

Brain Tissue Segmentation Using 3D FCN with Multi-modality Spatial Attention

Liyun Sun, Wena Ma, and Xinghao Ding(✉)

Fujian Key Laboratory of Sensing and Computing for Smart City, Xiamen University,
Fujian, China
dxh@xmu.edu.cn

Abstract. We proposed a multi-modality spatial attention 3D fully convolutional network (MSA-3DFCN) to address the MRI brain tissue segmentation task. In this work, parallel 3D deep convolutional neural networks are applied on each MRI modality including T1, T1-IR and T2-FLAIR. The 3D FCN architecture of U-shape is consisted of encoder part and decoder part with skip connections. The under-sampling (max-pooling) and un-sampling (deconvolution) is adopted to increase the receptive fields. We proposed a cross-modality channel attention layer. Before the resize of the feature maps, we group the features maps corresponds to a certain channel index of each parallel network and apply group convolution followed by a sigmoid activation function to obtain the weighted coefficients for the feature maps. The feature maps are recalibrated using these weights. We also adopted the deep supervision technique to further boost the model performance. The proposed CMCA-3DCNN achieved good performance on the brain tissue segmentation task.

Keywords: Brain Tissue Segmentation · Convolutional Neural Network · Multi-modality MRI · Spatial Attention