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Classification of Brain Tumor Types on Magnetic Resonance Images Using Hybrid Deep Learning Approach with Radial Basis Function Neural Network

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Abstract

Generally the classification or segmentation refers the partitioning of an image into smaller regions to identify or locate the region of abnormality. Even though remains owing to the complex structure of brain tumors is challenging task in medical applications, due to contrary image, local observations of an image, noise image, and non uniform texture of the images and so on. Many techniques are available for image segmentation, but still it requires introducing efficient, fast medical image segmentation methods. This research article introduces an efficient image classification method based on K-means clustering integrated with a k- means clustering algorithms. The main contributions of this research paper are as follows: firstly combined Hybrid PSO-WCA (Particle Swarm Optimization-Water Cycle Algorithm) based Radial Basis Function Neural Network (RBFNN) machine learning classification model for brain tumours was used. Secondly, feature extraction, the GLCM (Gray Level Co-occurrence Matrix) technique was used. Thirdly, the malignant and benign tumours were classified using Fast fuzzy c-means, KNN (Nearest Neighbor) algorithm, Fuzzy c means algorithm, and K-Means algorithm with features as input for visual localization, and the performance of the clustering classification was presented. Finally, the proposed hybrid model PSO-WCA-RBFNN extracted tumor images are segmented to obtain 99.62 percent accurate representations of brain tumors. In addition, the proposed algorithm was compared with other current segmentation algorithm models PSO-RBFNN, WCA-RBFNN, and LMS-RBFNN are also presented. The results show that the proposed algorithm performs better in terms of accuracy. The experiment is conducted over 255 MRI brain images from Harvard Medical School.

Keywords: Fuzzy c means algorithm; fast fuzzy c means; k-nearest neighbor; particle swarm optimization; radial basis function neural network