School of Engineering and Informatics
Department of Engineering and Design - Sensor Technology Research Centre
Post Doctoral Research Fellow (fixed term for 9 months, extensible to 12 months, full time)
Salary range: starting at £32,004 and rising to £38,183 per annum
Expected start date: 1 April 2017

The Wearable Computing Group within the Sensor Technology Research Centre at the University of Sussex is looking for a postdoctoral research associate with expertise in human activity recognition, dataset collection, traditional machine learning as well as deep learning techniques and Android to work on a research-intensive project aiming at recognising the manner in which users of mobile phone move about in their daily life from the mobile phone sensors. This project is funded by a large multinational active in the mobile device and telecommunication sector.

This project has potential for high-impact publications and high visibility through public dataset release. The applicant will contribute to generate patent ideas which are an integral part of the workplan. This project will be run in close collaboration with the funder's research team.

**Key Requirements.** This post is well suited to a highly motivated individual with excellent technical skills and with a willingness to operate in a dynamic research environment in an international team.

Candidates should have a PhD in Computer Science, Mathematics, Electrical Engineering or related with a strong background in (one or more of) Machine Learning (comprising traditional approaches and also Deep Learning), Feature extraction and selection, skills in managing data acquisition protocols, ability to organise and work with large datasets including managing annotations, and ability to think of innovative solutions to the problem of activity recognition. An established expertise in Activity Recognition and Wearable/Mobile Computing is desired. The candidate should have a strong interest in the combination of theoretical and experimental research.

Specific skills sought after include:
- Experience in data collection, including defining collection protocols, handling annotation challenges and doing day to day supervision of the people that will contribute to the data collection effort.
- Experience in machine learning including feature extraction and selection and traditional machine learning techniques (e.g. SVM).
- Experience in deep learning techniques (e.g. convnets, LSTM).
- Experience with common data science toolkits, such as Weka, NumPy, MatLab, including deep learning toolkits including Theano, TensorFlow, Lasagne, Keras, etc.
- Proficient in Android programming to adapt our data collection app and able to manage the Linux server receiving collected data.
- Willing to work in a research lab environment.
- Communicative, enthusiastic and good a team player.

**Project objectives.** The overall aim of the project is to develop new techniques to recognise how people move about in their daily life from the sensors in mobile phones. As part of this, the project will require first to establish a reference dataset. For this purpose, your first objective will be do day to day supervision of about 3 project assistants who will be tasked with carrying mobile phones and a body-worn camera and engaging in 8 activity classes. You will define the data collection protocol to lead to a balanced dataset, implement strategies to ensure data quality including re-annotation by the project assistants using the body-worn cameras. You will write dedicated software if necessary to identify data anomalies or streamline the annotation process (e.g. extending one of our annotation tools).
A second objective will be to define a baseline recognition system. For this you will be using traditional machine learning techniques (e.g. SVM) applied to combinations of sensors. This will involve ranking and selecting appropriate combinations of sensors and corresponding features to ensure highest recognition accuracy. Additional constraints such as minimising computational complexity or energy can be considered but aren't integral to the project. As a third objective you will explore new approaches to recognising the 8 activity classes using deep learning and recurrent networks (e.g. convnets and LSTM) to further enhance performance. Finally you will be contributing to generating innovation ideas which may result in patents.

High-level publications and dataset release are integral to this project and you will be driving these.

You will be responsible to regularly produce deliverables for the multinational funding this project.

**Background.** The wearable computing group of Dr. Daniel Roggen - part of the Sensor Technology Research Centre at the University of Sussex - develops novel wearable sensors and methods to recognize and understand human activities. Our vision are wearable systems capable of lifelong learning and adaptation to their users. Practical applications can be found in the domain of pervasive healthcare, life logging, memory prosthesis or mobile assistants. Research outcomes tie in to artificial intelligence and more broadly to action perception. We have a range of commercial (e.g. Glass) and custom wearables (e.g. motion sensors, data loggers) as well as a large variety of datasets, some of which are published e.g. on the UCI ML repository and commonly used as benchmark datasets by the community, and tools (e.g. for annotation).

**Advantages and career development.** This position is ideally suited for somebody who wants to demonstrate his/her expertise in a highly focused project that will deliver high impact publications, public dataset and possibly patents. This is a career enhancer that will allow the candidate to gain international visibility and collaborate with a large and growing multinational active in the mobile device sector. This position also gives an opportunity to learn about new sensor technologies.

The candidate will be supported in applying for grants to support his/her further career development. There will be possibility for joint proposal application afterwards to further this area of research.

This project is based at the growing Wearable Computing Group within the Sensor Technology Research Centre at the University of Sussex ([http://www.sussex.ac.uk/strc/research/wearable](http://www.sussex.ac.uk/strc/research/wearable)).

