Information on Postgraduate Research Scholarship - Ref: VCS-FES-01-25			
Faculty:	Engineering & Science	**Department:**	Engineering
Lead Supervisors:	Gianluca Tozzi and Wim J.C. Melis		
Project Title:	**Quantum-AI Synergy for Next-Generation Imaging of Biological Tissues**		
Project Description:	This project aims to pioneer a novel computational paradigm leveraging quantum computing architectures to enable advanced Artificial Intelligence (AI)-driven processing of imaging data for biological tissues. Contemporary digital processing of high-volume, high-dimensional image datasets—ranging from clinical imaging such as computed tomography and magnetic resonance to laboratory-scale techniques like high-resolution X-ray tomography and hyperspectral imaging —faces substantial challenges in computational scalability, data integration, and real-time interpretability. With the accelerating growth in both the quantity and diversity of imaging modalities—each providing unique yet complementary spectral, spatial, and structural information—there is an urgent need for a transformative data processing framework. The inherent limitations of classical digital computation in handling complex correlations across modalities underscore the potential for quantum-enhanced representations and processing strategies. Quantum computing, by virtue of its ability to encode, superpose, and entangle high-dimensional data, offers a fundamentally new approach to image representation, fusion, and AI-enabled analysis. The central objective of this project is to develop quantum-native representations of biological tissue images, enabling efficient AI operations such as classification, segmentation, measurement, and multimodal data fusion. We hypothesise that mapping imaging data into quantum states will facilitate the execution of AI algorithms with superior computational efficiency, reduced energy requirements, and enhanced capability for cross-modal inference. These approaches are expected to outperform classical techniques, yielding novel insights into the structural and functional characterisation of biological tissues. Our team is at the forefront of imaging-based AI research, including identification of image similarities and feature selection within the optical domain. These capabilities, while powerful, are constrained by the physical and computational limitations of classical systems. Transitioning these insights into the quantum domain will unlock enhanced dimensionality, parallelism, and integrative capacity for processing diverse imaging datasets. Key project objectives include: 1. *Quantum Representation of Imaging Data:* Elucidate the foundational requirements for encoding different types of image modalities into quantum formats amenable to AI processing.		

	2. *Quantum-AI Synergy Exploration:* Identify and characterise suitable quantum properties that can be exploited to enhance AI methodologies. Conduct comparative analyses of alternative quantum encoding and processing schemes. 3. *Simulative Validation:* Integrate quantum representations with AI workflows in a quantum simulation environment to assess feasibility, robustness, accuracy, and efficiency across imaging tasks. 4. *Hardware Prospection:* Pending progress, propose a conceptual quantum hardware implementation tailored to support the developed algorithms and data architectures. In this project, the candidate will gain interdisciplinary expertise at the intersection of quantum computation, AI, and biomedical image analysis. Given the technological plateau of classical computing, this research aims to align processing paradigms with quantum physical principles, offering a future-proof approach to the increasingly complex landscape of imaging and AI of biological tissues.
Duration:	3 years, Full-Time Study or 6 years, Part-Time Study

Bursary available (subject to satisfactory performance):

Year 1: £20,780 (FT) or pro-rata (PT) Year 2: In line with UKRI rate Year 3: In line with UKRI rate

In addition, the successful candidate will receive a contribution to tuition fees equivalent to the university's Home rate, currently £5,006.00 (FT) or pro-rata (PT), for the duration of their scholarship. International applicants will need to pay the remainder tuition fee for the duration of their scholarship.

This fee is subject to an annual increase.

Person Specification of Essential (E) or Desirable (D) requirements:

Criteria:	**E or D**
Education and Training:	
• 1st Class or 2nd class, First Division (Upper Second Class) honours degree or a taught master's degree with a minimum average of 60% in all areas of assessment (UK or UK equivalent) in a relevant area to the proposed research project	**E**
• For those whose first language is not English and/or if from a country where English is not the majority spoken language (as recognised by the UKBA), a language proficiency score of at least IELTS 6.5 (in all elements of the test) or an equivalent UK VISA and Immigration secure English Language Test is required, if your programme falls within the faculty of Engineering and Science a language proficiency score of at least IELTS 6.5 overall with a minimum of 6.0 in all elements of the test or an equivalent UK VISA and Immigration secure English Language Test is required. Unless the degree above was taught in English **and** obtained in a majority English speaking country, e.g. UK, USA, Australia, New Zealand, etc, as recognised by the UKBA.	**E**
Experience & Skills:	

• Previous experience of undertaking research (e.g. undergraduate or taught master's dissertation)	**E**
• Ability to work independently and operate within a diverse team, exhibiting excellent organisational, IT and interpersonal skills	**E**
• A good understanding of key quantum principles, AI type image processing applications.	**E**
• Understanding of data representation and its relevance towards processing and computer hardware / architectures.	**D**
• Understanding of key physics and engineering principles as well as AI application challenges.	**D**
Personal Attributes:	
• Understands the fundamental differences between a taught degree and a research degree in terms of approach and personal discipline/motivation	**E**
• Able to, under guidance, complete independent work successfully	**E**
• Develop expertise in research with an increasing degree of autonomy, actively participate in established professional development framework activities and behave in a manner which reflects the University values and creates a positive environment for work and study	**E**
• Adhere to and promote the University's policies on EDI, Health & Safety and Information Security	**E**
• Support and promote the University's Sustainability policies, including the Carbon Management Plan, and carry out duties in a resource-efficient way	**D**
Other Requirements:	
• This scholarship may require Academic Technology Approval Scheme approval for the successful candidate if from outside of the EU/EEA	**E**
• The scholarship must commence by December 2025.	**E**

Closing date for applications:	***midnight UTC on 22/06/2025***
For further information contact:	*The lead supervisors via g.tozzi@greenwich.ac.uk and Wim.J.C.Melis@greenwich.ac.uk*

Making an application:

Please read this information before making an application. Information on the application process is available at: https://www.gre.ac.uk/research/study/apply/application-process. Applications need to be made online via this link. **No other form of application will be considered**.

All applications **must include** all the following information. **Applications submitted by the deadline not containing all these documents will not be considered.**

- **Scholarship Reference Number (* VCS-FES-01-25*)**– included in the personal statement section together with your personal statement as to why you are applying
- **a CV including details of 2 referees** *
- **academic qualification certificates/transcripts and IELTs/English Language certificate if you are an international applicant or if English is not your first language or you are from a country where English is not the majority spoken language as defined by the UK Border Agency** *

**upload to the qualification section of the application form. Attachments must be a PDF format.*

Before submitting your application, you are encouraged to liaise with the lead Supervisors on the details above.