A Comparative analysis of MRI Brain Tumor by Using PNN Technique

Author: Yogita Nagar[1]; Neha Dubey[2]; Nitika Doohan[3]

Affiliation: [1]*M. Tech Scholar, Department of Computer Science Engineering,Sri Aurobindo Institute Technology, Indore*

[2]*Assistant Professor, Department of Computer Science Engineering, Sri Aurobindo Institute Technology, Indore, India*

3   *Head, Department of Computer Science Engineering, Sri Aurobindo Institute Technology, Indore, India*

E-mail: nagaryogita96@gmail.com

ABSTRACT

In the present world, brain tumor is becoming main reason of causing death all over the world. Brain tumor is causing due to the collection of abnormal cells inside mind. So, the detection of these abnormal cells is very complex due to their cell formation. It is very important to classified type of tumor like normal, benign, malignant. Brain tumor is detected by MRI images. The probabilistic neural network NN is used to classify the stages of mind tumor automatically. In this research study is suggested approach in the classification of brain tumor. This work focuses primarily on two key aspects of the classification problems viz. data pre-processing that is raw by using the networks. A Probabilistic Neural network (PNN) has been very useful in the categorization of new data sets. The working of PNN are based upon the Baye's theorem which are considering the values of features of classified data as true and then predicting the classification of any new picture basis on it. The values of feature of the twelve enlisted features serve as educating the data of neural network NN.

1. INTRODUCTION

We Brain tumor is the one of the dangerous disease which causes death of many the person at all over the world. We can predict that the ratio of number of patient's are rapidly increased in future also.

Magnetic Resonance Imaging (MRI) is the best suitable and efficient technology that is being more useful now a day for diagnosis of brain tumor. MRI Imaging technology are basically uses a powerful magnetic area, radio frequency pulses and a PC for producing a specific images of soft tissues and organs.

These are more helpful for doctors to detect any underlying medical issues. As compared to the computed tomography (CT) scan, MRI images are mostly preferred for the diagnosis of tumor. Besides, they have no any adverse effects on human body because they do not use any kind of radiation as it is utilizing radio waves and powerful magnetic field.

Also, MRI images produces more effective results as compared to CT scan as it is generated higher contrast between various kinds of soft tissues of the body.

2. Evaluation Parameters and Significance

After over the grouping stage, the efficacy of the systems is need to be evaluated on the basis of specific parameters.

- **Sensitivity (S_e):** It specifies the capability of algorithm to correctly detect the samples which tested affirmative and belong to a particular category which specified by the values of features.

- **Accuracy (Ac):** It indicates the capability of algorithm of correct detection whether a sample related to certain information set category or not out of all the possible outcome of classification.

3. METHODOLOGY

The proposed strategy used for the proposed work in classification is described and followed by flowchart:
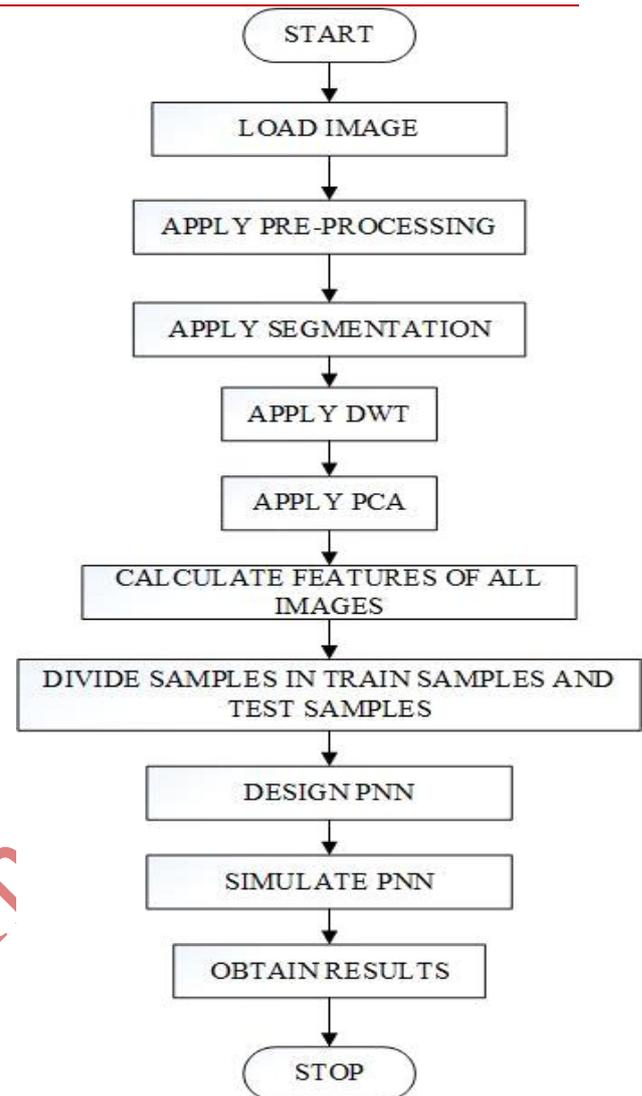