For any further information and informal inquiry contact Dr Daniel Roggen: D.Roggen@sussex.ac.uk

More details about the nature of the work can be inferred from past publications:

https://goo.gl/xh6bD9

Applications should be accompanied by a full CV and a statement of how you envisage your role.

The position is initially for 9 months but can be extended up to 12 months, depending on the starting date. Contact Dr Daniel Roggen: D.Roggen@sussex.ac.uk for clarification.

**Closing date for applications:** 8 March 2017

For full details and how to apply see [www.sussex.ac.uk/jobs](http://www.sussex.ac.uk/jobs)

*The University of Sussex is committed to equality of opportunity*
2 Senior leadership and management

The Vice-Chancellor (Professor Adam Tickell) is the senior academic officer and, as Chief Executive, is responsible to the University Council for management of the University. He is supported by an executive group which includes the three Pro-Vice-Chancellors, the Registrar and Secretary, the Director of Finance and the Director of Human Resources. The Heads of the Schools of Studies at Sussex report to the Pro-Vice-Chancellors.

The Registrar and Secretary heads the Professional Services of the University. In addition, under the University Statutes, the Registrar and Secretary is Secretary to the University Council. The Director of Finance reports to the Vice-Chancellor. The Director of ITS reports to the Registrar and Secretary, and the Librarian reports to one of the Pro-Vice-Chancellors.

3 The School of Engineering and Informatics

The School of Engineering and Informatics covers the disciplines of computer, electrical and electronic engineering, mechanical, and automotive engineering, product design, digital media, computer science and informatics.

Distinctive characteristics of the School are: creativity, interdisciplinarity, strong links with industry, and an international outlook in both research and teaching. £10m (£4.9m from HEFCE) is being invested in a new Computing, Robotics, Electronics and Mechatronics Centre (CREaM) as a result of a 60% surge in applications for the School’s degrees.

The School offers a range of undergraduate and postgraduate degrees in its areas of expertise, often in collaboration with other schools at Sussex, to create a distinctive focus that addresses the needs of industry, commerce and society. Examples include joint degrees with the MSc in Evolutionary and Adaptive Systems (EASy) that includes modules from the Schools of Engineering and Informatics and Psychology; and the MScs in Engineering Business Management, and Management of Information Technology, which were developed in collaboration with the School of Business, Management and Economics.

This interdisciplinary approach also applies to our research, with current and recent externally funded projects with researchers in a wide range of other subject areas including: geomorphology, media practice, medical imaging, neuroscience, anthropology, English literature, epidemiology, geography, international development, mathematics, psychiatry, psychology and sociology.

The School has strong links with industry, and has an established Strategic Advisory Board. Innovative research across the School has led to a number of patents which are being commercialised including: novel electric potential sensors (EPS) licensed to Plessey Semiconductors and marketed as the EPIC sensor chip; and University spin-out companies, including TribeHive, which is deploying delay-tolerant networking to provide smartphone connectivity in large crowds, and TexRAD, which has developed software for the analysis of medical images and has recently demonstrated the ability to detect brain texture anomalies in Asperger’s Syndrome patients. These developments have been supported by the University’s Enterprise fund. The EPS sensor technology was awarded the IET Innovation award for ‘Measurement in Action’, and was shortlisted for two other IET categories and for a THES award.

The School is, for administrative purposes, comprised of two departments: the Department of Engineering and Design, and the Department of Informatics. Staff teach across the School, and undertake research on cross-School, as well as cross-University projects.

Following a recent Professorial appointment, the School has just launched a major new School-wide research group in Creative Technology.
The Group brings together a number of academics working in the areas of human-centred technology, product design, experience design, tangible and physical computing, games, digital media, digital cultural heritage, child-computer interaction, broadcast technologies and social innovation.

### 3.1 Department of Engineering and Design

The Department of Engineering and Design has a strong reputation for excellence in research and teaching. Its research outputs were rated as 88%, and impact as 90% 4*/3* (world-leading/internationally excellent) in the REF 2014. In the 2014 NSS engineering students registered an 86% satisfaction level with respect to learning resources. Mechanical Engineering ranked 15th for graduate prospects, in the Complete University Guide 2015 and an overall ranking of 18th in the just released 2016 Guardian University Guide; with Electrical Engineering ranked 14th for student satisfaction in the Complete University Guide 2014.

The Department’s students won the automotive category of the Telegraph UK STEM Awards 2014 sponsored by McLaren Group (link to video).

Research activity is focused on mechanical engineering (turbomachinery, dynamics and control, and tribology); and electronic engineering (sensor technology, image and signal processing, and mobile digital communications). There are strong collaborations with industry, including Jaguar Land Rover, General Electric, Plessey Semiconductors and Meggitt Sensing Systems.

