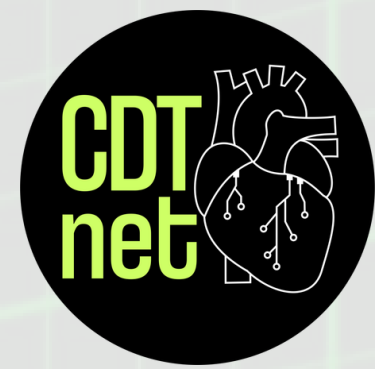


F6 Signal Analysis and Computational Models for Arrhythmic Risk Stratification in Cardiomyopathies



HOST ORGANISATION

Universidad de Zaragoza
(UZ), Spain

PHD AWARDING INSTITUTION

Universidad de Zaragoza
(UZ), Spain

Supervisory Team

Lead Supervisor

- Dr. Ana Mincholé (University of Zaragoza)

Co-Supervisors

- Dr. Andreu M. Climent (Corify Care)
- Dr. Javier Ramos-Maqueda (Fundación Instituto de Investigación Sanitaria Aragón)

Project Description

Genetic cardiomyopathies are an important cause of life-threatening ventricular arrhythmias and sudden cardiac death. However, marked variability in cardiac structure and electrophysiology makes it difficult to identify which patients are at greatest risk and would benefit from early, targeted preventive treatment.

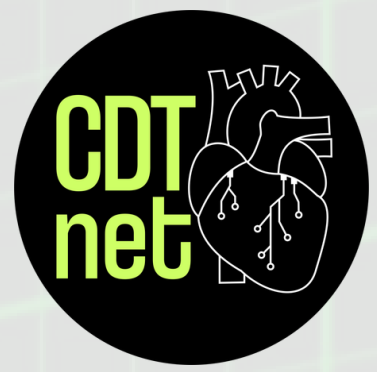
This PhD project will develop personalised approaches for arrhythmic risk stratification by integrating advanced signal processing, cardiac imaging and patient-specific digital twins. The candidate will combine electrocardiograms, cardiac magnetic resonance imaging and non-invasive electrocardiographic imaging to investigate how structural and electrical abnormalities interact to create arrhythmogenic substrates.

These multimodal data will be used to build personalised ventricular digital twins that reproduce individual cardiac electrical behaviour, explore arrhythmic mechanisms that cannot be directly observed clinically and derive novel digital biomarkers. Virtual populations of digital twins will support the development of multivariable risk models integrating electrophysiological, anatomical and imaging-derived features.

The project will use datasets from patients with hypertrophic and other genetic cardiac pathologies collected through collaborating clinical centres. Particular attention will be given to identifying robust biomarkers of arrhythmic events and understanding differences between women and men.

Ultimately, the project aims to deliver more accurate and personalised tools for clinical decision-making and the prevention of sudden cardiac death.

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Planned Secondments

- Corify Care, Spain (2 months): training in non-invasive electrocardiographic imaging (ECGi) and validation of hypotheses generated from digital twin simulations.
- King's College London, United Kingdom (2 months): development of large cohorts of anatomical models capturing population variability.
- University of Zagreb School of Medicine, Croatia (2 months): preparation of an external validation cohort and exposure to clinical cardiomyopathy research.

Desirable Project-Specific Qualifications and Skills

- MSc degree in Biomedical Engineering, Electrical Engineering, Physics, Mathematics, Computer Science, or a related discipline.
- Experience in scientific programming using MATLAB, Python, C/C++, or a similar language.
- Knowledge of signal processing, computational modelling, numerical simulation, or machine learning.
- Previous experience with cardiac electrophysiology, medical imaging, physiological signals, or patient-specific modelling would be advantageous.

Please direct any query regarding this project to:

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