

ABSTRACT

The development of abnormal cells in human brain leads to the formation of tumors. This research work proposes an efficient approach for meningioma brain tumor detection and segmentation using image fusion and Co-Active Adaptive Neuro Fuzzy Inference System (CANFIS) classification method. The brain MRI images are fused and the Dual Tree Complex Wavelet Transform (DTCWT) is applied on the fused image. Then, the statistical features, Local Ternary Pattern (LTP) features and Grey Level Co-occurrence Matrix (GLCM) features. These extracted features are classified using CANFIS classification approach for the classification of source brain MRI image into either normal or abnormal. Further, morphological operations are applied on the abnormal brain MRI image for segmenting the tumor regions. The proposed methodology is evaluated with respect to the performance metrics sensitivity, specificity, positive predictive value, negative predictive value, tumor segmentation accuracy with detection rate.

The meningioma tumors are also classified and segmented using soft computing methods in this research work. The noise contents are detected and reduced using directional filters and then Gabor transform is applied on this noise smoothed brain image for transforming the spatial pixels into multi resolution pixels. Further, features are derived from this Gabor transformed multi resolution image and these are optimized using ant feature learning optimization algorithm. These optimized features are classified using Adaptive Neuro Fuzzy Inference System (ANFIS) classification approach and then morphological segmentation method is applied on this classified abnormal meningioma brain image in order to segment the tumor regions. The proposed meningioma tumor detection system obtains 98.1% of sensitivity, 99.75 of specificity, 99.6% of accuracy, 98.55 of precision, 97.95 of F1-Score and 98.1% of relevance factor.

In this research work, brain tumor detection and diagnosis are performed using machine and deep learning algorithm. The detection process detects the meningioma tumor MRI images from the normal MRI images. The diagnosis process is used to analyze the severity level of the segmented tumor regions in meningioma brain MRI images. If the level of severity of the segmented tumor regions in meningioma brain image is mild, then proper medication will be preferred. If the level of severity of the segmented tumor regions in meningioma brain image is severe, then surgery or radiation therapy will be preferred to save the life of the patient. In this chapter, the meningioma brain tumors are detected and segmented using Genetic Algorithm (GA) based ANFIS classification approach, which classifies the source brain MRI image into either meningioma brain image or normal image. Then, the meningioma severity analysis is performed using proposed Convolutional Neural Network (CNN) architecture, which classifies the meningioma brain MRI image into either mild case or severe case. All proposed meningioma brain tumor detection and diagnosis method are tested on the brain MRI images which are available from BRATS 2015 and Nanfang open access datasets.