The Department’s research is organised into four groups:

- Dynamics, Control and Vehicle Research Group ([www.sussex.ac.uk/dcv](http://www.sussex.ac.uk/dcv))
- Industrial Informatics and Signal Processing Research Group ([http://www.sussex.ac.uk/iisp/](http://www.sussex.ac.uk/iisp/))
- Sensor Technology Research Centre ([www.sussex.ac.uk/strc/](http://www.sussex.ac.uk/strc/))
- Thermo-Fluid Mechanics Research Centre ([http://www.sussex.ac.uk/tfmrc/](http://www.sussex.ac.uk/tfmrc/))

The Department currently has 495 undergraduate students, 62 taught postgraduate students, and 43 postgraduate research students.

The Department’s undergraduate courses, all of which are accredited and have an industrial placement year option, include:

- MEng (Hons) / BEng (Hons) Automotive Engineering
- MEng (Hons) / BEng (Hons) Computer Engineering (*a cross-School course between the Departments of Engineering and Design and the Department of Informatics*)
- MEng (Hons) / BEng (Hons) Electrical and Electronic Engineering
- MEng (Hons) / BEng (Hons) Mechanical Engineering
- BSc (Hons) Product Design.

The Department’s masters level courses, the majority of which are also accredited, are in the process of being reviewed as part of a cross-School process, the courses currently include:

- MSc Advanced Mechanical Engineering
- MSc Digital Communication Systems
- MSc Embedded Digital Systems
- MSc Engineering Business Management

Detailed information about the Department can be found at [www.sussex.ac.uk/engineering](http://www.sussex.ac.uk/engineering)
3.2 Department of Informatics

The Department of Informatics is highly rated for its teaching and research. Its researchers work in an environment that was deemed to be wholly 4*/3* (world-leading/ internationally excellent) in the REF 2014.

Sussex was ranked in the top 25, ranking 19 in the UK in The Guardian University Guide 2016. Our students are highly employable: in early 2014, 95% of our previous year's graduates were employed, and of those, 100% were in professional or managerial jobs.

The Department maintains a strong emphasis on interdisciplinary teaching and research, and has substantive links with almost all other Schools of study at Sussex. Its research spans the theoretical and applied.

The Department’s research is organised into three groups:

- Cognitive and Language Processing Systems (www.sussex.ac.uk/calps/)
- Evolutionary and Adaptive Systems (www.sussex.ac.uk/easy/)
- Foundations of Software Systems (www.sussex.ac.uk/foss/),

and also plays leading roles in cross-disciplinary research centres:

- Sackler Centre for Consciousness Science (www.sussex.ac.uk/sackler/)
- Centre for Computational Neuroscience and Robotics (CCNR) (www.sussex.ac.uk/ccnr/)
- Centre for Cognitive Science (COGS) (www.sussex.ac.uk/cogs/)
- Sussex Neuroscience (www.sussex.ac.uk/sussexneuroscience/)..

The Department has long-standing collaborations with a range of external organisations including Animazoo, the Clinical Practice Research Datalink, and American Express, which has sponsored over 120 MSc students in Informatics over the past 10 years.

The Department currently has 420 undergraduates, 80 taught postgraduates, and 60 doctoral students. Undergraduate courses, accredited by the relevant professional institutions where appropriate, and have an industrial placement year option, include:

- MComp (Hons) / BSc (Hons) Computer Science
- BSc (Hons) Computer Science and Artificial Intelligence
- BSc (Hons) Computing for Business and Management
- BSc (Hons) Computing for Digital Media
- BSc (Hons) Games and Multimedia Environments
- MEng (Hons) / BEng (Hons) Computer Engineering (a cross-School course between the Department of Informatics and the Departments of Engineering and Design).

The Department’s masters level courses are in the process of being reviewed as part of a cross-School process, the courses currently include:

- MSc Advanced Computer Science
- MSc Computing with Digital Media
- MSc Evolutionary and Adaptive Systems
- MSc Human-Computer Interaction
- MSc Information Technology with Business and Management
- MSc Intelligent Systems
- MSc Management of Information Technology.

Detailed information about the Department can be found at www.sussex.ac.uk/informatics
CORE JOB DESCRIPTION

Job Title: Research Fellow in Sensor Technology
Grade: Research Fellow I, Grade 7
School: School of Engineering and Informatics
Location: Sensor Technology Research Centre, University of Sussex
Responsible to: Principal Investigator through to Head of School
Direct reports: n/a
Key contacts: Members of research group, members of faculty within the School and University.

Role description: Research Fellow I is an early career-grade research position. Post-holders will be expected to contribute to the work of the research team, and also to develop their research skills with support from more experienced members of staff.

