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Brain Tumor Semantic Segmentation and Classification using Deep Learning techniques

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ABSTRACT

Brain cancer, specifically Glioma, is a devastating disease with a very low chance of survival. In fact, only 3.6% of patients diagnosed with high-grade Glioma survive beyond five years. For medical professionals, accurately identifying and categorizing brain tumors into different classes is vital when it comes to diagnosing and planning the appropriate treatment for patients. Magnetic resonance imaging (MRI) is commonly used to examine brain tumors in clinical practice. Fortunately, deep learning methods have shown remarkable potential in effectively segmenting brain tumors and have yielded promising results in various biomedical applications.

This study examines brain tumors semantic segmentation and classification that used deep learning algorithms in medical technology applications such as Unet, Resnet, VGG net.

We initiate by providing an overview of the basic principles of deep learning. Subsequently, we delve into the applications of deep learning in the field of diagnosing and segmenting brain tumors using magnetic resonance (MR) images. Lastly, we conduct a comparative analysis of various approaches that have been explored, highlighting their respective findings and outcomes.

Keywords: deep learning, brain tumors, MRI, U-Net, convolutional neural networks

ABBREVIATIONS

MRI Magnetic Resonance Imaging

CT Computed Tomography

HGG High Grade Glioma

LGG Low Grade Glioma

FLAIR Fluid Attenuated Inversion Recovery

ML Machine Learning

AI Artificial Intelligence

DL Deep Learning

CNN Convolutional Neural Networks

MLP Multi Layer Perceptron

GAN Generative Adversarial Network

RNN Recurrent Neural Networks

WT Whole Tumor

TC Tumor Core

ET Enhancing Tumor

SGD Stochastic Gradient Descent

ReLU Rectified Linear Unit