Job description and selection criteria

Job title	Research Assistant in 5G Security Architecture
Division	MPLS
Department	Computer Science
Location	Wolfson Building, Parks Road, Oxford.
Grade and salary	Grade 7: Salary £30,434 – £37,394 p.a.
Hours	Full Time
Contract type	Fixed term for up to 2 years (starting 1/11/15 – ending 31/10/17)
Reporting to	Professor Andrew Martin
Vacancy reference	120392

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 11,000 staff and has a student population of over 22,000.

Our annual income in 2013/14 was £1,174.4m. Oxford is one of Europe's most innovative and entrepreneurial universities: income from external research contracts exceeds £478.3m p.a., and more than 80 spin-off companies have been created.

Oxford is a collegiate university, consisting of the central University and colleges. The central University is composed of academic departments and research centres, administrative departments, libraries and museums. There is a highly devolved operational structure, which is split across four academic divisions, Academic Services and University Collections and University Administrative Services. For further information, please see: www.ox.ac.uk/staff/about_the_university/new_to_the_university/structure_of_university.

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

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/

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, 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	5G Security and Privacy Architecture
Principal Investigator / supervisor	Professor Andrew Martin
Funding partner	EU Horizon 2020

Overview of the role

The newly-funded 5G-ENSURE project is an EU Horizon 2020 project with partners across the European telecoms sector, in collaboration with the 5G-PPP which is establishing standards for 5G networking.

5G-ENSURE will define and deliver a 5G Security Architecture, shared and agreed by the various 5G stakeholders. It will specify, develop and release an initial set of useful and usable security enablers for 5G. These enablers will be selected for their relevance in addressing some of the foremost security concerns in order to generate the trust and confidence necessary for 5G to be widely adopted and to deliver its promises through innovative business applications. The 5GENSURE project will also initiate a 5G Security testbed vision and initial set-up in which the security enablers will be made available. Moreover, the potential of the developed 5G Security enablers will be showcased and demonstrated in the context of carefully selected 5G security use cases (e.g. use cases related to cybersecurity and aerospace).

Coupled with this, 5G-ENSURE will be closely linked to the overall 5G PPP programme through active participation in common activities and fora. Specifically, 5G-ENSURE will be the project that creates and animates a dedicated 5G PPP Security Working Group to coordinate the various security-related activities.

5G-ENSURE is led by a strong consortium bringing together the appropriate and complementary skills, including standards involvement and deep telco understanding, along with an extensive network of interested parties, and have a proven track record in coordination.

Responsibilities/duties

The Oxford team will particularly focus upon technical measures for the management and preservation of privacy. Holders of these two posts will:

- Manage own academic research and administrative activities. This involves small-scale project management in order to co-ordinate multiple aspects of work to meet deadlines. Specific duties will include:
  - Undertake analysis of the privacy aspects of the project use cases, having regard to regulatory and social impacts, and investigate the interplay of trust and privacy, ensuring that the one does not defeat the purposes of the other.
  - Ensure that the privacy analysis is carried through into the architecture, and undertake review and formal modelling as needed to verify properties of the resulting proposals.
  - Contribute to the formal modelling and analysis of the authentication mechanisms, investigate different mechanisms for protecting device identity and authentication credentials and carry out research to realize the concept of network supported identity for external services.
  - Investigate the effectiveness of the core proposed privacy-enhancing techniques in protecting privacy across multiple layers and with respect to multiple stakeholders; undertake formal analysis of the core proposed privacy-enhancing techniques; propose and develop the architectural building blocks for privacy-preserving lawful interception; propose and develop the protocols and mechanisms necessary to achieve dynamic levels of privacy for different applications; and investigate the use of advanced privacy-enhancing architectures
- Contribute to the dissemination of research results to the relevant scientific communities through presentation and attendance at selected meetings and conferences, and publication in key journals.

- Adapt existing and develop new scientific techniques.
- Test hypotheses and analyse scientific data from a variety of sources, reviewing and refining working hypotheses as appropriate.
- Develop ideas for generating research income, presenting detailed research proposals to senior researchers.
- Act as a source of information and advice to other members of the group on scientific procedures and experimental techniques.
- Help with the organisation of seminars and workshops
- Assistance in the supervision of post-graduate students working on related projects.
- The postholder may 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.

Those participating in the project will need to communicate regularly through electronic means and teleconferences. They will need to travel periodically to project meetings in various European locations, and to international scientific conferences to present work. Post-holders may also undertake teaching within the Collegiate University – for which additional payment may be made.

Selection Criteria

Essential:

- A PhD (or very close to completion) in a relevant aspect of Computer Science or a related field, or equivalent research experience.

- 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)
- Proven expertise in security/privacy when developing and/or evaluating distributed systems architecture
- A clear understanding of some current technical issues in security of mobile devices and/or privacy of user data in this context.
- Demonstrated ability to work as a self-organised member of a team, and to manage own academic research and associated activities, leading to published results.
- Excellent communication skills, including the ability to write for publication, present research proposals and results, and represent the research group at meetings.

Desirable:
- Ability to contribute ideas for new research projects and research income generation
- Understanding of Trusted Computing
- Technical knowledge of existing (3G/4G) mobile standards.
- Availability to begin work at project start date.

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. All applicants must read the candidate notes on the University's pre-employment screening procedures, found at:

https://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 related posts (any grade above grade 5), 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 outlined at:

http://www.admin.ox.ac.uk/personnel/end/retirement/revisedejra/revproc/

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, is funded by Horizon 2020 and is available from 1st November 2015 until 31st October 2017, and has a salary on the University grade 07S scale (currently £30,434 - £37,394 p.a.). This includes membership of the Universities 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 two 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 describe your rationale for applying for the post, and outline your relevant skills, experience and knowledge gained over at least the last 10 years. This may have been through 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.

Information for priority candidates

A priority candidate is a University employee who is seeking redeployment owing to the fact that he or she has 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
- explain in your covering letter how you meet the selection criteria for the post.

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.