

Research Role Profile

<b>Job Title:</b>	Research Fellow A
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<b>Responsible to:</b>	Head of research group, or principal investigator
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<b>Responsible for:</b>	Not applicable
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<b>Job Summary and Purpose:</b>
To undertake research in accordance with the specified research project(s) under the supervision of the principal investigator.

<b>Main Responsibilities/Activities</b>
<p>To undertake a range of research activities within a specified research area, assuming responsibility for specific areas of projects and making use of new research techniques and methods, in consultation with the research award holder or supervisor. This may include fieldwork, interviews, laboratory experimentation, critical evaluation and interpretation, computer-based data analysis and evaluation or library research.</p> <p>Using initiative and creativity to identify areas for research develop new research methods and extend the research portfolio. Analysing and interpreting results of own research. Write up results and prepare papers for submission to appropriate journals and conferences, and other outputs as required and/or appropriate. Attend appropriate conferences for the purpose of disseminating research results of personal development. The post holder may also contribute to writing bids for research grants and will contribute to collaborative decision making with colleagues in areas of research.</p> <p>Continually to update knowledge and develop skills, and translate knowledge of advances in the area into research activity.</p> <p>To plan and manage own research activity in collaboration with others. To carry out administrative tasks associated with specified research funding, for example risk assessment of research activities, organisation of project meetings and documentation. Implementation of procedures required to ensure accurate and timely formal reporting and financial control.</p> <p>To contribute to teaching in the Faculty by carrying out student supervision and/or demonstrating within the post holder's area of expertise and under the direct guidance of a member of departmental academic staff, as appropriate.</p> <p>The post holder may occasionally be required to supervise more junior research staff.</p>

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### Person Specification

#### The post holder must have:

A doctoral degree in a relevant discipline (although individuals who have almost completed a doctoral degree may be appointed). Consideration may also be given to individuals who do not hold a doctoral degree but have required skills based on a number of years experience in specified / relevant fields

The post holder will have authority over some aspects of project work and must be capable of providing academic judgement, offering original and creative thoughts and be able to interpret and analyse results.

### Relationships and Contacts

Direct responsibility to the principal investigator or academic supervisor. The post holder may be asked to serve on a relevant Faculty committee. There may be additional reporting and liaison responsibilities to external funding bodies or sponsors. The post holder may work on original research tasks with colleagues in other institutions.

### Special Requirements

To be available to participate in fieldwork as required by the specified research project

#### All staff are expected to:

- Positively support equality of opportunity and equity of treatment to colleagues and students in accordance with the University of Surrey Equal Opportunities policy.
- Help maintain a safe working environment by:
  - Attending training in Health and Safety requirements as necessary, both on appointment and as changes in duties and techniques demand
  - Following local codes of safe working practices and the University of Surrey Health and Safety Policy
- Undertake such other duties within the scope of the post as may be requested by your Manager.

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Addendum to Role Profile

<b>Job Title:</b>	Research Engineer (Research Fellow) in Sound Sensing
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<p><b>Job Summary and Purpose:</b></p> <p><u>This information sheet should be read in conjunction with the accompanying generic Research RA1A Role Profile and will be used for shortlisting processes. More specifically the post holder will be expected to:</u></p> <ul style="list-style-type: none"> <li>(i) Design and develop software and hardware for sound sensors, and open-source software libraries and datasets to be produced and released by the “AI for Sound” project.</li> <li>(ii) Collaborate with other staff on the project to develop pilot and proof-of-concept systems for: monitoring of sounds in the home for assisted living; measuring sounds in non-domestic smart buildings; measuring sounds in smart cities to improve the urban environment; and developing tools to use sounds to help producers and consumers of broadcast content.</li> <li>(iii) Work with other researchers on the project to develop research software libraries and systems to facilitate reproducible research and public engagement.</li> <li>(iv) Contribute to participative research engagement events and activities with stakeholders.</li> <li>(v) Meet on a weekly basis with project staff, and attend project meetings and present results at other sites as required;</li> <li>(vi) Publish and present research in high-quality international journals and conferences.</li> <li>(vii) Pro-actively organise and manage own time and research-related activities.</li> <li>(viii) Report orally and prepare papers reporting progress and delivery of project outcomes, and be able to communicate at both technical and high-level for example with project research partners.</li> <li>(ix) Perform any other duties associated with the project, as deemed appropriate to the grade by the Principal Investigator.</li> <li>(x) Promote the research and activities of the project and the Centre for Vision, Speech and Signal Processing (CVSSP) in national and international forums.</li> </ul>
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<p><b>Main Responsibilities/Activities</b></p> <p>Undertake the development of research software and hardware for sound sensors, either using methods arising from research or to enable research to take place.</p> <p>Meet on a weekly basis on campus with CVSSP staff</p> <p>Attend project meetings and present results at other sites as required</p>
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Give oral and written reports on project progress and outcomes. Be able to report at both a technical low-level and conceptual high-level to a range of audiences including the public and industry

Continually update knowledge and develop skills

Carry out routine administrative tasks associated with a specified research project, for example risk assessment of research tasks, organisation of project meetings and documentation. This will entail planning own day-to-day research activity within the framework of the agreed programme, dealing with problems that may affect the achievement of research objectives and deadlines and implementing procedures required to ensure accurate and timely delivery.

