ROLE PROFILE

Job Title: Research Associate/Fellow

School/Department: School of Medicine, Division of Clinical Neuroscience & Precision Imaging Beacon

Job Family and Level: Research and Teaching Level 4 (Appointment will be Level 4 Career training grade where an appointment is made before PhD has been completed)

Contract Status: This post will be offered on a fixed term contract for a period of 24 months

Hours of Work: Full time (36.25 hours per week)

Location: Sir Peter Mansfield Imaging Centre, School of Medicine, Queen's Medical Centre, Nottingham

Reporting to: Associate Professor of Computational Neuroimaging

Purpose of the New Role:

The post is funded by a Wellcome Trust Award to develop “Unified models of structural and functional imaging for accurate brain connectivity mapping in health and disease”. The project will devise novel biophysical frameworks for integrating complementary information for brain networks and connections, available from different magnetic resonance imaging (MRI) modalities, such as diffusion and functional MRI. Given the existence of connections, we will define forward models for the different imaging datasets, reflecting the influence of connectivity on brain’s structure and function. We will subsequently develop inference approaches for estimating connections given the multiple data sources, using Bayesian Learning and generative modeling techniques. The aim is to reduce false positives and biases current connectivity estimation approaches have, in order to increase accuracy and reproducibility in neuroscience research. The methodology would be relevant to large data collection consortia on both sides of the Atlantic, including the various NIH-funded Human Connectome Projects and the UK Biobank.

The post holder will be a Post-Doctoral Researcher (with a PhD, or close to completion, in a relevant field) and will be a member of the computational neuroimaging group, led by Associate Professor Stam Sotiropoulos (www.nottingham.ac.uk/medicine/people/stamatos.sotiropoulos), in the Sir Peter Mansfield Imaging Centre (SPMIC), School of Medicine, University of Nottingham. The project involves collaborators from the School of Mathematical Sciences in Nottingham (Prof. Stephen Coombes) and from the Wellcome Centre for Integrative Neuroimaging (WIN) in Oxford (Dr. Saad Jbabdi). The successful candidate will work very closely under the supervision of Dr Sotiropoulos, who has considerable experience in conducting research in the field of brain mapping, and will be able to meet collaborators on a regular basis. They will further join the existing interdisciplinary team of imaging researchers in the SPMIC (www.nottingham.ac.uk/magres) and expected to benefit from collaboration opportunities with researchers and end-users of the developments within the Nottingham Biomedical Research Centre, the Precision Imaging Beacon and the Institute of Mental Health.

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<tr>
<th>Main Responsibilities</th>
<th>% time per year</th>
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<tr>
<td>1. Research Planning: Contribute to developing strategies for implementing new methods for</td>
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modelling brain connectivity using MRI datasets.

2. **Research Implementation:** Implement methods to infer on, and validate, models describing brain connections estimated from diffusion and functional MRI data. 20%

3. **Research Dissemination:** Where relevant publish and present research results to the international scientific community through conference presentations and journal publications. Provide research tools, initially to researchers locally, and eventually to the wider research community. 20%

4. **Career Development and Training:** In the context of work above and resources available, with the support of the group, prepare for appropriate career advancement. Train in relevant areas of neuroimage analysis, programming, biophysical modeling, if required. 15%

5. **Collaboration:** Liaise with research group colleagues to establish and manage collaborations (to a level appropriate to the grade and role of the person appointed) within the Nottingham BRC and Precision Imaging Beacon, as well as the WIN Centre in Oxford. 15%

6. **Teaching:** Contribute to graduate training and supervision of graduate research students for work related to above. 10%

