WORKSHOP ON ARTIFICIAL INTELLIGENCE FOR MEDICAL IMAGE ANALYSIS

WORKSHOPS

理論科學研究中心
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3D Fully Convolutional Networks for Segmentation, Detection and Tracking in Medical Imaging

Prof. Holger Roth

Automated segmentation, detection and tracking are important yet challenging problems for medical image analysis and computer-aided diagnosis. Recent advances in deep learning have made it feasible to produce dense voxel-wise predictions of volumetric images that can be utilized for segmentation, detection, and tracking tasks. For example, multi-class 3D fully convolutional networks (FCNs) trained on manually labeled CT scans of several abdominal structures are now achieving state-of-the-art segmentation results without the need for handcrafting features or training organ-specific models. Similar 3D FCNs can be utilized for detection tasks, e.g. finding and segmenting lymph nodes in CT images, without much need for re-designing the network architecture. Furthermore, 3D FCNs can be integrated with image tracking algorithms in order to robustly track and segment challenging anatomical structures, like the airways of the lung in chest CT.

For material related to this talk, click here.

Deep learning with medical imaging for software engineers

Prof. Eric Oermann

Deep learning has dramatically changed the field of computer vision. However, despite its successes, there remain significant barriers to utilizing deep learning for the study of medical imaging. This lecture will briefly discuss deep learning and computer vision, and then focus on the use of deep learning for medical image analysis from a theoretical perspective. We will conclude with some practical considerations and recommendations for deploying deep neural networks on medical imaging datasets.

Practical Fundamentals of Medical Image Analysis

Prof. Anthony Costa

We're no longer working with the ImageNet… Analyzing medical images with machine learning is increasingly common in academia and industry. However, actual clinical medical images are radically different from the canonical datasets we are familiar with in computer vision, and are also quite different from medical images obtained for research purposes. We will discuss some of the theoretical and practical aspects of working with medical imaging for the standard tasks of image segmentation and image classification. We will also emphasize the unique structure of medical imaging data, and emphasize the necessary quality control and pre-processing steps to approach medical datasets with.

Simulation from physics to medicine

Prof. Anthony Costa

It is probably true that most researchers in the field of medical simulation, medical image analysis, or medical device design begin their careers making contributions to more traditional computational or theoretical sciences. Yet, the tools and techniques which have been so rigorously developed over decades in physics, chemistry, and biology remain sparsely applied and poorly understood as one approaches clinical practicality. Even within the field of computational anatomy, clinical translation of well-established methods remains elusive in all but the most advanced medical research groups. Technical, regulatory, and cultural bottlenecks are significant and poorly understood in the research community. I am lucky to have had the opportunity to do work at the interface of computational physics and computational medicine, especially as it is translated to the level of individual patients and physicians. In this talk, I will review briefly review some of the work I've been involved in on both sides of the aisle, with an eye toward the specific challenges faced during the application of simulation tools in the clinic.

For material related to this talk, click here.