Fig 1: Working Flowchart

3.1 Training of the Neural Network NN

It Measure of the pixels values are read and stored. Further, some pre-processing may be done in advance in order to extracting the feature is required so as to getting accurate values of feature which will be eventually employed for training of the Neural Network NN. The pre-processing of image includes. The conversion from RGB to Grayscale. and Binary Thresholding (Binarizarion) is used to transform the binary image. It is appropriate for the features extraction through a binary image which is suitable in the case when it is not done.

3.2 Discrete Wavelet Transform (DWT)

Discrete Wavelet Transform (DWT) has been employed to smoothen out the non-linearity presented inside the image which is facilitated to feature extraction. Although there are various kinds of transforms are described, as yet conventional Fourier Methods are not adequate to handle the sudden changes in the pixel values of images due to Dirichlet's Conditions**.**

3.3 The conversion from RGB to Grayscale

Image having Grayscale value of an image which is also indicated to as an intensity, grey The conversion from RGB to Gray scale scale, or gray degree photo (Hua,2012). Sophistication array uint8, uint16, int16, single, or double those the value of pixels is defined depth values. In the color version of RGB, each color seems to be in number of one spectral components of carmine, untrained, and blue. The pixel shades having three types of components; red, untrained, and blue (RGB) with their corresponding intensities. These components of color are also known as color channels or coloration planes (components). Inside the shade model of RGB, color of photo may be shown by their feature of intensity.

3.4 Segmentation

Artificial Neural Networks

Th Consider dendrites of signals with their weights to the neuron. Then the sign values attaining the neuron could be. If there are "n" such indicators travelling through' one kind of the paths with weights starting from to various path and the neuron having an inner firing threshold fee , then the total activation function of the neuron is given as:

Segmentation of image is the department of a image into areas or categories, which is correspond to one kind of objects or elements of objects (Dahab, Ghoniemy & Selim, 2012). In the pictures, every pixel is assigned to the considered one of some of these categories. . Several segmentation approaches are generally used which have been discussed such as:

- **Thresholding:** In this technique, the pixels are assigned to categories consistent with the range values wherein a pixel reclined.

- **Segmentation based on edge-**In part-based segmentation, an clear out areais implemented to the photos, where pixels classification as part or non-part depending on the filter output, and pixels which are not separated via an area are allotted to the equal class.

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- **Segmentation based on regions:** In this approach, the process of segmentation in the image is typically done by using the regions

$$y = \sum_{i=1}^{n} x_i w_i \qquad \text{4.7}$$

Where X denotes the signals that are arriving through several paths,

W shows the weight corresponding to the various paths and

θ is the bias.

The fundamental of the above model lies in the reality that the instruments so, these evolved

attempts to copying the operating of human mind in the phrases of the following:

• They are working in a complex manner of parallel computation.

• Immoderate speed of performance because of their parallel structure.

• It can be learned and adapted consistent with the modified link weights.
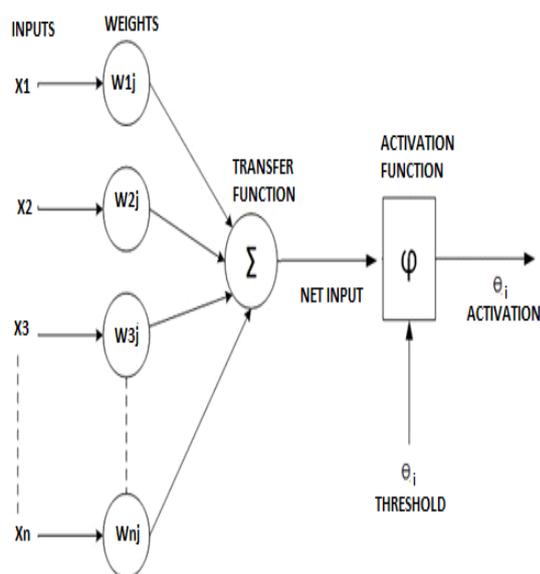
Fig 2: Mathematical Model of A Neural Network

