

Master Thesis

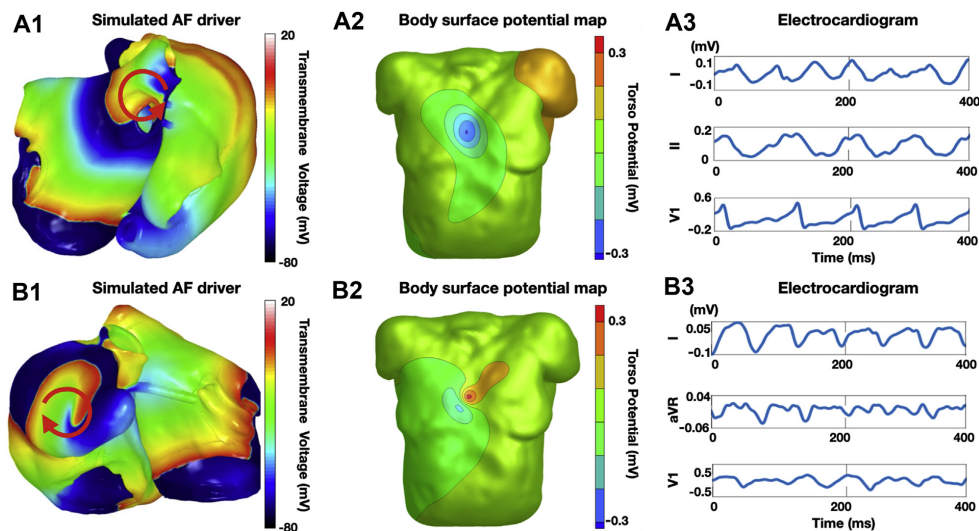
Model-informed machine learning for the prediction of postoperative atrial fibrillation

PD Dr.-Ing. Axel Loewe | axel.loewe@kit.edu | www.ibt.kit.edu/english/camo.php
 Dr. med. Christian Niklas | christian.niklas@med.uni-heidelberg.de | <https://bit.ly/3PZ32Uh>
 PD Dr. med. Jan Larmann | jan.larmann@med.uni-heidelberg.de | <https://bit.ly/3tBomHU>

Motivation and Background

Postoperative atrial fibrillation (POAF) complicates around 20% of surgical procedures and can lead to haemodynamic instability, increased risk of stroke, lengthened hospital and intensive care unit stays and greater costs (Dobrev et al. 2023, <https://doi.org/10.1038/s41569-019-0166-5>). The onset is typically 2-4 days after the surgery, which implicates a promising time window for preventive interventions if patients at high risk could be identified during the surgery or shortly after.

Heidelberg University Hospital has collected a rich dataset of biosignals and clinical readouts before, during, and after surgery. While this dataset comprises a sizable number of patients, it is likely underpowered for classic deep learning approaches. This is why we want to combine this real-world dataset with synthetic data obtained through validated multi-scale simulations of cardiac electrophysiology (Luongo et al. <https://doi.org/10.1016/j.cvdhj.2021.03.002>, Pilia et al. <https://doi.org/10.1016/j.art-med.2023.102619>).



Student Project

This thesis project shall first explore the potential of the clinical dataset with feature-based machine learning approaches. In the second phase of the project, the focus will be modeling of relevant risk factors and simulation of big synthetic data and/or deep learning approaches based on the preliminary results and your interest. For this, the student will be integrated in the Cardiac Modeling Group at IBT/KIT (simulation and machine learning) and the IMI/UniHD (medical domain expertise and machine learning).

If you are interested or have questions, send an email!