PRINCIPAL ACCOUNTABILITIES

1. To engage in individual and/or collaborative research activity resulting in high-quality publications; and to develop research funding and knowledge exchange income individually or in collaboration with others, as appropriate, depending on the size and scope of the bid.

2. To contribute to School teaching activities.
KEY RESPONSIBILITIES

1. **Research, Scholarship & Enterprise**

   2.1 Develop research objectives and proposals for own or joint research, at acceptable levels, with assistance if required.

   2.2 Conduct research projects individually and in collaboration with others.

   2.3 Analyse and interpret research findings and draw conclusions on the outcomes.

   2.4 Produce high-quality research outputs for publication in monographs or recognised high-quality journals, or performance/exhibition, as appropriate, and contribute to the School's REF submission at acceptable levels of volume and academic excellence.

   2.5 Contribute to the preparation of proposals and applications to external bodies, for example for funding purposes.

   2.6 Individually or with colleagues, explore opportunities for enterprise activity, knowledge exchange income and/or consultancy, where permissible.

   2.7 Build internal contacts and participate in internal networks and relevant external networks in order to form relationships and collaborations.

   2.8 Continually update knowledge and understanding in field or specialism, and engage in continuous professional development.

2. **Teaching & Student Support**

   2.1 Undertake teaching duties, if required.

   2.2 Assist in the assessment of student knowledge and supervision of student projects if required.

   2.3 Assist in the development of student research skills, for example as part of a postgraduate supervision team.

3. **Contribution to School & University**

   3.1 Attend and contribute to relevant School and project meetings.

   3.2 Undertake additional duties, as required by the Principal Investigator and/or Head of School.

4. **Role-specific duties**

   4.1 Engage in day to day supervision of about 3 project assistants who will be tasked with carrying mobile phones and a body-worn camera and engaging in 8 activity classes. This will include defining the data collection protocol to lead to a balanced dataset, implementing strategies to ensure data quality including re-annotation by the project assistants using the body-
worn cameras. You will write dedicated software if necessary to identify data anomalies or streamline the annotation process (e.g. extending one of our annotation tools).

4.2 Define a baseline recognition system. For this you will be using traditional machine learning techniques (e.g. SVM) applied to combinations of sensors. This will involve ranking and selecting appropriate combinations of sensors and corresponding features to ensure highest recognition accuracy. Additional constraints such as minimising computational complexity or energy can be considered but aren't integral to the project.

4.3 Explore new approaches to recognising the 8 activity classes using deep learning and recurrent networks (e.g. convnets and LSTM) to further enhance performance.

4.4 Generate innovation ideas which may result in patents.

4.5 Publish papers describing datasets and approaches in high-impact venues

4.6 Contribute to the public dataset release.

4.7 Exchange expertise with PhD students and colleagues.

4.8 Collaborate with the industrial funder, generate deliverables and reports and assist with flow of information among stakeholders.

This Job Description sets out current duties of the post that may vary from time to time without changing the general character of the post or level of responsibility entailed.

INDICATIVE PERFORMANCE CRITERIA

- A PhD or equivalent scholarly or relevant professional activity
- Pursuing a line of independent research within a research group.
- Publishing research (either from a recently completed PhD or new original research).
- Other forms of externally recognised professional practice of creative output of a standing equivalent to regular publication of original research.
- Initiating, developing or participating in links between the University and external bodies such as business and industry, the professions, community organisations and policy-makers.
- Evidence of successful engagement in teaching or supervision.
PERSON SPECIFICATION

ESSENTIAL CRITERIA

1. Normally educated to doctoral level, or other equivalent qualification, or appropriate level of experience, as appropriate to the discipline (see role-specific criteria below).

2. Evidence of engagement in high-quality research activity.

3. Excellent presentation skills, with the ability to communicate effectively, both orally and in writing, with students, colleagues and external audiences.

4. Ability to work individually on own initiative and without close supervision, and as part of a team.

5. Ability to exercise a degree of innovation and creative problem-solving.

6. Excellent organisational and administrative skills.

7. Ability to prioritise and meet deadlines.

8. Excellent IT skills.

ESSENTIAL ROLE-SPECIFIC CRITERIA

1. A degree in computer science, mathematics, physics; or an appropriate and related discipline.

2. Knowledge machine learning including traditional and recent deep learning techniques (convnets, LSTM, etc).

3. Expertise in managing data collection campaigns and managing large datasets.

4. Experience of writing technical reports and high-quality publications.

DESIRABLE CRITERIA

1. Emerging track record of high-quality publications in reputable journals and other appropriate media of similar standing.

2. Experience of generating research or knowledge exchange income.

The University is committed to equality and valuing diversity, and applications are particularly welcomed from women and black and minority ethnic candidates, who are under-represented in academic posts in science and engineering at Sussex.