ABSTRACT

Brain tumors are abnormal cell growths in the brain that can lead to impaired cognitive and motor functions and quality of life. Early detection of brain tumors using Magnetic Resonance Imaging (MRI) is essential to improve diagnosis accuracy and treatment effectiveness. However, manual segmentation of MRI images is highly skilled, time-consuming and error-prone. Therefore, Deep Learning-based approaches such as the U-Net architecture are a promising solution for automatic segmentation of brain tumors due to faster time consumption and relatively smaller errors. This study aims to implement U-Net architecture in automatic segmentation of brain tumors in MRI images, analyze its accuracy and performance, and optimize model parameters to improve segmentation results. The data used is the original dataset from the Jakarta Cempaka Putih Islamic Hospital. The research method involves literature study, data collection, data modification, model design, training, testing, and performance evaluation. The model is designed by experimenting with epoch and learning rate variations, epoch variations used are 20, 40 60, 80 and 100 epcoh with two learning rate variations, namely learning rate 1e-3 or 0.001 and 1e-4 or 0.0001. The evaluation results show that the best configuration of learning rate 1e-4 and 100 epochs produces a Dice Coefficient value of about 0.88, IoU of about 0.78, and Loss as low as 0.1, which indicates high and accurate segmentation performance. The expected result of this research is a U-Net-based automatic segmentation system that is able to improve efficiency and accuracy in brain tumor diagnosis, so as to speed up the diagnosis process and reduce the risk of segmentation errors.

Keyword**:** *Brain tumor*, MRI, *Segmentation*, U-Net, *Deep Learning*.