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An efficient framework for glioma tumor classifications and diagnosis using proposed CNN architecture

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Abstract

This article proposes the deep learning algorithm- Convolutional Neural Networks (CNN) for both Glioma tumor classifications and diagnosis process. This proposed CNN architecture is derived from the conventional CNN architecture to obtain the optimum classification and diagnosis accuracy. This proposed CNN architecture is derived from the conventional system for obtaining the high classification and diagnosis performance. This proposed methodology stated in this paper uses BRATS 2015 open access dataset for obtaining the brain Magnetic Resonance Image (MRI) for tumor region detection. The proposed methodology stated in this paper for tumor diagnosis achieves 97.7% of Jaccard Index (J) and 83.8% of Dice Similarity Index (DSI) and 99.025 of Diagnosis Rate (DR) using CNN algorithm..

Keywords: Glioma, tumor, deep learning algorithm, classification, diagnosis
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1 Introduction

The brain is a permanent and foremost important area for storing the memory of the persons. It is the origin of all human behavior, thoughts, feelings and understanding [5], [7], [9] and [10]. It also integrates and controls relating to balance and autonomic functions in the body. The development of the uncontrolled tissue patterns in brain region causes tissue damage which leads to tumor cells. The tumor cells are rapidly developing and their boundaries are slashed with the boundaries of nearby cells in brain. The modality of the brain can be viewed in Magnetic Resonance Imaging (MRI). This paper utilizes MRI scanning modality for identifying the tumor cells in brain regions. This MRI scan produces the clear cross sectional view of the brain regions and it locates the tumor pixels. Even though many methods were developed for the last two decades for detecting the tumor pixels in brain regions, they were not able to provide high grade diagnosis factor [14] and [6]. This issue can be solved using the modified deep learning method in this article.

Hayit Greenspan et al. (2018) [3] implemented an automated segmentation algorithm to segment brain MRI images acquired under varying noise conditions using Expectation Maximization (EM) and Gaussian Mixture Model (GMM).

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