PhD Position – A real-time in silico electro-anatomical mapping system for optimal ablation therapy planning and delivery.

Supervision The PhD project will be hosted at the Medical University of Graz, Computational Cardiology Laboratory [1], within the Doctoral School of Mathematics and Scientific Computing, Karl Franzens University, Graz, Austria:

1^{st} supervisor, Prof. Gernot Plank, Medical University of Graz, Austria
2^{nd} supervisor, Dr. Matthias Gsell, Medical University of Graz, Austria
3^{rd} supervisor, Prof. Gundolf Haase, University of Graz, Austria
Industrial supervisor, Dr. Aurel Neic, NumeriCor GmbH, Graz, Austria
Clinical supervisor, Dr. Martin Manninger, Cardiology, Medical University of Graz, Austria
Funding: by the **FFG project InstaTwin** (50%) and **NumeriCor GmbH** [2] (50%)

Motivation Ventricular tachycardias (VTs) are associated with an increased risk of sudden cardiac death in patients with ischemic heart disease. Catheter ablation has become an increasingly utilized treatment for post-infarction VTs. Success rates remain sub-optimal, however, as ablation is a personalized therapy that depends on the ability of electro-anatomical mapping (EAM) systems to characterize the VT substrate. Patient-specific simulation of EAM procedures provides an exciting opportunity to advance EAM-based VT ablation towards a computer-guided precision therapy.

State-of-the-art Computational models of the heart will play a leading role in a future precision medicine as they allow integrating multi-modal imaging data and functional measurements through digital twins – *in-silico* replicas of a patients heart. Current models are limited i) in their ability to match clinical data, ii) by the vast computational costs that are incompatible with clinical time frames, and, iii) the impact of uncertainties on model predictions is not quantified.

Objectives The PhD project will focus on the development of a novel *real-time electro-anatomical mapping system* (Fig. 1) for the online simulation of clinical therapies. This includes the advancement of existing technology to facilitate real-time simulations of clinical signals, the development of calibration techniques to match simulated with clinically observed electrophysiology, and the quantification of uncertainties in clinical data on model predictions.

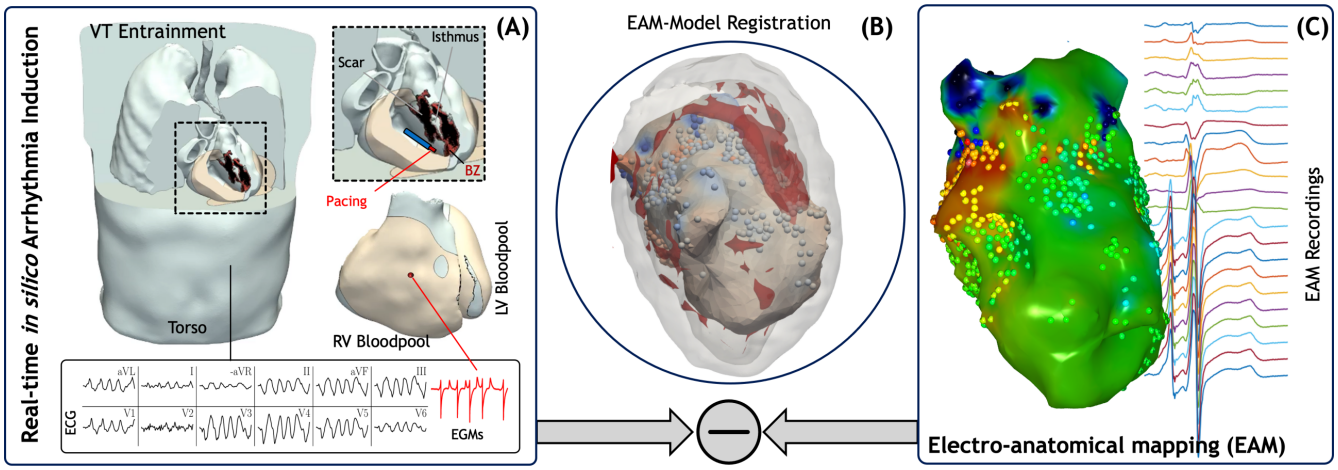

Figure 1: A) Simulations [3] of EAM procedures (A) are compared (B) to measured EAM data (C).

Candidate Background A suitable candidate ideally has a strong background in the physical sciences (applied maths, physics, computer science, engineering) with a particular interest in medicine and physiology. Previous experience in machine learning and strong coding skills is also highly desired.

Offer Fully funded (53k€/year) PhD position (fixed term for duration of 3 years), to work on leading edge technologies at the interface between academia and industry in a multidisciplinary team.

Application Applicants are asked to submit a CV, pdf files of master thesis and peer-reviewed publications (if applicable). Applications should be sent to Prof. Gernot Plank (gernot.plank@medunigraz.at) before March 15th.

[1] https://ccl.medunigraz.at
[2] https://numericor.at
[3] https://www.youtube.com/watch?v=SNNMvoDN_nE