



Trinity College Dublin

Coláiste na Tríonóide, Baile Átha Cliath

The University of Dublin

Job Description

Reference ID:	EENH_RF02
Job Title:	Research Fellow in Multimodal Neural Architectures
School/Department:	School of Engineering
Principal Investigator:	Prof Naomi Harte
Duration:	3 years, starting Sept 2024 (can be flexible)
Salary	Gross Salary starts at €46,569 -€49,177 depending on experience. Annual increments apply on SFI Pay Scale.

The Wider Research Project

This Research Fellow is required to contribute to a new overall project led by Prof. Naomi Harte focused on the development of a unified multimodal framework for modelling and analysing real-world speech-based interaction. This Research Fellow will develop neural architectures for multimodal speech applications. The Research Fellow will rethink the development of sophisticated deep learning architectures that can fully exploit the relevant modalities of speech in an application. They will develop approaches that are agile in deployment and that can change how modalities combine in real-time. Applications will be in audio-visual speech recognition and conversational analysis.

This work will be interdisciplinary in nature, requiring consideration of theories around conversation not only from a speech science and technology perspective, but also incorporating knowledge from established theories in the fields of psycholinguistics and cognitive science. Other elements of the project will focus on how to model multimodality in deep learning architectures. The overall team in this major project will consist of two Research Fellows (this position is one of those two), 4 PhD students, and one Research Assistant. The position is fully in-person and requires the person to be based in Dublin, Ireland.

Context

The School of Engineering is ranked #1 in Ireland (QS Rankings) and is a proud recipient of a Bronze Athena Swan award, attained in 2021. As part of the School's on-going actions in relation to equality, diversity and inclusion it welcomes all applications that meet the criteria below and particularly those from under-represented groups. The School offers a collegiate and supportive environment to all its staff and works to ensure that all its staff and students can perform at their best while putting in those steps that facilitate a healthy work/life balance

The Sigmedia Research Group is part of the Discipline of Electronic and Electrical Engineering (<https://www.tcd.ie/eleceng/>). The group was founded in 1998 in Trinity College Dublin. Originally with a focus on video and image processing, the group today spans research in areas across all aspects of media – video, images, speech and audio. The group is widely recognised for its work in audio and video engineering and is one of the few groups in the world to have had its technology acquired by Google in the areas of video engineering and spatial audio. Prof. Naomi Harte leads the Sigmedia research endeavours in human speech communication. Her team has active research in audio-visual speech recognition, evaluation of speech synthesis, multimodal cues in human conversation, and birdsong analysis. Her group is interested in all aspect of human interaction, centred on speech. Much of the research is underpinned by signal processing and machine learning, but we also have researchers grounded in linguistic and psychology aspects of speech processing to give us the complete view of human interaction in all its richness.

Main Responsibilities

Research

As part of the overall project, this Research Fellow will work on the following tasks:

- New optimisation strategies for audio-visual neural architectures focused on corpus level performance in AVSR in the first instance
- Development of agile neural architectures that can monitor and react to changes in reliability of modalities.
- Report regularly to the PI of the project, and interact regularly with other team members to maintain momentum in the project
- Publish and present results from the project in leading journals and conferences

Additionally, they will support other team members (PhD students and a Research Assistant) with the following tasks:

- Agile architectures for changing noise environments

- Active speaker tracking

Their expertise in neural architectures will also be important in interfacing with the modelling aspect of the project, led by a second Research Fellow and involving two additional PhD students. Thus, the position requires this Research Fellow to interact with team members focused on understanding interaction from a multimodal viewpoint, exchanging ideas on what aspects of multimodal speech are important to capture and model in neural architectures. The interface between our understanding of how humans interpret speech and how to teach a machine to do so, is an essential aspect of the overall project.

Administrative

As a Research Fellow within a larger Research Group, the person will occasionally be required to engage in administrative tasks in support of the PIs overall activity. This may include drafting sections of reports for funding bodies; organising a programme of suitably themed group meetings and seminars; contributing to research funding proposals; drafting of ethics applications; and other such tasks as they arise. In particular, this Research Fellow will be asked to contribute to the strategic oversight of the existing computing facilities within the research group, in consultation with the EE Systems Team. This will mainly consist of maintaining and updating configuration scripts and adding new users. As such, applicants having experience with the Linux environment (especially shell/bash scripts and user management) will be preferred.

