Wolfson School of Mechanical, Electrical and Manufacturing Engineering

Loughborough University

Research Fellow in Digital Through-life Engineering

Job Ref: REQ260062

As part of the University's ongoing commitment to redeployment, please note that this vacancy may be withdrawn at any stage of the recruitment process if a suitable redeployee is identified.

The Wolfson School of Mechanical, Electrical and Manufacturing is one of the leading Engineering Schools in the country. With a strong tradition in Manufacturing for a broad range of industrial sectors (e.g., robotics, electronics, automotive, bioengineering & healthcare, food industry, etc.), we strive for academic excellence and research at the leading edge.

Project Description

Digital Through-life Engineering aims to develop innovative digital solutions to optimize value and cost of complex engineering systems across its life cycle. As part of the overall aim, this project will focus on developing self-engineering (SE) solutions using digital technologies and biological inspiration. A SE system is defined as: "An ability designed and built into a system to independently identify any loss or potential loss of function, and then automatically restore the functionality fully or partially to maintain its availability and improve system resilience." The four key characteristics for a SE system are:

1) It must have the ability to restore or partially restore lost function or capacity.
2) It must be built into the system.
3) The system should avoid or reduce maintenance, prolong life and/or increase the system resilience and robustness.
4) No human or operator intervention; any process, response and behaviour should be automatic.

Major use cases will involve robotic systems used in difficult to access environment. The project will investigate self-reconfiguration, self-healing, self-repair/community repair, and design for SE.

Key Requirements:

The candidate needs to have experience in:

- Robotic system development and programming
- Autonomous systems development
- Computer programming and system integration
- Understanding of system degradation and maintenance
- Experience of developing systems with biological inspiration
- Experience of acquiring, curating and analysing data derived from analytical techniques.
- Experience in high quality journal publication and research grant proposal development.
- Experience in industrial collaboration.
- Demonstrate excellent communication and interpersonal skills
- Demonstrated experience working in a lab, including the preparation of risk assessments and COSSH forms to ensure a safe working environment

Job Description

Job Grade: Specialist and Supporting Academic Grade 6

Job Purpose

To conduct research in the general area of Digital Through-life Engineering, especially focusing on self-engineering of complex engineering systems. The purpose of the role is to innovate novel approaches to self-reconfiguration, self-healing, self-repair and design for SE to optimize the life cycle value and cost of the systems.

Job Duties

- To define degradation and failure modes of robotic systems within difficult to access environment.
- To support the development of autonomous robotic systems test rigs within the laboratory environment based on the level of complexities.
- To develop simulation models for the robot degradation (e.g. using a Digital Twin) and calibrate with the test rigs
- To develop machine learning based self-reconfiguration, self-healing and self-repair/community-repair strategies to restore any lost function in use.
- To develop a technique to assess the quality of the self-reconfiguration, self-healing, and self-repair/community-repair strategies on the robotic system.
- To assist in demonstrating a novel Design for SE principles within the Test Rigs.
- To conduct research of academic rigour and scientific standard, carry out authoritative literature reviews, and publish in top quality journals, consistent with the School's quality and ambition.
- Demonstrate excellent self-management and organisational skills and a committed approach to work
- Write up regular progress reports and present outcomes to the Principal Investigator, making recommendations for next steps.
- To contribute ideas for new research and impact directions.
- Contribute actively to research proposal development.
- Develop industrial collaboration.
- To attend and contribute to conferences, seminars, webinars and other events of interest to the team.
- To contribute to project promotion and public engagement events.
- To always maintain confidentiality and ensure that intellectual property (IPR) generation is safeguarded, and agreements are not violated.
- To assist the Principal Investigator with the supervision of undergraduate, MSc or PhD project work and day-to-day supervision and support of other researchers.
- To engage in training programmes in the University (or elsewhere) that are consistent with the needs and aspirations of the project and those of the Lab.
- To undertake other duties as may be reasonably requested and that are commensurate with the nature and grade of the post.

Points To Note

The purpose of this job description is to indicate the general level of duties and responsibility of the post. The detailed duties may vary from time to time without changing the general character or level of responsibility entailed. Training will be provided as necessary and in support of the Researchers' professional development, and an attitude for learning will be an essential criterion in the selection of a successful candidate.

