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Conference Paper · November 2023

DOI: 10.1109/ICSSS58085.2023.10407395

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Publisher: IEEE

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Abstract:
Magnetic Resonance Imaging (MRI) serves as a widely employed diagnostic method for evaluating glioma-type brain lesions. This study introduces an automated segmentation approach for glioma-type tumors in MRI scans, employing U-NET Convolutional Neural Networks (CNN) with compact 3x3 kernel sizes. The adoption of small kernels serves to combat overfitting in deep neural networks and reduces the computational complexity associated with numerous network weights. To address the significant spatial and structural variations within brain tumors, a deep learning semantic segmentation technique known as the Multi-Scale Multimodal Convolutional Neural Network (SSMCNN) is employed, accommodating multiple MRI modalities. The primary objective of this methodology is the precise identification and separation of tumor categories by evaluating each individual pixel within the images. Furthermore, employing a classification approach based on patches enhances the effectiveness of semantic segmentation. The method utilizes a deep convolutional network, the Multiscale U-NET, to categorize multimodal images into three distinct scale segments through detailed analysis at the pixel level. By amalgamating these methodologies, the proposed approach aims to achieve precise and consistent image segmentation, a crucial aspect of effective clinical evaluations in glioma diagnosis.

Published in: 2023 9th International Conference on Smart Structures and Systems (ICSSS)

Date of Conference: 23-24 November 2023

DOI: 10.1109/ICSSS58085.2023.10407395

Date Added to IEEE *Xplore*: 31 January 2024

Publisher: IEEE

ISBN Information:

Conference Location: CHENNAI, India

Contents

I. Introduction

Magnetic Resonance Imaging (MRI) is a frequently employed imaging technique for the evaluation and detection of brain lesions. It delivers superb spatial resolution and provides sharp imaging of soft tissues. While other imaging methods such as CT scans and PET scans are available for brain examination, MRI remains the favored option. Nevertheless, manual segmentation of MRI images is a labor-intensive and intricate process, leading to the development of automated segmentation methods to enhance accuracy, especially in well-trained datasets. With the rising incidence of brain tumor diagnoses, particularly gliomas in adults, there is an increasing demand for efficient and precise methods for classifying and segmenting tumor images. [1].