

Research Associate in 3D Machine Vision, Photogrammetry and Advanced Image Processing

Job Ref: REQ230035

As part of the University's ongoing commitment to redeployment, please note that this vacancy may be withdrawn at any stage of the recruitment process if a suitable redeployee is identified.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, at Loughborough University, aims to deliver breakthroughs in automation and robotics for industrial applications. Our research is focused on enabling organisations to remove traditional barriers that limit the uptake and benefits of automation, by enabling people to work closely and effectively with automation and robots. We promote multi-disciplinary working, bringing together expertise from robotics, engineering, computer science, and design. We also work very closely with a wide range of industrial collaborators to ensure the research we deliver has the greatest opportunity for real-world impact.

The Centre is based in a brand new purpose-built lab located in the heart of our campus. Within the lab academics and researchers work with industrial partners, sharing their complementary expertise to develop truly multidisciplinary research. Resources include a range of large industrial robot arms, machine vision and motion sensing equipment supported by a high end computational infrastructure.

Project Description

A creative researcher is required to support an exciting project that combines advanced 3D vision, high-speed image processing, and multi-camera metrology. Their work will contribute to a three recently funded projects: Industrial robotics as a service, the Midlands Centre for Data Driven Metrology, and the Research Centre for Smart, Collaborative Industrial Robotics; these multi-million-pound projects, brings together over 50 industrial and academic partners across the UK.

The programme of research will investigate the fundamental limits of workspace digitisation, aiming to create new technology that can detect, track and measure multiple people, parts and machines, in real-time (>50Hz) with sub-millimetre accuracy using sensors that can be deployed rapidly as services. Ideally, target items will be recognised, measured and tracked while in their natural state, i.e. without the addition of tags or other markers. This will require the development of algorithms and science to support the integration of a cutting-edge multi-sensor 3D measurement systems for industrial and factory workspace digitisation.

Job Description

Job Grade: Specialist and Supporting Academic Grade 6

Job Purpose [suggested wording to be tailored to specific role to provide a brief concise overview of the purpose of the role]

To conduct research in 3D vision, photogrammetry, and image processing, with the aim of creating an integrated system of cameras, sensors, computer hardware and the associated algorithms, to recognise and track objects, people, parts and other features of interest. This will be done within our dedicated laboratory that simulates a challenging industrial workplace, and the system must meet high demands in terms of speed, accuracy, and robustness. Working with our team you will be required to develop, test and validate the integrated technology, then demonstrate and publish results to our project partners, at international conferences and in high impact international journal papers.

Job Duties [suggested wording to include a breakdown of at least 3 project specific requirements of the role]

- To be responsible for investigating and formalising a new conceptual framework for integrating a network of 3D vision systems within large factor spaces.
 - To develop planning tools and algorithms to facilitate the optimal deployment of sensors, and enable calibration and registration of camera data using natural features in the workspace scene.
 - To investigate and create machine learning algorithms for robust feature extraction in real-time from human-robot collaborative work environments.
 - To investigate data fusion strategies, algorithms and processing pipelines to improve accuracy and increase measurement speed.
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- 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-to-day 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 Peter Kinnell

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	3D vision or photogrammetry for measurement of large objects, environments, or spaces.	1, 3
	Developing machine vision applications and image processing algorithms.	1, 3
	Design and conduct experiments in a lab-based or industrial setting.	1, 2, 3
	Authoring original work for academic journal papers, conference papers or technical reports	1
Skills and abilities	Machine vision camera integration, calibration, data acquisition and analysis.	1, 3
	Processing 3D point cloud data to register, combine, filter and extract features.	1, 2, 3
	Feature extraction from camera data using a variety of approaches.	1, 2, 3
	Excellent written and oral communication skills.	1, 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	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 in a relevant topic area: e.g., Robotics, Control Engineering, Mechanical Engineering, Electrical Engineering, Computer Science, or related discipline.	1
	2:1 Bachelors or Masters level degree in Robotics, Control Engineering, Mechanical Engineering, Electrical Engineering, Computer Science, or related discipline.	1
Other	Commitment to observing the University's Equal Opportunities policy at all times.	3

Desirable Criteria

Area	Criteria	Stage
Experience	Experience of deep learning for image processing applications	1, 3
	Research and development of robotics or autonomous systems.	1, 2, 3
	Using higher-level object-oriented programming language such as Matlab or Python.	1, 2, 3
	Developing substantial projects using ROS.	1, 3

	Developing proposals for funding from external agencies.	1, 3
	Using Blender or similar software to model camera and light interactions in 3D scenes.	1, 3
Skills and abilities	Working knowledge of ROS, Python	1
	A strong publication track record.	1
Other	Able to travel to industrial collaborators' sites	1, 3

Conditions of Service

The position is FULL TIME and FIXED TERM for 24 months. Salary will be on Specialist and Supporting Academic Grade 6, £32,348 - £42,155, 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 1-5/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 **12 February 2023**.