Interpretability in cardiac parameter mapping

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Theme: Tissue structure

In quantitative imaging, there is a need to reliably recover multidimensional model parameter from noisy measurements. Such inverse problems are often ill-posed, meaning that small errors in the measured data may lead to large errors in the model parameter estimation. Addressing uncertainty is critical in quantitative imaging, since clinical decisions are based on the accuracy and precision of the derived model parameter.

Different machine learning approaches have been proposed for solving inverse problems.

The aim of the project is to develop a theoretical framework to determine uncertainty in machine learning applications for inverse problems in cardiac MR parameter mapping and motion compensation.Model uncertainty can be estimated using a Bayesian approach, in which not only parameters are estimated but also their posterior distributions.

The use of generative neuronal networks as, e.g. normalizing flows, can make the estimation of uncertainties feasible with low computational time.

The project is based in the group of G. Steidl (Applied Mathematics, TU Berlin) and requires a tight cooperation with the groups of T. Schäffter (Biomedical Imaging, PTB and TU Berlin) and of J. Schulz-Menger (Cardiology, Charité Berlin).

Therefore, we are searching for a candidate with excellent background in Applied Mathematics and with interest in interdisciplinary research.

Please contact Gabriele Steidl (steidl@math.tu-berlin.de) for any further questions on this project.