

Postdoc position: experimental study of electrical impedance tomography in the context of electrocardiography

Main mission(s) or project to accomplish:

The project context revolves around the detection of cardiac arrhythmias, specifically ventricular fibrillation, which is responsible for the vast majority of the 350,000 sudden cardiac deaths occurring annually in Europe. One of the most promising recent approaches to detecting these cardiac rhythm disorders is electrocardiographic imaging (ECGi), currently under study at IHU-Liryc. It is a non-invasive imaging technique that reconstructs the heart's electrical activity based on electrical measurements taken on the patient's chest using a vest adorned with numerous electrodes, commonly referred to as the "vest." However, current ECGi resolution techniques do not allow for sufficiently accurate reconstruction of cardiac electrical activity for complex clinical cases. In particular, it is widely accepted that uncertainties in organ and chest movement, as well as inter-individual variations in tissue conductivities, play a role in the loss of ECGi precision.

To improve ECGi resolution, it is therefore necessary to propose more comprehensive descriptions of electrical properties within the chest volume and enhance the information obtained from measurements on the vest. We propose using Electrical Impedance Tomography (EIT) for this purpose: it is a non-invasive technique for reconstructing internal conductivities as well as shapes. Although currently commonly used for medical purposes, it has not yet been applied to the detection of cardiac rhythm disorders. The objective of this project is to validate EIT resolution methods through experiments conducted at IHU-Liryc, using an experimental setup developed there for ECGi.

The postdoc will aid in experimental preparations in the laboratory, develop the signal processing pipelines to process raw data, evaluate available EIT methods to determine organ conductivities and position within the torso. In a second stage, the post-doc will help develop and validate experimentally a coupled EIT-ECGI approach to reconstruct cardiac electrical activity, and in doing so identify the key parameters of influence on the electrical propagation within the torso.

Essential activities

Signal processing, experimental studies, potentially modeling

Degrees or level of qualification

PhD or equivalent degree

Work environment and context:

The postdoc will take place at Liryc: the Institute of Cardiac Rhythm Disorders, within the signal processing team, in Pessac (Bordeaux area), France. The planned duration of the postdoc is 2 years.

Required skills:

- Knowledges: Basic knowledge of any of the following would be a plus: impedance spectroscopy, finite element models, model fitting, cardiac electrophysiology, inverse problems
- Expertise, know how: Programming in MATLAB and basic signal processing
- Soft skills: teamwork, communication

People to contact:

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