

Job description and selection criteria

Job title	Post-Doctoral Research Associate in Machine Learning/Machine Learning Scientist
Division	Medical Sciences
Department	Nuffield Department of Women's & Reproductive Health
Group / Unit	Deep Medicine Programme
Location	Deep Medicine, Hayes House, 75 George Street, Oxford OX1 2BQ
Grade and salary	Grade 8: £45,585 – £54,395 (with a discretionary range to £59,421) per annum
Hours	Full-time/Part-time minimum of 0.6 FTE. (applications for flexible working arrangements are welcomed and will be considered in line with business needs)
Contract type	Fixed term for 24 months
Reporting to	Dr Shishir Rao and Professor Kazem Rahimi
Vacancy reference	173110

The Post

Overview of the Role

We invite applications for the position of Postdoctoral Research Associate in Machine Learning/Machine learning Scientist to join the Deep Medicine programme at the Nuffield Department of Women's and Reproductive Health (NDWRH), University of Oxford. The successful candidate will join a multi-disciplinary group of machine learning scientists, epidemiologists and clinicians at Deep Medicine who lead pioneering artificial intelligence (AI) research in precision medicine with a focus on multiple long term conditions (MLTC) and cardiovascular health.

This prestigious research position is set to lead ground-breaking work in interdisciplinary MLTC research. The role will provide a unique opportunity to perform cutting-edge research into various aspects of chronic disease and MLTC progression, and be challenged and grow in a multi-disciplinary environment, and develop a high-profile academic career by taking a leadership role while working alongside other junior and senior researchers within Deep Medicine and proactively collaborating with other project leads and researchers from both within and external to the University of Oxford.

Project

The objective is to develop and enhance a range of Transformer-based models to predict the risk of key clinical outcomes, such as all-cause mortality and cardiovascular events and undertake subsequent analyses of the models for hypothesis generation in the context of MLTC. At the onset, the focus will be to develop robust AI models for prediction as compared to established benchmarks. The focus will then shift to explainability and association studies. These are designed to unravel the decision-making process of the models, identify new risk factors, assess the potential for algorithmic bias, and generally, clarify aspects of the "black-box" nature of AI modelling in healthcare. Initially, modelling will involve analysing diverse multi-modal electronic health record (EHR) datasets. Future studies will aim to integrate various "Omics", image-driven, and other orthogonal clinical datasets into the models.

Top of Form
Bottom of Form

Work to date

Deep Medicine is internationally acclaimed for its use of advanced statistical techniques, along with machine learning and deep learning, to explore cardiovascular health-related questions. This initiative extends from foundational work in developing sophisticated AI methods for managing multimodal, high-dimensional electronic health record (EHR) data, crucial for maximizing the impact of this collaboration. Notably, Deep Medicine has been at the forefront of using Transformer-based models for complex EHR analysis. Utilizing powerful Transformer architecture modelling for rich feature capture in raw, minimally processed EHR, the team's research has advanced the fields of risk prediction modeling, explainability, and the identification of risk and protective factors.

The researcher

The researcher is expected to lead, build upon and advance this work in order to integrate various EHR data sources and other "omics" database and build multi-type and multi-modal AI solutions for risk prediction. Working with some of the largest and most comprehensive EHR, in the world, such as CPRD and UK Biobank as well as more niche "Omics" datasets, the project provides a unique opportunity to apply advanced techniques from machine learning and conduct high-impact research, while contributing to the broader goals of Deep Medicine. The researcher is expected to take ownership of the project, propose novel methods, models and applications of ML/DL, write protocols for studies, present the ideas within the group, have advanced coding and data processing skills to execute the ideas in a timely manner and publish the results in high impact ML conferences and medical journals such as ICML, NeurIPS,

Lancet, JAMA, BMJ, and Nature Machine Intelligence. As a senior researcher the holder of the position is expected work with other senior researchers within the team and lead grant applications on related topics.

Key Relationships

The successful applicant will report to Dr Shishir Rao and Professor Kazem Rahimi. The researcher will also work closely with DPhil researchers in the lab currently working/leading orthogonal research projects and collaborate with other project leads and collaborators

Responsibilities

- Have advanced knowledge in DL and a strong background in statistics. Familiarity with prediction modelling and specifically, explainability or causal inference on observational data and prior related experience is preferred.
- Be a self-starter and translate health questions to ML problems.
- Apply and advance Deep Medicine's prior work on the applications of statical machine learning and novel deep learning models to large-scale longitudinal, electronic health records and biobanks for representation learning.
- Work closely with other collaborators and deliver high-quality results against project milestones.
- Propose new studies, present them internally and externally and disseminate research findings in high-impact journals (Lancet, Jama, Nature Medicine) and conferences (NIPS, ICML, ICLR, AAAI).
- Lead and contribute to grant applications.
- Lead and contribute to efforts to secure additional clinical datasets
- Lead and contribute to innovative cross-functional projects.
- Review, contribute to, direct and inspire the research of other researchers in the team.

