

Research Associate in computer vision and deep learning for sports video analysis

Automated football action event detection in football video

Job Ref: REQ190405

As part of the University's ongoing commitment to redeployment, please note that this vacancy may be withdrawn at any stage of the recruitment process if a suitable redeployee is identified.

Loughborough University is a top-10 research-leading university in the UK with world-class research facilities and environment in engineering and sciences. Department of Computer Science has an excellent research track record with projects funded by the EPSRC, Innovate UK, EU, NHS, Ministry of Defence, Home Office, national and international industry. In addition to having a strong track record of fundamental research in Computer Science, a particular focus of its research is applied research aimed at creating research and economic impact by supporting industry. The proposed project will mainly be conducted by staff of the Vision, Autonomous and Human- Computer Systems (VAHC) Research Group, who have strong expertise in computer vision, human motion analysis, deep learning, machine learning, robotics & autonomous systems. Dr Li is a key member of the VAHC research group. A range of ongoing projects on using deep learning and computer vision for human/object detection and tracking from videos/images for human behaviour analysis, sports video analytics, robot navigation can directly contribute to this project.

Project Description

Project Title: Automated football action event detection in football video

Player's performance data in football is essential for the match analysis and can have a huge impact on player and team performance. However existing player performance analysis relies on manual logging a large amount of action events (e.g. ball passing, shots) associated with the player, action location and its result (successful or not). Such detailed data currently have to be obtained by watching every game video, which is very time-consuming and subject to human judgement and errors.

The goal of this project is to employ cutting edge computer vision/deep learning technology to detect and track players and the football, recognise body limbs, and thus to derive performance relevant game event and motion data (e.g. running, kicking, ball passing) for football player analytics.

This project is funded by the Innovate UK. Loughborough University and Statmetrix Ltd are working together to develop a solution that will close the gap for automated sports video analytics. Statmetrix Ltd is an innovative sports technology company, providing a sound commercial proposition and route to market of this solution. We are looking for a motivated individual to join the project team. Ideally, candidates are expected to have practical experience in deep learning, computer vision, and human motion analysis from videos/ images with a PhD/MSc

degree or equivalent in these fields. Programming skills in Python, C/C++ and relevant packages are highly desirable.

The post holder will work within the Department of Computer Science under the supervision of Dr Li and Prof. Meng with expertise in computer vision, deep learning and human motion analysis and AI. You will also closely work with other academics, researchers and software engineers in the project consortium from both LU and industry partner Statmetrix. You will have access to various training and a wide range of facilities including HPC, high-spec deep learning machines, computer vision software platforms, and various cameras and embedded systems.

Job Description

Job Grade: Specialist and Supporting Academic Grade 6
Fixed-term for 11 months from 1st September 2019.

Job Purpose

To develop and implement algorithms for sensor-based situational awareness, collision avoidance and safety, hybrid control architecture, and path planning; to integrate the developed algorithms into the robot control system; to evaluate the developed system in simulation and on a real robot system.

Job Duties

- To undertake a literature and technology review on deep-learning based approaches for human and object tracking, pose detection and activity recognition.
- To conduct data pre-processing and augmentation, in preparation for the use of such data for training machine learning algorithms and deep learning models.
- To compare state-of-art tracking algorithms and implement a robust tracking model for multi-player tracking.
- To investigate DL-based pose recognition algorithms and train a pose detection model for football players.
- To investigate the use of DL for activity recognition in football games.
- To conduct evaluation of the developed models.
- To work effectively in collaboration with the technical teams of other researchers and the collaborating industry partners, in formulating practical solutions, meeting industry requirements and performance criteria.
- 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 the Project Principle Investigator Dr Baihua Li

Person Specification

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 Computer Science, or other related engineering areas	1	
	Experience in computer vision, deep learning and their applications	1, 3	
	Programming skills, e.g. Python, C/C++,	1	
	Experience in carrying on theoretic study using mathematically sound approaches	1	
	Experience working in an academic or industrial research environment	1	
	Authoring original work for academic journal/conference papers, or technical reports	1	
Skills and abilities	An appreciation and understanding of real-world requirements in computer vision applications	3	
	Ability to understand, apply and develop computer vision algorithms and deep neural network models	1,3	
	Ability of data processing	1,3	
	Excellent written and oral communication skills	1,3	
	Self-motivated with ability to meet deadlines	1,3	
	Excellent interpersonal, and organisational skills	3	
	Ability to take part in collaborative activities	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	PhD (or near completion) in Computer Science with specialisation in Computer Vision, Deep Learning, Machine Learning, or Image Processing	1
	Other	Commitment to observing the University's Equal Opportunities policy at all times	3

Desirable Criteria

Area	Criteria	Stage
Experience	Experience in using Deep Neural Networks in solving practical problems	1,3
	Ability to design and implement application specific, optimised, pruned, Deep Neural Networks	1,3
	Developing proposals for funding from external agencies	1,3

	Working in a high-quality academic research environment	1,3
	Experience of teaching and / or supervision of students in relevant areas	1,3
Skills and abilities	Working in PCs with GPU support or/and High-Performance Computing (HPC) platforms	1,3
	A strong publication track record	1
	Authoring original work, in the highest quality refereed academic journals	1, 3
Qualifications	PhD (or near completion) in Artificial Intelligence/Applications of Deep Neural Networks	1
Other	Able to travel independently	3

Conditions of Service

The position is full-time and fixed-term for a maximum of 11 months to end no later than 31 July 2020. Salary will be on Specialist and Supporting Academic Grade 6 (£30,395 - £32,236 per annum), subject to an annual pay award, at a starting salary to be confirmed on offer of appointment.

The appointment will be subject to the University's normal Terms and Conditions of Employment for Grades 6 and above 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 <https://www.lboro.ac.uk/services/hr/benefits/family/>

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 <https://www.lboro.ac.uk/services/hr/benefits/family/childcaresupport/>

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 **Friday 5th July**.