Job description and selection criteria

Job title	Senior Researcher on Mobile Robotics: Enabling a Pervasive Technology of the Future
Division	MPLS
Department	Computer Science
Location	Wolfson Building, Parks Road, Oxford.
Grade and salary	Grade 8: £38,511 - £45,954 p.a.
Hours	Full Time
Contract type	Fixed term for 3 years from 1 August 2015, with a possibility of an extension for 2 years
Reporting to	Professor Marta Kwiatkowska
Vacancy reference	117991
Additional information	This is a re-advertisement; previous applicants need not apply.

Introduction

The University

The University of Oxford is a complex and stimulating organisation, which enjoys an international reputation as a world-class centre of excellence in research and teaching. It employs over 10,000 staff and has a student population of over 22,000.

Most staff are directly appointed and managed by one of the University's 130 departments or other units within a highly devolved operational structure - this includes over 6,500 'academic-related' staff (postgraduate research, computing, senior library, and administrative staff) and over 2,700 'support' staff (including clerical, library, technical, and manual staff). There are also over 1,600 academic staff (professors, readers, lecturers), whose appointments are in the main overseen by a combination of broader divisional and local faculty board/departmental structures. Academics are generally all also employed by one of the 38 constituent colleges of the University as well as by the central University itself.

Our annual income in 2012/13 was £1,086.9m. Oxford is one of Europe's most innovative and entrepreneurial universities: income from external research contracts exceeds £436.8m p.a., and more than 80 spin-off companies have been created.

For more information please visit www.ox.ac.uk/staff/about_the_university.html

MPLS Division

The Mathematical, Physical, and Life Sciences Division (MPLS) is one of the four academic divisions of the University.

Oxford is widely recognised as one of the world's leading science universities. In the 2008 UK Research Assessment Exercise over 70% of research activity in MPLS was judged to be world-leading (4*) or internationally excellent (3*), and Oxford was ranked first in the UK across the mathematical sciences as a whole.

The MPLS division's ten departments and three interdisciplinary units span the full spectrum of the mathematical, computational, physical, engineering and life sciences, and undertake both fundamental research and cutting-edge applied work. We have over 6,000 students and research staff, and generate over half of our funding from external research grants. Our research addresses major societal and technological challenges and is increasingly interdisciplinary in nature. We collaborate closely with colleagues in Oxford across the medical sciences, social sciences and humanities, as well as with researchers from around the world.

For more information, please visit:

http://www.mpls.ox.ac.uk/

Department of Computer Science

The Department of Computer Science was established in 1957, making it one of the longest-established Computer Science departments in the country. It is one of the UK's leading Computer Science Departments (ranked first in a number of international rankings). The Research Excellence Framework (REF) in December 2014 resulted in 74 members of the Department having 53% of their research activity ranked in the top category of 4* (world-leading). Overall, we received an average of 3.34 across the department (3* being internationally excellent). A significant majority of the Department are active in externally sponsored research, with both government and industrial funding. At present there are 69 members of academic staff and almost 100 research staff.

The Department has close links with government, industry, and other departments within the University. Among the latter are Mathematics, Engineering, Physics, Statistics and a number of life sciences departments. The Department is housed across multiple sites within the University's South Parks Road Science area, facilitating strong collaborative links with research groups and institutes in closely allied areas (including the Oxford Internet Institute and the Oxford e-Research Centre). This is an essentially inter-disciplinary activity which is at present attracting major funding from a number of sources. At present the Department holds over £50m in external research contracts.

