

# Analysis and Design of Soft Clustering Method in Detection of Brain Tumor

Hemalatha K. L<sup>1</sup>, Sneha H<sup>2</sup>, Sumana H.R<sup>3</sup>

Associate Professor & HOD, Department of Information Science, Sri Krishna Institute of Technology,  
Bengaluru, India<sup>1</sup>

U.G Student, Department of Information Science, Sri Krishna Institute of Technology, Bengaluru, India<sup>2</sup>

U.G Student, Department of Information Science, Sri Krishna Institute of Technology, Bengaluru, India<sup>3</sup>

**ABSTRACT:** Brain Tumor extraction and analysis are challenging task in Medical Image Processing. Segmentation places a very important role in medical Image Processing. Detecting Brain Tumor takes special skills and techniques because they are difficult to detect specially in early stages. The technique based on Soft Clustering and Supervised Learning method for Brain Tumor classification has been proposed here to identify the Brain Tumor in an efficient way. In this proposed paper, image is enhanced using Enhancement Technique such as Contrast Improvement and Mid Range Stretch. Skull Striping is done by using Double Thresholding and Morphological Operations. Soft Clustering algorithm is used for Segmentation purpose to detect suspicious region in Brain. Supervised Learning model is used for Classification and Detection of Brain Tumor such as SVM.

**KEYWORDS:** *Soft clustering, SVM*

## I. INTRODUCTION

The Brain is most important part of central nervous system. Brain Tumor is an Intracranial Solid Neoplasm. Data mining method is the process of analyzing data from different perspective and summarizing it into useful information [1]. The only solution for this problem is the use of image segmentation. In this field many classification techniques are available such as Soft Clustering, Supervised Learning, and Artificial Neural Network and Bayesian classification. MRI technique is used it provide higher resolution and very good result. In this paper image is enhanced using enhancement technique like contrast improvement and mid range stretch. After the image is enhanced segmentation step is carried out. To extract suspicious region from MRI images segmentation technique is used. Here Soft Clustering method is used for purpose of segmentation [2]. GLRLM is used for feature extraction [3]. Finally the MRI images are classified by using Supervised Learning method it is also used for data analyzing and pattern recognizing. The main objective of this work is to achieve good performance that can be measured in terms of Sensitivity, Specificity, Accuracy. This method is very good and useful method to detect the Brain Tumour in MRI images.

## II. RELATED WORK

Support Vector machines were applied in many researchers which are given in [1-3]. H.B. Nandapuru, Dr. S. S. Salankar and Prof. V. R. Bora, worked on MRI Brain cancer classification using Support Vector Machine. Support Vector Machine was applied to Brain image classification. In this paper feature extraction from Brain MRI Images were carried out by gray scale, symmetrical and texture features. They achieved good result [1]. A. Padma and R. Sukanesh, their study on SVM based classification of Soft Tissues in Brain CT images using Wavelet Based Dominant Gray Level Run Length Texture Features. They have emphasized on the technique of medical CT imaging as one of the widely applied and reliable technique used for the detection and location of pathological changes efficiently, using SVM. They obtained 98% accuracy [2]. S.H.S.A. Ubaidillah, R. Sallehuddin and N.A. Ali, worked on cancer detection using artificial neural network and support vector machine: A comparative study. In this paper, they compared the performance of four different cancer datasets using SVM and ANN classifiers. In this study, the ANN classifier

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obtained good classification performance on the datasets that have bigger amount of input features , SVM also presented good performance on datasets with smaller amount of input features, but finally SVM classifier provide better result for tumor.

### III. METHODOLOGY

The proposed methodology consists of set of stages starting from collecting brain MRI images. The main steps are shown in figure 1. The hybrid technique involves the following main steps such as enhancement, skull stripping, and segmentation using Soft Clustering, feature extraction and classification using SVM to detect the tumor whether it is normal or abnormal. The image is processed through the following steps:

- Collection of MRI images
- Pre processing
- Soft clustering
- Feature extraction
- SVM classifier

