

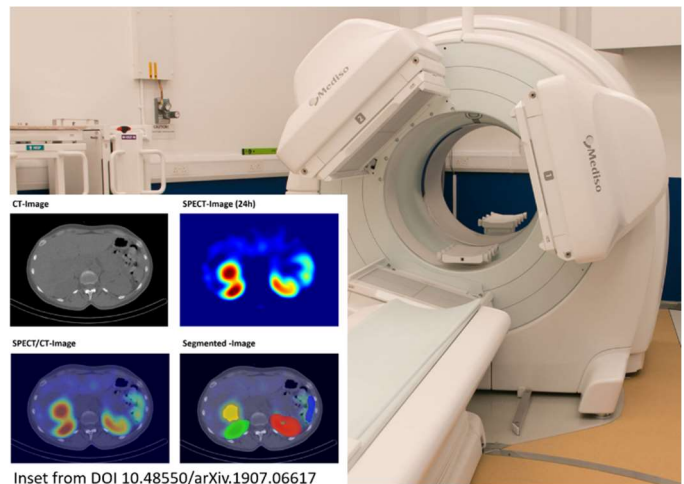
EPSRC PhD Studentship at UCL in collaboration with the UK National Physical Laboratory and UCL Hospital

Improving absorbed dose prediction for Molecular Radiotherapy with Machine Learning

UCL has a close collaboration with the UK National Physical Laboratory. As part of this collaboration, NPL is co-funding a PhD studentship.

Background

Molecular Radiotherapy (MRT) is a rapidly growing cancer treatment modality where molecules that bind to cancerous cells are labelled with a radionuclide and injected into the patient for targeted delivery of radiation. Multimodality imaging using CT and nuclear imaging (SPECT/PET) can be performed to quantify absorbed doses to the tumours and organs at risk. Nevertheless, personalised treatments have not yet made it into routine clinical use. This is partly due to a lack of standardisation and knowledge on the uncertainties in dosimetry calculations as well as increased resources needed, leading to a lack of evidence from large randomised clinical trials.



Machine learning techniques are under investigation for nuclear medicine dosimetry but have not yet been implemented clinically due to the lack of validation and knowledge on their potential benefits. In particular, deep learning models have been proposed as a way to increase the speed of the absorbed dose calculation step and decrease the need for imaging resources.

Project

The aim is to contribute towards the implementation of personalised treatment planning into clinical practice through the provision of accurate voxel-wise absorbed dose maps from SPECT and CT images. The student will compare conventional methods for absorbed dose map generation with state-of-the-art Machine Learning methods. As well as accuracy and precision of the various methods, sensitivity to acquisition protocol and reconstruction method will be investigated, with a view to optimise protocols.

The project will include the development and validation of a simulation framework for generating a realistic ground truth dataset using open source software [GATE](#) / [STIR](#) / [OpenDose](#) / [Dositest](#), based on existing clinical data from theragnostic studies at UCLH. Some experiments using phantoms will have to be performed at UCLH and NPL.

Location and supervision

This project is a collaboration between the Institute of Nuclear Medicine (INM), and the nuclear medicine group of the National Physical Laboratory. The student will be part of the UCL i4health Centre for Doctoral Training and the postgraduate institute (PGI) at NPL, and will benefit from a wide range of activities and opportunities.

The student will be primarily located at INM in the University College Hospital, near the UCL Bloomsbury Campus. Imaging facilities include SPECT-CT, PET-CT and PET-MRI scanners. A substantial proportion of the student's time will be spent at the NPL Teddington Campus for collaboration and experiments. The supervisory team will include Prof Kris Thielemans (UCL), Dr Sarah McQuaid (UCLH) and Dr Ana Denis-Bacelar (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.

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, additional research and/or programming experience would be an advantage. Depending on experience the student will be entered into either a 4-year PhD or a 1-year MRes+3-year PhD programme.

Funding

The funding covers an increased annual stipend (around £19,000) and tuition fees at the rate for UK nationals/residents only for 4 years. Funding is available to cover travel, conferences and consumables.

Application

Send an expression of interest and current CV to: k.thielemans@ucl.ac.uk and cdtadmin@ucl.ac.uk

Please quote Project Code: **UCL-NPL PhD Dosimetry** in the email subject line.

Make a formal application to via the UCL application portal <https://www.ucl.ac.uk/prospective-students/graduate/apply> . Please select the programme code **Medical Imaging TMRMEISING01** and enter Project Code UCL-NPL PhD Dosimetry under 'Name of Award 1' .

The closing date for application is **22 April 2022**. Interviewing will be soon after. The candidate would be expected to start 1st of October 2022 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 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 in Teddington, 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>