BIG DATA INSTITUTE

<table>
<thead>
<tr>
<th>Job title</th>
<th>Postdoctoral Research Scientist in Statistical Machine Learning for Stratified Medicine</th>
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<tbody>
<tr>
<td>Division</td>
<td>Medical Sciences</td>
</tr>
<tr>
<td>Department</td>
<td>Nuffield Department of Medicine</td>
</tr>
<tr>
<td>Location</td>
<td>Big Data Institute, The Li Ka Shing Centre for Health Information and Discovery Old Road Campus, Headington, OX3 7LF</td>
</tr>
<tr>
<td>Grade and salary</td>
<td>Grade 7: £31,604 - £38,833 p.a (with a discretionary range to £42,418 p.a)</td>
</tr>
<tr>
<td>Hours</td>
<td>Full time</td>
</tr>
<tr>
<td>Contract type</td>
<td>Fixed-term to 31st March 2020</td>
</tr>
<tr>
<td>Reporting to</td>
<td>Professor Chris Holmes</td>
</tr>
<tr>
<td>Vacancy reference</td>
<td>133654</td>
</tr>
<tr>
<td>Additional information</td>
<td>Funded by the National Institute for Health Research (NIHR) through the Oxford Biomedical Research Centre (BRC)</td>
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<table>
<thead>
<tr>
<th>Research topic</th>
<th>Biostatistics and statistical machine learning</th>
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<tbody>
<tr>
<td>Principal Investigator / supervisor</td>
<td>Prof Chris Holmes</td>
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<tr>
<td>Project team</td>
<td>Prof Chris Holmes, Dr David Church</td>
</tr>
<tr>
<td>Project web site</td>
<td><a href="https://oxfordbrc.nihr.ac.uk/research-themes-overview/molecular-diagnostics/">https://oxfordbrc.nihr.ac.uk/research-themes-overview/molecular-diagnostics/</a></td>
</tr>
<tr>
<td>Funding partner</td>
<td>The funds supporting this research project are provided by the National Institute for Health Research (NIHR) through the Oxford Biomedical Research Centre (BRC)</td>
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Introduction

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, while providing all our staff with a welcoming and inclusive workplace that enables everyone to develop and do their best work. Recognising that diversity is our strength, 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 2015/16 exceeded £537.4m and we rank first in the UK for university spin-outs, with more than 130 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.

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

Medical Sciences

The Medical Sciences Division is an internationally recognized centre of excellence for biomedical and clinical research and teaching. We are the largest academic division in the University of Oxford

World-leading programmes, housed in state-of-the-art facilities, cover the full range of scientific endeavour from the molecule to the population. With our NHS partners we also foster the highest possible standards in patient care.

For more information please visit: www.medsci.ox.ac.uk

Nuffield Department of Clinical Medicine (NDM)... fostering your career in science

The Nuffield Department of Clinical Medicine (NDM) is one of the largest departments of the University of Oxford and is part of the Medical Sciences Division, with responsibility for a significant part of the teaching of clinical students within the Medical School.

NDM has significant financial turnover and complexity, resulting from its diverse research portfolio, its geographical spread and its close links with NHS funding and strategic teams involved in the development and delivery of increasingly integrated clinical research platforms. For more information please visit: http://www.ndm.ox.ac.uk/home

The Nuffield Department of Clinical Medicine has been presented with a Departmental Athena SWAN Silver award in recognition of the commitment made to promote gender equality through our organisational and cultural practices and our efforts to improve the working environment for both men and women. For more information please see our Departmental Athena SWAN pages: https://www.ndm.ox.ac.uk/working-for-ndm/aboutndmatheneswan/
Oxford Big Data Institute (BDI)

The Big Data Institute (BDI) is a state-of-the-art building at Oxford University's Old Road Campus, which opened in March 2017. This interdisciplinary research centre focuses on the analysis of large, complex, heterogeneous data sets for research into the causes and consequences, prevention and treatment of disease. To this end, BDI researchers will develop, evaluate and deploy efficient methods for acquiring and analysing information for large clinical research studies. These approaches will be invaluable in identifying the associations between lifestyle exposures, genetic variants, infections and health outcomes around the globe.

Research is conducted in 4 general themes: genomics, population health, infectious disease surveillance, and methodology (including informatics, statistics, and engineering). Big Data methods could transform the scale (breadth, depth and duration) and efficiency (data accumulation, storage, processing and dissemination) of large-scale clinical research. The work of the BDI requires people and projects that span traditional departmental boundaries and scientific disciplines, supported by technical resources to handle the vast quantities of data they generate.

