EPSRC Industrial CASE PhD Studentship at UCL in collaboration with the UK National Physical Laboratory and Mediso Medical Imaging Systems

Synergistic Triple Modality PET/SPECT/CT Reconstruction for Early Detection and Treatment of Cancer

UCL has a close collaboration with the UK National Physical Laboratory. As part of this collaboration, NPL is co-funding a PhD studentship. The funding covers an annual stipend and tuition fees at the rate for UK nationals/residents for 4 years.

Project

This project aims to improve the accuracy and precision of clinical functional imaging using joint information from Single Photon Emission Computed Tomography (SPECT), Positron Emission Tomography (PET) and x-ray Computed Tomography (CT). PET and SPECT are two of the main imaging modalities for cancer detection and are also used for the detection of inflammation and calcification. They also play a fundamental role in the newly established Theragnostic approach delivering patient-specific treatment and therapy monitoring using images. For the first time, the synergistic reconstruction methods developed in this project will fully exploit the data obtained from triple modality scanners. In addition, we will investigate the possibility to jointly reconstruct data from SPECT/CT and PET/CT scans acquired at different time points. Our aim is to increase the ability of these modalities to early detect and diagnose priority diseases, and to monitor therapy effectiveness.

The project will be mostly related to method development but will include some experiments using phantoms, both at UCL and NPL. We will also have access to patient data of some theragnostic clinical studies. The student will extend current methods for guided and synergistic reconstruction, implement the algorithms in our open source image reconstruction framework, evaluate the performance based on mathematical analysis, numerical simulations and clinical impact.

This project is a collaboration between the Institute of Nuclear Medicine (INM), and the nuclear medicine group of the National Physical Laboratory and Mediso, the manufacturer of the only commercial clinical tri-modality system (available at NPL). The student will be part of the UCL i4health Centre for Doctoral Training and benefit from a wide range of activities and opportunities.

Location and supervision
The student will be located at the UCL Bloomsbury Campus or at the nearby INM in the University College Hospital. Imaging facilities include PET-MRI, PET-CT and SPECT-CT scanners. The student must spend at least three months at the industrial partner (NPL Teddington Campus) for collaboration and experiments. The supervisory team will include Prof Kris Thielemans (UCL) and Dr Daniel Deidda (NPL).

Requirements and eligibility
Eligibility follows standard research council rules, and normally include ordinary residence within the UK for 3 years prior to the funding commencing, although this might be relaxed for exceptional candidates. More information can be found on the EPSRC website.

Candidates must meet the UCL graduate entry requirements which include holding at least an upper second-class degree or equivalent qualifications in a relevant subject area such as physics, biomedical

engineering, computer science or applied mathematics. A Master's degree in a relevant discipline and additional research experience would be an advantage. Depending on experience the student will be entered into either a 1-year MRes+3-year PhD programme, or a 4-year PhD.

Funding
The funding covers an increased annual stipend (around £19,000) and tuition fees at the rate for UK nationals/residents only. Funding is available to cover travel, conferences and consumables. Limited opportunity might be available for non-UK residents for top-up funding but details are currently still under review.

Application
Informal enquiries and applications should be sent directly to Prof Kris Thielemans by email to k.thielemans@ucl.ac.uk with subject-line "trimodality PhD application" and include a Curriculum Vitae (CV) and a cover letter. This should set out your previous academic or other experience relevant to the proposed research; why you wish to undertake this research at UCL; your previous research or professional training and what further training you think you will need to complete a PhD; and what ethical issues you will need to consider in undertaking this research. In addition, two references should be named at the end of the statement. At least one reference must be from an academic referee who is in a position to comment on the standard of your academic work and suitability for postgraduate level study. Where appropriate, a second referee can provide comment on your professional experience.

The closing date for application is **22 March 2021**. Interviewing will be soon after. The candidate would be expected to start 1st of October 2021 but there is some flexibility.

University College London (UCL)
UCL is ranked highly in the world in World University Rankings and publications from UCL have the highest number of citations outside the US. UCL hosts one of the largest and most productive centres for biomedical science in Europe. Staff and students enjoy a wide range of facilities including on-line access to most journals and an active program of interdisciplinary seminars. Of particular note are the MSc/MRes lectures organised by the i4health Centre for Doctoral Training.

National Physical Laboratory (NPL)
NPL is the UK's National Metrology Institute, developing and maintaining the national primary measurement standards. The focus of NPL science is to deliver extraordinary impact for the UK and provide the measurement capability that underpins the UK's prosperity and quality of life. NPL is located at the edge of Bushy Park, and hosts the postgraduate institute (PGI) which provides training opportunities and a mentorship scheme to support students throughout the PhD.

Further information
UCL Institute of Nuclear Medicine: https://www.ucl.ac.uk/nuclear-medicine/research/medicalphysics
EPSRC Centre for Doctoral Training in Intelligent, Integrated Imaging In Healthcare (i4health)
https://www.ucl.ac.uk/intelligent-imaging-healthcare/
UCL Graduate Prospectus: http://www.ucl.ac.uk/prospective-students/graduate/
UCL Campus information: https://www.ucl.ac.uk/prospective-students/study-abroad-at-ucl/life-ucl/campus-and-facilities
National Physical Laboratory: https://www.npl.co.uk/medical-physics/nuclear-medicine
Mediso: https://mediso.com/global/en/