Teaching

The Research Fellow has no fixed lecturing responsibilities but may contribute guest lectures to suitable modules if they wish to acquire teaching experience. Their primary focus is research.

Person Requirements

The Research Fellow will require a range of knowledge, skills and attributes for successful performance in the role. The successful candidate is expected to:

- Have a thorough understanding of speech-based interaction, including linguistic, verbal, non-verbal and visual cues
- Experience of the development of deep learning architectures for speech processing
- Familiarity with running of large-scale experiments e.g. on a high-performance compute farm
- Have excellent written and oral proficiency in English
- Be skilled at taking disparate research ideas and draw innovative conclusions, or see new solutions
- Have excellent communication and interpersonal skills
- Be willing to work as part of a multidisciplinary team and learn new cross-over skills as well as transfer skills to others

- Be highly organised in their work, with an ability to balance medium term and longer-term objectives in a project.
- Ability to represent the group at appropriate national and international conferences

Qualifications

Candidates appointed to this role must have completed a PhD in Electrical or Electronic Engineering, or a closely related field that makes them qualified to conduct this research in multimodal interaction.

Knowledge & Experience (Essential & Desirable)

Essential:

- Understanding of and demonstrated experience working with multimodal cues in speech based interaction
- Extensive knowledge and understanding of deep learning architectures and their use in speech recognition
- Familiarity with audio signal processing, feature extraction, and data pre-processing techniques for speech recognition
- Proficiency and experience with a range of coding languages and environments, e.g. python, PyTorch, TensorFlow, GitHub etc
- Publication track record commensurate with career stage in high quality conferences and/or journals
- Strong commitment to their own professional development
- Experience with the Linux environment (especially shell/bash scripts and user management)

Desirable

- Extensive knowledge and understanding of deep learning architectures and their use in audio-visual speech recognition
- Experience in video processing and related environments, e.g. ffmpeg, OpenCV etc
- Strong knowledge of signal processing and treatment of signals in noise
- Mentoring of junior team members (can be informal depending on career stage)
- Record of open-source publishing of code
- Contribution to successful funding applications
- Exposure to standard tools for editing and labelling of conversations, (e.g. Adobe Suite, Elan, Anvil, Praat or others)

Benefits

- Competitive salary and equity
- High-end computer and peripherals
- Dedicated desk in shared office space, with generous social spaces
- A creative and enabling environment with impactful research
- Pension and social insurance (PRSI) included
- Trinity Day Nursery
- Travel Pass Scheme
- Bike to Work Scheme
- Employee Assistance Programme
- Sports Facilities
- 22 days of Annual Leave
- Paid Sick Leave
- Training & Development
- Staff Discounts locally

Application Procedure

Applicants should provide the following information when applying:

1. A motivation statement outlining their interest and suitability for the position.
2. A comprehensive curriculum vitae, including a full list of publications.
3. The names and contact details (e-mail) of three referees.

Application link here

Note:

Candidates who do not address the application requirements above will not be considered for interview.

Further Information

Informal enquiries about this post should be made to Professor Naomi Harte (nharte@tcd.ie) but applications are only accepted through the procedure outlined above.

Snapshot of the Faculty

The Faculty of Science, Technology, Engineering and Mathematics is located at the east end of the Trinity campus. It brings together eight schools that deliver discipline-specific research and training (**Biochemistry & Immunology, Chemistry, Computer Science and Statistics, Engineering, Genetics & Microbiology, Mathematics, Natural Sciences, Physics**). Each School produces graduates that are leaders, innovators and doers in STEM education and research, in Ireland and beyond.

As well as these eight schools, the Faculty is made up of three Trinity College Research Institutes, five National Research Centres and three Units. Together these represent approximately 30% of the staff in the College.

Researchers in the Faculty address challenges that are complex and multi-faceted. They do this by continuously asking the fundamental questions of how? and why? They seek out answers to current and future challenges in climate change, food and water security, sustainable urbanisation, personal privacy, healthy ageing and eradicating infectious diseases. They lead innovations at the frontiers of science and technology often in high-level multi-disciplinary teams based within the Schools, Research Institutes and Centres.

