学术报告

Cardiac Magnetic Resonance Image Segmentation with Anatomical Knowledge

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Venue： Room 326, Center for Applied Mathematics

Abstract： This talk focuses on segmentation of cardiac magnetic resonance (CMR) images from both healthy and pathological subjects. Specifically, we will propose three different approaches that explicitly consider heart geometry (anatomy) information.

First, we introduce a novel deep level set method, which explicitly considers the image features learned from a deep neural network. To this end, we estimate joint probability maps over both region and edge locations in CMR images using a fully convolutional network. Due to the distinct morphology of pulmonary hypertension (PH) hearts, these probability maps can then be incorporated in a single nested level set optimisation framework to achieve multi-region segmentation with high efficiency. We show results on CMR cine images and demonstrate that the proposed method leads to substantial improvements for CMR image segmentation in PH patients.

Second, we propose a multi-task deep learning approach with atlas propagation to develop a shape-refined bi-ventricular segmentation pipeline for short-axis CMR volumetric images. The pipeline combines the computational advantage of 2.5D FCNs networks and the capability of addressing 3D spatial consistency without compromising segmentation accuracy. A refinement step is introduced for overcoming image artefacts (e.g., due to different breath-hold positions and large slice thickness), which preclude the creation of anatomically meaningful 3D cardiac shapes. Extensive numerical experiments on the two large datasets show that our

method is robust and capable of producing accurate, high-resolution, and anatomically smooth bi-ventricular 3D models, despite the presence of artefacts in input CMR volumes.

欢迎大家参加！