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4. Probabilistic Neural network PNN

The extraordinary layers presented in Probabilistic Neural network PNN are:

Input Layer: This layer is containing the wide variety of neurons which is equal to the quantity of features used for training the neural community.
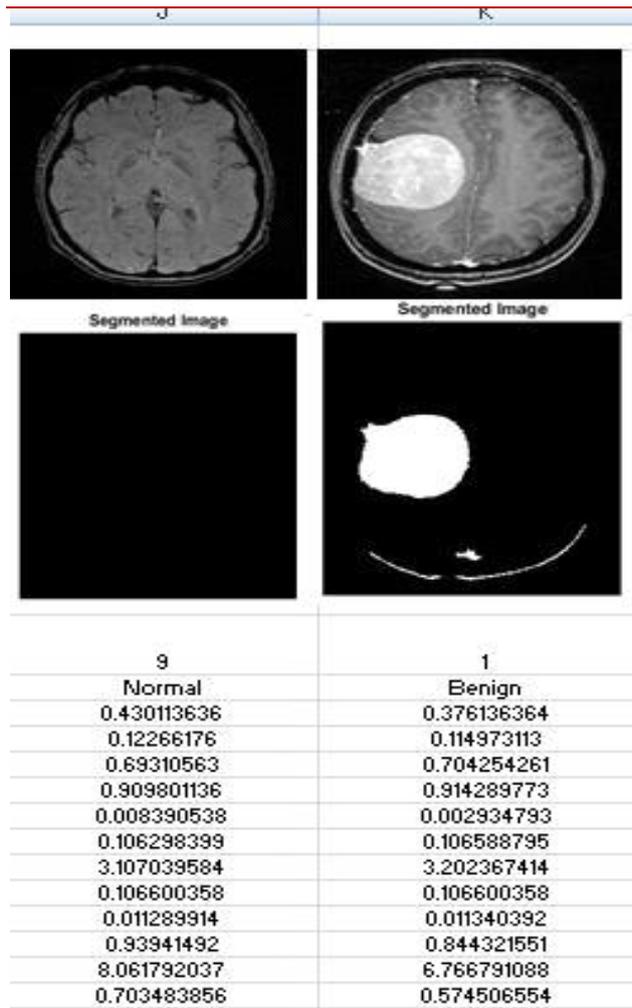
Sample Layer: This accretion is carrying single neuron for each case in the training of facts set. It is basically used to find, collect and keep in the memory the values or numbers for a class in concurrence with the value of target. In these layer, neuron is not explicitly visible and said to be the 'hidden' which uses the process of categorization in regards to the distance from a central point in a class case to the neuron's middle segmentation process of the categorical value and the radial relevance function (RRF) is the foundation function kernel characteristic which is usage of the values of sigma.

Summation Layer: In this layer, entire output of the sample layer is acquired and then it may be feed and sending it to the output layer for sophistication dedication. It is also the hidden layer within the Neural network NN.

Output Layer: Now, the entire outputs from the summation layers are taken and a ramification of the excessive cost is carried out and that are specified the magnificence of the selection which determines the magnificence of the sample.

5. Results

The result is contained the MRI images of brain of both normal and processed (segmented) form. Here in the above figure 3 , first row containing MRI images of normal Brain and another row consiststhe segmented forms of the same which improves particular places of the images so that the features extraction of the principal components become more easier.

that extraction of features by the principal component become more easier. The above figure consists of MRI images of the Brain without any tumors that is considered as healthy Brain

Fig.3: Shows the Parameters Calculated for Brain MRI Images

Table. 1: This table is generated by fig 3

s.no	MRI type	Normal	Benign
1	Contrast	0.430113636	0.376136364
2	Correlation	0.12266176	0.114973113
3	Energy	0.69310563	0.704254261
4	Homogeneity	0.909801136	0.914289773
5	Mean	0.008390538	0.002934793
6	Standard Deviation	0.106298399	0.106588795
7	Entropy	3.107039584	3.202367414
8	RMS	0.106600358	0.106600358
9	Variance	0.011289914	0.011340392
10	Smoothness	0.93941492	0.844321551
11	Kurtosis	8.061792037	6.766791088
12	Skewness	0.703483856	0.574506554

6. Conclusion

The presented work study is suggested a novel yet comprehensive approach in the classification of brain tumor. This work focuses primarily on two key aspects of the classification problems viz. data pre-processing that is raw by using the networks. Since the pictures of MRI can be consists of disturbances and degradations in the form of noise and random variations, in future it is become necessarily to remove them with the help of some special suitable tool.

