



Job Description

Research Fellow in Deep Learning for Ultrasound Therapy

Department of Medical Physics and Biomedical Engineering

Location: UCL Bloomsbury campus, London

Grade 7 – £35,328 to £42,701 per annum, inclusive of London allowance.

Appointment at Grade 7 is dependent upon having been awarded a PhD. Or if about to submit a PhD, the appointment will be at Grade 6B (£30,922 - £32,607 salary, inclusive of London Allowance) with payment at Grade 7 being backdated to the date of final submission of the PhD thesis.

Reports to:

Dr Bradley Treeby.

Context

Biomedical Ultrasound Group

The Biomedical Ultrasound Group at University College London (UCL) was formed in 2013 to bring together researchers in acoustics, medical physics, and computer science with doctors and front-line users in medicine and the life sciences (<http://bug.medphys.ucl.ac.uk>). The group currently comprises twelve full-time research staff, with expertise extending from physical acoustics and numerical modelling, through to ultrasonic and optical instrumentation, and in vivo experimentation.

The group has a particular focus on the development of advanced computer models which can predict how ultrasound waves propagate in the human body. These models have many applications in therapeutic and diagnostic ultrasound, including imaging, treatment planning, image reconstruction, and hardware design. The results of our modelling research have culminated in ten releases of an open-source acoustics toolbox called

k-Wave (<http://www.k-wave.org>). The toolbox is widely used in both academia and industry, and currently has more than 11,000 registered users in 70 countries.

Under recent EPSRC funding, we are now exploring the use of deep learning approaches to treatment planning and wave modelling, with the ultimate aim of delivering clinical tools that can make real-time predictions to guide ultrasound therapies in the brain. We are also investigating applications of deep learning to image reconstruction in photoacoustic tomography, a rapidly emerging biomedical imaging technique based on the generation of ultrasound waves using pulsed laser light.

University College London (UCL)

UCL is one of the UK's premier universities and is consistently ranked in the world's top-10. UCL brings together world-renowned experts, from across the academic spectrum. It is a world-class research and teaching institution whose staff and former students include 28 Nobel Prize winners and three Field's medallists.

Founded in 1826, it was the only university in England at that time which admitted students regardless of race or

religion. UCL was also the first to admit women on equal terms with men. Today, UCL is an inspiring university in which to work and study, and it continues to thrive on the diversity and creativity of its community.

UCL currently employs approximately 8,000 staff across 54 Academic Departments and Institutes whose activities span arts and humanities, social and historical sciences, law, architecture and the built environment, engineering sciences, mathematical and physical sciences, life and clinical sciences, and medicine. UCL's academic and research staff are a truly international community with more than a quarter coming from 84 countries outside the UK.

Main purpose of the job

The aim of the project is to apply deep learning techniques to treatment planning for ultrasound therapy in the brain, and to ultrasound imaging and therapy more generally. The project will involve building statistical shape models of the skull, running forward simulations using conventional acoustic wave models to generate training data, and building and training deep learning models. The deep learning component will include developing tailored deep learning architectures for regression and image reconstruction problems, hyper-parameter tuning (e.g., using Bayesian optimization), and investigating methods for estimating model uncertainty and interpretability.

Duties and responsibilities:

- To undertake research as stated in the Main Purpose.
- To prepare and present findings of research activity to colleagues, interested parties and at appropriate conferences.
- To contribute to the drafting and submitting of papers to appropriate peer reviewed journals, and of drafting research bids and proposals.
- To contribute to the overall activities of the research team and department as required.
- To contribute to the induction and direction of other research staff and students as requested.
- To carry out any other duties as are within the scope, spirit and purpose of the job.
- To actively follow UCL policies including Equal Opportunities and Race Equality policies.

- To maintain an awareness and observation of Fire and Health & Safety Regulations.

All research staff are expected to demonstrate their ongoing commitment to academic excellence; that is, to the conduct of research, publication, teaching, enabling and other forms of knowledge transfer, at the highest levels of international achievement. More information on UCL standards is available at <http://www.ucl.ac.uk/excellence/>.

This job description reflects the present requirements of the post, and as duties and responsibilities change/develop, the job description will be reviewed and be subject to amendment in consultation with the post holder.

Person specification

Criteria	Essential or Desirable
Qualifications	
PhD or about to submit a PhD (or equivalent) with a strong mathematical component (e.g., in applied mathematics, engineering, computer science).	Essential
Experience and knowledge	
Knowledge of the fundamentals of deep learning and inverse problems.	Essential
Experience in developing scientific software in a common coding language (e.g., C/C++, Python, MATLAB).	Essential
Experience in applying deep learning to problems in image analysis and regression.	Desirable
Experience with common deep learning packages (e.g., TensorFlow, Keras, PyTorch).	Desirable
Experience in developing application-specific deep learning architectures.	Desirable
Experience of working with experimental (measured) medical imaging or sensing data.	Desirable
Knowledge of approaches and tools for statistical shape modelling.	Desirable
Knowledge of approaches and tools for image segmentation.	Desirable
Skills and abilities	
Excellent written and verbal communication skills including the ability to effectively present complex or technical information to a range of audiences.	Essential
Ability to prioritise and work efficiently as well as a willingness to support development projects when meeting deadlines.	Essential
Ability to work collaboratively within a multidisciplinary team of software engineers, physicists, engineers, and clinicians.	Essential
Attributes	
Commitment to academic research.	Essential
Willingness to learn and develop new skills as required	Essential
Commitment to supporting the work of UCL and the Department	Essential
Commitment to continuous professional development	Essential
Commitment to UCL's policy of equal opportunity and the ability to work harmoniously with colleagues and students of all cultures and backgrounds	Essential

Apply

To apply for this position visit:

ucl.ac.uk/jobs