



Trinity College Dublin

Coláiste na Tríonóide, Baile Átha Cliath

The University of Dublin

Post Title:	PhD Studentship - Development and fabrication of bidirectional neural interface ASICs with arbitrary waveform stimulators
Post Status:	Full-time
Research Group / Department / School:	Medical Circuits and Systems Laboratory & Wireless Engineering and Complexity Science Laboratory, School of Engineering, Trinity College Dublin, the University of Dublin
Location:	Department of Electronic and Electrical Engineering, Aras An Phiarsaigh, Trinity College Dublin, Dublin 2, Ireland
Reports to:	Professor Friedrich Wetterling & Professor Nicola Marchetti
Terms & Conditions:	<p>The appointment will be on a temporary basis for a maximum period of 36 months (PhD student, regular full-time employment contract), with an attractive salary plus allowances package according to the Marie Skłodowska-Curie / Innovative Training Networks rules, namely Annual Living Allowance: €51,843.80; Annual Mobility Allowance: €7,658.43; Annual Family Allowance, if applicable: €7,119.10; these figures are subject to taxes and social charges. Furthermore, the PhD academic fees will be paid by Trinity.</p> <p>The doctoral candidate must not have lived or worked in the Republic of Ireland for over 12 months in the 36 months before recruitment.</p>
Hours of Work:	Full time ~ 38 hours/week
Closing Date:	Open until suitable candidate is identified

Post Summary

The **Medical Circuits and Systems Laboratory** ([MediCAS-Lab](#)) & **Wireless Engineering and Complexity Science Laboratory** ([WhyCOM-Lab](#)) at Trinity College Dublin are seeking a PhD student to explore and develop a non-invasive deep brain stimulation concept for common neurological disorders. Deep Brain Stimulation (DBS) is effective in treating neurological disorders like Parkinson's Disease (PD), Dystonia, or Major Depression Disorder (MDD). However, DBS uses deep brain implants as stimulation electrodes. Although done by key-hole surgery under stereotaxic control, they bear elevated surgical risks and an acute risk of brain damage by haemorrhage and deep brain bleeding. **In BRAINET (Networked Distributed Neural Interfaces for Interference-Based Brain Stimulation), we confront the pressing need to keep clinical benefits of DBS whilst avoiding potentially devastating side effects of chronic long term brain implants.** BRAINET embarks on the challenge of **harnessing the power of novel nanostructured smart materials in close contact with the brain.** These new materials hold the promise of efficacious brain stimulation and wireless energy harvesting.

BRAINET is equally **committed to nurturing a new generation of responsible researchers.** Our program encompasses comprehensive training for PhD students, including translational neuroscience, neuroethics, new smart nano-architected materials, and wireless signal safety guidelines. We recognize that besides the technological development; we are pushing innovation that will **reshape the landscape of bioelectronic medicine.** BRAINET's multidisciplinary team will lead us toward pioneering **breakthroughs in communication engineering and neuroscience technology** targeting clear unmet clinical needs and achieving substantial impact for better healthcare and societal benefits. *The BRAINET consortium includes top universities, research institutes, and industry partners. All partners are internationally renowned in DBS-related fields like neural engineering, smart nanostructured materials, networking, and intra-body wireless communications.* BRAINET will chart a compelling path forward in the realm of neural interface technology.

This BRAINET PhD position at Trinity College Dublin is dedicated to **developing body-coupled networking ad-hoc protocols** that facilitate the coordination and efficiency of transcranial (across the skull) brain stimulators only touching the brain. The project will achieve this through exploring **novel methods for temporal interference brain stimulation.** The overall goal is to develop early-stage prototypes in the lab that lead to fabrication of bidirectional neural interface with arbitrary waveform stimulators in the form of Application Specific Integrated Circuit (ASIC).

The specific objectives are:

- (a) **Develop the external transceiver to transmit to the implants** coded information based on the stimulation configuration of choice, as well as based on user-specified parameters. This will be facilitated via the use of a secondary wireless inductive/magnetic coupling channel.
- (b) **Adopt a compressed sensing approach to achieve implanted devices' status monitoring**, via the use of the secondary wireless inductive/magnetically coupled channel.
- (c) **Establish the downlink using information of the provided parameters** such as power and time-delay, as well as phase- and/or frequency-coded stimulation commands.
- (d) **Establish the corresponding uplink containing monitored stimulation state information**. This will enable a multi-scale network-level control approach.

The PhD student will spend 3 months at the University of Essex, UK, hosted by Prof Michael Barros, to investigate suitable signal processing algorithms for compressed sensing of the monitoring information. The student will also spend 3 months with INRIA (Institut National De Recherche En Informatique Et Automatique), Lyon, France, hosted by Dr Malcolm Egan, to study how to more efficiently manage the trade-off between cost minimization and identification in multi-scale network-level control. The researcher will work closely with other members of a large multidisciplinary project team. This project is supported by the European Commission through the BRAINET MSCA doctoral training network.

