Deformation modelling for heart segmentation
- A part of the Computerized Radiologist (COMRAD) project

Among medical imaging techniques, Magnetic Resonance Imaging (MRI) stands out as the most promising candidate for performing a comprehensive evaluation of cardiac disease. However, the acquisition is complex and time-consuming for the radiologist, because the positioning and angulation of imaging planes must be adapted to the anatomy of each individual patient. Moreover, in order to quantify the function and efficiency of the heart, the images need to be segmented subsequently. This currently limits the clinical potential of cardiac MRI.

The project is a part of an atlas-based image registration framework. The idea is to create a statistical model of deformation fields¹ resulting from image registration and apply the model to simplify and speed up the image registration procedure. The task is to investigate two to three different methods for modelling; Principal Components Analysis (PCA), sparse PCA, probabilistic PCA and/or weighted PCA, where weights are calculated from the input images or registrations. The end-result from the model-based registration procedure is the segmentation and quantification of cardiac function.

The analysis may be carried out using MATLAB. We have available images and deformation fields from 35 registrations to be used in the statistical modelling. Furthermore, source code to get the students started is available.

Contact: Hildur Ólafsdóttir (ho@imm.dtu.dk), Line Harder Clemmensen (lhc@imm.dtu.dk) and Henrik Pedersen (klaverhenrik@gmail.com)