**Knowledge, Skills, Qualifications & Experience**

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<th>Essential</th>
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<tr>
<td><strong>Qualifications/ Education</strong></td>
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<tr>
<td>PhD (or close to completion) in subject related to a relevant computational domain, such as engineering, physics, mathematics, statistics, neuroscience, etc.</td>
<td>Research experience in biophysical modelling/connectivity mapping using diffusion/resting-state functional MRI/MEG.</td>
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<tr>
<td><strong>Skills/Training</strong></td>
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<tr>
<td>Advanced Programming/scripting skills (C / C++ / Matlab / Python / Java/ shell scripting)</td>
<td>Parallel programming and/or High-performance computing skills using computing clusters.</td>
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<td>Good understanding of statistical modelling and/or signal and/or image processing.</td>
<td>Understanding of Bayesian statistics and/or machine/deep learning.</td>
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<td>Excellent academic track record commensurate with career stage.</td>
<td>Understanding of MR image acquisition and sources of artefacts.</td>
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<td>Ability to write clearly and report appropriately to line manager.</td>
<td>Strong publication record in neuroimaging methods development.</td>
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<tr>
<td>Experience</td>
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<tr>
<td>Experience with image acquisition and/or processing and/or analysis.</td>
<td>Neuroimage analysis / micro-structure mapping / connectivity estimation / tractography / quantitative MRI/functional connectivity.</td>
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<tr>
<td>Experience with computational processing of large datasets.</td>
<td>Neural mass/neural field modeling of functional dynamics/ dynamic causal modeling.</td>
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<tr>
<td>Experience with biophysical modeling and inference.</td>
<td>Use of FSL/SPM or other major packages for brain image analysis.</td>
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Developing software toolboxes for others to use.

| Other                                    | Willingness to adopt the Ethos and Principles of the School of Medicine. |

The University of Nottingham strongly endorses Athena SWAN principles, with commitment from all levels of the organisation in furthering women’s careers. It is our mission to ensure equal opportunity, best working practices and fair policies for all.

The School of Medicine holds a Silver Athena SWAN in recognition of our achievements in promoting and advancing the representation of women in science, technology, engineering, medicine and mathematics (STEMM). Please see [http://www.nottingham.ac.uk/medicine/about/athena-swan.aspx](http://www.nottingham.ac.uk/medicine/about/athena-swan.aspx)

## Appendix 1

### The University of Nottingham

Described by the Times Good University Guide 2017 as “the nearest Britain has to a truly global university” The University of Nottingham has award-winning campuses in the UK, China and Malaysia and hosts a global academic community in all three countries. The University has an institution-wide commitment to embedding an international dimension across all of our activities enabling us to produce graduates who are empowered to excel in a challenging global environment and deliver genuinely world-changing research.

Our reputation for world-class research has yielded major scientific breakthroughs such as Nobel-winning MRI techniques, drug discovery, food technologies and engineering solutions for future economic, social and cultural progress.

Already ranked among the UK’s elite universities and global polls for research excellence, our reputation for world-class research has been further enhanced with the 2014 results of the Research Excellence Framework (REF).

In addition to scoring highly in quality rankings covering major disciplines in science, engineering, the social sciences, medicine, business and the arts, it is Nottingham’s research power rankings which demonstrate the impressive volume of excellent research which is carried out. We are now ranked 8th in the UK on a measure of ‘research power’ which takes into account both the quality of research and the number of research-active staff who made REF returns, confirming Nottingham’s place in the top tier of the world’s elite higher education institutions.

The main University campus is set beside a lake, in an extensive belt of woodland, parks and playing fields. The 330 acre University Park Campus is the focus of life for more than 32,000 students and houses the majority of the University’s academic schools and many of the central Services. The Jubilee campus is situated 2 miles away from the University Park, and provides extra capacity. The University Medical School is situated next to the University Park. Together with the University Hospital, it forms the Queen’s Medical Centre (QMC).

### The Sir Peter Mansfield Imaging Centre

The Sir Peter Mansfield Imaging Centre (SPMIC) ([www.nottingham.ac.uk/research/groups/spmic](http://www.nottingham.ac.uk/research/groups/spmic)), directed by Prof. Richard Bowtell, is an interdisciplinary, cross-faculty centre for innovative imaging in experimental and translational medicine, bringing together researchers who develop new medical imaging techniques with clinicians and scientists who use them. The SPMIC, concentrating on MRI-based imaging, along with related technologies such as MEG, builds upon the contributions of Sir Peter Mansfield in inventing MRI and is the home of echo planar imaging and slice selection. Nottingham has played its part in bringing MRI technology to the level where it stands today, both with massive improvements in scanner hardware and the development of increasingly imaginative imaging methods.
The Centre has hosted various flagships MRI systems, including the world’s first 3T and UK’s first 7T scanners. The SPMIC remains at the forefront of neuroimaging development with significant contributions in the fields of MRI and fMRI, MEG and simultaneous EEG-fMRI. It currently hosts various human imaging systems, including one 7Tesla MRI scanner, three 3Tesla scanners, one 1.5T MRI Scanner, one 0.5T upright MRI scanner, an MRI Hyperpolariser for imaging metabolism, MR-compatible EEG, a CTF whole-head MEG system and an OPM MEG system. It also hosts various computing facilities for high-performance scientific computing.