Research in the Department is currently managed in seven themes:

- *Programming Languages and Software Engineering* (led by Professor Jeremy Gibbons, and including Professor Jim Davies) works on a wide variety of areas including model-driven development, functional programming, and static analysis;
- *Security* (led by Professor Bill Roscoe) specialises in cybersecurity (Professor Sadie Creese leads a new Cybersecurity Centre), protocol analysis, trusted computing, networking, and human-centred computing;

- *Automated Verification* (led by Professor Marta Kwiatkowska) covers probabilistic and software model checking (Professor Daniel Kroening), time and concurrency (Professor Joel Ouaknine, Professor James Worrell, and Professors Roscoe and Lowe), and hardware (Professor Tom Melham);
- *Computational Biology* (led by Professor David Gavaghan, and including Professors Kevin Burrage, Helen Byrne, and Blanca Rodriguez) is one of the world's leading groups building computational models of biological systems, and is particularly well-known for its work on the heart;
- *Foundations, Logic and Structures*, (leader Professor Samson Abramsky) which includes groups working on quantum information and computation (Professors Samson Abramsky and Bob Coecke), game semantics and verification (Professor Luke Ong), and constraints (Professor Peter Jeavons);
- *Information Systems* (led by Professor Ian Horrocks, and including Professors Michael Benedikt, Nando de Freitas, Boris Motik, Georg Gottlob, and Michael Wooldridge) has groups working on databases, knowledge representation and reasoning, multi-agent systems, and computational linguistics (Professor Stephen Pulman);
- *Algorithms* (led by Professor Leslie Ann Goldberg, and including Professors Paul Goldberg and Elias Koutsoupias) covering computational complexity, algorithmic game theory, and constraint satisfaction.

For more information please visit: http://www.cs.ox.ac.uk/

Summary of the University's Equal Opportunities Policy

The policy and practice of the University of Oxford require that all staff are afforded equal opportunities within employment. Entry into employment with the University and progression within employment will be determined only by personal merit and the application of criteria which are related to the duties of each particular post and the relevant salary structure. In all cases, ability to perform the job will be the primary consideration. Subject to statutory provisions, no applicant or member of staff will be treated less favourably than another because of age, disability, gender reassignment, marriage or civil partnership, pregnancy or maternity, race, religion or belief, sex, or sexual orientation.

Job description

Research topic	Quantitative Verification and Synthesis
Principal Investigator / supervisor	Professor Marta Kwiatkowska

Overview of the role

A Grade 8 postdoctoral Senior Researcher post is available to work on the Programme Grant project "Mobile Robotics: Enabling a Pervasive Technology of the Future" in the area of quantitative verification and synthesis, focusing on ensuring safety and trust for mobile autonomous systems. The post will be under the supervision of Prof. Marta Kwiatkowska, head of the Automated Verification Group, in collaboration with Profs. Paul Newman and Ingmar Posner (Oxford Engineering Science Dept.) and Prof. Niki Trigoni (Oxford Dept. of Computer Science).

The key objective of the Programme Grant project on Mobile Robotics is to endow machines with the fundamental capability of working synergistically with people in large, complex and time-changing environments, and for long periods of time. This programme grant has a vast industrial footprint, and impinges on, at a minimum, personal transport, security and defence, inspection, warehouse and factory automation, space exploration, built infrastructure monitoring, construction, logistics and agriculture. This cross-disciplinary project combines aspects of sensing, mapping, localisation, perception for action, learning from interaction and cooperation and verification.

The focus of the advertised post is on developing novel quantitative verification, strategy synthesis and software synthesis techniques, with application to autonomous driving, personal transport and space robotics. Areas of interest include: 1) probabilistic modelling of driver behaviour for semi-autonomous driving scenarios and validation on real data; 2) model-based quantitative verification against multi-objective specifications; 3) quantitative runtime verification and validation on real driving scenarios; 4) quantitative modelling of trust for human-robot interaction; 5) strategy synthesis from specifications, including obstacle avoidance; and 6) automated synthesis of software components from quantitative specifications.

More information about activities in quantitative verification and the partners of the Mobile Robotics Programme Grant can be found here:

http://qav.comlab.ox.ac.uk/projects/marta.kwiatkowska.php
http://www.cs.ox.ac.uk/marta.kwiatkowska/
http://mrg.robots.ox.ac.uk/
http://www.cs.ox.ac.uk/activities/sensors/index.html

The main duties are described below. The exact scope of the research will depend on the skills of the candidate appointed, who will be expected to fulfil the selection criteria defined below.

