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RESEARCH ARTICLE

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Detection and diagnosis of brain tumors-framework using extreme machine learning and CANFIS classification algorithms

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Abstract

In this paper, brain tumors are detected and diagnosed using machine learning approaches in brain magnetic resonance imaging (MRI), which has many real time clinical applications. Noise variations in brain images are detected and removed using index filter, which is proposed in this paper. Brain images devoid of noise content are in spatial domain format, which are not suitable for further feature extraction process. Hence, there is a need for converting all the spatial pixels into multi orientation pixels. In this paper, Gabor transform is used for spatial into multi oriented image conversion. The noise filtered images are transformed into multi orientation-based brain image using Gabor transform method. Then, the hybrid features which are the integration of statistical and texture features (GLCM, gray level co-occurrence matrix, and LDP, local derivative pattern), are computed from this transformed brain image. These computed features are classified using extreme machine learning (EML) approach, which categorizes the source brain image as normal or abnormal. Then, the segmented tumor regions are diagnosed using co-active adaptive neuro fuzzy inference system (CANFIS) classifier, which classifies the segmented regions as mild or severe. The proposed tumor detection and diagnosis methods are applied and tested on the brain images which are available as open access dataset. The performance of the proposed brain tumor detection method is analyzed in terms of sensitivity, specificity, and accuracy with classification rate.

KEYWORDS

brain, features, machine learning, transforms, tumors

1 | INTRODUCTION

The detection of tumor regions in brain images is done by either invasive or non-invasive method. In case of invasive method, the foreign material is inserted into the human brain, which locates the abnormal regions in the brain. This method consumes more time for the tumor region detection and also produces high pain for the patients. The blood loss is inevitable in this method. These limitations are tolerated by proposing a non-invasive method for detecting and locating the tumor regions in the brain. This non-invasive method is based on the scanning techniques, which can be categorized into computer tomography (CT) and magnetic resonance imaging (MRI). The earlier scanning method detects the soft region tissues only as depicted in Figure 1A and hence it is not suitable for the hard tissues region such as scull of the human head. The MRI scanning method

