

Research Project

Name of Institution and department:

Department of Cancer Imaging,

School of Biomedical Engineering and Imaging Sciences

King's College London

Link to website:

<https://www.kcl.ac.uk/bmeis/our-departments/cancer-imaging>

<https://www.kcl.ac.uk/bmeis/about-us>

City and Country of Institution:

London, United Kingdom

RESEARCH GROUP

Brief description of the research group and of its mission:

The KCL Cancer Imaging Group within the School of Biomedical Engineering and Imaging Sciences (BMEIS), led by Prof. Vicky Goh, is the key academic radiology unit, physically located at Guy's, St. Thomas' and Evelina Hospitals in Central London.

A highly collaborative department, we work closely with national and international institutions, industry leaders and clinical academics to personalise treatment for each patient. We also have very strong links with the wider research groups with the BMEIS School – including senior academics in medical image computing and deep learning-based image analysis

- Our clinical academics are world-leaders who serve on national and international societies and committees, and have authored best practices around the world
- Our research spans preclinical development to multicentre clinical trials

- State-of-the-art imaging facilities (including access to state-of-the art Ultra High Field 7T MRI, 3T, 1.5T and 0.55T Research MRI systems)
- Close collaboration and support from industry leaders

Research Specialisms

- Biomarker development, methodology, treatment planning
- Disease phenotyping and response prediction, evaluation and prognosis
- Development and optimisation of hybrid imaging
- Image analysis, processing & optimisation, radiomics and artificial intelligence
- Radiotherapy imaging
- Multicentre clinical trials including programmes for clinical pathway development and optimisation

TITLE OF PROPOSED RESEARCH PROJECT

Exploring imaging biomarkers of brain health, cerebrovascular disease and aging in older adults from the large scale TwinsUK MRI study

OBJECTIVES

- The TwinsUK imaging study is an ongoing 'big-data' health project acquiring a rich variety of multi-organ MRI scans (brain, spine, heart, liver, body) of some 2500 individual twins, aged 40 and older. (>1000 participants have been scanned to date)
- These include comprehensive 3D scans of the brain, MR angiography of the brain vascular tree, gradient echo/SWI images sensitive to brain iron and diffusion (DTI) data.
- The twins have also been comprehensively assessed with wide variety of biochemical (e.g. blood biomarkers) and genetic tests (including whole-genome sequencing) and clinical assessments (e.g. blood pressure; cognitive and depression scores). Other details e.g. diet and medical histories are recorded in detail.
- The goal of this study is to use twin data to disentangle the genetic/heritable vs. environmental vs. lifestyle factors contributing to manifestations of healthy brain aging and conversely suboptimal brain health (particularly cerebrovascular disease, including small vessel disease) seen on MRI
- This could comprise a number of different analysis approaches including: radiological scoring (e.g. Fazekas grading), automated machine learning analyses (e.g. of brain atrophy, brain age and pathology), and heritability (e.g. ACE modelling).

APPLICANT'S DUTIES

The project will be tailored to the Fellow's interest but would involve:

- A short literature review on brain findings in cerebrovascular health and aging, including other twin cohorts as well as in other large population studies such as UK Biobank.
- Analysis of an aspect of the brain imaging data – which could include: assessment of small vessel disease – white matter changes, perivascular spaces; vascular tree morphology; assessments of brain iron from SWI; advanced connectivity/diffusion metrics from DTI data

APPLICANT'S BENEFITS

- This work would be expected to lead to presentation at key radiology/neuroradiology meetings, e.g. ASNR/ESNR and or neuroscience meetings – e.g. OHBM
 - A significant contribution to a peer-reviewed publication based on their data.
 - Although primarily a research post, the Fellow would be welcome to attend teaching sessions, clinico-radiological case conference meetings and observe clinical reporting sessions within the Department of Radiology at Guy's, St. Thomas' and Evelina Hospitals
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- Project Leader: Dr. Jon Cleary, Consultant Neuroradiologist and Adjunct Senior Lecturer (Associate Professor)
 - Members:
Dr. Liane Canas, AI+ Academic Senior Fellow , Department of Biomedical Computing
Dr. Marc Modat, Reader, School of Biomedical Engineering & Imaging Sciences