Wolfson School of Mechanical, Electrical and Manufacturing Engineering

Loughborough University

Research Associate in Aerospace Digitalization – Digital-twins with Embedded Tacit Knowledge

Job Ref: **REQ230291**

As part of the University's ongoing commitment to redeployment, please note that this vacancy may be withdrawn at any stage of the recruitment process if a suitable redeployee is identified.

Project Description

Loughborough University (AVRRC) is undertaking several research projects to develop digitalization applications for aerospace engineering and manufacture. These projects involve developing new digital engineering information systems to establish a seamless digital thread through concept, design, manufacture and into service operations. This research post is funded by the Royal Academy of Engineering and Airbus to assist Prof Roy Kalawsky - RAEng/Airbus Research Chair in Digital and Data Engineering Information Systems. An aspect of this research is developing new digitalization applications known as digital-twins. Digital-twins have emerged from more traditional engineering modelling and simulation activities, but their key difference is that the digital-twin mimics the behaviour and response as observed by the physical counterpart. However, current digital-twins are very much in their infancy and for them to be useful they need inclusion of tacit knowledge. Tacit knowledge is the inherent skill an expert has that has been accumulated over many years and is held in their heads but is not currently captured. Crucially, large companies are facing at least one third (or more) of their experienced work force leaving or retiring in the next three years which means capturing tacit knowledge is extremely urgent before fundamental knowledge is simply lost for ever. IT is hoped that by embedding tacit knowledge into digital-twins it will make them key for long service life assets in aerospace.

An RA is sought to join and contribute to ongoing projects being led by Prof Roy Kalawsky, specifically digital-twins with embedded tacit knowledge.

The research being undertaken at AVRRC includes:

1. Development of new digital-twins concepts
2. Investigation of methods to couple multiple digital-twins as part of a co-simulation environment. The idea here is that several digital-twins will be required spanning different levels of fidelity from surrogate to high fidelity models. Understanding how these different digital-twins will communicate with each other and with certain aspects of the physical counterpart is of significant research interest.
3. Investigating methods to mine tacit knowledge, possibly using something like a 'reversed engineered' ChatGPT (or similar tool) that could be trained on a series of questions that would interrogate experienced users.

Job Purpose

The Research Associate will be predominantly involved in research to investigate methods to couple multiple digital-twins as part of a co-simulation environment. The idea here is that several digital-twins will be required spanning different domains and at different levels of fidelity from surrogate to high fidelity models. Understanding how these different digital-twins will communicate through prototyping of digital-twins. The research will explore how tacit knowledge can be captured and whether something like a 'reversed engineered' ChatGPT (or similar tool) could be trained toon a interrogate experienced experts.

Job Duties

- To be responsible for conducting the day to day running of the research in collaboration with other team members.
- To be responsible for undertaking the main research activities as follows:
- To research and investigate methods to couple multiple digital-twins as part of a co-simulation environment.
- To research whether something like a 'reversed engineered' ChatGPT (or similar tool) could be trained on a series of questions that would interrogate experienced experts
- Develop and commission experimental test systems and characterise the performance of a range of prototype systems
- To assist in the dissemination of results arising out of the project.
- To work as a committed member of the project and university team.
- To write reports, papers and make presentations to industry and academia.
- To maintain confidentiality where appropriate and to ensure that intellectual property (IP) agreements are met.

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. There is an assumption that the successful applicant will be competent at programming in a modern computer language such as Python. This post for six months in the first instance.

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 Equality & Diversity policy and procedures at all times. Duties must be carried out in accordance with relevant Equality & Diversity legislation and University policies/procedures.

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

Organisational Responsibility

Reports to the Project Investigator, Professor Roy S. Kalawsky

Person Specification

Your application will be reviewed with respect to meeting the essential and desirable criteria listed below. Your application will be reviewed against 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. Stages of assessment are as follows:

1 – Application
2 – Test/Assessment Centre/Presentation
3 – Interview

Essential Criteria

Area	Criteria	Stage
Experience	Background in Engineering, Science or other suitable subject related to thermal engineering	1, 3
	Experience of developing code in a modern computing language such as Python. (Not novice level)	1, 3
	Experience of having produced technical reports	1, 3
Skills and abilities	Knowledge of modelling and simulation techniques, ideally digital-twins	1, 3
	Excellent written and oral communication and IT skills	1, 3
	Self-motivated with ability to meet deadlines	1, 3
	Excellent interpersonal, and organisational skills	1, 3
	Ability to work independently and as part of a team, interacting with different academic and industrial partners	1, 3
	Ability to write project reports and make technical presentations to industrial and academic research groups	1, 3
	Knowledge of relevant Health & Safety issues	1, 3
Training	Demonstrate evidence of having undertaken further training	1, 3
Qualifications	2:1 or Masters Degree in an engineering, or relevant computing subject	1, 3
Other	Commitment to observing the University's Equal Opportunities policy at all times.	1, 3

Desirable Criteria

Area	Criteria	Stage
Experience	Current or recent relevant work experience at post-doctoral level in an academic or industrial environment	1, 3
	Practical experience of working with modelling and simulation	1, 3
Skills and abilities	Authoring original work, in the highest quality refereed academic journals	1, 3
	Knowledge of aerospace engineering/manufacturing	1,3
	Working knowledge of a range of software packages and excellent ability in a programming language	1, 3

	Knowledge of systems engineering	1, 3
	Knowledge of model based systems engineering	1, 3
	Previous experience of producing reports	1, 3
	A strong publication track record	1, 3
Qualifications	A good honours degree in Engineering, manufacturing, or other suitable computing subject	1
Other	Travel / Able to travel Independently / Willing to work flexibly	1, 3

Conditions of Service

The position is FULL-TIME and FIXED TERM for 6 months in the first instance years (not extending beyond the project end date). Salary will be on Specialist and Supporting Academic Grade 6 (£33,348 to £43,155 per annum), at a starting salary to be confirmed on offer of appointment.

The appointment will be subject to the University's Terms and Conditions of Employment for STAFF GRADES 6 AND ABOVE, 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.

The University offers a wide range of employee benefits which can be found here.

In addition, the University is supportive, wherever possible, of flexible working arrangements.
We also strive to create a culture that supports equality 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/