4-year (MRes+PhD) studentship opportunity in Man-Machine Interfacing: SURFACE ELECTROMYOGRAPHY FOR BRAIN-MACHINE INTERFACE APPLICATIONS

Supervisors: Dario Farina, Etienne Burdet, Emmanuel Drakakis (Bioengineering-Imperial College London); Industry supervisor: Patrick Kaifosh (Cognescent Corporation)

The Imperial College Centre for Doctoral Training (CDT) in Neurotechnology for Life and Health and Cognescent are recruiting candidates for a 4-year joint academic/industrial studentship in the field of Man-Machine Interfacing. The studentship will start in October 2017 and is open to Home (UK) or EU candidates.

This studentship represents a unique opportunity for a motivated doctoral candidate wishing to work at the interface of translational academic-industrial research.

The project
Highly qualified students are sought for a project focused on developing a wearable interface with spinal motor neurons. Non-invasive recordings of muscle activity can provide access to the neural activity of the innervating neural cells in the spinal cord. Therefore, they offer a window into the neural control strategies of movement by the central nervous system. As such, they can in principle be used for establishing a neural interface with humans. Moreover, since muscle electrical signals are easy to access and can be recorded non-invasively, this interface can be used both by patients (for rehabilitation technology) and by healthy individuals (for augmentation technology). This project will develop a wearable, high-density sensor for electromyographic recordings aimed at decoding the neural activity of spinal motor neurons during activities of daily living. The aim is to provide an additional control channel over external devices (e.g., smart watches, gaming, robots) that can be used in a robust way during daily activities and can overcome the limitations of other systems used for decoding the user intention (e.g., motion capture systems). The system will consist of several tens of electrodes embedded in textile or other material to be worn at the wrist, similar to a tennis band, and embedded electronics for powering, conditioning, and processing of the signals. The signals will be decoded into the activity of motor neurons. The main challenge will be related to highly non-stationary conditions and brief contractions that will impose limitations on the statistical methods for blind separation of the neural cell activity. Moreover, methods for mapping the neural activity into control commands will be developed, with special emphasis on proportional and impedance control. Application scenarios will include virtual interfaces and gaming and will be tested over long-term conditions (several days of usage).

The successful candidate will be based at Imperial College London, South Kensington Campus, London, SW7 2AZ, UK and is expected to spend time at Cognescent (US).

The CDT programme
The programme begins with a one-year MRes in Neurotechnology, which comprises 3 months of taught courses followed by the MRes research project. Students then enter the PhD phase having developed the interdisciplinary and technical skills to thrive in a cutting edge research environment, and make the most impact with their PhD. Throughout the 4 years, there is considerable emphasis upon multidisciplinary and transferrable skills, through centre activities beyond the individual research project. More details on the CDT can be found at www.imperial.ac.uk/neurotechnology/ctd.

Who should apply?
The ideal student will have a solid foundation in Electrical Engineering (circuit design, algorithms, signal processing and control theory) complemented with a good understanding of the neural control of movement, specifically hand control. Additional strengths for consideration include demonstration of experimental experience in muscle electrophysiology, biomechanics (specifically of the hand), and proficiency with technical writing and communication. Ideally, the student’s primary career interests should be focused on translational neuroengineering. Applicants should be self-motivated and comfortable working at the interface of academic and industrial research. The studentship is open to UK or EU applicants only.

Funding
The studentship will cover Home/EU tuition fees and a tax-free annual stipend of approximately £16,500. An annual allowance is provided for research consumables and for conference attendance.

www.imperial.ac.uk/neurotechnology/ctd
How to Apply
Full application instructions are available at the Neurotechnology CDT website (www.imperial.ac.uk/neurotechnology/cdt).

However interested candidates are urged to first send a CV to:
Prof. Dario Farina, Professor and Chair in Neurorehabilitation Engineering, Department of Bioengineering, Imperial College: d.farina@imperial.ac.uk
Prof. Etienne Burdet, Professor in Human Robotics, Department of Bioengineering, Imperial College: e.burdet@imperial.ac.uk
Prof. Emmanuel Drakakis, Professor in Bio-Circuits and Systems, Department of Bioengineering, Imperial College: e.drakakis@imperial.ac.uk
Dr. Patrick Kaifosh, Chief Science Officer, Cognescent Corporation: pk@cognescent.com

Applications will be accepted until the position is filled. Potential candidates are urged to contact the supervisors as soon as possible since an October 2017 start date is anticipated.