In 2015, a £7.7M grant from the MRC enabled the imaging activities at the School of Medicine to be brought together with those from the School of Physics to form the new multi-disciplinary facility. The SPMIC also runs an MRC/EPSRC Centre for doctoral training in Biomedical Imaging jointly with the University of Oxford, continuing its excellent educational track record (more than 200 PhD students have been trained over the last 25 years).

**The Precision Imaging Beacon of Excellence**

As part of its ambitious Research Strategy, the University of Nottingham is making a significant investment in its research capacity and capability through six multi-million pound cross-disciplinary Beacons of Excellence (https://www.nottingham.ac.uk/research/beacons-of-excellence), including the Precision Imaging Beacon.

Directed by Prof. Dorothee Auer, the Precision Imaging Beacon undertakes a coherent and integrated portfolio of research, doctoral training and knowledge exchange activities in translational and clinical imaging to provide the next generation diagnostics tools needed for precision medicine. The mission is to deliver world class research to help address the challenge of diseases that have the biggest impact on our societies and lack adequate treatment. Our advances in imaging for precision medicine offer the prospect of new understanding and revolutionary treatments to deliver personalised care.

**University of Nottingham Medical School**

Nottingham has a strong reputation for both clinical medicine and teaching. As one of the most popular medical schools in the country, it is able to select excellent students and produce and attract good junior doctors.

**The School of Medicine** comprises the Divisions of Cancer and Stem Cell Sciences, Child Health, Obstetrics and Gynaecology; Clinical Neuroscience; Epidemiology and Public Health; Primary Care; Psychiatry and Applied Psychology; Rehabilitation and Ageing; Medical Sciences and Graduate Entry Medicine; Respiratory Medicine; Rheumatology, Orthopaedics and Dermatology and the Nottingham Digestive Diseases Centre. The School also hosts the Education Centre, the Centre for Interprofessional Education and Learning, the Clinical Research Facility, the Clinical Skills Centre, NIHR Design Service East Midlands, Nottingham Clinical Trials Unit, PRIMIS and Medical Imaging Unit.

The School of Medicine brings together in one School staff undertaking research for the benefit of the health of patients. It includes all primary care and hospital-based medical and surgical disciplines, principally in the Queen’s Medical Centre and City Hospital Nottingham Campuses, Royal Derby Hospitals NHS Foundation Trust and also at the University’s main campus and at the King’s Meadow and Jubilee Campuses. Most of our School’s Senior Researchers and Teachers are also clinicians who dedicate 50% of their time to patient care within the Nottingham University Hospitals NHS Trust & Royal Derby Hospitals NHS Trust. This close juxtaposition brings cutting-edge clinical care to our patients and clinical relevance to our research and teaching. We are closely integrated with our full time NHS clinical colleagues, many of whom are themselves leaders in research and teaching and who work closely with the University and this increases the mutual benefit from integration between the University and NHS.

**Mission:**

Our mission is to improve human health and quality of life locally, nationally and internationally through outstanding education, research and patient care.

