



**Cardiff University**  
**School of Psychology**

<b><i>Studentship Title:</i></b>	EPSRC Doctoral Training Partnership PhD Studentship
<b><i>Research Area/ Project Title:</i></b>	Patient-motion tolerant functional Magnetic Resonance Imaging at the Ultra-high Field
<b><i>Location:</i></b>	Cardiff University Brain Research Imaging Centre (CUBRIC)
<b><i>Expected Start Date:</i></b>	1 October 2018
<b><i>Duration:</i></b>	3.5 years
<b><i>Deadline for Application:</i></b>	30 <sup>th</sup> June 2018

#### **Description of Research Opportunity:**

Functional magnetic resonance imaging (fMRI), the most commonly used technique to map neuronal activity, makes it possible to evaluate how healthy versus diseased/injured brains function and determine which regions of the brain handle tasks like moving or speaking. Because fMRI acquisitions consist of repetitive scanning of the same volume to conduct statistical analysis on the temporal variation of the signal in every part of the brain, patient motion makes data inconsistent over time and deteriorates the analysis. Motion is specifically problematic with uncooperative patients such as patients with Parkinson's or dementia.

The state-of-the-art ultra-high field (UHF) scanners provide a unique opportunity to study neuronal activity with increased accuracy of the functional mapping signals for fMRI. Unfortunately, correcting the artificial contrast variations intrinsic to UHF MRI require specifically designed imaging protocols (parallel-transmit RF pulses). With current techniques, these pulses are designed for a stationary patient, leading to inconsistent data when the patient moves.

In this study, you will develop techniques to design pulses that will “freeze” motion; i.e., acquire consistent data while the patient can freely move during a functional MRI scan. These motion-tolerant parallel-transmit pulses will be designed only once before a scan to accommodate a user-specified range of “expected” or “maximum” patient motion, and will require only simple adjustments rather than a computationally expensive redesign during the scan. The effect of motion on fMRI analysis will be documented, and the performance of these pulses will be evaluated via in-vivo experiments. The outcomes will guide the development of novel fMRI imaging protocols and make it more feasible to conduct UHF functional MRI on patients with dementia and Parkinson's.

This interdisciplinary project lies at the boundary of engineering, physics and psychology, and the student benefit from working with faculty members from the schools of Physics and Psychology.

**Supervisors:**

[Dr. Emre Kopanoglu](#)

[Prof. Richard Wise](#)

[Prof. Kevin Murphy](#)

**Research Training:**

The project lies at the interface of multiple disciplines and benefits from a team of supervisors from Physics and Psychology. The student will develop specific and transferrable skills across multi-disciplinary domains, including

- robust knowledge on MRI and fMRI physics
- signal processing
- conducting research with patients,
- fMRI data acquisition and analysis,
- MRI scanner (7T), parallel-transmit and motion tracking hardware
- computational modelling and electromagnetic simulations (Sim4Life)
- programming fluency (e.g. Matlab, C++, Python)
- experiment design (PsychoPy)
- MRI sequence development (Siemens IDEA).

S/he will also be supported to attend from over 350 workshops offered through the Doctoral Academy to further develop research and professional skills, and the schools of Psychology and Physics have active portfolios of training for PhD students that include teaching opportunities, seminars and networking events. The multi-disciplinary nature of the project and acquired skills will launch the student on a successful research career.

CUBRIC has strong collaborative ties with Siemens Healthcare and benefits from the full-time presence of an on-site Siemens engineer, which will expose the student to academia-industry collaborations.

**Award:**

The studentship will commence in October 2018 and will cover your tuition fees (at UK/EU level) as well as a maintenance grant. In 2018-19 the maintenance grant for full-time students was £14,777 per annum. As well as tuition fees and a maintenance grant, all School of Psychology students receive conference and participant money (approx. £2250 for the duration of the studentship). They also receive a computer and office space, additional funding for their research, and access to courses offered by the University's Doctoral Academy and become members of the University Doctoral Academy.

**Eligibility:**

The Doctoral Training Partnership welcomes applications from both UK and EU applicants; however, as a consequence of the EU referendum result, final award decisions will depend on the outcomes of the UK/EU negotiations.

Full awards (fees plus maintenance stipend) are open to UK Nationals and EU students who can satisfy UK residency requirements. To be eligible for the full award, EU Nationals must have been in the UK for at least 3 years prior to the start of the course for which they are seeking funding, including for the purposes of full-time education.

A small number of awards may also be made available to EU Nationals who do not meet the above residency requirement, provided that they have been ordinarily resident in the EU for at least 3 years prior to the start of their proposed programme of study. There are also a very limited number of opportunities for international applicants, in competition with

applicants across all the DTP Schools to receive a full award, which includes an international fee waiver.

Applicants for a studentship must have obtained, or be about to obtain, a 2.1 degree or higher in a relevant subject or a masters degree with distinction in the research dissertation in a relevant discipline.

### **How to apply:**

Applicants should submit an application for postgraduate study via the Cardiff University Online Application Service.

Applicants should select Doctor of Philosophy (Psychology), with a start date of October 2018, either full-time or part-time, depending on your preference.

In the "Research proposal and Funding" section of your application, please specify the project title and supervisors of this project and copy the project description in the text box provided.

Please select "No, I am not self-funding my research" when asked whether you are self-funding your research.

Please add "EPSRC Doctoral Training Partnership PhD in Psychology" when asked "Please provide the name of the funding you are applying for".

Please specify that you are applying for this particular project.

**Application deadline:** 30<sup>th</sup> June 2018

### **Webpages:**

<https://www.cardiff.ac.uk/study/postgraduate/research/programmes/project/patient-motion-tolerant-functional-magnetic-resonance-imaging-at-the-ultra-high-field>

<https://www.cardiff.ac.uk/study/postgraduate/funding/view/epsrc-doctoral-training-partnership-phd-in-psychology>

### **General Information:**

The School of Psychology is one of the largest and most successful in the UK (<http://www.cf.ac.uk/psych/>). The School's excellent standard of research and teaching has been recognised in every Research Assessment Exercise. It has its own brain-imaging centre (<http://www.cf.ac.uk/psych/cubric/>), enhancing the international-leading research in behavioural neuroscience, cognitive ergonomics, forensic, social and developmental psychology.

Cardiff is the youngest capital city in Europe and the fastest growing in the UK. It plays host to many national and international sporting events at the Millennium Stadium (<http://www.millenniumstadium.com/>). Culturally, the city is thriving, with the Wales Millennium Centre (<http://www.wmc.org.uk/>) in Cardiff Bay. Cardiff is in very close proximity to the beautiful Welsh countryside (<http://www.breconbeacons.org/>), has a two hour rail link to London and a (cheap) one hour air link to Paris and Amsterdam (<http://www.cardiffairportonline.com/>)

### **Please address any informal enquiries to:**

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**For further information please contact:  
Postgraduate Research Enquires**

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