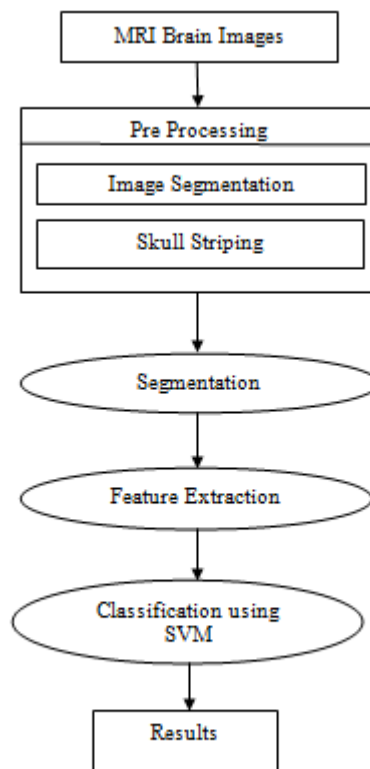


Fig: Proposed System

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## A. Collection of MRI images

Brain MRI images were collected from different medical centers. These brain MRI images were converted into two dimensional matrices using MATLAB.

## B. Pre processing

In Pre processing step, it includes two processes:

### ➤ Image Enhancement:

The qualities of images are improved using enhancement technique. It is essential to improve the image information for human viewers, so the accurate outcomes are achieved. The methods given below that are used for enhancement of brain MRI images.

- **Contrast improvement-** MRI images are RGB images, which are converted into gray scale images. These gray scale images are called intensity images. Here intensity values are mapped into low and high intensity values using `imadjust` (MATLAB function).
- **Mid-range Stretch-** This is also enhancement technique. In this method, the middle range MRI image intensity values are stretched. So it improves the quality of brain MRI images.

### ➤ Skull striping:

Skull striping is a method of eliminating the non-brain tissue in magnetic resonance Brain image. The steps involved in skull striping are given below.

### • Double Thresholding

It is a segmentation technique. The technique, convert the image into binary form, that is gray scale image to binary image. This technique generate the mask by setting each pixel in the range of  $0.1 \times 255 - 0.88 \times 255$  to 1 means white and remaining pixels to 0 means black. Non brain tissues pixels were discarded in MRI image. Here two thresholds upper and lower are considered so it is known as double thresholding technique.

### • Erosion

Erosion is one of the two basic operators in the area of mathematical morphology, the other being dilation. It is typically applied to binary images, but there are versions that work on gray scale images. The basic effect of the operator on binary image is to erode away the boundaries of regions of foreground pixels. Thus areas of foreground pixels shrink in size, and holes within those areas become larger.

## C. Soft Clustering

Soft Clustering is also referred as fuzzy clustering, data elements can belong to more than one cluster, and associated with each element is a set of membership levels. Segmentation is the technique of separating an image into multiple slices and object region. The skull striping images are used in image segmentation. This provides good results for tumor segmentation. Soft clustering algorithm is used to find out the suspicious region from the brain MRI image.

## D. Feature extraction using GLRLM

Feature extraction is a technique to find the relevant features from images, which are used to understand the images easier. This input data set images are converted into compressed form is called feature extraction.

## E. Support Vector Machine

In machine learning, support vector machines are supervised learning models with associated learning algorithms that analyze data used for classification and regression analysis. SVM is based on the conception of decision planes. A decision plane is one that separate the set of items having different memberships. The classification and detection of brain tumor was done by using the SVM technique. Classification is done to identify the tumor class present in the image.

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## F. Performance measures

The sensitivity, specificity, and accuracy were calculated using the formulas given below:

- True Positive (A): Abnormal brain correctly identified as abnormal.
  - True Negative (B): Normal brain correctly identified as normal.
  - False Positive(C): Normal brain incorrectly identified as abnormal.
  - False Negative (D): Abnormal brain incorrectly identified as normal.
- 1) Sensitivity=  $A/(A+D)*100\%$
  - 2) Specificity=  $B/(B+C)*100\%$
  - 3) Accuracy=  $(A+B)/(A+B+C+D)*100\%$

## IV. RESULT

In this paper, SVM technique with soft clustering technique is used for segmentation and classification of brain MRI images. Real data set of MRI brain images have been used to detect tumor and non-tumor MRI images.

## V. CONCLUSION

In this proposed system Brain MRI images proved to be a significant way to detect the brain tumor. The hybrid methodology of combining support vector machine and soft clustering technique for classification gives accurate result for identifying the Brain Tumor. In future work, different data mining techniques can be used to train using different kernel functions in order to improve the performance and data sets can also be increased.

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