Research Associate in Human-Robot Collaboration

Job Ref: REQ220513

As part of the University's ongoing commitment to redeployment, please note that this vacancy may be withdrawn at any stage of the recruitment process if a suitable redeployee is identified.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 Intelligent Automation Centre's mission is to deliver breakthroughs in productivity, agility, and resilience through fundamental research in automation and robotics. We believe in enabling people and organisations to remove traditional barriers to maximise their benefits from automation. We promote multi-disciplinary working bringing together expertise from manufacturing, mechanical, electrical and systems engineering, computer science, design, mathematics, and economics. We work very closely with our industrial, research & technology organisations and academic partners to deliver excellence from original conception through to industrialisation.

Project Description

The post will contribute to two EPSRC funded projects that both focus on enhancing human-robot collaboration for industrial applicants.

The Industrial Robots-as-a-Service (IRaaS) is a three-year research project co-funded by a consortium of Industrial partners. It presents the opportunity to investigate how to make automation more accessible particularly for small and medium size enterprises (SMEs). The ambition of IRaaS is creating automation services based on light-weight mobile robots that will significantly reduce the effort required to deploy, redeploy and changeover automation systems in different workplaces; from days to just minutes. Allowing human operators to collaborate seamlessly with robots is one of the key enablers to transform the responsiveness of traditionally difficult to change automation systems. One of the objectives is to proof that human-robot teams can jointly carry out complex collaborative tasks with an efficiency and quality exceeding those of monolithic dedicated systems.

The Made Smarter Innovation – Research Centre for Smart, Collaborative Industrial Robotics is a new multi-disciplinary, cross-sectorial research centre focused on delivering the next generation of automated factories. The centre will be let by Intelligent Automation Centre based in the Wolfson School of Mechanical, Electrical and Manufacturing Engineering at Loughborough University. It involves 5 universities (Loughborough, Bristol, Cranfield, Strathclyde, and Warwick) and >50 industrial and international partners. The centres mission is to create and set the national research agenda for smart, industrial automation and robotics, inform government policy, raise public awareness, and create breakthrough technologies. The consortium will jointly investigate transformative new automation concepts, respond to industry led challenges, and build a community to overcome current fundamental barriers and limitations for the wider adoption of automation in industry.

Job Description

Job Grade: Specialist and Supporting Academic Grade 6

Job Purpose
The purpose of this role is to conduct research in the area of human-robot co-manipulation. To investigate and create shared, distributed, and safe control methods for allowing mixed human-robot teams to collaboratively work together more naturally. To test and validate new methods in a lab-based setting with latest industrial robot arms and mobile platforms on use cases co-created with industry. To join a multi-disciplinary team of enthusiastic researchers working in the Intelligent Automation Centre located in the Wolfson School of Mechanical, Electrical and

Manufacturing Engineering. To publish results in high impact international journal papers and present at peer reviewed international conferences. *]*

Job Duties

- To be responsible for investigating new autonomous and distributed control algorithms to enable more natural human-robot interaction methods and more robust shared task control including but not limited to impedance control.
- To develop methods for detecting human intention from their interactions with objects and devices using multiple sensors (vision, force/torque, electromyography, electroencephalogram, etc.).
- To investigate and create contextual safety approaches for mixed human-robot industrial workspaces based on deep neural networks to recognise risk.
- To support and adopt a goal-oriented programming approach.
- To support and interface with the development of a real-time contextual awareness systems from multiple sensor services.
- To contribute to the creation of a simulation model to test the scalability and responsiveness of the IRaaS model.
- To contribute to the design, build and testing of a demonstration system using industrial robot arms and mobile robot platforms.

- Be responsible for conducting the day to day running of the project.
- To formulate detailed plans for the project based on broad guidance from the project team.
- To feed back to the project team on progress, to make recommendations for next steps.
- Write up regular progress reports and present outcomes to all Investigators and Collaborators.
- Travel to attend meetings and make presentations both within the project partners working group and to external stakeholders.
- To support the project team by enhancing relationships with existing collaborators and by assisting the establishment of relationships with new collaborators.
- To write research papers suitable for publication in high quality academic journals.
- To attend and contribute to conferences.
- To contribute to project promotion and public engagement events.
- Contribute ideas for new research and enterprise directions.
- Maintain confidentiality at all times and ensure that intellectual property (IPR) agreements are not violated.
- To assist the academic staff in the project team with the supervision of undergraduate MSc and PhD project work and day-today supervision and support of other researchers.
- Where appropriate, to deliver teaching, tutorial and laboratory sessions to students.
- Engage in training programmes in the University (or elsewhere) that are consistent with the needs and aspirations of the project and those of the Department.
- 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.

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 Professor in Manufacturing Automation and Robotics.

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 Robot Control development or related area.	1, 3
	Using higher-level object-oriented programming language such as Java, C++, Python, or equivalent.	1, 3
	Significant experience within a high-quality research or development environment.	1, 3
	Design and conduct experiments in a lab-based setting.	1, 2, 3
	Authoring original work for academic journal papers, conference papers or technical reports	1
Skills and abilities	Use and develop sensor data acquisition and analysis methods.	1, 3
	Position and force/torque control of robotic manipulators.	1, 2, 3
	Excellent written and oral communication skills.	1, 2, 3
	Self-motivated with ability to meet deadlines.	1, 3
	Excellent interpersonal, and organisational skills.	1, 3
	Working knowledge of ROS.	1, 3
	Working knowledge of word processing, presentation, and data analysis software packages.	1, 3
	Working knowledge of machine learning methods.	1, 2, 3
	Ability to write project reports and make technical presentations to industrial and academic research groups.	1, 2
	Knowledge of relevant Health & Safety issues.	1, 3
Training	Demonstrate 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 (or near completion) in Robotics, Control Engineering, Mechanical Engineering or Electrical Engineering or related disciple.	1
	2:1 (or higher) Bachelors or Masters level degree in Robotics, Control Engineering, Mechanical Engineering or Electrical Engineering or related disciple.	1
Other	Commitment to observing the University's Equal Opportunities policy at all times.	3

Desirable Criteria

Area	Criteria	Stage
Experience	Working with industry.	1, 3

	Research and development of new concepts and solutions for human-robot collaboration.	1, 2, 3
	Develop and/or assess safety critical systems.	1, 2, 3
	Developing substantial projects using ROS.	1, 3
	Developing proposals for funding from external agencies.	1, 3
	Experience of teaching and / or supervision of students in relevant areas.	1, 3
Skills and abilities	Authoring original work, in the highest quality refereed academic journals.	1
	A strong publication track record.	1
	Develop distributed control systems.	1, 3
Qualifications	Distinction or Merit Masters level degree in Robotics, Control Engineering, Mechanical Engineering or Electrical Engineering or related disciple.	1
Other	Able to travel to industrial collaborators' sites	1, 3

Conditions of Service

The position is full-time and fixed term for 36 months. Salary will be on Specialist and Support Academic, grade 6 £31,406 - £40,927 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 can be found here.

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

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.
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/

Applications

The closing date for receipt of applications is **5 June 2022.**