Combining deep and handcrafted image features for MRI brain scan classification

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ABSTRACT

Progresses in the areas of arti_cial intelligence, machine learning, and medical imaging technologies have allowed the development of the medical image processing field with some astonishing results in the last two decades. These innovations enabled the clinicians to view the human body in highresolution or three-dimensional cross-sectional slices, which resulted in an increase in the accuracy of the diagnosis and the examination of patients in a non-invasive manner. The fundamental step for magnetic resonance imaging (MRI) brain scans classifiers is their ability to extract meaningful features. As a result, many works have proposed different methods for features extraction to classify the abnormal growths in the brain MRI scans. More recently, the application of deep learning algorithms to medical imaging leads to impressive performance enhancements in classifying and diagnosing complicated pathologies, such as brain tumors. In this paper, a deep learning feature extraction algorithm is proposed to extract the relevant features from MRI brain scans. In parallel, handcrafted features are extracted using the modified gray level co-occurrence matrix (MGLCM) method. Subsequently, the extracted relevant features are combined with handcrafted features to improve the classfication process of MRI brain scans with support vector machine (SVM) used as the classifier. The obtained results proved that the combination of the deep learning approach and the handcrafted features extracted by MGLCM improves the accuracy of classification of the SVM classifier up to 99.30%.

KEYWORDS

Deep learning, MGLCM, MRI brain scans, feature extraction, SVM classifier

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