Title: Experimental Bifurcation Analysis of Neurons Using Control-based Continuation

Type of award  PhD Research Studentship

Department  Engineering Mathematics

Scholarship  A minimum £14,777 p.a. for 2018/19 subject to contracts (please check below for further scholarship details)

Funding Duration  3.5 years

Eligibility  Home/UK applicants only

Start date  1 October 2019

PhD Topic Background/Description

The behaviour of biological systems is governed by a wide range of complex phenomena that are intrinsically nonlinear and interact on different time and spatial scales. Mathematical modelling currently plays a central role in understanding the dynamic behaviour of these nonlinear systems. The major caveat with this approach is that discovered phenomena critically depend on the model assumptions (i.e. captured physics) and the model parameter values identified experimentally. As of now, there exists no experimental method that can directly measure nonlinear dynamic phenomena during biological experiments.

Control-based continuation (CBC) is a non-parametric method that has the potential to fill this void. The fundamental principles of CBC are well established, and the method has been used to map out the nonlinear dynamic features of a wide range of non-living (i.e. electro-mechanical) systems directly during experimental tests, without relying on the estimation of the parameters of a mathematical model, or a particular model structure.

We are seeking a PhD student to further develop CBC such that it can be applied to biological systems. In particular, the project aims to experimentally characterise the bursting dynamics of excitable cells such as neurons. The project draws on a wide range of underlying areas including mathematical modelling, dynamical systems and bifurcation theory, control theory, system identification as well as theoretical and experimental electrophysiology. Applicants are expected to have experience in at least one of these areas.

The successful candidate will drive this research forward alongside other researchers who are working on closely related problems. More widely, the candidate will be part of the Dynamics and Control research group and the Applied Nonlinear Mathematics research group both of which carry out cutting-edge research in a wide range of application areas.

URL for further information: www.ludovicrenson.com
Further Particulars

Candidate Requirements
We are looking for an enthusiastic student with either a 1st or minimum 2:1 honour degree in Engineering or a recognised taught Master’s degree.

Scholarship Details
Scholarship covers full UK/EU (EU applicants who have been resident in the UK for 3 years prior to 1st September 2019) PhD tuition fees and a tax-free stipend at the current RCUK rate (£14,777 in 2018/19). EU nationals resident in the UK may also apply but will only qualify for PhD tuition fees.

Informal enquiries
For informal enquiries, please email Dr Ludovic Renson, l.renson@bristol.ac.uk with your up-to-date CV.

For general enquiries, please email sceem-pgr-admissions@bristol.ac.uk

Application Details
To apply for this studentship, submit a PhD application using our online application system [www.bristol.ac.uk/pg-howtoapply]

Please select PhD Engineering Mathematics on the Programme Choice page and enter details of the studentship when prompted in the Funding and Research Details sections of the form with the name of the supervisor.

Applications made before 28 February 2019 will be prioritised.

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