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3dunet architecture

Currently, volume image segmentation known as the most significant medical imaging task has been addressed with deep learning algorithms wherein usually a large number of fully annotated volumes are required. However, scarcely is a perfect training dataset accessible in the area of medical imaging, since creating manual segmentation masks is monotonous and time-consuming for annotators particularly on volumetric images. In this paper, we purpose to learn a volumetric segmentation model with the sparse annotations in which ground truth on only a limited number of slices of a 3D volume image is available. We propose an iterative framework that alternates between two steps consisting of assigning pseudo annotations to unlabeled voxels and updating the 3D segmentation model applying both the labeled and pseudo labeled data. In each iteration, pseudo labels are predicted by employing both a deformable registration model which performs label propagation between 2D slices and the 3D segmentation model updated in the previous iteration. Experiments on the two publicly available datasets CHAOS and 3Dircadb1 including different organs demonstrate the superiority of our proposed method on volume image segmentation with the sparse annotation. Our method with only one annotated slice has the potential to achieve comparable results to the case in which all slices are annotated.