جامعة عبد المالك السعدي
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Université Abdelmalek Essaadi

Pole for Doctoral Studies
Center for Doctoral Studies
Sciences, Technologies, and Medical Sciences

ANNOUNCEMENT OF DOCTORAL THESIS DEFENSE

M. YAHYA MOHAMMED Ali Mohammed

Will present here research work with the aim of earning a Doctorate

Doctoral program: Mathematical Sciences, Physics, and New Technologies
Discipline: Computer Science
Specialty: Computer Science and Artificial Intelligence

On 09/07/2025 at 10H00 at the Thesis Defense Hall of the Faculty of Sciences of Tetouan
Under the Theme

Deep Learning Algorithms for Semantic Segmentation of Medical Images: Application on Multimodal Magnetic Resonance Imaging of Brain Tumors

Front of the jury composed of :

First Name & Last Name	Establishment	Designation
Pr. AMJAD Souad	Faculty of Sciences of Tetouan, UAE	President
Pr. SADIQ Abdelalim	Faculty of Sciences of Kenitra, UIT	Reviewer
Pr. BEN-HDECH Adil	Faculty of Sciences of Tetouan, UAE	Reviewer
Pr. BENAMEUR Lamia	Faculty of Sciences of Tetouan, UAE	Reviewer
Pr. BEN MAATI Mohammed Larbi	Faculty of Sciences of Tetouan, UAE	Examiner
Pr. ZAZ Youssef	Faculty of Sciences of Tetouan, UAE	Examiner
Pr. EL GAROUANI Said	Faculty of Sciences of Fes, USMBA	Co-Supervisor
Pr. JELLOULI Ismail	Faculty of Sciences of Tetouan, UAE	Supervisor

Research Laboratory: Intelligent Systems Design Laboratory

Abstract

Brain imaging techniques play an important role in determining the causes of brain cell injury. Therefore, earlier diagnosis of these diseases can bring huge benefits in improving treatment possibilities and avoiding potential complications that may occur to the patient. Recently, brain tumor segmentation has become a common task in medical image analysis due to its efficacy in diagnosing the type, size, and location of the tumor in automatic methods. Despite deep learning-based methods have successfully improved the accuracy of brain tumor segmentation in MRI, some challenges remain.

These challenges are particularly prominent in small-scale tumor regions, where issues arise due to their diminutive size and the substantial variation between regions occupied by different tumor classes. Additionally, limitations in parameters and computational complexity contribute to these challenges. Thus, considerable potential remains for enhancing these methods and increasing their efficacy. In this thesis, we develop two deep learning-based brain tumor segmentation methods with multimodal MRI images. The first method focuses on MRI brain tumor segmentation with a 2D residual neural network (2D ERU-Net). This method uses residual units to speed up training and convergence, and a deep supervision module (DSM) to address gradient-related problems and obtain high-resolution feature maps.

The second method aims to present a lightweight multi-modal brain tumor segmentation network based on Multi-Perspective Attention (MPA) module, along with residual units and DSM, to enhance feature representation by recalibrating spatial, channel-wise, and depth (inter-slice) attention information in a merged method, ensuring improved sensitivity to relevant tumor structures in 3D MRI image. We evaluated these proposed methods on public multi-modal brain tumor segmentation datasets and demonstrated the effectiveness of these proposed methods.

Keywords: Deep learning, Convolutional neural networks, MRI, Multi-modality, Brain tumor segmentation, Residual block, Multi-perspective attention, Deep supervision module.