nnU-Net with Multiple Loss Ensembles for Aneurysm Segmentation (Second Submission)

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Method

A 3D full resolution of U-Net [1] was proposed for brain Aneurysm segmentation. In literature, working with imbalanced datasets is one of the most challenging issues. Since lesions often occupy a very smaller volume relative to the background, the model's prediction is biased towards low sensitivity. Therefore, to address the highly imbalanced dataset, three different loss functions were analyzed as follows: {Dice loss + Cross entropy}, {Dice loss + TopK loss}, {Dice loss + Cross entropy + TopK loss}. While none of the mentioned loss functions get the best results in each fold, we tried to assign a constant weight for each loss to capture the different aspects of embedding as well as diverse features. So, we made the next loss term as: $0.5 \times \text{Dice} + 0.25 \times \text{TopK} + 0.25 \times \text{CE}$. We employed the nnU-Net with the architecture as same as the first submission. The ADAM dataset includes 113 cases. However, there is no aneurysm in some cases. As a result, we just used the cases with aneurysm included. So, we used 65 cases as training set and 24 cases for test data. We also apply five-fold cross validation and use a 3* RTX 3090 GPU workstation with patch size of $256 \times 224 \times 56$ and a batch size of 2, and CUDA version 11.6. Each fold took about 30 hours.