



F10 Digital Twin to Monitor the Outcomes of Physiological Pacing for Bradycardia Therapy

HOST ORGANISATION

Universidad de Zaragoza
(UZ), Spain

PHD AWARDING INSTITUTION

Universidad de Zaragoza
(UZ), Spain

Supervisory Team

Lead Supervisor

- Prof. Esther Pueyo (Universidad de Zaragoza)

Co-Supervisors

- Dr. Marc Strik (University of Bordeaux / LIRYC Institute)
- Prof. María Guillem (Corify Care)

Project Description

Cardiac pacemakers are widely used to treat bradycardia. Newer approaches such as left bundle branch area pacing (LBBAP) aim to replicate the heart's natural electrical activation more closely than conventional right ventricular pacing. Although early results are promising, key questions remain about patient selection, long-term outcomes, and personalised treatment.

This project will develop digital twin technologies to assess and monitor physiological pacing therapies. Patient-specific computational models will be created using cardiac imaging, electrocardiographic signals, and electrophysiological data collected before and after pacemaker implantation. These models will be used to study the effects of different pacing strategies on cardiac electrical activation, mechanical function and clinical outcomes.

A central focus will be the comparison of LBBAP with conventional right ventricular pacing, using data from clinical centres in Spain and France. Digital twins will be used to identify underlying mechanisms, improve patient selection, optimise pacing strategies and enable more personalised management of bradycardia.

Planned Secondments

- University of Bordeaux, France (2 months): training in pacing procedures and planning, clinical decision-making and follow-up.

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- University of Oxford, United Kingdom (1 month): development of computational models to simulate the effects of different pacing strategies.
- Corify Care, Spain (1.5 months): training in body-surface potential mapping and advanced electrophysiological analysis.

Desirable Project-Specific Qualifications and Skills

- The candidate should hold a BSc / MSc degree in Engineering, Physics or Mathematics, or a related discipline.
- Prior experience in signal processing, mathematical modelling, and computational simulation would be advantageous.
- Programming experience in MATLAB, Python, or C is desirable.
- Experience with multimodal data and/or data-driven modelling approaches (including machine learning) is a plus.
- Ability to work in an interdisciplinary and international research environment, with strong communication skills in English, is desirable.
- Familiarity with version control systems (e.g., Git) is beneficial.

Please direct any query regarding this project to:
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