ABSTRACT

The uncontrollable developments of cells in human brain are called as tumors which are generally classified into benign and malignant based on the cells in the human brain. In case of benign tumor regions, the cells are inactive and it does not spread to the nearby regions in the brain. In case of malignant tumor regions, the cells are active and it spreads to the other regions of the brain. The benign tumor cells can be controlled and cured by proper medication and it does not lead to death. The malignant tumor cells cannot be controlled and cured by medication. It can be controlled by only surgical operations in the affected brain regions. Generally, the brain regions are scanned by Computer Tomography (CT) and Magnetic Resonance Imaging (MRI) techniques. In this work, MRI scanning approach is used to detect the abnormal tumor regions in brain due to the high level of accuracy.

This research work proposes an efficient and automated computer aided methodology for brain tumor detection and segmentation using image registration technique and classification approaches. This proposed work consists of the following modules as image registration, Contourlet transform, and feature extraction with feature normalization, classifications and segmentation. The extracted features are optimized using Genetic Algorithm (GA) and then Adaptive Neuro Fuzzy Inference System (ANFIS) classification approach is used to classify the features for the detection and segmentation of tumor regions in brain Magnetic Resonance Imaging (MRI). The quantitative analysis are performed to evaluate the proposed methodology for brain tumor detection using sensitivity, specificity, segmentation accuracy, precision and Dice similarity coefficient.

This work research work also proposes an efficient approach for developing the brain tumor detection framework using fusion based classification approach. The brain MRI images from open access dataset are fused with each other to enhance the internal low resolution border pixels. The Curvelet transform is applied now on the fused brain image for obtaining the non-linear coefficient

metric patterns. Then, features are computed from these transformed non-linear coefficient metric patterns and these are further classified by proposed Extreme Learning Adaboost Classification (ELAC) algorithm for differentiating the tumor affected brain images from non-tumor affected brain images. This work also uses morphological segmentation algorithm for segmenting the tumor regions in tumor classified brain MRI images.

In this research work, Convolutional Neural Networks (CNN) is used to detect and classify the brain MRI images into normal and abnormal. In existing methods, machine learning algorithms are used to detect and classify the brain tumor affected and normal brain MRI images. It requires complex pre processing steps and also requires large number of external features from the brain MRI images for the classification process. In order to eliminate such limitations in conventional methods, this chapter proposes an efficient methodology for brain tumor detection and classification using CNN classification approach. This approach does not require any complex preprocessing steps and external features from the images. Instead, it generates the internal features from this architecture itself. Hence, the tumor segmentation accuracy is high through the implementation of deep learning algorithm.