Special Conditions

All staff have a statutory responsibility to take reasonable care of themselves, others and the environment and to prevent harm by their acts or omissions. All staff are therefore required to adhere to the University's Health, Safety and Environmental Policy & Procedures.

All staff should hold a duty and commitment to observing the University's Equity & Diversity policy and procedures at all times. Duties must be carried out in accordance with relevant Equity & Diversity legislation and University policies/procedures.

Successful completion of probation will be dependent on attendance at the University's mandatory courses which include Belonging and Inclusion and, where appropriate, Recruitment and Selection.

Organisational Responsibility

Reports to Professor Rajkumar Roy, Principal Investigator of the project.

Person Specification

Your application will be reviewed with respect to meeting the essential and desirable criteria listed below.

Applicants are strongly advised to explicitly state and evidence how they meet each of the essential (and desirable) criteria in their application, giving examples of recent experience. You may use the **STAR** approach: explain what the **S**ituation was, which **T**ask you had to do or were allocated, what **A**ction you took, what you did and a justification, and what was the **R**esult. It is highly recommended that the candidates express in their Cover Letter how they fit to the Job Purpose and Job Duties described above. Stages of assessment are as follows:

1 – Application

2 – Test/Presentation

3 – Interview

Essential Criteria

	Criteria	**Stage**
Experience	Experience within a high-quality research and development environment	1, 3
	Authoring original work for academic journal papers, conference papers or technical reports	1
	Experience of autonomous robotic systems development within a laboratory environment	1, 3
	Knowledge of Health & Safety procedures, risk assessments, COSHH forms, safe disposal routes, etc	1, 3
	Experience of data curation, post-processing using acquired data and simulation.	1, 3
	Experience of programming in Python, MATLAB, ROS, etc.	1, 3
	Experience in systems integration	1, 3
	Demonstrate excellent self-management and organisational skills and a committed approach to work	1, 3
Skills and abilities	Ability to organise resources to support and further own research activities within the scope of their work, including liaising with third parties (e.g. industry)	1, 3
	Ability to work independently to meet deadlines	2, 3
	Excellent written and oral communication skills in English	1, 2, 3
	Ability to write research grant proposals and consortium building	1, 2, 3
	Excellent interpersonal and organisational skills	1, 3
	Ability to write project reports and make technical presentations to industrial and academic research groups	1, 3
Training	Evidence of having undertaken further training and a willingness to be trained if necessary to fulfil the requirements of the job	1, 3
Qualifications	PhD in a related subject (e.g. robotics, self-engineering, mechatronics, systems engineering, etc.)	1
Other	Commitment to observing the University's Equal Opportunities policy at all times.	3

Desirable Criteria

Area	**Criteria**	**Stage**
Experience	Experience in self-engineering techniques and Design for SE	1, 3
	Experience in modelling from biological inspiration	1, 3

Skills and abilities	A self-starter who can operate effectively with minimal supervision, liaising with other researchers on own initiative	3
	Presentation skills of technical and non-technical aspects of the project to various audiences (i.e. academic and industrial collaborators, and general public dissemination of results and impact)	1,3
	Industrial partnership development skills	1,3
Other	Able to travel to academic and industrial collaborators' sites	1,3

Conditions of Service

The position available is FULL-TIME and FIXED TERM for 3 years, until around 31 March 2029. Salary will be on Specialist and Supporting Academic Grade 6 (£35,608 to £46,049 per annum) at a starting salary to be confirmed on offer of appointment (based on the level of experience and achievements).

The appointment will be subject to the University's normal Terms and Conditions of Employment for Academic and Related staff/Operational and Administrative staff, details of which can be found here.

The University is committed to enabling staff to maintain a healthy work-home balance and has a number of family-friendly policies which are available at http://www.lboro.ac.uk/services/hr/a-z/family-leave-policy-and-procedure---page.html.

We also offer an on-campus nursery with subsidised places, subsidised places at local holiday clubs and a childcare voucher scheme (further details are available at: http://www.lboro.ac.uk/services/hr/a-z/childcare-information---page.html

In addition, the University is supportive, wherever possible, of flexible working arrangements and dynamic working when the tasks and assignments of the project can permit it.

We also strive to create a culture that supports equity and celebrates diversity throughout the campus. The University holds a Bronze Athena SWAN award which recognises the importance of support for women at all stages of their academic career. For further information on Athena SWAN see http://www.lboro.ac.uk/services/hr/athena-swan/