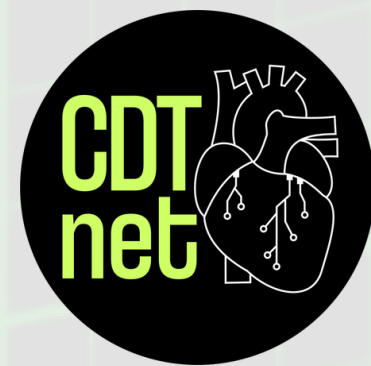


F13 Progression of AF Substrate and Electrophysiology



HOST ORGANISATION

University of Bordeaux
(UBx), Bordeaux, France

PHD AWARDING INSTITUTION

University of Bordeaux
(UBx), Bordeaux, France

Supervisory Team

Lead Supervisor

- Dr. Edward Vigmond (University of Bordeaux / LIRYC)

Co-Supervisors

- Prof. Mèlèze Hocini (University of Bordeaux)
- Prof. Vicente Grau (University of Oxford)

Project Description

Catheter ablation is an established treatment for atrial fibrillation (AF), yet a significant proportion of patients experience arrhythmia recurrence and require additional procedures. One of the major challenges is the limited understanding of how the atrial substrate evolves over time and how these changes influence treatment outcomes. Improved methods are needed to identify patients at risk of recurrence and to support more personalised treatment planning.

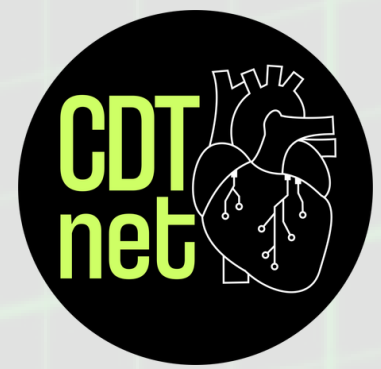
Research objectives

This project aims to develop new approaches for understanding the progression of atrial fibrillation and predicting outcomes after ablation therapy.

The doctoral candidate will:

1. Construct personalised digital twin models of the atria from cardiac MRI/CT and high resolution electrical data.
2. Model structural and electrical remodelling using machine learning techniques to reconstruct missing or incomplete anatomical information and to analyse how structural and electrical remodelling evolve over time from longitudinal data.
3. Predict therapy response to investigate how changes in atrial anatomy, electrophysiology and tissue characteristics influence the response to pulsed field ablation and other AF therapies and identify biomarkers that predict recurrence.
4. Personalise rhythm management by combining digital twins with longitudinal clinical data to estimate when repeat interventions may be required and determine which patients are most likely to benefit from more extensive treatment strategies.
5. Wearable ECG recordings and other remote monitoring data will also be incorporated to provide additional insight into disease progression.

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Data and resources :

The project will make use of MRI/CT and ECG datasets collected from patients undergoing AF treatment at the University of Bordeaux, supplemented by data from the UK Biobank and other CDTnet partners. Ultimately, the research aims to improve understanding of AF progression and support the development of more personalised approaches to rhythm management.

Planned Secondments

- University of Oxford, United Kingdom (1 month): training in advanced medical image analysis techniques.
- University of Zaragoza, Spain (1 month): training in electrocardiogram processing and signal analysis.
- Corify, Spain (2 months): training in non-invasive electrophysiological mapping and the characterisation of atrial fibrillation substrate.
- Medtronic Bakken Research Center, Netherlands (1 week): exposure to Holter monitoring and advanced electrogram analysis technologies.

Desirable Project-Specific Qualifications and Skills

The candidate should possess a Master's degree in a relevant field such as Biomedical Engineering, Electrical Engineering, Mechanical Engineering, Medical Technology, Physics or Cardiovascular Science.

We are looking for a motivated candidate with an interest in cardiac modeling and clinical translation with the following skills:

- Knowledge of cardiac electrophysiology to tune and parameterize cardiac digital twin models
- Setting up simulations and running them on high performance computing facilities
- Machine learning to tune models, and perform risk prediction
- Image analysis to characterize cardiac tissue and remodelling
- Python programming to automate tasks and analyse results

Please direct any query regarding this project to:

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