RESEARCH CONTRACT PROPOSAL

The Cardiac Modeling Group belongs to the Electronics Engineering Department of the Polytechnical University of Valencia (UPV), Spain. The group is integrated by 5 faculty members and a variable number of post-doctoral and PhD students. We seek **two** highly motivated **Graduate Students** to build electroanatomical models of the heart at 3D level to enable the *in silico* testing of mechanistic hypotheses and improve the identification and evaluation of therapeutic targets for the treatment of atrial fibrillation (AF), myocardial infarction (MI), and heart failure (HF). The candidates will be contracted for four months and working in the frame of a national funded research project:

"Multi-scale modeling of cardiac pathologies and optimization of personalized therapies" (meHeart) PID2019-104356RB-C41, funded by Ministerio de Ciencia e Innovación y Universidades, Proyectos de I+D+i Retos Investigación.

The candidates will be fully integrated in the group as an active member and can develop their **Master final Thesis (TFM)**.

The group has an ample experience in modeling and simulating the electrical activity of the heart. Throughout our cardiac simulation work, we have developed and analyzed cardiac action potential (AP) models of different tissues (atrium, ventricle, and Purkinje) and different animal species (dog, rabbit, guinea pig, and human) under normal and under several pathological conditions, such as ischemia, heart failure, atrial fibrillation, and mutations. The group also has a valuable experience in modeling the effects of drugs on different ionic channels. Moreover, we have developed computational tools for the simulation of the electrophysiological activity of a variety of tissue structures (unicellular, one-dimensional, bi-dimensional and tri-dimensional).

ROLE SUMMARY:

The candidates will develop 3D ventricular and atrial personalized models based on clinical images provided by clinical partners. These models will allow to simulate arrhythmias and optimize therapies. Methods of image processing and mathematical modeling will be used to achieve the objectives.

The candidates will personalize cardiac models to specific patients that will undergo interventions (e.g. cardiac ablation). Ventricular and atrial three-dimensional models will be developed from MRI and CT images, and ECG signals and endocardial and epicardial cartographic electrical mapping in some cases. The clinical data will be provided by the hospitals involved in our research projects. The 3D models developed will be suitable to simulate the electrical activity of the heart.

CONTRACT DETAILS:

Applications: September 2023. The application will be published soon at: <u>http://www.upv.es/entidades/SRH/conypi/591169normalc.html</u>

Contrato de investigación a cargo del proyecto RETOS de Investigación: PID2019-104356RB-C41

Initial date: October 2023 Duration: 4 months Number of positions: 2 Dedication: partial (30 hours/week)

QUALIFICATIONS:

• Degree in Biomedical Engineering, Applied Mathematics, Physics, other Engineering degrees or related discipline with strong numerical components focusing on mathematical modeling, simulation, and image processing.

• Being a current student of the Master Degree in Biomedical Engineering will be highly considered.

• Basic Knowledge of image processing.

• Training and/or experience in mechanistic modeling of electrophysiological systems is preferred.

- Keen interest in learning new computational skills.
- Self-directed with ability to work independently.

CONTACT:

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