ABSTRACT

Low-Grade Glioma (LGG) is a type of brain tumor with infiltrative characteristics, making it challenging to identify manually through MRI imaging necessitating an automatic segmentation method based on deep learning. However, the performance of such models can still be improved through hyperparameter optimization. Hyperparameters such as learning rate, kernel size, number of filters, and batch size significantly impact the model's performance. This study aims to optimize the DeepLabv3+ model for LGG segmentation using two hyperparameter optimization approaches: Bayesian Optimization and Grid Search. The dataset used is the TCGA LGG Brain Tumors dataset, published on Kaggle, consisting of 3,929 MRI images with manually segmented masks. The DeepLabv3+ model is implemented with a ResNet50 backbone and a Spatial Pyramid Pooling Module+ (SPPM+). Model performance is evaluated using Intersection over Union (IoU) and Dice Coefficient metrics. The results indicate that Bayesian Optimization achieves better segmentation accuracy than Grid Search, with a Iou score reaching 92,2% and a Dice Coefficient score reaching 94,64%. This study confirms that optimal hyperparameter selection significantly contributes to improving brain tumor segmentation performance using deep learning.

Keywords : Low-Grade Glioma, DeepLabv3+, Hyperparameter Optimization, Bayesian Optimization, Grid Search, MRI, Image Segmentation