Under the leadership of Professor Gil McVean (Director) and Professor Martin Landray (Deputy Director), the BDI will comprise around 350 researchers (approx. 30 research groups) drawn from a wide range of departments and will form an analytical hub, deeply connected to the wider experimental and clinical community in Oxford and beyond.

Wellcome Centre for Human Genetics (WCHG)

In the first decades of the 21st century, researchers are beginning to understand in detail how our genetic inheritance makes us who we are. At the Wellcome Centre for Human Genetics, our aim is to extend that understanding in order to gain a clearer insight into mechanisms of health and disease. Looking across all three billion letters of the human genetic code, we aim to pinpoint variant spellings and discover how they increase or decrease an individual's risk of falling ill.

The WCHG is a research institute of the Nuffield Department of Medicine at the University of Oxford, funded by the University, the Wellcome Trust and numerous other sponsors. It is based in purpose-built laboratories on the University of Oxford's Biomedical Research Campus in Headington, one of the largest concentrations of biomedical expertise in the world.

With more than 400 active researchers and around 70 employed in administrative and support roles, the Centre is an international leader in genetics, genomics and structural biology. We collaborate with research teams across the world on a number of large-scale studies in these areas. Our researchers expend close to £20m annually in competitively-won grants, and publish around 300 primary papers per year.

The WCHG has a strong cancer focus with research groups led by clinically qualified (Leedham, Church) and non-clinical PIs (Lewis, Chapman, Green) working on cancer genetics, tumour evolution and post-genomic functional studies. In addition, Dr David Wedge, an expert in cancer genome analysis based at the Oxford Big Data Institute, has an affiliation at the WCHG and works closely with the clinical and non-clinical researchers based there.

For more information please visit: http://www.well.ox.ac.uk/home
The position is linked to the CSML group in the Department of Statistics, [http://csml.stats.ox.ac.uk/](http://csml.stats.ox.ac.uk/), where Prof Holmes has a joint appointment. The CSML group undertake world leading research in modern statistical science and probabilistic machine learning. The post holder will have access to a desk in the CSML group with the expectation they attend and contribute to group meetings.

**The Department of Statistics**

The Department of Statistics at Oxford carries out world-leading research in computational statistics, statistical and population genetics, bioinformatics, core theoretical statistics, and probability. As part of the Oxford Mathematical Sciences submission, the Department was ranked first in the UK in the 2014 REF exercise; this included having the highest proportion and highest volume of research judged to be world-leading or internationally excellent.

This is an exciting time for the Department, which has just relocated to new premises on St Giles’ in the heart of the University of Oxford. Our newly-renovated building provides state-of-the-art teaching facilities and modern space to facilitate collaboration and integration, creating a highly visible centre for Statistics in Oxford.

The Department’s research grant portfolio is currently over £8m. Industrial partners from Pharma, Finance and the Information sector all also support research in the Department.

The Department’s research excellence has been recognised both collectively through success in REF 2014 and individually. Recent awards include Fellowships of the Royal Society to Professors Peter Donnelly and Alison Etheridge, FMedSci to Professor Donnelly, the Weldon Memorial Prize to Professors Donnelly and Gilean McVean, the Guy Medal in Bronze to Professor Chris Holmes, the Francis Crick Prize Lecture to Professor McVean, and the Genetics Society Balfour Prize to Professor Simon Myers. Other recent achievements include the election of Professor Gesine Reinert as an Institute of Mathematical Statistics Fellow, and publication by Professor Jonathan Marchini of an article among the top ten most downloaded in *PLOS Genetics* of all time.

The Department of Statistics offers an undergraduate degree (BA or MMath) in Mathematics and Statistics jointly with the Mathematical Institute and an MSc in Statistical Science, as well as a lively and stimulating environment for postgraduate researchers (DPhil or MSc by Research). The Department leads two Centres for Doctoral Training (CDTs): the EPSRC/MRC CDT in Systems Approaches to Biomedical Science and the EPSRC/MRC CDT in Next Generation Statistical Science, a joint programme in Statistics with the University of Warwick. The Department is also part of the National Academy for PhD Training in Statistics, which provides graduate training in fundamental areas of Statistics and Applied Probability. Our students go on to work in a wide range of occupational sectors throughout the world, including higher education.

