Job description and selection criteria

Job title	Researcher on Reinforcement Learning
Division	MPLS
Department	Computer Science
Location	Wolfson Building, Parks Road, Oxford.
Grade and salary	Grade 7: £31,076 - £38,183 p.a.
Hours	Full Time
Contract type	Fixed term for 2 years
Reporting to	Professor Shimon Whiteson
Vacancy reference	129704
Additional Information	This is a re-advertisement; previous candidates need not apply

The role

This position is funded by a Starting Grant from the European Research Council. The goal of the project is to develop a new class of reinforcement learning and sample-based decision-theoretic planning methods that overcome fundamental obstacles to the efficient optimisation of control policies for autonomous agents. Creating agents that are effective in diverse settings is a key goal of artificial intelligence with large potential implications in robotics, e-commerce, information retrieval, traffic control, etc.
£31,076 - £38,183 p.a.
In particular, the aim is to develop principled, robust methods that are practical enough to use in real systems, e.g., to enable efficient optimisation of control policies in a robotic simulator followed by successful sample-efficient deployment on a physical robot. This requires coping with challenges such as robustness to rare events, efficient exploration, and automatic feature discovery.

The focus of the project is on methods for reinforcement learning, both policy-search and temporal-difference based, as well as closely related methods for sample-based decision-theoretic planning. Techniques such as stochastic optimisation, Bayesian optimisation,

Bayesian quadrature, and deep learning are expected to play a key role. The project will involve both theoretical work as well as extensive empirical analysis on challenging tasks in, e.g., robot control.

Research topic	Co-evolutionary Policy Search
Principal Investigator / supervisor	Professor Shimon Whiteson
Funding partner	European Research Council

Responsibilities

- Collaborate in the preparation of research papers for publication in the scientific literature.
- Contribute to the development and analysis of new algorithms within the project Scope.
- Test hypotheses and analyse scientific data from a variety of sources, reviewing and refining working hypotheses as appropriate.
- Present papers at conferences or public meetings.
- Act as a source of information and advice to other members of the group on scientific procedures and experimental techniques.
- Participate in regular meetings with colleagues in Oxford and elsewhere.
- Help with the organisation of seminars and workshops.
- Assist in the supervision of post-graduate students working on related projects.
- The post holder may have the opportunity to teach. This may include lecturing, small-group teaching, and tutoring of undergraduates and graduate students.
- The post holder may 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 PhD (or very close to completion) in Computer Science, or a related area
- A documented track record of the ability to conduct and complete research projects, as witnessed by published peer-reviewed work (according to the experience of the candidate) in machine learning and/or decision-theoretic planning (or a related area)
- Ability to manage own academic research and associated activities with an organised approach
- Ability to work independently, as well as collaborate with others
- Strong mathematical skills in probability and statistics
- Strong scripting and object-oriented programming skills
- Ability to contribute ideas for new research projects
- Excellent communication skills, including the ability to write for publication, present research proposals and results, and represent the research group at meetings.
- Good knowledge of the current state-of-the-art in machine learning

Desirable

- Good knowledge of the current state-of-the-art in reinforcement learning and decision-theoretic planning
- Experience conducting large-scale experiments with complex datasets and simulators
- Experience supervising PhD students and managing projects
- Experience of actively collaborating in the development of research articles for publication

About the University of Oxford

Welcome to the University of Oxford. We aim to lead the world in research and education for the benefit of society both in the UK and globally. Oxford's researchers engage with academic, commercial and cultural partners across the world to stimulate high-quality research and enable innovation through a broad range of social, policy and economic impacts.

We believe our strengths lie both in empowering individuals and teams to address fundamental questions of global significance, and in providing all of our staff with a welcoming and inclusive workplace that supports everyone to develop and do their best work. Recognising that diversity is a great strength, and vital for innovation and creativity, we aspire to build a truly diverse community which values and respects every individual's unique contribution.

While we have long traditions of scholarship, we are also forward-looking, creative and cutting-edge. Oxford is one of Europe's most entrepreneurial universities. Income from external research contracts in 2014/15 exceeded £522.9m and ranked first in the UK for university spin-outs, with more than 130 spin-off companies created to date. We are also recognised as leaders in support for social enterprise.

Join us and you will find a unique, democratic and international community, a great range of staff benefits and access to a vibrant array of cultural activities in the beautiful city of Oxford.

