

M.Sc. Thesis

Automatic aortic segmentation on 3D MRI: Applications in Computer-Aided Diagnosis of Aortic Anomalies and Scan Workflow Automation

Motivation

- Geometric parameters of the aorta (size, diameter, centerline, arch bend, ...) are important biomarkers in the diagnosis of aortic diseases (e.g. arteriosclerosis) as well as during follow-up of several types of diseases (e.g. Marfan disease).
- Knowledge about the aortic geometry can also be used to automate and standardize subsequent targeted MR measurements (e.g. 2D and 4D flow) in the aorta.
- The segmentation of the aorta (Figure 2) on 3D magnetic resonance angiography (MRA) images (Figure 1) remains extremely time intensive.
- This hampers the extraction of this geometric parameters in a clinical realm.
- The goal of this project is to develop DL-based segmentation algorithms combined with the extraction of geometric parameters of the aorta.

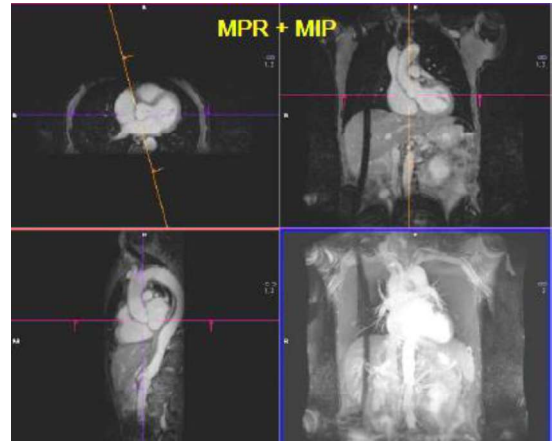


Figure 1: MRI acquisition of the thorax.

Methods

- Existing 3D datasets will be used to semi-automatically extract segmentations of the aorta in volunteers and patients.
- Based on existing 3D heatmap regression algorithms, a method to automatically detect, segment and parametrize the aorta will be implemented.
- The algorithms' accuracy will be analyzed and compared to manual intra- and inter-user reproducibility.
- Additional data will be acquired in-house (volunteers) and at collaboration sites (patients) to test the algorithm.



Figure 2: Segmentation of the aorta

Requirements

- Solid programming skills (Python, C++)
- Machine Learning, Deep Learning

Advisors

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Contact

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