ABSTRACT

In the field of medical image analysis, Computer-Aided Diagnosis (CAD) attracts more attention in recent years. The automatic segmentation of tumor from Brain MRI and classification is one of the major research problems in the medical field. The brain is composed of gray and white matter where as the brain tumor is the unusual growth of cells in a particular region. The brain tumor is one of the major deaths defying diseases. The detection of tumors in the early stages will increase the patient's survival rate. The manual segmentation of tumor from brain MRI is time-consuming process and may be prone to error. So the automatic segmentation and classification of brain tumor plays a key role in medical applications. Machine learning, deep learning based algorithms make accurate predictions from input data without human intervention. So machine, deep learning –based algorithms act as a base for CAD.

Segmentation is used to predict the Region of Interest (ROI) from the brain image and the classification technique is used to classify the severity of the disease. In the segmentation process, the tissue regions of the brain image are divided into clusters based on the relevancy between the intensity of pixels. Then the class of tumor based on severity is achieved by classification algorithms. There are several clustering and classification machine learning algorithms available to automate the process of segmentation and classification. But each algorithm has its own advantage and disadvantage. Even though deep learning algorithms provide accurate results, they need more data samples. Another disadvantage of deep learning is opaqueness in results. The main objective of the proposed work is to create an ensemble model for brain tumor segmentation and classification. The ensemble is the process of combining the predictions from different algorithms by this we will get improved results compared to a single algorithm. In the proposed work three different types of MRI such as T1-weighted MRI, T2-Weighted MRI and FLAIR MRI are used to get the complementary information from each type of image. First the images

are pre-processed by using the Laplacian Cellular Automata Filtering (LCAF) method to enhance the quality of image. For the segmentation process two ensemble based models are used. First ensemble model is based on K-Means, Self-Organization Map (SOM) and Gaussian Mixture Model (GMM) and in the second ensemble model K-Means, Fuzzy based clustering, and Self-Organization Map (SOM) are used. In the classification part super learner is used to classify segmented tumor into benign, malignant. The super learner is an ensemble model for classification, in which the predictions from m base learning models is used by meta model to make final predictions.

The performance of proposed work was analyzed and compared by using the parameters such as, sensitivity, specificity, precision, recall, true positive rate, false positive rate and accuracy with the reference to Ground truth of database. The results are validated and compared with the other state-of-art methods.