

Addressing the Exorbitant Cost of Labeling Medical Images with Active Learning

Authors : Saba Rahimi, Ozan Oktay, Javier Alvarez-Valle, Sujeeth Bharadwaj

Abstract : Successful application of deep learning in medical image analysis necessitates unprecedented amounts of labeled training data. Unlike conventional 2D applications, radiological images can be three-dimensional (e.g., CT, MRI), consisting of many instances within each image. The problem is exacerbated when expert annotations are required for effective pixel-wise labeling, which incurs exorbitant labeling effort and cost. Active learning is an established research domain that aims to reduce labeling workload by prioritizing a subset of informative unlabeled examples to annotate. Our contribution is a cost-effective approach for U-Net 3D models that uses Monte Carlo sampling to analyze pixel-wise uncertainty. Experiments on the AAPM 2017 lung CT segmentation challenge dataset show that our proposed framework can achieve promising segmentation results by using only 42% of the training data.

Keywords : image segmentation, active learning, convolutional neural network, 3D U-Net

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