3 Year PhD Studentship available for September 2019

Department: Cardiovascular Sciences & Informatics

Supervisors: Professor Andre Ng (Cardiovascular Sciences) gan1@le.ac.uk, Dr Huiyu Zhou (Informatics) hz143@le.ac.uk & Dr Xin Li (Cardiovascular Sciences) xl251@le.ac.uk

Eligibility: UK/EU applicants only

Project Title: MAchine learninG In Characterising electrophysiological mechanisms underlying persistent Atrial Fibrillation (MAGIC-AF)

Project Description:
The PhD student will work in a strong interdisciplinary setting that builds on the cross-college collaboration between Cardiovascular Sciences and Informatics. Our research aim is to improve treatment of heart rhythm disturbances (arrhythmias) using novel biomedical signal processing and intelligent algorithms.

Atrial fibrillation (AF) is the commonest sustained arrhythmia in the clinical practice affecting 1-2% general population, but incidence increases sharply with age occurring in >10% people over 70 years old. AF is associated with a five-fold increase in stroke and increased mortality. The mechanistic origin of AF is still poorly understood. Catheter ablation is an effective treatment for early stage of the disease (paroxysmal AF) by inserting catheters in the heart to ‘burn’ (ablate) and eliminate the triggers causing AF. However, results are poor in more advanced form of the disease (persistent AF) as there is interplay between trigger and substrate whereby simply eliminating the triggers would not produce an effective outcome. Also, accurate identification of relevant substrate targets cannot be achieved currently as the electrical signals (electrograms) during AF exhibit complex and chaotic behaviour which require more advanced methods of analysis. Identification of atrial sites which are effective ablation targets remains challenging. A variety of signal processing techniques (i.e. complex fractionated electrogram, dominant frequency, local activation time mapping and rotational focal activity by phase mapping) have been developed and applied in clinical studies but failed to generate consistent outcome. Usually, a certain set of ‘rules’ were pre-defined for such single-hypothesis-driven techniques. However, multiple mechanisms may co-exist during AF.

This project aims to develop novel machine learning algorithms (i.e. deep learning, convolutional neural network, pattern recognition) based on advanced signal processing techniques, which may provide better performance than traditional methods, in unveiling the underlying mechanisms of persistent AF and provide new insight in the strategy of catheter ablation. The student will gain skills in a wide range of areas including: cardiac electrophysiology, digital signal processing, statistics, bioinformatics and machine learning to analyse high throughput biological data previously collected. The large database of digitised data from several patient cohorts include standard ECG, intracardiac high density non-contact multi-site (2048) electrograms as well as body
surface potential mapping signals (128 leads) during AF and in normal sinus rhythm during and following interventions including cardioversion and catheter ablation. This project will suit an enthusiastic and dynamic student with a background in computer science, biomedical engineering or medical sciences with a keen interest in multidisciplinary research. This work will provide unique mechanistic insight, which will generate high impact interdisciplinary publications as well as new machine learning tools identifying the source of AF as suitable targets for catheter ablation. These tools have great potential to facilitate industrial collaboration and further translation into clinical tools for effective interventional treatment and improved patient outcome.

References:

Funding details:
The College of Life Sciences (CLS) HDRUK Studentship will provide a tax-free stipend at RCUK rates (£15,009 for 2019/20) and UK/EU fees for 3 years.

Entry requirements:
Applicants are required to hold/or expect to obtain a data science related UK Bachelor Degree 2:1 or better (e.g. Computer Science, Bioinformatics, Biostatistics), and preferably also a similar MSc qualification. The University of Leicester English language requirements apply where applicable.

How to apply:
You should submit your application using our online application system.

Apply for a PhD in Cardiovascular Sciences Research

In the funding section of the application please indicate you wish to be considered for a CLS HDRUK Studentship

In the proposal section please provide the name of the supervisor and project you want to be considered for – please list both your first and second choices.

Project / Funding Enquiries: Professor Andre Ng gan1@le.ac.uk

Application enquiries to pgradmissions@le.ac.uk

Closing date for applications: 3rd April 2019

Interviews are likely to be week commencing 8th or 15th April 2019