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A Neural-Fuzzy SOM Based Approach On Brain Tumor Detection From MRI Images

Nikita Sarawat[1], Neeraj Kumar[2]

M. Tech Scholar, MIET, Meerut, Uttar Pradesh[1]

Assistant Professor, MIET, Meerut, Uttar Pradesh[2]

Abstract: In this paper, presents an effective strategy for brain tumor characterization, where, the brain tumor pictures are arranged into typical normal, non-dangerous (Benign) brain tumor and destructive (Malignant) brain tumor. This paper introduces an efficient method approached of brain tumor classification and segmentation, where, the brain tumor images are generally classified into a normal or non-cancerous (benign) brain tumor detection and cancerous (malignant) brain tumor detection. The proposed method follows three steps, (1) pre-processing for Gaussian filter, (2) textural feature extraction for glcm and (3) SOM classification. Gaussian filter is first utilized utilizing for evacuate commotion the brain picture into various levels of rough and itemized coefficients and after that the dim level co-event matrix is framed, from which the surface measurements, for example, vitality, differentiate, relationship, homogeneity and entropy are achieved. The results of co-occurrence matrices are then fed into a SOM (self-organizing map) for further classification and tumor detection with fuzzy partition matrix clustering and segmentation.

Keywords: GUI, MRI, SOM Technique, Fuzzy logic, Confusion Matrix, Benign, Malignant

1. INTRODUCTION

In this paper, an endeavor has been made to abridge division strategies which are valuable for partition of tumor locale from brain tumor MRI images. [2][3] By choosing a legitimate division system, it is conceivable to section tumor district precisely, which helps in estimating the zone of tumor area from brain tumor MRI image.[1] This is conceivable by utilizing advanced image processing mechanisms. Computerized picture handling is valuable for CT scan sweep, MRI, and Ultrasound sort of restorative pictures. [4]Digital picture handling enhances the nature of these therapeutic pictures utilizing different upgrade procedures. From this upgraded picture the radiologist can without much of a stretch recognize contaminated area and its area. [5]Digital picture handling likewise ready to isolate out tainted district from MRI or CT examine pictures effortlessly which enables radiologist for analyses of the sickness at prior to arrange. It has a few points of interest over other imaging procedures, giving high complexity between delicate tissues. [6][7]However, the measure of information is a great deal excessively for manual examination, which has been one of the greatest snags in the successful utilization of MRI. The discovery of tumor requires a few procedures on MRI pictures which incorporates picture preprocessing, include extraction, picture improvement and classification.[8][9] The last grouping process or segmentation presumes that a man is sick or not. Albeit various endeavors and promising outcomes are gotten in medicinal imaging territory, reproducible division and order of variations from the norm are as yet a testing undertaking due to the distinctive shapes, areas and picture forces of various sorts of tumors. [10]In this paper, different methodologies of MRI brain picture division calculations are assessed and their points of interest, weaknesses are discussed about.