### Person Specification

#### The post holder must have:

Master's degree in electronic engineering, computer science or a related subject, or equivalent professional experience

At least 1 year's experience in software and hardware development relevant to signal processing or sensor devices

Experience in software development in topics such as audio signal processing, machine learning, deep learning, and/or sensor systems

Ability to work independently, with strong organisational and time management skills

#### The post holder would ideally have:

Experience in development and deployment of hardware sensors and/or Internet-of-Things (IoT) devices is desirable, especially for audio systems

Skills and experience of development using languages such as Python, C++ and/or MATLAB, with relevant signal processing, machine learning and/or deep learning tools (TensorFlow, PyTorch, Keras, etc.) is desirable

Direct research experience in audio signal processing or machine learning, or experience of hardware or software development while working closely with researchers working in audio signal processing or machine learning is desirable, including developing new algorithms related to research

Strong writing skills across different levels of technical audience are desirable

A track record of publishing academic papers, open-source software tools and/or research datasets is desirable

### Relationships and Contacts

Direct responsibility to Principal Investigator Prof Mark Plumbley

Informal enquiries are welcome and should be directed to Prof Mark Plumbley, [m.plumbley@surrey.ac.uk](mailto:m.plumbley@surrey.ac.uk)

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### **Additional Background Information**

This post is part of an EPSRC Fellowship “AI for Sound” (<https://ai4s.surrey.ac.uk/>), led by Prof Mark Plumbley in the Centre for Vision Speech and Signal Processing (CVSSP) at the University of Surrey.

The aim of this Fellowship (summary below) is to deliver a step-change in research into computational analysis of everyday sounds, for the benefit of society and the economy. This will be achieved through undertaking this research in the context of a set of real-world use cases in assisted living in the home, smart buildings, smart cities, and the creative sector.

The postholder will be responsible for designing and building the hardware and software to be developed in the fellowship, including sound sensor systems, open-source software libraries and datasets to be released from the project. The postholder will be based in CVSSP and work under the direction of PI (EPSRC Fellow) Prof Mark Plumbley.

### **Centre for Vision Speech and Signal Processing (CVSSP) at the University of Surrey**

The Centre for Vision, Speech and Signal Processing (CVSSP), part of the Department of Electronic and Electrical Engineering at the University of Surrey, is an International Centre of Excellence for research in Audio-Visual Machine Perception, with 180 researchers, including 22 academics and 90 PhD researchers, a grant portfolio of £26M (£17M EPSRC), and a turnover of £7M/annum. The Centre is internationally unique in bringing together expertise in both audio and visual machine perception, with the central goal of creating machines that can see and hear to understand the world around them. The Centre has state-of-the-art acoustic capture and analysis facilities and a Visual Media Lab with video and audio capture facilities supporting research in real-time video and audio processing and visualisation. CVSSP has a compute facility with 120 GPUs for deep learning and >1PB of high-speed secure storage. National standing is evidenced by sustained EPSRC investment, including two Programme Grants (2013-19, 2015-21) and three Platform Grants in Audio-Visual Research (2003-08, 2008-14, 2017-22), and as a lead partner of the BBC Data Science and Audio Research partnerships. The centre has an outstanding track record of pioneering research leading to successful technology transfer with UK industry and spin-out companies.

The Fellowship is also part of the new Surrey Institute for People-Centred AI (<https://www.surrey.ac.uk/artificial-intelligence>), a major strategic £7.5m investment in artificial intelligence and machine learning across the University of Surrey.

### **Project Summary: EPSRC Fellowship in “AI for Sound”**

Imagine you are standing on a street corner in a city. Close your eyes: what do you hear? Perhaps some cars and busses driving on the road, footsteps of people on the pavement, beeps from a pedestrian crossing, rustling and clonks from shopping bags and boxes, and the hubbub of talking shoppers. You can do the same in a kitchen as someone is making breakfast, or as you are working in a busy office. Now, following the successful application of AI and machine learning technologies to the recognition of speech and images, we are

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beginning to build computer systems to tackle the challenging task of "machine listening", to build computer systems to automatically analyse and recognize everyday real-world sound scenes and events.

This new technology has major potential applications in security, health & wellbeing, environmental sensing, urban living, and the creative sector. Analysis of sounds in the home offers the potential to improve comfort, security, and healthcare services to inhabitants. In environmental sound sensing, analysis of urban sounds offers the potential to monitor and improve soundscapes experienced for people in towns and cities. In the creative sector, analysis of sounds also offers the potential to make better use of archives in museums and libraries, and production processes for broadcasters, programme makers, or games designers. The international market for sound recognition technology has been forecast to be worth around £1bn by 2021, so there is significant potential for new tools in "AI for sound" to have a major benefit for the economy and society.

Nevertheless, realising the potential of computational analysis of sounds presents particular challenges for machine learning technologies. For example, current research use cases are often unrealistic; modern AI methods, such as deep learning, can produce promising results, but are still poorly understood; and current datasets may have unreliable or missing labels.

To tackle these and other key issues, this Fellowship will use a set of application sector use cases, spanning sound sensing in the home, in the workplace and in the outdoor environment, to drive advances in core machine learning research.

Specifically, the Fellowship will focus on four main application use cases: (i) monitoring of sounds of human activity in the home for assisted living; (ii) measuring of sounds in non-domestic buildings to improve the office and workplace environment; (iii) measuring sounds in smart cities to improve the urban environment; and (iv) developing tools to use sounds to help producers and consumers of broadcast creative content.

Through this Fellowship, we aim to deliver a step-change in research in this area, bringing "AI for Sound" technology out of the lab, helping to realize its potential to benefit society and the economy.

### **Project partners**

Accenture Labs Dublin; Audio Analytic Ltd.; BBC R&D; Connected Places Catapult; Digital Catapult; Environment Agency; Pindrop; Samsung AI Centre Cambridge; Alan Turing Institute; UK Dementia Research Institute.