Standard Duties and Responsibilities of the Posts

Applicants should ideally hold a primary degree in biomedical engineering, materials science, electronics, communication engineering, or mechanical engineering. Preference will be given to candidates who have experience in signal processing and circuit and system development techniques. Specific skills that would enhance a candidate's application for the position might include experience in some of the following areas: radio-frequency sensors, shape-memory metal processing, medical imaging, device design, and other system related topics. Excellent written and oral communication skills are essential.

Funding Information

This position is financially supported through the BRAINET doctoral training network of the European Commission granted to Professor Marchetti who is with the School of Engineering, Trinity College Dublin.

Person Specification

Qualifications

The ideal candidate should hold an honours undergraduate degree in a relevant discipline (e.g. electronics or mechanical engineering, or biomedical engineering). There is no one 'specific' discipline that fits this project. Ideally an engineer or physicist. We are looking for someone that is motivated, intrigued by scientific discovery, diligent and pays attention – taking pride in their work; and overall a good team player. This is the primary criteria.

Knowledge & Experience (Essential & Desirable)

Desirable

- Knowledge of materials used as implants
- A keen desire to learn and become proficient in new skills
- In silico modelling (CST, MATLAB)
- Good programming skills (MATLAB and or Python)

Essential

- Experience working with statistical software, e.g. GraphPad Prism, R.
- Experience working as a research assistant in applied settings.
- Experience working with qualitative and/or quantitative data.

- Demonstrable research interests within regenerative medicine and communication engineering.
- Proven ability to plan, prioritise and meet deadlines.
- Excellent communication and interpersonal skills.
- Ability to work independently and as part of a team.
- Excellent IT skills, including MS Office, e-mail and Internet.

Skills & Competencies

While candidates may not possess all the skills above, we still welcome applications from individuals in complimentary skills. For many of the techniques above, candidates will be expertly trained by existing members in our labs and through collaborators. It really is key that an individual is open to such training and can grasp concepts quickly.

Application Procedure

Applicants should submit a full Curriculum Vitae to include the names and contact details of 2 referees (including email addresses) to Professor Friedrich Wetterling (Friedrich.wetterling@tcd.ie) and Professor Nicola Marchetti (nicola.marchetti@tcd.ie). Only shortlisted applicants will be responded to, the next stage being a zoom call with Prof Wetterling, Prof Marchetti and their teams. Please include a cover letter, CV, relevant academic transcripts and other information in ONE submitted .pdf file.

Further Information for Applicants

URL Link to Area	www.tcd.ie
URL Link to the MediCAS-Lab	www.MediCAS-Lab.eu
URL Link to the WhyCOM Lab	https://nicolamarchetti.wordpress.com/

Trinity College Dublin, the University of Dublin

Trinity is Ireland's leading university and is ranked 75th in the world (QS World University Rankings 2026). Founded in 1592, the University is steeped in history with a reputation for excellence in education, research and innovation.

Located on an iconic campus in the heart of Dublin's city centre, Trinity has 20,000 undergraduate and postgraduate students across our three faculties – Arts, Humanities, and Social Sciences; Engineering, Mathematics and Science; and Health Sciences.

Trinity is ranked as the 31st most international university in the world (Times Higher Education Rankings 2024) and has students and staff from over 120 countries.

The pursuit of excellence through research and scholarship is at the heart of a Trinity education, and our researchers have an outstanding publication record and strong record of grant success. Trinity has developed 19 broad-based multidisciplinary research themes that cut across disciplines and facilitate world-leading research and collaboration within the University and with colleagues around the world. Trinity is also home to 5 leading flagship research institutes:

- Trinity Biomedical Sciences Institute (TBSI)
- Trinity College Institute of Neuroscience (TCIN)
- Trinity Translational Medical Institute (TTMI)
- Trinity Long Room Hub Arts and Humanities Research Institute (TLRH)
- Centre for Research on Adaptive Nanostructures and Nanodevices (CRANN)

Trinity is the top-ranked European university for producing entrepreneurs for the past five successive years and Europe's only representative in the world's top-50 universities (Pitchbook Universities Report).

Trinity is home to the famous Old Library and to the historic Book of Kells as well as other internationally significant holdings in manuscripts, maps and early printed material. The Trinity Library is a legal deposit library, granting the University the right to claim a copy of every book

published in Ireland and the UK. At present, the Library's holdings span approximately 6.5 million printed items, 400,000 e-books and 150,000 e-journals.

With over 120,000 alumni, Trinity's tradition of independent intellectual inquiry has produced some of the world's finest, most original minds including the writers Oscar Wilde and Samuel Beckett (Nobel laureates), the mathematician William Rowan Hamilton and the physicist Ernest Walton (Nobel laureate), the political thinker Edmund Burke, and the former President of Ireland Mary Robinson. This tradition finds expression today in a campus culture of scholarship, innovation, creativity, entrepreneurship and dedication to societal reform.

Rankings

Trinity is the top ranked university in Ireland and ranked 75th in the world (QS World University Rankings 2026). Trinity ranks in the top 100 in 18 subjects (QS World University Rankings by Subject 2025). Full details are available at: www.tcd.ie/research/about/rankings.