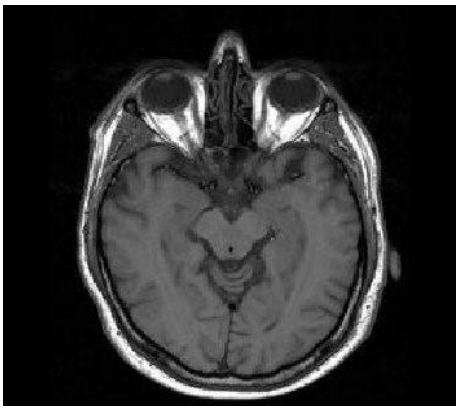

Figure 1: Normal Brain MRI

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2. SEGMENTATION TECHNIQUE

Image Segmentation is one of the ordinary computational applications for the most part used as a piece of the therapeutic field, especially for variety from the standard recognizable proof in magnetic resonation (MR) brain pictures. Therapeutic picture course of action is a case affirmation method in which unmistakable pictures are orchestrated into a couple of social affairs in light of some similarity measures. One of the basic applications is the tumor form recognizing confirmation in abnormal MR brain pictures. The proposed multi-class brain tumor gathering structure includes incorporate extraction and course of action. In feature extraction, the characteristics of the co-occasion matrix and the histogram are addressed inside the component vector. In this work, the upside of both co-occasion matrix and histogram to isolate the surface part from each area is used for better portrayal. In portrayal, the fuzzy method of reasoning based cross breed part is arranged and associated with set up the assistance vector machine for customized portrayal of four remarkable sorts of brain tumors, for instance, Meningioma, Glioma, Astrocytoma, and Metastases. In light of the preliminary comes to fruition, the proposed brain tumor gathering methodology is more great than other standard systems in regards to the evaluation estimations, affectability, specificity, sensitivity and accuracy. [1]

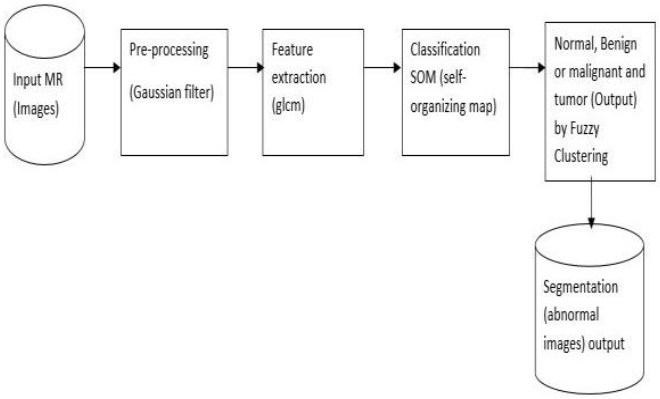

Figure 2: Block Diagram for SOM Neuro Fuzzy Technique

The whole process is divided into several parts as shown in the block diagram in Figure 2. First in Matlab Code, input image is taken which may be benign or malignant or normal image, in the second step preprocessing is done by using proper Gaussian filter and applying color form, converting the image by threshold in grayscale. The next process is of feature extraction like mean, entropy from the graycomatrix.[11] Then SOM is applied on train set and the input image which undergoes a classification process gives output for Benign, Malignant or normal type.

3. IMPLEMENTATION & RESULTS

Simulation Results:
In table 1, all comparison of Accuracy, sensitivity and specificity is shown. In figure 3, 4 and 5 corresponding charts of sensitivity, accuracy and specificity are shown.

Table 1: Comparison of different techniques

	SVM-Fuzzy	SOM-Fuzzy
Accuracy (%)	94.3	98.2
	SVM-Fuzzy	SOM-Fuzzy
Specificity (%)	98.5	98.2
	SVM-Fuzzy	SOM-Fuzzy
Sensitivity (%)	97.2	94.6

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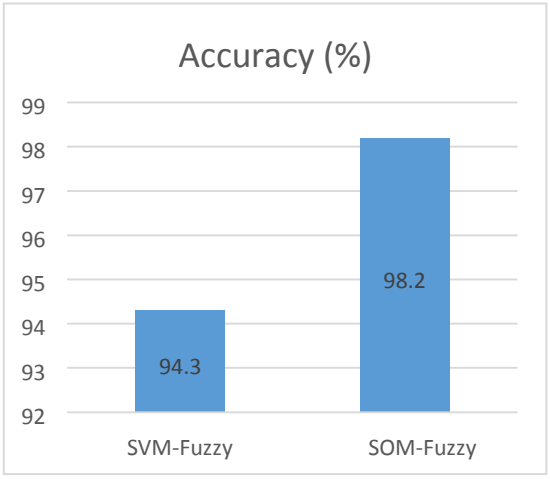

