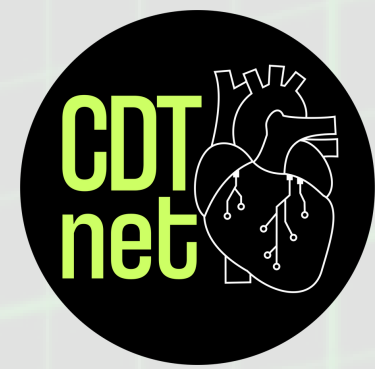


F12 In Silico Trials on Heart Failure Using a Digital Twin Platform



HOST ORGANISATION

Maastricht University
(UM), Maastricht, Netherlands

PHD AWARDING INSTITUTION

Maastricht University
(UM), Maastricht, Netherlands

Supervisory Team

Lead Supervisor

- Prof. Joost Lumens (Maastricht University)

Co-Supervisors

- Prof. Kevin Vernooy (Maastricht University)
- Dr. Richard Cornelussen (Medtronic Bakken Research Center)

Project Description

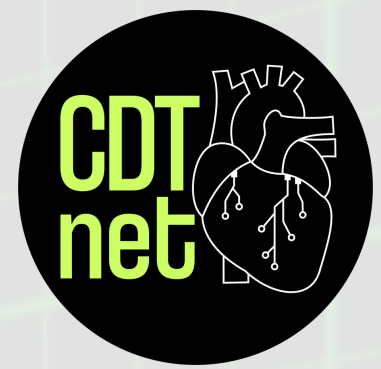
Heart failure affects millions of people worldwide and remains one of the leading causes of hospitalisation. Although new pacing therapies and monitoring technologies are emerging, it remains difficult to predict which treatments will work best for individual patients. Digital twin technologies offer an opportunity to address this challenge by creating personalised computational models that simulate cardiovascular function and predict the effects of different therapeutic strategies.

This project aims to develop a comprehensive cardiovascular digital twin platform that can be used for patient-specific therapy planning and virtual clinical trials. The doctoral candidate will create personalised digital twins of heart failure patients and use them to simulate the outcomes of different pacing therapies, with a particular focus on heart failure with preserved ejection fraction (HFpEF) and diastolic dysfunction.

A key aspect of the project is the integration of novel intramyocardial sensor data generated within CDTnet. These sensors provide information on cardiac relaxation, compliance and filling pressures, enabling the digital twins to be continuously refined and used for therapy optimisation. By combining clinical observations, physiological knowledge and computational modelling, the project will create virtual patient populations that can be used to evaluate new treatment approaches before they are tested in clinical practice.

The doctoral candidate will work with data from ongoing clinical studies, preclinical experiments and large-scale computational simulations. The project will also investigate how virtual cohorts can be used to conduct in silico trials that follow emerging regulatory standards for computational evidence generation. Ultimately, the research aims to accelerate the development of personalised therapies, improve treatment outcomes and support the clinical adoption of digital twin technologies for heart failure management.

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Planned Secondments

- Oslo University Hospital, Norway (2 months): collection and analysis of experimental data for validation of virtual pacing simulations.
- Medtronic Bakken Research Center, Netherlands (3 months): implementation and evaluation of state-of-the-art pacing strategies within the digital twin platform.

Desirable Project-Specific Qualifications and Skills

In this project, collaboration, scientific curiosity and translational impact are central. We are looking for someone who enjoys working at the intersection of engineering, physiology and clinical application, and who is motivated to contribute to research with real-world impact.

- Curious and translationally minded
- Research-minded and analytical
- Technically creative and hands-on
- Independent and proactive
- Strong communicator and team player
- Open to learning

Your background should include:

- A Master's degree in a relevant field such as Biomedical Engineering, Electrical Engineering, Mechanical Engineering, Medical Technology, Mathematics, Physics, Computer Science, Cardiovascular Science or related field.
- Proven interest in cardiovascular physiology, heart failure, cardiac arrhythmias, cardiac (electro)mechanics/hemodynamics and/or related therapies.
- Experience in or affinity with medical imaging analysis, wearable technologies, and signal processing.
- Programming and quantitative data analysis skills, preferably in Python, MATLAB, C/C++ or similar.
- Proven interest in computational modelling and simulation, digital twins or in-silico testing.
- Good organisational, project management and scientific writing skills.
- Excellent English language skills, both written and spoken.

Please direct any query regarding this project to:
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