For more information please visit www.ox.ac.uk/about/organisation

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:

- *Algorithms* (led by Professor Leslie Ann Goldberg, and including Professors Paul Goldberg, Elias Koutsoupias, and Peter Jeavons) covers computational complexity, algorithmic game theory, and constraint satisfaction;
- *Automated Verification* (led by Professor Marta Kwiatkowska, and including Professors Daniel Kroening, Gavin Lowe, Tom Melham, Joel Ouaknine, and James Worrell) covers probabilistic and software model checking, time and concurrency, and hardware;
- *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* (led by Professor Samson Abramsky, and including Professors Bob Coecke and Luke Ong) includes groups working on quantum information and computation, game semantics, and verification;
- *Information Systems* (led by Professor Ian Horrocks, and including Professors Michael Benedikt, Bernardo Cuenca Grau, Nando de Freitas, Georg Gottlob, Thomas Lucasiewicz, Boris Motik, Stephen Pulman, and Michael Wooldridge) has groups working on databases, knowledge representation and reasoning, multi-agent systems, and computational linguistics;
- *Programming Languages and Software Engineering* (led by Professor Jeremy Gibbons, and including Professors Jim Davies, Marina Jirotka, Nigel Shadbolt, Niki Trigoni, and Hongseok Yang) covers model-driven development, functional programming, program analysis, cyber physical systems, social computing, and web science;
- *Security* (led by Professor Bill Roscoe, and including Professors Sadie Creese, Cas Cremers, Michael Goldsmith, and Andrew Martin) specialises in cybersecurity, protocol analysis, systems security, trusted computing, human-centred security, and networking.

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

The Mathematical, Physical, and Life Sciences Division (MPLS)

The Mathematical, Physical, and Life Sciences (MPLS) Division is one of the four academic divisions of the University. Oxford is widely recognised as one of the world's leading science universities. The disciplines within the MPLS Division regularly appear at the highest levels in world rankings. In the results of the six-yearly UK-wide assessment of university research, REF2014, the MPLS division received the highest overall grade point average (GPA) and the highest GPA for outputs. We received the highest proportion of 4* outputs, and the highest proportion of 4* activity overall. More than 50 per cent of MPLS activity was assessed as world leading.

The MPLS Division's 10 departments and 3 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. Our research addresses major

societal and technological challenges and is increasingly focused on key interdisciplinary issues. We collaborate closely with colleagues in Oxford across the medical sciences, social sciences and humanities, and with other universities, research organisations and industrial partners across the globe in pursuit of innovative research geared to address critical and fundamental scientific questions.

MPLS is proud to be the home of some of the most creative and innovative scientific thinkers and leaders working in academe. Our senior researchers have been awarded some of the most significant scientific honours (including Nobel prizes and prestigious titles such as FRS and FR.Eng) and we have a strong tradition of attracting and nurturing the very best early career researchers who regularly secure prestigious fellowships. The Division is also the proud holder of eight Athena Swan Awards (4 Silver and 4 Bronze) illustrating our commitment to ensure good practice and to encourage women in science at all levels in the division.

We have around 6,000 students and play a major role in training the next generation of leading scientists. Oxford's international reputation for excellence in teaching is reflected in its position at the top of the major league tables and subject assessments. MPLS academics educate students of high academic merit and potential from all over the world. Through a mixture of lectures, practical work and the distinctive college tutorial system, students develop their ability to solve major mathematical, scientific and engineering problems.

MPLS is dedicated to bringing the wonder and potential of science to the attention of audiences far beyond the world of academia. We have a strong commitment to supporting public engagement in science through initiatives including the Oxford Sparks portal (http://www.oxfordsparks.net/) and a large variety of outreach activities; these are crucial activities given so many societal and technological issues demand an understanding of the science that underpins them. We also endeavour to bring the potential of our scientific efforts forward for practical and beneficial application to the real world and our desire is to link our best scientific minds with industry and public policy makers.

For more information about the MPLS division, please visit: http://www.mpls.ox.ac.uk/

How to apply

Before submitting an application, you may find it helpful to read the 'Tips on applying for a job at the University of Oxford' document, at www.ox.ac.uk/about/jobs/supportandtechnical/.

If you would like to apply, click on the **Apply Now** button on the 'Job Details' page and follow the on-screen instructions to register as a new user or log-in if you have applied previously. Please provide details of two referees and indicate whether we can contact them now.

You will also be asked to upload a CV and a supporting statement. The supporting statement should explain how you meet the selection criteria for the post using examples of your skills and experience. This may include experience gained in employment, education, or during career breaks (such as time out to care for dependants).

