University of Basel
Department of
Biomedical Engineering

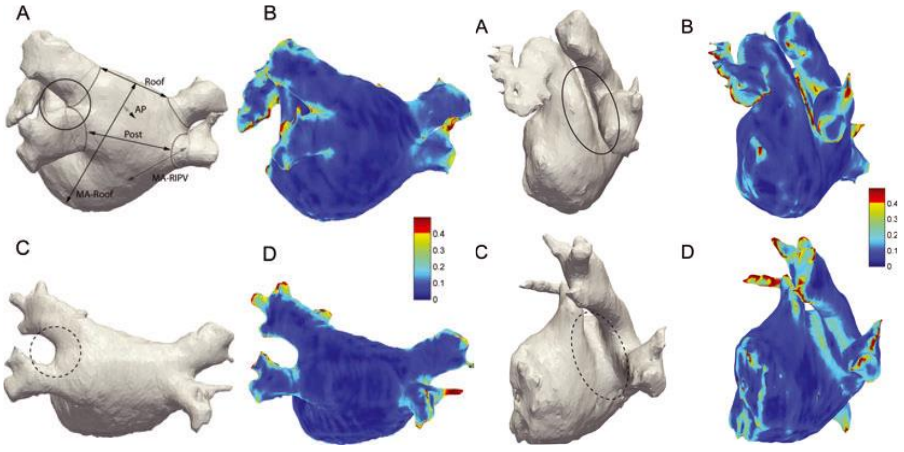
University of Basel, Department of Biomedical Engineering, Gewerbestrasse 14, 4123 Allschwil

Master of Science – Biomedical Engineering
Thesis Proposal

Automatic Curvature Analysis of the Left Atrium from cardiac Magnetic Resonance Imaging

Atrial fibrillation (AF) is one of the most common arrhythmias affecting about 1% of the general population with an increasing incidence. Initiation of the arrhythmia mainly arises from the pulmonary veins of the left atrium (LA), but other unspecific triggers locations are reported, too. Trigger activation/initiation is caused by the uncontrolled automaticity of certain cells in the heart. The cellular automaticity can be provoked amongst other factors by mechanical stimulation of the cardiac cells (the so-called mechano-electrical coupling). This mechanical stimulation of the cells is caused by the tissue inhomogeneity as well as by the curvature of the tissue resulting in pronounced stretch of the cells.
In the cardiology department of the University Hospital Basel, we have a database of more than 1300 pts including comprehensive clinical as well as follow-up data and cardiac Magnetic Resonance Imaging (cMRI) acquisitions from all patients referred for catheter ablation. To investigate the clinical significance of the mechanical stretch in the LA on the treatment of these patients, we will use the surface curvature of the 3D model as surrogate for increased myocardial stretch.

The aim of the study is to develop an automatic algorithm to 1) automatically segment the left atrium from pre-procedural cMRI acquisition and to characterize and classify the curvature of the resulting 3D geometry (exemplary figure below).



Nature of the Thesis
Experimental: 10%
Programming: 80%
Documentation: 10%

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Specific Requirements
Experience in signal processing; (pytorch)

Supervisor
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