Selection criteria

Applications will be judged only against the criteria that are set out below. Applicants should ensure that their application shows very clearly how their skills and experience meet these criteria within the supporting statement. This should describe, with specific examples, how you meet each item listed below. See <https://www.jobs.ox.ac.uk/cv-and-supporting-statement> for further guidance on writing an effective supporting statement; you should list each of the criteria in turn, and explain briefly how your skills and experience match these requirements.

Essential

1. Hold a minimum of PhD, or nearing completion of PhD, or an equivalent qualification in computer science, statistics, mathematics, engineering or other relevant areas.
2. Enthusiasm and interest in high-impact population health research.
3. Strong foundation and up-to-date knowledge in advanced AI topics, such as deep learning, representation learning, sequence models, NLP, multimodal AI, generative models.
4. Domain expertise in one or more of the following domains:
 - a) Representation learning
 - b) Natural language processing (NLP) and sequence models
 - c) Multimodal AI
 - d) Deep reinforcement learning and/or generative models
 - e) Mathematically inspired representation learning (physics-based or ODE-based etc)
 - f) Theoretical expertise in time-to-event modelling, uncertainty estimation, assessing bias/fairness, assessing generalisability, other relevant fields of AI methods
5. Advanced programming skills in Python and related data processing, machine learning, deep learning, and visualisation libraries, such as PyTorch, TensorFlow, scikit-learn, Dask, PySpark, Pandas.
6. Self-starter attitude and ability to work independently with minimal supervision.
7. Ability to collaborate with internal and external collaborators.
8. Good communication skills and excellent academic writing skills evident from high-impact publications and/or successful grant applications.

Desirable

1. Scientific expertise and experience in the applications of machine learning techniques in biomedical and health informatics.
2. Experience or knowledge about causal inference on observational data.
3. Experience, familiarity, or willingness to learn statistical and epidemiological analysis methods such as survival analysis and hypothesis testing.
4. Experience in working with large-scale EHR (e.g. CPRD) and/or other biomedical databases (e.g. UK Biobank).
5. A proven track record of excellence – evident from past projects, publications and/or grants.
6. A proven track record of working in a fast-paced environments and delivering high-quality results against project milestones.
7. Competitive ML experience e.g. Kaggle
8. Publication track record in high-impact journals and scientific conferences such as NIPS, ICML, ICLR, AAAI, ACL.

Pre-employment screening

All offers of employment are made subject to standard pre-employment screening, as applicable to the post.

If you are offered the post, you will be asked to provide proof of your right-to-work, your identity, and we will contact the referees you have nominated. You will also be asked to complete a health declaration (so that you can tell us about any health conditions or disabilities so that we can discuss appropriate adjustments with you), and a declaration of any unspent criminal convictions.

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/.

How to apply

Applications are made through our e-recruitment system and you will find all the information you need about how to apply on our Jobs website <https://www.jobs.ox.ac.uk/how-to-apply>. You should list each of the criteria in turn, and explain briefly how your skills and experience match these requirements.

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

As part of your application you will be asked to provide details of two referees and indicate whether we can contact them now.

You will be asked to upload a CV and a supporting statement. The supporting statement must explain how you meet each of 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 dependents). **Please note that if you do not upload a supporting statement, we will be unable to consider your application.**

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

All applications must be received by **midday** UK time 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 department(s).

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).

If you need help

Help and support is available from: <https://hrsystems.admin.ox.ac.uk/recruitment-support>

If you require any further assistance please email:

recruitment.support@admin.ox.ac.uk.

To return to the online application at any stage, please go to: www.recruit.ox.ac.uk.

Please note that you will receive an automated email from our e-recruitment system to confirm receipt of your application. **Please check your spam/junk mail** if you do not receive this email.

Assessment

It is anticipated that interviews for this post will take place on **Friday 5th July 2024**.

You will be notified by **Wednesday 26th June 2024** if you have been shortlisted for interview.

During the interview, you will be asked questions based around the selection criteria listed in this job description and will be asked to undertake a test beforehand.

If you are selected for interview you will be invited to disclose any special requirements which we might need to consider in relation to the interview arrangements, for example, in the case of disability, access to facilities or equipment. These will not be taken into account in the selection process.

