ABSTRACT

The fast development of health care technology in the field of information and communication engineering is used to give the fast recovering solutions for many health care problems of the patients around the world. According to the report received from National Cancer Institute Statistics (NCIS) and World Health Organization (WHO), every year 12,764 persons are affected by brain tumors. In present, the detection of tumors in brain, lung and liver are screened using various modern health care techniques (Kong *et al.* 2015). In this paper, the brain tumor screening using digital health care system is proposed. Brain tumor is the abnormal development of cells in brain regions, which can spread the tumor regions to the nearby or its surrounding cells. The detection of brain tumors in brain Magnetic Resonance Imaging (MRI) image is an important process for preventing earlier death. In this research work, the brain tumors are detected and diagnosed using three different proposed approaches.

In proposed Approach-I, the brain tumors are detected and segmented using Hybrid Classification (HC) approach. The HC approach stated in this research work detects the tumor affected brain MRI image and then segmentation approach is applied on the detected tumor affected brain MRI image in order to segment the tumor regions. Finally, the performance of the proposed tumor detection method is compared with the other conventional methods.

The proposed Approach-II states an automated computer aided method for detecting and locating the brain tumors in brain MRI images using modified deep learning algorithms. The proposed method has three sub modules as preprocessing, classifications and segmentation. In this Approach-II, preprocessing is used to convert the image resolution into fixed format. The preprocessed brain MRI images are classified into either tumor case or non-tumor case using classification approach. In this brain tumor detection and segmentation process, Convolutional Neural Networks (CNN) classification

algorithm is used for detecting the tumor regions in brain MRI images. The morphological based segmentation methodology is proposed in this work for segmenting the tumor regions in classified brain image. Further, the segmented tumor regions are diagnosed into ‘Mild’ and ‘severe’ case using modified deep learning algorithm. The proposed methodology is applied on the brain MRI images in BRATS open access dataset. The performance of the proposed system is analysed in terms of sensitivity, specificity, precision, F-score, Disc Similarity Index and tumor region segmentation accuracy with respect to ground truth images. The simulation results of this proposed brain tumor detection and diagnosis method is verified by expert radiologist.

In Approach-III, the tumors are detected and diagnosed using CNN-EML architectures. The main limitation of two stage diagnosis system is that it requires external features from the segmented tumor regions for further two stage diagnosis processes. Moreover the conventional CNN architecture consists of FCNN layer with 2048 numbers of neurons which makes the design as complex. In order to overcome such limitation in previous work, this research work proposes three stage diagnosis of the tumor affected brain MRI images using CNN-EML architecture. This method uses only internal features for diagnosing the severity levels (mild, moderate and severe) of the tumor affected brain MRI images.