The Department leads and participates in many interdisciplinary research centres, including the Wellcome Trust Centre for Human Genetics, where Professor Donnelly is Director, and the Big Data Institute, part of the Li Ka Shing Centre for Health Information and Discovery, where Professor McVean is Director. We are a founding partner in the Alan Turing Institute (ATI), the UK’s new national data science centre, which is bringing together world-leading expertise in the emerging field of data science.
The Department continues to grow and is now flourishing in its new home under the leadership of Professor Charlotte Deane, whose own research in structural bioinformatics links the Department to many pharmaceutical and other biotech partners.

For more information please visit: www.stats.ox.ac.uk.

The Department of Statistics holds a bronze Athena Swan award to recognise advancement of gender equality: representation, progression and success for all.

Overview of the role

We are looking for a postdoctoral scientist to undertake research in statistical machine learning methodology within the broad area of stratified medicine, and molecular diagnostics for cancer in particular. This post holder will research novel statistical methods for the integrated analysis of multiple genomic data linked to clinical outcomes. It is expected that the methods developed will have wider applicability within the field of statistical machine learning, genomics and stratified (precision) medicine.

You will work within Chris Holmes’ research group and be predominantly based at recently opened Big Data Institute, https://www.bdi.ox.ac.uk/ but will have access to a desk at the CSML group http://csml.stats.ox.ac.uk/ in the department of Statistics to engage with researchers and will be expected to attend and contribute to group meetings. The post holder will also work in close collaboration with Dr David Church, based in the nearby Wellcome Centre for Human Genetics. There will also be opportunities to engage with researchers in the Centre for Statistics in Medicine https://www.csm.ox.ac.uk/.

The position is funded under the cross cutting Molecular Diagnostics Theme within the BRC which aims to advance the delivery of precision cancer medicine. One specific sub-theme within this, “Precision Biomarkers”, addresses the challenge of defining the effects of genomic and other markers which occur at only modest frequency in tumours or germline DNA. Such tumour markers already account for most cancer variants discovered in genome sequencing studies, and are predicted to increase substantially as more cancers are sequenced during the next decade. Uncommon constitutional DNA variants may also predict substantial or life-threatening toxicities from common therapeutics, including those used against cancers, although known risk variants explain only a small fraction of adverse effects in patients. While rare biomarkers may have a strong prognostic or predictive effect, it is hard to provide conventional levels of evidence for this, with the exception of cases in which the “biomarker” is itself a therapeutic target.

Statistical machine learning methods hold great promise for the identification of such potential biomarkers and the analysis of their association with clinical outcomes. Access to randomised clinical trial data will also facilitate causal models of interaction through the randomised treatment intervention.

The research team have access to a word-class data sets from biorepositories of tumour and normal samples from participants in national and international clinical trials (VICTOR, QUASAR2, SCOT, FOCUS4, ProMPT, ProtecT, FLAIR, AML18, AML19, MUK9, MUK10, CHOP-OR) for which molecular analysis has either been performed or is underway. In addition, the post-holder will work with data generated by previous and current tumour genome sequencing projects, including the Genomics England 100,000 Genomes Project (in which Dr Church co-leads the Endometrial Cancer sub-domain) and other work funded by the BRC locally in Oxford, and by collaborators internationally. You will be supported in getting to grips
with these data repositories and collaborate with other members of the Molecular Diagnostics Theme at the Oxford Big Data Institute (BDI), and the Department of Oncology.

The posts are funded by NIHR through the Oxford BRC. The BRCs aim to drive innovation in the prevention, diagnosis and treatment of ill-health and to translate advances in biomedical research into benefits for patients. Further details may be found here: NIHR BRC. This research program will build upon the infrastructure of the national 100,000 genomes project (https://www.genomicsengland.co.uk/), focusing on the strengths of the University of Oxford in the areas of colorectal, prostatic, haematological, endometrial and testicular cancers.

**Responsibilities/duties**

- Undertake research in statistical machine learning methodology to identify and characterise precision biomarkers using well characterised clinical data sets.
- To assist in the development of statistical and machine learning solutions for integrated analysis of multidimensional "omics" datasets analysis linked to clinical outcomes.
- To present results and analyses to the BRC partners and externally.
- To keep accurate and comprehensive records of data analyses, methods used and work.
- To engage in discussions with research scientists on the analysis strategy
- To maintain confidentiality regarding research data when interacting with non-collaborating researchers.
- If appropriate, to assist with related teaching and other work for the Department that takes into account the post-holder's career aspirations and development aims.
- To collaborate in the preparation of research publications, and book chapters.
- To present papers at conferences or public meetings.
- Participate in and support public engagement activities on behalf of the group and Centre (anticipated to be around 2 days per year).

