shows the experimental analysis of our proposed work.

5.CONCLUSION:

The classification of brain tumor is successfully executed by using the neural network toolbox, GUI (graphical user interface) and DIP (digital image processing) tool box. This work used dataset contains all modalities T1, T2 of MR Images, which is giving it high potential, accuracy and yield in detecting any kind or definite type of abnormalities.

In my proposed work 40% of the data has been used for training and left over 60% was used for validation and testing.

The neural network training tool is used to check the performance of the proposed method so that it is helpful to increase the classification accuracies. For future work, I plan to design an efficient magnetic resonance imaging hardware model. This hardware model would detect and classify the brain tumor hundred percent successfully without any limitations.

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