That figure consists of MRI Images of mind without any tumors that is considered as healthy Brain. There has been radical variation in the parameter measures of the areas of healthy brain and ones with tumor. Since these are healthy Brain pictures consequently the abrupt variations are not presented here.

The results contained MRI images of Brain of both normal and processed (segmented) form. Here in the above figure 3, contains first row which contains MRI images of normal and second row contains segmented types of the same which improves particular places of the photograph so

In that case the special tool used is Discrete Wavelet Transform DWT. The DWT transform are uses for smoothens up the pictures by eliminating the non-linearity. Also, being a sampled version of the Continuous Wavelet Transform, the DWT are also very helpful in the removing of spatial redundancy.

Sectoring of the sector consists of the suspected tumors which are implemented by the use of pixel thresholding. This process is very helpful in order to achieve clear identification of the possible tumor area.

7. References

[1] Othman M. &BasriM(2011), "Probabilistic Neural Network for Brain Tumor Classification", Second International Conference on Intelligent Systems, Modeling and Simulation, IEEE Computer Society.

[2] Sridhar D. & Krishna M(2013), "Brain Tumor Classification U sing Discrete Cosine Transform and Probabilistic Neural Network", International Conference on Signal Processing, Image Processing and Pattern Recognition [ICSIPR].

[3] AmrutaHebli & Sudha Gupta (2017)"Brain tumor prediction and classification using support vector machine"2017 International Conference on Advances in Computing, Communication and Control (ICAC3)

[4] Mala K.& Alagappan V(2015), "Neural network based texture analysis of CT images for fatty and cirrhosis liver classification" Applied Soft Computing /Volume 32, , Pages 80–86in the general.

[5] Dr.Kulhalli K. &KolgeV(2014), "Primary Level Classification of Brain Tumor using PCA and PNN", International Journal on Recent and Innovation Trends in Computing and Communication Volume: 2 Issue.

[6] K.S. Thara&K.Jasmine (2016) "Brain tumor detection in MRI images using PNN and GRNN" International Conference on Wireless Communications, Signal Processing and Networking (WiSPNET) IEEE.

[7] Kharrat A, Benamrane N, Messaoud M, Abid M. Detection of brain tumor in medical images. In: 3rd IEEE international conference on signals, circuits and systems; 2009. p. 1–6 in the general.

[8] Mortazavi D, Kouzani AZ, Soltanian-Zadeh H. Segmentation of multiple sclerosis lesions in MR images: a review. Neuroradiology 2011;54:299–320.

[9] Popescu L &SasuI(2014),"Feature extraction, feature selection and machine learning for image classification: A case study" International Conference on Optimization of Electrical and Electronic Equipment (OPTIM), IEEE.

[10] Ahmed S, Iftekharuddin KM, Vossough A. Efficacy of texture, shape, and intensity feature fusion for posterior-Fossa tumor segmentation in MRI. IEEE Trans InfTechnol Biomed 2011; 15:206–13.

[11] P. Mohamed Shakeel ; Tarek E. El. Tobely ; Haytham Al-Feel ; GunasekaranManogaran ; S. Baskar(2019)Neural Network Based Brain Tumor Detection Using Wireless Infrared Imaging Sensor IEEE.

[12] Kabir Y, Dojat M, Scherrer B, Forbes F, Garbay C. Multimodal MRI segmentation of ischemic stroke lesions. In: Proceedings of the 29th annual international conference of IEEE-EMBS; 2007. p. 1595–8.

[13] Kharrat A, Benamrane N, Messaoud M, Abid M. Detection of brain tumor in medical images. In: 3rd IEEE international conference on signals, circuits and systems; 2009. p. 1–6.

[14] Liu YH, Muftah M, Das T, Bai L, Robson K, Auer D. Classification of MR tumor images based on gabor-wavelet analysis. J Med BiolEng 2011;32:22–8.

[15] Menzes B.,(2015), "The Multimodal Brain Tumor Image Segmentation Benchmark (BRATS)",IEEE Transactions on Medical Imaging, VOL. 34, NO. 10.

[16] Hua X.(2012), "Human–computer interactions for converting color images to gray" National Journal on Neurocomputing 85 , Elsevier, PP 1–5.

[17] Y. Nagar, N. Dubey, and N. Doohan, "The Comparative Analysis of Brain Tumor Identification on MRI Image by Probabilistic Neural Networks – A Preview", *IJRESM*, vol. 4, no. 3, pp. 182–184, Apr. 2021.