3 Year PhD Studentship available for September 2019

Department: Cardiovascular Sciences & Informatics

Supervisors:
Dr Emma Chung, Department of Cardiovascular Sciences, emlc1@le.ac.uk
& Dr Mohammad Reza Zare, Department of Informatics, mrz@le.ac.uk

Eligibility: UK/EU applicants only

Project Title: Intelligent Automated Interpretation and Reporting of Medical Images

Project Description:
Over the last decade, the quantity of digital medical imaging data held by NHS hospitals and other healthcare establishments has increased dramatically. Medical images are full of implicit information and conceptual insights and are a key component of healthcare screening, diagnosis and treatment. Currently, highly trained medical experts identify clinically relevant information from a wide range of medical images. Image interpretation is often context-dependent, time-consuming, and subjective, resulting in potential inconsistencies in the identification of pathology and misinterpretation of reports by other clinical colleagues.

The development of Artificial Intelligence and Machine Learning methods for automatically extracting and learning clinically relevant features contained in medical images is receiving increasing attention and provides an unprecedented opportunity to accelerate clinical workflows and improve patient care [1-3]. Automated interpretation of medical images has potential to significantly speed up the reporting of medical imaging data, to improve the quality and consistency of reporting, and to act as a second opinion for medical diagnosis. In addition to numerous novel clinical applications, machine learning could aid the identification of new imaging biomarkers for medical research and education. However, feature learning from medical imaging data, supported by machine learning, is only one aspect of clinical reporting. Contextualisation of this information and incorporation into clinical pathways will be key to avoiding bottlenecks in translation to the NHS, ensuring meaningful interpretation of images that maximise the impact of digital technologies, and provide relevant clinical information to staff and patients. These ‘smart reporting’ methods can only be achieved through development of algorithms in close partnership with NHS staff to embed machine learning support into referral procedures appropriate to the clinical context of the imaging. Interpretation algorithms should acknowledge potential differences in medical equipment, demographic factors, potential confounders relating to image quality, the clinical context of referral and implications for patients. This PhD is unique in having a focus on translation of machine learning to clinical practice, and development of
frameworks for ‘smart reporting’ of medical images capable of articulating complex conceptual information to medical staff and patients.

This PhD project aims to improve reporting of a range of medical conditions by working in partnership with UHL hospital staff to develop machine-learning approaches, especially deep learning, for automated image interpretation. The student will apply AI to data available through ImageCLEF 2019 ( https://www.imageclef.org/2019/medical/caption ) to automatically extract clinically valuable textual information for ‘smart reporting’ of medical images within the NHS and to provide a lay summary of imaging results suited to the patient’s understanding.

Dr Chung has a background in Medical Physics, including the evaluation of new image analysis methods within the NHS. Dr Zare is a Bioinformatics expert specialising in medical image analysis using machine learning tools. The student will gain skills in medical image processing, various handcrafted image representation techniques, different machine learning approaches and in particular deep learning. Importantly, the student will work in partnership with clinical imaging experts based within the University Hospitals of Leicester and the Midlands Medical Imaging Network (MMIN) to ensure translation of visual medical imaging features to clinically useful written reports and patient information. This project will suit an enthusiastic and dynamic student with a background in computer science and machine learning, who has good communication skills and an interest in multidisciplinary research.

References:
[1] Ionesco et al., Overview of ImageCLEF 2017: Information Extraction from Images, 2017
[2] Eickhoff et al., Image caption prediction and concept detection for biomedical images, 2017,

Funding details:
The College of Life Sciences (CLS) HDRUK Studentship will provide a tax-free stipend at RCUK rates (£15,009 for 2019/20) and UK/EU fees for 3 years.

Entry requirements:
Applicants are required to hold/or expect to obtain a data science related UK Bachelor Degree 2:1 or better (e.g. Computer Science, Bioinformatics, Biostatistics), and preferably also a similar MSc qualification. The University of Leicester English language requirements apply where applicable.

How to apply:
You should submit your application using our online application system.

Apply for a PhD in Cardiovascular Sciences Research

In the funding section of the application please indicate you wish to be considered for a CLS HDRUK Studentship
In the proposal section please provide the name of the supervisor and project you want to be considered for – please list both your first and second choices.

Project / Funding Enquiries: Dr Emma Chung emlc1@le.ac.uk

Application enquiries to pgradmissions@le.ac.uk

Closing date for applications: 3rd April 2019

Interviews are likely to be week commencing 8th or 15th April 2019