Figure 3: Accuracy Comparison

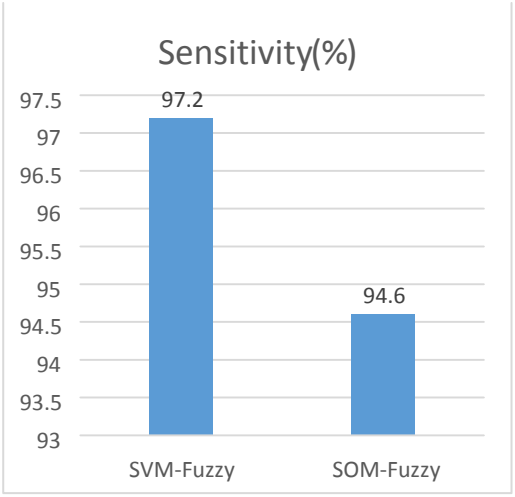

Figure 4: Sensitivity Comparison

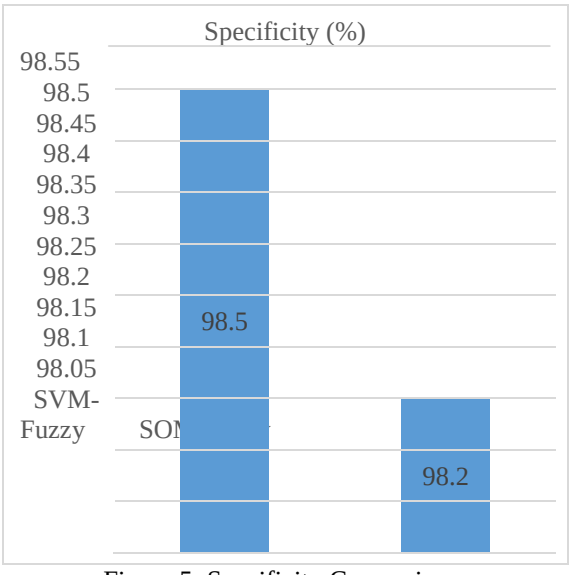

Figure 5: Specificity Comparison

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Figure 6 shows screenshot of confusion matrix and Figure 7 shows image of performance based on Mean Squared Error (MSE)

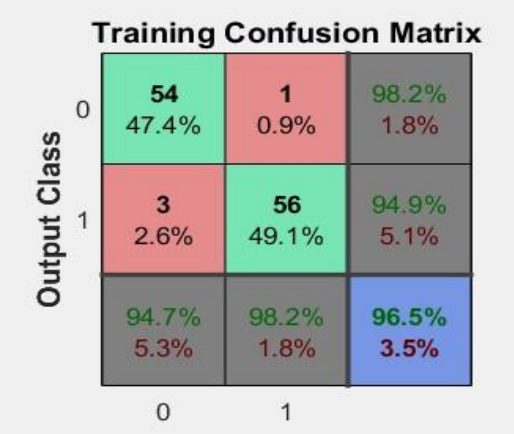

Figure 6: Confusion Matrix

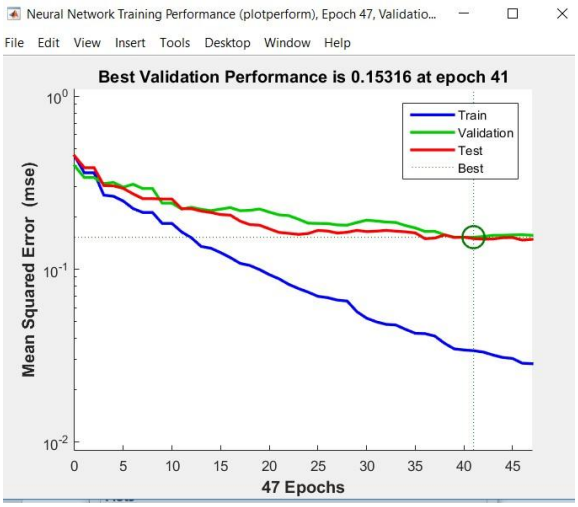

Figure 7: MSE performance

4. CONCLUSION

- Here we are providing a new methods in MRI brain images.
- Here pre-processing will be find for input images by Gaussian filter. Then feature extraction will be find for image by glcm (gray level co-occurrence matrix) feature extraction.
- Then feature extraction will be applied by SOM (Self Organizing map) classification.
- It will identify the normal and abnormal for input images.

The proposed approach gives better accuracy and sensitivity results as compared to SVM fuzzy logic segmentation. It an efficient method of classifying MR brain images into normal, benign and malignant tumor, using a probabilistic neural network. The proposed approach gives very promising results in classifying MR images.

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