1 Advertisement

Post Title: Research Fellow in Embedded Computing for Digital Communication
School/department: Engineering and Informatics
Hours: Full time or part time hours considered up to a maximum of 1.0 FTE
Requests for flexible working options will be considered (subject to business need).
Requires regular working on campus
Contract: One year fixed term, with possibility to extend to two years
Reference: 6546
Salary: starting at £34,304 to £40,927 per annum, pro rata if part time
Placed on: 10 August 2021
Closing date: 7 September 2021. Applications must be received by midnight of the closing date.
Expected start date: As soon as possible

The Sensor Technology Research Centre at the University of Sussex is looking for a Research Fellow to work on an innovative project funded by a large consumer electronics multi-national. This is a research-intensive role with high publication potential in the rapidly developing field of low-power electric field communication. The primary aim of the project is to develop a novel near-field capacitive communication channel based on the patented Electric Potential Sensor technology.

This is an exciting opportunity to participate in a project that may lead to commercialisation of innovative communication links for various smart wearable devices, such as transmitting music from a mobile phone or smart watch to a pair of headphones.

Key responsibilities
Your role will be to research, implement and evaluate various modulation and demodulation schemes, bitstream encoding and decoding. This will be done using a combination of software define radio (SDR) platforms and FPGA and micro-controller systems. You will need to gauge the suitability of each approach for electric field based near-field digital communication as well as documenting and characterising the advantages and disadvantages of each method for BAN (body area network) applications. As part of the role, you will write scientific papers and contribute to monthly project reports, quarterly demonstrations and contribute towards patent filing. You will be working in a core team of four to five researchers within a larger research centre.

Key Requirements. This post suits a highly motivated individual with excellent scientific and technical skills, and a willingness to publish in high profile venues. The candidate should have experience in digital signal processing and its translation to the design of low-power and low-data rate (<1 Mbps) communication systems, as well as a willingness to operate in a dynamic research environment within an international team. Experience in the design, fabrication, characterisation, and application of low-frequency (less than 100 MHz) RF circuits is beneficial.

Candidates should have a PhD in computer engineering, electronics engineering, physics, or an equivalent field, combined with a strong background in signal processing and/or digital communication design and implementation. The candidates should have demonstrable experience and/or knowledge in the implementation of various modulation/demodulation and
An interest in the application of research outcome in novel wearable devices exploiting this communication channel is desirable. For instance, the applicant could translate this research in wearable VR/AR, health, sports and entertainment applications. This project may lead to translation to ASICs carried out by the industrial partner.

**Background.** The Sensor Technology Research Centre at the University of Sussex works at the interface between electronic engineering, computer science, and physics to develop advanced and innovative sensor systems for applications in sports, healthcare, and smart wearables. The two main groups involved in this project are led by Prof. Robert Prance and Prof. Daniel Roggen.

**Advantages and career development.** This position is ideally suited for somebody who wants to advance their career in the rapidly expanding field of short-range low-power electric field communication and smart wearables. This project will provide an opportunity to publish and present in high-impact journals and conferences as well as filing patents. The project has the potential to lead to a spin-off, further industrial collaboration and offers broad networking opportunities.

Please contact Professor Daniel Roggen, D.Roggen@sussex.ac.uk for informal enquiries.

Please note that this position may be subject to ATAS clearance if you require visa sponsorship.

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, Technology, Engineering, Medicine and Mathematics (STEMM) at Sussex.

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

The University of Sussex values the diversity of its staff and students and we welcome applicants from all backgrounds.

2. **The School / Division**

Please find further information regarding the school/division at http://www.sussex.ac.uk/engineering/

3. **Job Description**

Job Description for the post of: **Research Fellow in Embedded Computing for Digital Communication**

**Department:** Engineering and Design

**Section/Unit/School:** School of Engineering and Design

**Location:** Sensor technology Research Centre (STRC) Richmond Building
KEY RESPONSIBILITIES

1. **Research, Scholarship & Enterprise**
   1.1 Develop research objectives and proposals for own or joint research, at acceptable levels, with assistance if required.
   1.2 Conduct research projects individually and in collaboration with others.
   1.3 Analyse and interpret research findings and draw conclusions on the outcomes.
   1.4 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.
   1.5 Contribute to the preparation of proposals and applications to external bodies, for example for funding purposes.
   1.6 Individually or with colleagues, explore opportunities for enterprise activity, knowledge exchange income and/or consultancy, where permissible.
   1.7 Build internal contacts and participate in internal networks and relevant external networks in order to form relationships and collaborations.
   1.8 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 To implement and evaluate various modulation and demodulation schemes in digital/mixed signal domain

4.2 Thorough documentation and characterisation of the advantage and disadvantage of each method for BAN (body area network)

4.3 Engage and collaborate with the project’s core team to implement functional prototypes

4.4 Translate project outcomes to wearable computing application

4.5 Support a potential commercialization of the developed technologies

4.6 Publish scientific results in high quality journals and present your work at international conferences.

4.7 Generate innovation ideas which may result in patents

4.8 Exchange expertise with PhD students and colleagues

4.9 Collaborate with the industrial partners, 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 policymakers.
- Evidence of successful engagement in teaching or supervision.
5. Person Specification

ESSENTIAL CRITERIA

1. 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. Demonstrable expertise in digital communication and/or digital signal processing including topics such as complex sampling, I/Q representation, digital filter design and implementation (e.g. CIC, FIR, pulse shaping filters)

2. Experience either with FPGA system design (VHDL/Verilog) or Software Defined Radio (e.g. GNURadio)

3. Familiar with direct up-conversion and direct down-conversion

4. Expertise in embedded computing and micro-controller programming

5. Experience with ADC and DAC systems

DESIRABLE CRITERIA

1. Experience with error correction in digital communication systems, source and channel encoding and decoding, channel characterisation and simulation

2. Familiarity with PCB design and low-frequency RF circuits

3. Interest in wearable computing applications for consumer electronics, health, sport and Entertainment

4. Successful track record for the practical implementation of modulation/demodulation schemes (e.g. FSK, DQPSK, QAM)
5. Ability to design embedded computing platforms that includes FPGAs, micro-
controllers, ADC, DAC and various sensors

6. Experience of implementing analogue modulation and demodulation schemes (e.g.
FSK)

7. Familiar with RF circuit simulation

8. Experience/Knowledge in RF PCB design and schematic capture, including but not
limited to:
   - Mixers (e.g. Quadrature mixers)
   - Filters (e.g. Pulse shaping)
   - Lower power oscillators
   - Phase Lock Loops (PLL)
   - RF amplifiers & AGCs

9. Knowledge of antenna theory

10. Understanding of electrostatics and electric fields