In advance of the interview, you will be asked to complete an online McQuaig Word Survey. You can read more about McQuaig at [Candidate Section | McQuaig](#).

You can find more information and guidance about the recruitment and selection process at the Nuffield Department of Women's & Reproductive Health at [Candidate Briefing — Nuffield Department of Women's & Reproductive Health \(ox.ac.uk\)](#).

Important information for candidates

Data Privacy

Please note that any personal data submitted to the University as part of the job application process will be processed in accordance with the GDPR and related UK data protection legislation. For further information, please see the University's Privacy Notice for Job Applicants at: <https://compliance.admin.ox.ac.uk/job-applicant-privacy-policy>. The University's Policy on Data Protection is available at:

<https://compliance.admin.ox.ac.uk/data-protection-policy>.

The University's policy on retirement

The University operates an Employer Justified Retirement Age (EJRA) for all academic posts and some academic-related posts. 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:

<https://hr.admin.ox.ac.uk/the-ejra>

For **existing** employees, any employment beyond the retirement age is subject to approval through the procedures: <https://hr.admin.ox.ac.uk/the-ejra>

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.

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 and we rank first in the UK for university spin-outs, and in recent years we have spun out 15-20 new companies every year. 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.

Nuffield Department of Women's & Reproductive Health (NDWRH)

The Nuffield Department of Women's & Reproductive Health (NDWRH) is one of the largest and most successful academic departments in the world in its field. There are approximately 160 people working in the department, including senior academic staff, research support staff, clerical and technical staff, and graduate students (including clinicians) carrying out research towards a higher degree. There are also a number of visiting researchers from many parts of the world. The average annual income is approximately £10 million, of which over 75% comes from outside sources.

NDWRH encompasses multi-disciplinary research across the full spectrum of women's health. Our work has four overarching themes; Cancer, Global Health, Maternal & Fetal Health and Reproductive Medicine & Genetics. We focus on genetic studies, the dissection of molecular, biochemical and cellular mechanisms underlying normal and aberrant reproductive tissue function, and clinical studies in women's health, assisted

reproduction and pregnancy, as well as growth and development across the first 1000 days of life.

The clinical and laboratory programmes are based in the Women's Centre, John Radcliffe Hospital; Weatherall Institute of Molecular Medicine; Winchester House, and the Big Data Institute, and there are collaborations with the School's Institutes, the University's Science Departments and with researchers outside Oxford, in both the UK and abroad, especially in low-middle income countries.

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

The University of Oxford is a member of the [Athena SWAN Charter](#) and holds an institutional Bronze Athena SWAN award. NDWRH holds a departmental Silver Athena award in recognition of its efforts to introduce organisational and cultural practices that promote gender equality in SET and create a better working environment for both men and women.

Benefits of working at the University

Employee benefits

University employees enjoy 38 days' paid holiday, generous pension schemes, travel discounts, and a variety of professional development opportunities. Our range of other employee benefits and discounts also includes free entry to the Botanic Gardens and University colleges, and discounts at University museums. See <https://hr.admin.ox.ac.uk/staff-benefits>

University Club and sports facilities

Membership of the University Club is free for all University staff. The University Club offers social, sporting, and hospitality facilities. 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 <https://www.sport.ox.ac.uk/>.

Information for staff new to Oxford

If you are relocating to Oxfordshire from overseas or elsewhere in the UK, the University's Welcome Service website includes practical information about settling in the area, including advice on relocation, accommodation, and local schools. See <https://welcome.ox.ac.uk/>

There is also a visa loan scheme to cover the costs of UK visa applications for staff and their dependents. See <https://staffimmigration.admin.ox.ac.uk/visa-loan-scheme>

Family-friendly benefits

With one of the most generous family leave schemes in the Higher Education sector, and a range of flexible working options, Oxford aims to be a family-friendly employer. We also subscribe to My Family Care, a service that provides practical advice and support for employees who have caring responsibilities. The service offers a free telephone advice line, and the ability to book emergency back-up care for children, adult dependents and elderly relatives. See <https://hr.admin.ox.ac.uk/my-family-care>

Childcare

The University has excellent childcare services, including 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 <https://childcare.admin.ox.ac.uk/>

Disabled staff

We are committed to supporting members of staff with disabilities or long-term health conditions. For further details, including information about how to make contact, in

confidence, with the University's Staff Disability Advisor, see <https://edu.admin.ox.ac.uk/disability-support>

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 <https://edu.admin.ox.ac.uk/networks>

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 settle into Oxford, and provides them with an opportunity to meet people and make connections in the local area. See www.newcomers.ox.ac.uk.