

**Information on Postgraduate Research Scholarship - Ref: VCS-FES-08-22**

<b>Faculty:</b>	Engineering and Science	<b>Department:</b>	Computing & Mathematical Sciences
<b>Lead Supervisor:</b>	Dr. Mohammad Majid al-Rifaie		
<b>Project Title:</b>	Reducing scan time and radioactive exposure in nuclear imaging using swarm intelligence		
<b>Project Description:</b>	<p>This scholarship will support the PhD candidate to carry out frontier research in swarm led Tomographic Reconstruction (TR), which is the process of inferring the internal structure of an object from the projected images cast by penetrating radiation. TR plays an essential computational role in all medical imaging procedures (X-Ray CT, PET, MRI, Nuclear Medicine and ultrasound). It also has wide application in industry, science and mathematics. The reconstruction problem is similar to inferring the 3D structure of an object from its shadow or filling a grid of numbers given the row and column sums (a style of Japanese crossword).</p> <p>The PhD candidate will work under the supervision of Dr. Mohammad Majid al-Rifaie at the University of Greenwich, London. The supervisory team includes Dr. Hooman Oroojeni (University of Greenwich), along with Dr. Tim Blackwell (Goldsmiths University of London) and Dr. Bal Sanghera (Paul Strickland Scanner Centre, Mount Vernon Hospital).</p> <p>We are looking for an outstanding student to work with the team.</p> <p>The research will pioneer the development of new class of population-based algorithms tailored for few-view tomographic reconstruction. These techniques include: dispersive flies optimisation (DFO), particle swarm optimisation (PSO) and differential evolution (DE). The aim of the project is to evolve a tomographic reconstruction process founded on swarm intelligence algorithms and capable of clinically acceptable reconstructions. The proposed method will be comparable to conventional techniques for normal images but will surpass conventional techniques for situations where the number of projections is reduced. This work is substantiated by a body of work published by the supervisors.</p> <p>The short-term objective is to demonstrate feasibility and lay the foundation of a swarm-plausible framework over experimental phantoms such as the clinically important Shepp-Logan phantom and others.</p> <p>The team's long-term goal is to create a framework capable of reconstructing images from real-world clinical projections under few-view scenarios. This work benefits from the existing literature on swarm intelligence, optimisation in high dimensional search spaces, and</p>		

	<p>traditional and novel techniques in nuclear imaging. The ultimate goal is a reduction in scan time and radioactive exposure.</p> <p><b>### References</b></p> <p>al-Rifaie, M.M. and Blackwell, T., 2022, July. Swarm led tomographic reconstruction. In Proceedings of the Genetic and Evolutionary Computation Conference (pp. 1121-1129).</p> <p>al-Rifaie, M.M. and Blackwell, T., 2022. Swarm optimised few-view binary tomography. In International Conference on the Applications of Evolutionary Computation (Part of EvoStar) (pp. 30-45). Springer, Cham.</p> <p>al-Rifaie, M.M. and Blackwell, T., 2016, March. Binary tomography reconstruction by particle aggregation. In European Conference on the Applications of Evolutionary Computation (pp. 754-769). Springer, Cham.</p>
<b>Duration:</b>	3 years, Full-Time Study
<p><b>Bursary available (subject to satisfactory performance):</b>  Year 1: £17,668 plus London weighting where applicable (FT) or pro-rata (PT) Year 2: In line with UKRI rate Year 3: In line with UKRI rate</p> <p>In addition, the successful candidate will receive a contribution to tuition fees equivalent to the university's Home rate, currently £4,596 (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.</p> <p>This fee is subject to an annual increase.</p>	
<b>Person Specification of Essential (E) or Desirable (D) requirements:</b>	
<b>Criteria:</b>	<b>E or D</b>
<b>Education and Training:</b>	
<ul style="list-style-type: none"> <li>1<sup>st</sup> Class or 2<sup>nd</sup> 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 (<i>i.e. computer science, mathematics and/or physics</i>)</li> </ul>	<b>E</b>
<ul style="list-style-type: none"> <li>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 <b>and</b> obtained in a majority English speaking country, e.g. UK, USA, Australia, New Zealand, etc, as recognised by the UKBA.</li> </ul>	<b>E</b>
<b>Experience &amp; Skills:</b>	
<ul style="list-style-type: none"> <li>Previous experience of undertaking research (e.g. undergraduate or taught master's dissertation)</li> </ul>	<b>E</b>
<ul style="list-style-type: none"> <li>Strong Python and/or C++ programming ability</li> </ul>	<b>E</b>
<ul style="list-style-type: none"> <li>Knowledge or experience in imaging or tomographic image reconstruction</li> </ul>	<b>D</b>

<ul style="list-style-type: none"> <li>• Knowledge of swarm intelligence and evolutionary computation</li> </ul>	<b>D</b>
<b>Personal Attributes:</b>	
<ul style="list-style-type: none"> <li>• Understands the fundamental differences between a taught degree and a research degree in terms of approach and personal discipline/motivation</li> </ul>	<b>E</b>
<ul style="list-style-type: none"> <li>• Able to, under guidance, complete independent work successfully</li> </ul>	<b>E</b>
<b>Other Requirements:</b>	
<ul style="list-style-type: none"> <li>• This scholarship may require Academic Technology Approval Scheme approval for the successful candidate if from outside of the EU/EEA</li> </ul>	<b>E</b>
<ul style="list-style-type: none"> <li>• The scholarship must commence before <b>1 October 2023</b></li> </ul>	<b>E</b>
<b>Closing date for applications:</b>	<b>midnight UTC on 19<sup>th</sup> June 2023</b>
<b>For further information contact:</b>	<b>m.alrifaie@gre.ac.uk</b>
<p><b>Making an application:</b> Please read this information before making an application. Information on the application process is available at: <a href="https://www.gre.ac.uk/research/study/apply/application-process">https://www.gre.ac.uk/research/study/apply/application-process</a>. Applications need to be made online via this link. <b>No other form of application will be considered.</b></p> <p>All applications <b>must include</b> the following information. <b>Applications not containing these documents will not be considered.</b></p> <ul style="list-style-type: none"> <li>• <b>Scholarship Reference Number (VCS-FES-08-22)</b>– included in the personal statement section together with your personal statement as to why you are applying</li> <li>• <b>a CV including 2 referees *</b></li> <li>• <b>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 *</b></li> </ul> <p><i>*upload to the qualification section of the application form. Attachments must be a PDF format.</i></p> <p>Before submitting your application, you are encouraged to liaise with the Lead Supervisor on the details above.</p>	