PhD Studentship

At University College London working with ESRF, and part of the Centre for Doctoral Training in Intelligent, Integrated Imaging In Healthcare (i4health)

STUDENTSHIP TITLE: *Synchrotron Imaging to inform models of whole organ behaviour in health and disease;* ***PRIMARY SUPERVISORS:*** *Profs. Rebecca Shipley and Peter D Lee; ESRF: Dr Paul Tafforeau*

Project Background

As part of a joint UCL-ESRF & collaborator project we are developing a method for using high-energy X-rays to create images of whole human organs at high resolution (ca. 1 µm) and in three dimensions, called HiP-CT. The 3D (and 3D plus time) images from this method will be used to simulate biophysical processes in the human body from blood and air flow to joint movement; allowing investigations into dynamics processes with real human organ geometries with a resolution up to 100 times greater than prior studies.

The images are generated using the European Synchrotron Radiation facility (ESRF) in Grenoble, where you will spend extended placements. This X-ray source offers the brightest and most coherent high energy beam in the world, allowing us to image entire human organs (including lung, heart, brain) with 25µm resolution, and then zoom in on cellular structures at ~1.2µm resolution without cutting the tissue. We have imaged human organs in health and disease (Covid-19 victims, see https://mecheng.ucl.ac.uk/HiP-CT).

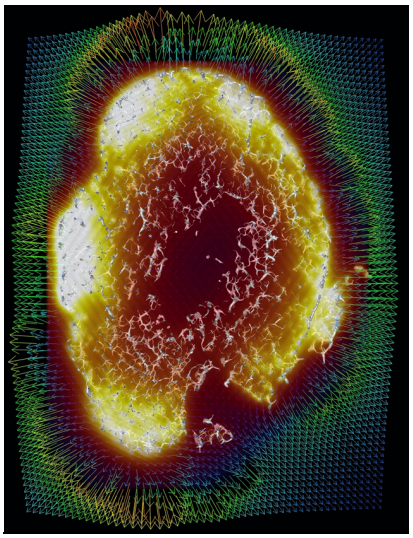
We have recently received a Chan Zuckerberg initiative grant to further develop this technique. You will be part of this international team of scientists, X-ray physicists and medics working to develop this technique and apply it to hopefully image organism development, whole organs, and finally the whole human body.

Your role will be to help develop ML segmentation techniques and then use the segmented synchrotron data as input for models of blood flow prediction, air flow prediction, and drug delivery. Models of joint motion are also possible, coupled to DVC measurement of nano-strains during mechanical loading, depending on the student's interests. The models will be used as a tool to infer insights about physiology and pathophysiology from the structural data sets.

The PhD project is jointly supervised by Profs. Rebecca Shipley and Peter D Lee (UCL) with Drs. Paul Tafforeau (ESRF) and Claire Walsh (UCL). You will be based either at UCL, but spend significant time at ESRF.

Person Specification:

Applicants should ideally have a first class undergraduate degree (or equivalent) in Physical Sciences (Computer Science, Engineering, Mathematics and Physics) with a preferred route through any core Engineering discipline (e.g. Bioengineering/Biomedical Engineering, Mechanical Engineering, Chemical, Electrical Engineering, etc.). All applicants must be able to demonstrate strong mathematical skills and ideally have experience in modelling Applicants should have an interest in bioengineering combined with medical imaging as this is core to our projects. Excellent organisational, interpersonal and communication skills, along with a stated interest in interdisciplinary research, are essential.



Predicted flow in a tumor. Project determine flow in entire organs

Closing Date and Start Date:

Applications considered on a rolling basis until position is filled. Latest start date available Sept 2021.

Value of award:

Full home student tuition fees and stipend of ca. £17,000 per annum (for up to 3 years, with possible 4th year if required.)

Eligibility:

The position is open to students on Home Fees and applicants whose first language is not English are usually required to provide evidence of proficiency in English by UCL. Please do not enquire about this studentship if you are ineligible. Please refer to the following website for eligibility criteria: https://www.ucl.ac.uk/prospective-students/graduate/research-degrees/mechanical-engineering-mphil-phd

Application Process:

Please send an expression of interest and current CV to Prof Shipley rebecca.shipley@ucl.ac.uk or peter.lee@ucl.ac.uk. Further details at ***http://bit.ly/HiP-CT_PhD02***