

ETSIP007 Transfer Learning for Image Segmentation by Combining Image Weighting and Kernel Learning

Abstract

Many medical image segmentation methods are based on supervised classification of voxels. Such methods generally perform well when provided with a training set that is representative of the test images to segment. However, problems may arise when training and test data follow different distributions, for example due to differences in scanners, scanning protocols, or patient groups. Under such conditions, weighting training images according to distribution similarity has been shown to greatly improve performance. However, this assumes that part of the training data is representative of the test data; it does not make unrepresentative data more similar. We therefore investigate kernel learning as a way to reduce differences between training and test data and explore the added value of kernel learning for image weighting. We also propose a new image weighting method that minimizes maximum mean discrepancy (MMD) between training and test data, which enables the joint optimization of image weights and kernel. Experiments on brain tissue, white matter lesion, and hippocampus segmentation show that both kernel learning and image weighting, when used separately, greatly improve performance on heterogeneous data. Here, MMD weighting obtains similar performance to previously proposed image weighting methods. Combining image weighting and kernel learning, optimized either individually or jointly, can give a small additional improvement in performance.



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