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# Brain Tumor Segmentation using 3D U-Net

Project proposal

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Brain tumor is a life threatening condition which affects more than 300K people in a year worldwide. Glioma, in particular glioblastoma, is a malignant form of brain tumor which has the worst prognosis despite being the most common brain cancer. We plan to develop a Brain Tumor Segmentation architecture to separate healthy tissues from different sub-regions of glioma by using the clinically acquired BraTS 2022 dataset. The sub-regions that are being considered are "enhancing tumor" (ET), the "tumor core" (TC), and the "whole tumor" (WT).

About half of those affected with glioblastoma do not survive a year. This tumor varies greatly in shape, size and appearance which makes the diagnosis a slow, tedious and extremely challenging problem. Developing a reliable machine learning model that can accurately predict the genetics of cancer could significantly speed up the process and avoid the requirement of multiple invasive surgeries and therapies.

We attempt to implement a deep learning model using a 3D U-Net following the work by Feng, Tustison, et. al[1]. The publicly available BraTS 2021 dataset which consists of four multimodal MRI pulse sequences each of 2,000 cases (8,000 mpMRI scans) would be used for this project. Modifications in the architecture, hyperparameters and the training and testing strategy would be made to strive to get the best possible results keeping in mind the limited resources and time available to us in this project.

‘Dice Similarity Coefficient’ and the ‘Hausdorff distance (95%)’ would be used to evaluate the results.

References

1. ‘Brain Tumor Segmentation Using an Ensemble of 3D U-Nets’ by Feng, Tustison, et. al