Cardiac MRI Analysis Using Deep Convolutional Neural Networks

PROJECT DESCRIPTION

Cardiac MRI generates a large number of images per patient in each scan. For instance, a typical short-axis sequence of an adult MRI scan consists of more than 200 images, and manual segmentation of the left ventricle from all these images might take more than 20 minutes. Only a limited set of measurements associated with the scan is computed in regular clinical practice. Automating the analysis could lead to a comprehensive analysis of the heart function. However, automating the analysis using traditional image processing approaches poses a number of challenges including accurately identifying the regions of the heart chamber walls which have more or less the same intensities as other tissues such as papillary muscles. Recent studies have shown that deep learning approaches have the ability to accurately delineating the regions of interests provided that they are trained with sufficient data.

The objective of this study is to delineate cardiac structures and analyze the function automatically. We intend to segment the left ventricle from a sequence of cardiac magnetic resonance imaging. We further plan to investigate the cardiac function through a number of measurements including volumetric filling rate, strain, strain rates and E and A peak filling rates. Deep learning approaches require a large number of datasets for training to produce accurate results. Two hundred MR scans will be utilized in this study, where the first hundred scans will be used as training set and the second hundred scans will serve as the testing set. The results of the automated segmentation will be compared with manual delineation in terms of Dice score, root mean squared error and Hausdorff distance. The segmentation results of the deep learning approaches will be used for generating quantitative clinical measurements such as ejection fraction, stroke volume, strain, strain rates, volumetric filling rates.

FACULTY-DEPARTMENT
Medicine and Dentistry - Radiology and Diagnostic Imaging

OPEN TO STUDENTS FROM THE FOLLOWING INSTITUTIONS
Chinese universities participating in the *Double First-Class Initiative*.

DESIRED FIELD OF STUDENT STUDY
The project requires programming skills in Python and MATLAB. The successful candidate will be an undergraduate student from computer science, mathematics, electrical engineering, computer engineering or any other related discipline with a background in i

INTERNSHIP LOCATION

Edmonton Campus

NUMBER OF INTERNSHIP POSITIONS

2

INTERNSHIP DATES

Start: July 2, 2019

End: October 2, 2019

ARE THE DATES FLEXIBLE?

Yes, I am flexible regarding the internship dates. Selected students can contact me to request a date change.