The three Trinity Research Institutes are:

- **CRANN** - The Centre for Research on Adaptive Nanostructures and Nanodevices
- **TBSI** - Trinity Biomedical Sciences Institute
- **TCIN** - Trinity College Institute of Neuroscience

The four National Research Centres are:

- **ADAPT** - The SFI Centre for digital content and media innovation
- **AMBER** - The SFI Centre for Advanced Materials and BioEngineering Research
- **CONNECT** - The SFI Centre for digital content and media innovation
- **ENABLE** - Connecting communities with smart urban environments through the Internet of Things

The three units that support our teaching and learning mission are:

- **Biology Teaching Centre** - responsible for the coordination of all Biology teaching to Junior and Senior Freshman students in Science, as well as providing service teaching to other groups within the College.
- **Comparative Medicine Unit** - aims to advance knowledge and improve the health and wellbeing of humans and animals by servicing, and providing, world-class facilities and infrastructures, to the Trinity research community.
- **Science Course Office** - responsible for facilitating the Junior and Senior Fresh undergraduate Science Programmes.



Trinity College Dublin, the University of Dublin

Trinity College Dublin, the University of Dublin is Ireland's leading university, one of the top ranked universities in Europe and a member of the League of European Research Universities. It is currently ranked 98th in the QS World University Rankings 2023. Founded in 1592, the University is steeped in history with a reputation for excellence in education, research, and innovation.

Located on an iconic campus in the heart of Dublin's city centre, Trinity has 18,000 undergraduate and postgraduate students across our three faculties – Arts, Humanities, and Social Sciences; Science, Technology, Engineering and Mathematics; and Health Sciences.

The pursuit of excellence through research and scholarship is at the heart of a Trinity education, and our researchers have an outstanding publication record and strong record of grant success. Our research charter outlines the principles that are central to our research vision:

www.tcd.ie/research/about/charter

Trinity has developed **19 broad-based multidisciplinary research themes** that cut across disciplines and facilitate world-leading research and collaboration within the University and with colleagues around the world. Trinity is also home to five leading flagship research institutes:

- n Trinity Biomedical Sciences Institute (TBSI)
- n Trinity College Institute of Neuroscience (TCIN)
- n Trinity Translational Medical Institute (TTMI)
- n Trinity Long Room Hub Arts and Humanities Research Institute (TLRH)
- n Centre for Research on Adaptive Nanostructures and Nanodevices (CRANN)

Trinity is the top-ranked European university for producing entrepreneurs for the past seven successive years and Europe's only representative in the world's top-50 universities (Pitchbook Universities Report 2021).



Trinity has been incorporating sustainability right across the university. Commitments to sustainability have been made in the Strategic Plan (2020 – 2025) and via Trinity’s environmental sustainability practices under nine goals in areas that range from biodiversity to sustainable transport and green procurement.

For more on these sustainability commitments, please visit www.tcd.ie/provost/sustainability/initiatives

Trinity is home to the famous Old Library and to the historic Book of Kells as well as other internationally significant holdings in manuscripts, maps, and early printed material. The Trinity Library is a legal deposit library, granting the University the right to claim a copy of every book published in Ireland and the UK. At present, the Library’s holdings span approximately 7 million printed items, 500,000 e-books and 150,000 e-journals.

With over 130,000 alumni, Trinity’s tradition of independent intellectual inquiry has produced some of the world’s finest, most original minds including the writers Oscar Wilde and Samuel Beckett (Nobel laureates), the mathematician William Rowan Hamilton and the physicist, Ernest Walton (Nobel laureate), the political thinker Edmund Burke, and the former President of Ireland Mary Robinson. This tradition finds expression today in a campus culture of scholarship, innovation, creativity, entrepreneurship, and dedication to societal reform.

Rankings

Trinity is the top ranked university in Ireland and ranked 98th in the world (QS World University Rankings 2023). Trinity ranks in the top 50 in the world on 4 subjects and in the top 100 in 17 subjects (QS World University Rankings by Subject 2021).

Full details are available at: www.tcd.ie/research/about/rankings