PhD position available
Institut de RYthmologie et de modélisation Cardiaque, Institut Hospitalo-Universitaire (IHU-LIRYC), Bordeaux, France

Director: Bruno Quesson, PhD
Title: MRI thermometry for the guidance of interventional cardiology

Keywords: MRI, Heart, Arrhythmias, Thermometry, Interventional imaging

Summary of the project:
The objective of the PhD research project is to develop Magnetic Resonance Imaging (MRI) thermometry for the guidance of the treatment of cardiac arrhythmias. Current treatment exploits endovascular catheters (measure of electrophysiological activity and radiofrequency thermo-ablation), but without monitoring of tissue temperature during the procedure. MR-thermometry should allow for a better characterization of thermal lesions and improvement of the therapy using optimized local energy deposition.

The candidate will develop methods in cardiac Magnetic Resonance Imaging (MRI) on a clinical scanner (1.5T Siemens Avanto) dedicated to methodological and preclinical research. The objective is to obtain quantitative temperature images with an uncertainty of 1°C, a spatial resolution in the range of a millimetre, and a sub-second temporal resolution (several images/cardiac cycle). For this purpose, parallel imaging (Grappa/MSense) will be combined with sophisticated acquisition methods including real-time respiratory and cardiac motion compensation (online repositioning of the imaging slice and cardiac triggering) to map temperature distribution in the myocardium surrounding the treatment electrode.

The catheter may also be used as a MR probe in order to exploit its inherent increased spatial selectivity and sensitivity. The developed methods will be evaluated on large animal models, taking advantage of the local facilities of the “LIRYC” institute (MRI scanner, catheter-lab with XRay fluoroscopy, surgery,…), the expertise of the research team (MRI methods, image processing, hardware, clinicians) and the support of Siemens (MRI), MRI-Interventions (catheters) and Image-Guided-Therapy SA (MRI thermometry SW).

Knowledge in MRI (or NMR) and in biophysics, good skill in computer programming, scientific curiosity, capacity in independent and multidisciplinary team work, fluency in English will be considered as added values for this research position offering perspectives toward industry.

Funding:
ANR TACIT

Publications:

Research environment
The IHU-LIRYC was recently established through significant national funding awarded to Pr Michel Haïssaguerre and focuses on the diagnostic and treatment of cardiovascular diseases with an electrophysiological basis. This growing multidisciplinary research environment, unique in Europe, brings together competences in interventional cardiology, imaging, signal processing and modelling. Projects are developed through collaborations between basic scientists, clinicians and industrial partners (imaging and interventional devices), enhancing future career perspectives towards academia and industry. (http://www.univ-bordeauxsegalen.fr/fr/recherche/politique-de-recherche/investissements-d-avenir/liryc.html)

Facilities
Current installations include a 1.5T Siemens MRI and one interventional catheter/X-Ray lab (electrophysiology/RF ablation) dedicated to preclinical research and integrated to animal facilities. The clinical environment is equipped with similar facilities to enhance accurate transfer of the developed methods to clinical applications. In 2013, the institute will be equipped with a 9.4T wide bore (30 cm) dedicated to methodological (sequence development and data processing) and applied cardiovascular research (3D cardiac structure).

Bordeaux
Bordeaux is a UNESCO world heritage site located in Southwest France. The area is world-renowned for its vineyards, elegant architecture and rich culture, with proximity to beaches (40km) and mountains (200km).
The research institute is located in Pessac, about 10km from downtown Bordeaux and 5km from the international airport.

How to apply
Please send (by email only) a detailed CV, motivation letter and 3 names + contact information for references to:

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