**Priorities:**

1. **Teaching and learning,** particularly training tomorrow’s doctors and teaching specialised postgraduates
2. **Research and research training:** We will perform and support the highest quality “big” research which impacts on human health and disease
3. **Partnership with the NHS** and other healthcare providers
Visibility and profile of the School of Medicine: We will do what we do better, and we will tell others about it

Ethos and principles:
1. Having people and patients at the heart of all we do: our teaching and learning, our research and our patient care
2. Contribution within the School of Medicine and to society beyond our immediate roles; helpfulness and service
3. Openness and fairness, with particular emphasis on communication (both internal and external) and on equality and diversity among students and staff
4. Personal and group responsibility for all aspects of our work, within a culture of opportunity and reward

Our research spans 11 major themes, ranging from cancer to vascular medicine. We work closely with industry and the NHS. Our world-leading research ranges from basic and translational science through to clinical trials, epidemiology, and health services research. Our clear theme is improving human health, underpinning a vibrant postgraduate research training programme leading to PhD or DM. Many of our academics are clinicians, using their expertise to provide cutting edge specialised treatment to NHS patients; reflecting our ethos that patients are at the heart of all we do.

The partnership between University of Nottingham and Nottingham University Hospitals NHS Trust was recently awarded by NIHR, a transformational £23.6 million to to expand their pioneering work into new treatments and diagnostics for a wide range of health problems, establishing a new Biomedical Research Centre (BRC), which will incorporate two existing smaller Biomedical Research Units in the city. The Nottingham BRC will be the leading UK hub in five key areas of health research:

- Deafness and hearing loss
- Gastrointestinal and liver disease
- Respiratory medicine
- Musculoskeletal disease
- Mental health technology

At the core of the Biomedical Research Centre will be Nottingham’s world-leading expertise in magnetic resonance imaging (MRI). It means the latest medical imaging research and technology pioneered here can be translated into real benefits for patients in all five of the BRC’s research areas.

In the 2014 Research Excellence Framework the four Units of Assessment included in the School of Medicine were among the six most improved in the whole University since RAE 2008: Over 80% of our research in 2014 was graded as world-leading or internationally excellent. Our research spans 11 major themes and ranges from basic and translational science through to clinical trials, epidemiology, and health services research. We work closely with industry and the NHS. Our research is underpinned by a strong postgraduate research training programme leading to PhD or DM. Our major research themes are in Cancer and Stem Cells; Child Health, Obstetrics & Gynaecology; Clinical Neurosciences; Dermatology; Digestive Diseases; Epidemiology and Public Health; Mental Health; Musculoskeletal physiology and disease; Primary Care; Rehabilitation and Ageing; Respiratory Medicine; and Renal Medicine.

The School of Medicine trains tomorrow’s doctors on a vibrant undergraduate medical course with a unique intercalated BMedSci, as well in a specialised graduate-entry programme built around clinical problem solving. We teach medicine and related disciplines at both undergraduate and postgraduate level. We have a dedicated clinical academic training programme and are committed to training PhD and doctoral research students and to supporting postdoctoral clinicians and scientists in their research.

Professor Tony Avery is Dean of the School of Medicine.

For further information, please see our website [http://www.nottingham.ac.uk/medicine](http://www.nottingham.ac.uk/medicine)

Nottingham
Central within the East Midlands, Nottingham is a vibrant and prosperous city with something to offer everyone. It is one of the UK’s leading retail centres and has a huge variety of restaurants, bars and nightclubs which attract people from all over the UK. Culturally, it has good theatres, an arena which attracts both national and international performers and a range of historical interests relating to subjects such as the lace industry, Lord Byron and DH Lawrence. Nottingham is also known for sport, being the home of Trent Bridge Cricket Ground,
Nottingham Forest and Notts County Football Clubs, the National Water Sports Centre and the Nottingham Tennis Centre. There is a good network of roads with easy access to the M1 and the A1, a fast frequent rail service to London and other major cities. Nottingham East Midlands Airport is only eighteen miles away.

The city is set within a county of outstanding natural beauty which includes Sherwood Forest, Wollaton Park, lively market towns and wonderful historic buildings. Housing is relatively inexpensive and, in addition to the two Universities, there are excellent schools and colleges available.

To find out more about Nottingham, use the following links:

Nottingham County Council – Tourism  http://www.experiencenottinghamshire.com/
University of Nottingham  http://www.nottingham.ac.uk
Zoopla (Guide to local properties)  http://www.zoopla.co.uk/

My Nottingham (information on schools, term dates, school transport etc.)  https://www.nottinghamcity.gov.uk/