**Selection criteria**

**Essential**

- A PhD in Statistics, Statistical Machine Learning, Biostatistics, Statistical Genetics or similar subject.
- An understanding and strong potential to implement novel statistical and machine learning techniques in clinical studies/genomic research
- Experience in high-dimensional data analysis, integration and interpretation, preferably in human disease and cancer in particular.
• Working knowledge of statistical software packages such as R/BioConductor, MATLAB and scripting skills in languages such as Python, Perl or Awk.

• An active interest in undertaking scientific research and the ability to learn new techniques and apply them to a high standard.

• Extensive research experience and an ability to develop research projects.

• The ability to work closely with others, while taking personal responsibility for assigned tasks. Ability to collaborate effectively with other computational and wet-lab scientists.

• The proven ability to communicate technical advice and intellectual support and assist others in tools relating to data processing and analysis.

• Enthusiasm for and a desire to make a career in statistical machine learning within the medical sciences.

• Excellent interpersonal, communication and team working skills, along with good spoken and written English.

Desirable

• Experience of conducting complex applied statistical analyses.

• Experience with model building and algorithm development, in particular using Bayesian methods.

• Knowledge of modern computational statistics and/or machine learning approaches.

• Experience in High Performance Computing Environment.

• A publication record in peer-reviewed journals.

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_the_university/jobs/research/

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.
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 (EJRA) for all academic posts and some academic-related posts. From 1 October 2017, the University has adopted an EJRA of 30 September before the 69th birthday for all academic and academic-related staff in posts at **grade 8 and above**. The justification for this is explained at:

www.admin.ox.ac.uk/personnel/end/retirement/acrelretire8+/

For **existing** employees, any employment beyond the retirement age is subject to approval through the procedures: www.admin.ox.ac.uk/personnel/end/retirement/acrelretire8+/

From 1 October 2017, there is no normal or fixed age at which staff in posts at **grades 1–7** have to retire. Staff at these grades may elect to retire in accordance with the rules of the applicable pension scheme, as may be amended from time to time.

### 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

University Club and sports facilities

The University Club provides social, sporting and hospitality facilities. It incorporates a bar, café and sporting facilities, including a gym. Staff can also use the University Sports Centre on Iffley Road at discounted rates, including a fitness centre, powerlifting room, and swimming pool. See: www.club.ox.ac.uk and www.sport.ox.ac.uk/oxford-university-sports-facilities.

Information for international staff (or those relocating from another part of the UK)

If you are relocating to Oxfordshire from overseas, or elsewhere in the UK, the University's International Staff website includes practical information related to moving to and settling in Oxford such as advice on immigration, relocation, accommodation, or registering with a doctor. See: www.internationalstaffwelcome.admin.ox.ac.uk/

The University of Oxford Newcomers' Club

The University of Oxford Newcomers' Club is an organisation run by volunteers that aims to assist the partners of new staff to settle into Oxford and to provide them with an opportunity to meet people in the area. See www.newcomers.ox.ac.uk/

Childcare

The University has excellent childcare services with five University nurseries, as well as University-supported places at many other private nurseries. For full details including how to apply and the costs, see www.admin.ox.ac.uk/childcare.

Family-friendly benefits

The University subscribes to My Family Care (www.admin.ox.ac.uk/personnel/staffinfo/benefits/family/mfc/) and staff are eligible to register for emergency back-up childcare and adultcare services, a 'speak to an expert' phone line and a wide range of guides and webinars through a website called the Work + Family space.

Disabled staff

We are committed to supporting members of staff with disabilities or long-term health conditions. Please visit www.admin.ox.ac.uk/eop/disab/staff for further details including information about how to make contact, in confidence, with the University’s Staff Disability Advisor.

Staff networks

The University has a number of staff networks including the Oxford Research Staff Society, BME staff network, LGBT+ staff network and a disabled staff network. You can find more information at www.admin.ox.ac.uk/eop/inpractice/networks/

Other benefits

Staff can enjoy a range of other benefits such as free visitor access to the University's colleges and the Botanic Gardens as well as a range of discounts. See www.admin.ox.ac.uk/personnel/staffinfo/benefits