Team Schmalstieg
Institute of Computer Graphics and Vision
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Head and Neck Tumor Segmentation from combined PET/CT scans using Deep Learning

Bachelor's Thesis / Seminar Project / Master Project

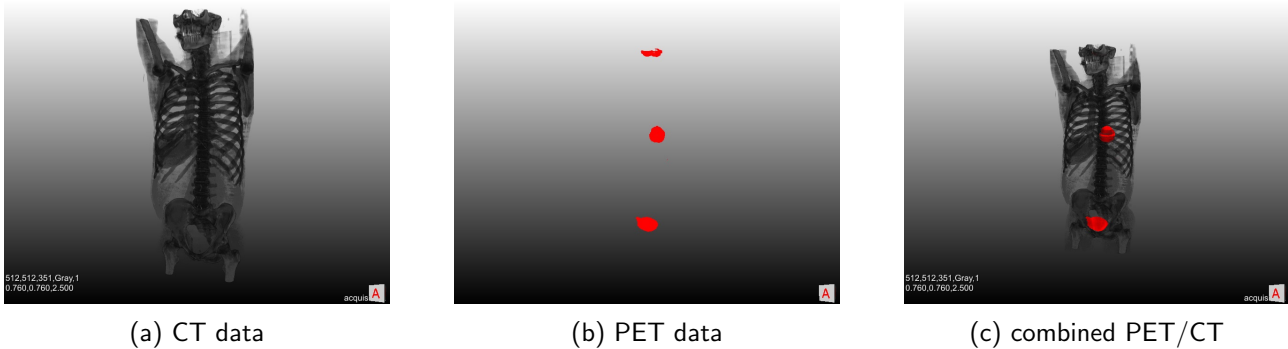(a) CT data   (b) PET data   (c) combined PET/CT

Figure 1: 3D CT, PET and PET/CT. (a) CT shows important anatomical structures but the contrast for soft tissue is poor. (b) PET shows metabolically active regions with high contrast. (c) PET/CT makes it is possible to assign active regions anatomically.

Description:

Fully automatic segmentation has proven to be a challenging task and therefore, in clinical practice, segmentation is mostly done manually. This leads to a large workload for physicians and a high error rate. Recent advances in deep learning have significantly improved the performance of image recognition and segmentation algorithms in medical image analysis. However, one major limitation for data driven approaches in the medical domain is the lack of annotated image data for supervised learning. In this project, this problem should be overcome by utilizing combined Positron Emission Tomography / Computed Tomography (PET/CT) acquisitions, using the PET portion of the data to automatically generate ground truth segmentations for training neural networks. A preliminary study segmenting the urinary bladder has been performed, which should now be expanded to the more challenging task of tumor segmentation.

Objectives:

- Perform literature review about medical image segmentation using deep learning
- Implement a pipeline for data preparation and generation
- Implement network architectures for segmentation
- Train & test the algorithm on the generated data

Qualifications:

- Interest in medical image analysis / processing
- Interest in deep learning
- Programming experience in Python
- Experience with TensorFlow / PyTorch is an advantage

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