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A Deep Learning Approach for Semantic, Multi-Organ Segmentation of PET Images

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Within the last decade, algorithms built on convolution neural networks have become the de facto methods for semantic segmentation of imaging data and currently yield state-of-the-art results. Early efforts focused on natural images, but applications related to segmentation of 2D and 3D medical images soon followed. Currently however, most of the published literature in the segmentation space is dominated by research related to high-resolution, anatomical imaging modalities like CT or MRI. There is a much smaller amount of work involving PET or SPECT emission images, largely due to the limitations pertaining to image noise and relatively poor spatial resolution of these functional modalities. This work investigates a deep learning approach for total-body anatomical segmentation, directly on PET image volumes. A single network, once trained, was found to be capable of performing high quality segmentations simultaneously for a large number of organs on emission images acquired from a variety of radiotracers. The segmentations derived from the PET images in a small number of test subjects were visually assessed and compared to those generated from the corresponding CTs within the same subjects.

Field

Software and quantification

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