

## Project/BSc/MSc thesis

**Title:** Heart surface tracking to determine contrast agent enrichment

**Background:** After bypass operation a fluorescence angiography of the heart can be performed to verify the perfusion of the arteries. Therefore, a contrast agent is injected and the enrichment is recorded with a camera positioned over the opened thorax. Based on the gray values in the video frames, the enrichment of the arteries can be recorded over time. Due to the beating heart, the enrichment curve is not continuously increasing. This work will focus on detecting the motion of the heart between the video frames to enable tracking the heart surface.

**Tasks:** Your main task will be the development of feature tracking algorithms and the extension of previous work. As no ground-truth data is given, you need to implement a suitable evaluation method. Further tasks include a segmentation of the arteries to detect regions of interest for tracking along the arteries and an evaluation of the overall perfusion in the heart.

Your tasks include:

- Implementation of data loading pipeline
- Implementation of data preprocessing
- Implementation of algorithms for heart surface tracking
- Implementation of segmentation to detect regions of interest for tracking
- Evaluation of tracking results with suitable evaluation method
- Potentially: use deep learning methods for tracking

**Requirements:**

- Good programming skills (e.g. Python, Matlab)
- Experience in signal and image processing
- Knowledge of machine learning is a plus
- Ability to work independently

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