Responsibilities/duties

The role will require the postholder to undertake innovative research as defined by the project proposal and to work with colleagues to progress the objectives of the project.

The duties and responsibilities are as follows:

- Provide leadership for the research aspects of the quantitative verification group's projects as a whole in interaction with research staff at partner organisations.
- Develop research questions within a specific context, conduct individual research, analysing detailed and complex qualitative and/or quantitative data from a variety of sources, and generate original ideas by building on existing concepts.
- Develop and implement new research methodologies and materials, and coach other members of the group on these.
- Use scientific equipment in a laboratory environment.
- Lead software development in the area of quantitative verification and synthesis.
- Direct junior research assistants and doctoral students who are associated with the project by setting clear task objectives, organising, and delegating work.
- Write publications at the standard of the internationally leading venues.
- Present results at international conferences and grant review meetings.
- Raise research funds through grant applications, and manage own area of a larger research budget.

- Share responsibility for shaping the research group's plans and the writing of group-funding applications for new research projects.
- Liaise with funding bodies and provide information to project stakeholders and represent the research group at external meetings/seminars, either with other members of the team or alone.
- Carry out collaborative projects with colleagues in partner institutions, and research groups.
- Member of departmental committees advising on scientific and management matters for the department.
- Assist in the supervision of MSc students working on related projects.
- The postholder will have the opportunity to teach. This may include lecturing, small-group teaching, and tutoring of undergraduates and graduate students.
- The postholder will carry out any other duties as are within the scope, spirit and purpose of the job as requested by their line manager or the Principal Investigators.

Selection Criteria

Essential:

- A doctoral degree in computer science, mathematics or related discipline with post-qualification research experience
- Strong track record of high-quality publications in internationally leading venues in an area related to automated quantitative verification (such as CAV, TACAS, HSCC)
- Specialist knowledge of existing literature and research in the field of quantitative/probabilistic modelling, quantitative verification, game theory and controller synthesis
- Proven experience of software development in automated verification, such as constraint solving, automata-theoretic techniques and static analysis
- Ability to independently plan and manage a research project, including a research budget
- Ability to raise research funds through making grant applications
- Excellent communication skills, including the ability to write for publication, present research proposals and results, and represent the research group at meetings

Desirable:
- Experience of embedded systems and/or robotics
- Knowledge of machine learning and statistics
- A track record advising the research of doctoral students
- A track record of writing successful applications for research funding

Working at the University of Oxford

For further information about working at Oxford, please see:

http://www.ox.ac.uk/about_the_university/jobs/research/

Salary and Benefits

The post, which is a full time appointment funded by the department, is available for up to 3 years from 1 August 2015 (with the possibility of extension for a further 2 years) and has a salary on the University grade 08S scale (currently £38,511 - £45,954 p.a.). This includes membership of the University Superannuation Scheme (USS) and has an annual leave entitlement of 38 days per year (inclusive of all public holidays and university closed periods).

How to apply

If you consider that you meet the selection criteria, click on the **Apply Now** button on the 'Job Details' page and follow the on-screen instructions to register as a user. You will then be required to complete a number of screens with your application details, relating to your skills and experience. When prompted, please provide details of three referees and indicate whether we can contact them at this stage. You will also be required to upload a CV and supporting statement. The supporting statement should state how you would like to contribute to the project if you were appointed and describe what you have been doing over at least the last 10 years. This may have been employment, education, or you may have taken time away from these activities in order to raise a family, care for a dependant, or travel for example. Your application will be judged solely on the basis of how you demonstrate that that you meet the selection criteria outlined above and we are happy to consider evidence of transferable skills or experience which you may have gained outside the context of paid employment or education.

Please save all uploaded documents to show your name and the document type.

All applications must be received by **midday** on the closing date stated in the online advertisement.

Should you experience any difficulties using the online application system, please email recruitment.support@admin.ox.ac.uk

To return to the online application at any stage, please click on the following link www.recruit.ox.ac.uk

Please note that you will be notified of the progress of your application by automatic e-mails from our e-recruitment system. **Please check your spam/junk mail** regularly to ensure that you receive all e-mails.