A Skip-connected 3D DenseNet Networks with Adversarial Training for Volumetric Segmentation

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In this paper, we extend the work [1] by adding the adversarial network to enhance the performance of brain MRI segmentation. The network includes two parts: the segmentor network S and the discriminator network D. The segmentor networks S is similar to the architecture proposed in [1], with a minor different by adding a Squeeze-and-excitation module [2]. The discriminator network D extends from DCGAN architecture [3] by replacing the fully connected layer by $1 \times 1 \times 1$ convolution to maintain spatial information. We also combine local predictions and global predictions by concatenating features map of fine and coarse discriminator layers that allow capturing multi-scale contextual information. To deal with the insufficient tissue contrast, we took the complementary information by integrating image modalities, such as T1, FLAIR, and IR as inputs for our deep network. We first normalized the input to zero mean and unit variance before feed it to the network. We use 6 subjects from MRBrainS18 for training, 1 subjects for cross-validation. The proposed network aims to segment the input into 9 different classes (including background). It spends about 6 minutes to segment each subject on Titan X Pascal.

References

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