Loughborough University

Research Associates in Goal-Oriented Control Systems (2 Post)
Job Ref: REQ231348

As part of the University's ongoing commitment to redeployment, please note that this vacancy may be withdrawn at any stage of the recruitment process if a suitable redeployee is identified.

Job Description

The post holder will contribute to the exciting research programme of an awarded EPSRC Established Career Fellowship to Prof Wen-Hua Chen. It aims to develop fundamental control theory for next generation of control systems where the specifications are given in terms of what the system needs to achieve, rather than how to achieve as in traditional control systems. This was driven by the needs of moving from low levels of automation to high levels of automation. Such an example could be found in unmanned aircraft systems, autonomous driving, precision agriculture, and fully automated warehouse and factory. The fellowship will make ground-breaking through in developing new analysis and design tools for high levels of automation systems with proven properties. The research focus will be on the interplay between learning, uncertainty, controlled dynamics, information processing, decision making/control strategy, environment, and constraints (e.g. safety, physical, or legal). The post holder will have an opportunity joining an international leading team working on cutting edge research. He/she will have opportunities to collaborate with industrial partners and international leading universities. It is expected that the post holder shall have strong analytical skills, and are interested in working on challenging theoretic problems in the engineering context.

There is an opportunity for appointing **TWO** Post Doc Research Associates that are complementary with the current research profile in the Fellowship programme. It is expected that the appointee shall be working on either advanced control theory (e.g. Markov Decision Process, model predictive control, stability and performance under disturbance/uncertainty, multi-rate control, decentralised or hierarchical control), or on autonomy and computation aspects (e.g. temporal logic control, formal methods, model checking, optimisation, Monte Carlo tree search, and decision making). They will closely collaborate with other members of the core Fellow team. We are looking for candidates with strong skills in one or several areas: model predictive control, optimisation, reinforcement learning, control of Markov Decision Processes, reachable sets, temporal logic control, artificial intelligence or learning based control, hierarchical control systems, nonlinear control, and formal methods. Applicants do not necessarily have experience in unmanned vehicles, robotics, or autonomous systems although it would be desirable. The position is available until 01/2025 with a possible extension of 12 months.

Job Grade Research Grade 6

Job Purpose
The successful candidate will conduct research in developing analysis and design tools for high levels of automation systems.

Job Duties
- To develop modelling techniques and new problem formulations for Goal Oriented Control Systems including system specifications and operation constraints.
- To develop analysis tools for stability and performance of Goal Oriented Control Systems

- To develop tools to understand and capture the influence of environment disturbance and uncertainty on the high-level goals and fulfilment of constraints
- To develop new design methods for Goal Oriented Control Systems
- To implement and verify the proposed analysis and design methods using simulation and other available means
- To support and work with PhD students to implement the proposed tools on aerospace and automotive case studies.
- To collaborate and work with the Fellow, other research staff, and industrial and international partners.
- To write reports, conference and journal papers on the research outcomes and make presentations on the work to present to academic and other partners.
- To undertake such other duties as may reasonably be 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 PI. Prof. Wen-Hua Chen

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	Experience in control theory, autonomous systems, temporal logic, formal methods, learning based control, optimization, or robotics related research	1,3
	Experience in doing research related to any of the following topics: model predictive control, reinforcement learning, dual control, disturbance observer-based control, Markov Decision Process, temporal logic control, optimisation, advanced control theory, decision making, unmanned vehicles, abstraction, reachability, formal methods such as model checking, and learning based control	1,3
	Experience in carrying on theoretic study using mathematically sound approaches	1,3
	Experience of computer programming	1,3
	Experience in producing conference and journal papers	1,3
Skills and abilities	An appreciation and understanding of operational requirements of high levels of automation	1,3
	Ability to work independently and as part of a cross-disciplinary team	3
	Ability to take part in collaborative research activities	3
	Ability to communicate complex technical concepts and requirements	3
	Strong analytical skills with sound mathematical training	1,3
	Ability to design and develop analysis and design tools/algorithms for high levels of control/decision making systems	1
	Ability to take part in collaborative activities	
	A demonstrated ability to write research papers of high quality and make technical presentations to industrial and academic research groups	
Training	Demonstrate evidence of having undertaken further training	3
Qualifications	A PhD related to control engineering, computer science, or mathematics	1
Other	Commitment to observing the University's Equal Opportunities policy at all times.	1,3
	Willingness to travel for meetings and conferences sometimes internationally and requiring overnight stay	3

Desirable Criteria

Area	Criteria	Stage

Experience	Experience in developing and verifying autonomous functions, hierarchical control systems, stability for model predictive control, learned based control, or temporal logic control	1,3
	Knowledge of unmanned vehicles or related engineering contexts	1,3
	A strong publication track record	1
Skills and abilities	Strong analytical and programme skills	1,3
	A strong team player, and strong leadership skills for working with others	1,3
	Strong scientific writing skills	1,3
	Strong mathematical and problem-solving skills	3
Qualifications	A PhD in a subject related to theoretic study of control engineering, formal methods, safety, unmanned vehicles, and autonomous systems	1

Conditions of Service

The positions are FULL TIME and FIXED TERM until 01/2025 with a possible extension of 12 months. Salary will be on Research Grade 6, £33,966 – 44,263 per annum.

The appointment will be subject to the University's normal Terms and Conditions of Employment for Academic and Related 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 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 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.