Your application will be judged solely on the basis of how you demonstrate that you meet the selection criteria stated in the job description.

Please upload all documents **as PDF files** with your name and the document type in the filename.

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

Information for priority candidates

A priority candidate is a University employee who is seeking redeployment because they have been advised that they are at risk of redundancy, or on grounds of ill-health/disability. Priority candidates are issued with a redeployment letter by their employing departments.

If you are a priority candidate, please ensure that you attach your redeployment letter to your application (or email it to the contact address on the advert if the application form used for the vacancy does not allow attachments)

Should you experience any difficulties using the online application system, please email recruitment.support@admin.ox.ac.uk. Further help and support is available from www.ox.ac.uk/about_the_university/jobs/support/. To return to the online application at any stage, please go to: www.recruit.ox.ac.uk.

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

Important information for candidates

Pre-employment screening

Please note that the appointment of the successful candidate will be subject to standard pre-employment screening, as applicable to the post. This will include right-to-work, proof of identity and references. We advise all applicants to read the candidate notes on the University's pre-employment screening procedures, found at:

www.ox.ac.uk/about/jobs/preemploymentscreening/.

The University's policy on retirement

The University operates an employer justified retirement age for all academic and academic-related posts (grade 6 and above), for which the retirement date is the 30 September immediately preceding the 68th birthday. The justification for this is explained at: www.admin.ox.ac.uk/personnel/end/retirement/revisedejra/revaim/.

For **existing** employees any employment beyond the retirement age is subject to approval through the procedures: www.admin.ox.ac.uk/personnel/end/retirement/revisedejra/revproc/

There is no normal or fixed age at which **support staff** in posts at **grades 1–5** have to retire. Support staff may retire once they reach the minimum pension age stipulated in the Rules of the pension scheme to which they belong.

Equality of Opportunity

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. No applicant or member of staff shall be discriminated against because of age, disability, gender reassignment, marriage or civil partnership, pregnancy or maternity, race, religion or belief, sex, or sexual orientation.

Benefits of working at the University

Training and Development
A range of training and development opportunities are available at the University. Further details can be found at
www.ox.ac.uk/staff/working_at_oxford/training_development/index.html.

For research staff only: Support for Research Staff
There is a particularly wide range of support for career development for research staff.
Please visit: www.ox.ac.uk/research/support-researchers to find out more.

Pensions
The University offers generous occupational pension schemes for eligible staff members. Further details can be found at www.admin.ox.ac.uk/finance/epp/pensions/pensionspolicy/.

Information for international staff *(or those relocating from another part of the UK)*
A wealth of information is available on the University's International Staff website for staff who are relocating to Oxford from abroad, at
www.admin.ox.ac.uk/personnel/staffinfo/international/.

The University of Oxford Newcomers' Club
The Newcomers' Club is aimed at helping partners of newly-arrived visiting scholars, graduate students and academic members of the University to settle in and to meet people in Oxford.

Transport schemes
The University offers a range of travel schemes and public transport travel discounts to staff. Full details are available at www.admin.ox.ac.uk/estates/ourservices/travel/.

University Club and University Sports Facilities
The University Club provides social, sporting and hospitality facilities. It incorporates a Club bar, a cafe and sporting facilities, including a gym. See www.club.ox.ac.uk for all further details.

University staff can use the University Sports Centre at discounted rates, and have the chance to join sports clubs. Please visit www.sport.ox.ac.uk/oxford-university-sports-facilities.

Childcare and Childcare Vouchers

The University offers quality childcare provision services at affordable prices to its employees. For full details about the services offered, please visit www.admin.ox.ac.uk/childcare/. **NB: Due to the high demand for the University's nursery places there is a long waiting list.**

The University also offers nursery fee payment schemes to eligible staff as an opportunity to save tax and national insurance on childcare costs. Please visit www.admin.ox.ac.uk/childcare.

Disabled staff

The University is committed to supporting members of staff with a disability or long-term health condition and has a dedicated Staff Disability Advisor. Please visit www.admin.ox.ac.uk/eop/disab/staff for further details.

BUPA - Eduhealth

Bupa Eduhealth Essentials private medical insurance offers special rates for University of Oxford staff and their families www.eduhealth.co.uk/mini-site/.

All other benefits

For other benefits, such as free entry to colleges, the Botanic Gardens and staff discounts offered by third party companies, please see www.admin.ox.ac.uk/personnel/staffinfo/benefits/.