## **JOB DESCRIPTION AND**

## **SELECTION CRITERIA**



| Job title         | Senior Research Scientist/Software Engineer – Cardiotocography and Fetal ECG Algorithms   |
|-------------------|---|
| Division          | Medical Sciences Division   |
| Department        | Nuffield Department of Women's & Reproductive Health  |
| Location          | Level 3 Women's Centre, John Radcliffe Hospital, Oxford OX3 9DU   |
| Grade and salary  | Research Grade 8: £48,235 to £57,255 per annum  |
| Hours             | Full Time<br>Applications for flexible working arrangements are welcomed and will<br>be considered in line with business needs. |
| Contract type     | Fixed Term for 1 year   |
| Reporting to      | Ms Beth Albert and Dr Gabriel Davis Jones   |
| Vacancy reference | 179723  |



## THE ROLE

### **Overview of the Role**

Oxford Digital Health Labs is seeking a highly skilled Senior Research Scientist or Software Engineer with expertise in signal processing and algorithm development for cardiotocography, with a specific focus on fetal heart rate analysis and fetal ECG data. The successful candidate will be responsible for managing cardiotocography algorithms and pioneering the development of next-generation algorithms, including both automated and manual processing pipelines. This role is central to advancing our research capabilities and supporting high-impact projects aimed at improving clinical diagnostics and patient care.

In this position, the candidate will collaborate with clinicians, data scientists, research scientists, and industry partners to integrate cutting-edge algorithms into both clinical workflows and on-device implementations. The role requires the algorithm development, application of rigorous validation studies, the optimisation of algorithm performance, and the development of robust technical documentation and academic publications. In addition, the candidate will utilise advanced analytical techniques to extract novel insights from large, complex healthcare datasets, thereby contributing to innovative research in maternal and fetal health.

The successful applicant will join a dynamic, multidisciplinary team within a supportive and collaborative research environment. This is an exciting opportunity to work at the forefront of healthcare technology, engaging with international experts and leveraging state-of-the-art resources to drive forward the development of bespoke signal processing solutions. A strong commitment to data quality, patient confidentiality, and adherence to regulatory standards is essential for this role.

Applicants are strongly encouraged to familiarise themselves with the previous literature detailing the development and application of computerised and AI-driven algorithms for cardiotocography analysis and fetal ECG analysis, as well as the work conducted at Oxford Digital Health Labs. An in-depth understanding of these foundational studies will be invaluable in shaping innovative approaches and advancing current research initiatives within the department.

### Responsibilities

- Algorithm Development: Design and develop innovative signal processing algorithms for fetal biosignals for processing fetal ECG and CTG data, incorporating both automated and manual CTG processing pipelines, with a view to enhancing clinical accuracy.
- Algorithm Management: Ensure the operation, maintenance, and ongoing calibration of the existing algorithms, ensuring its performance consistently meets established and emerging clinical and research standards.
- Performance Optimisation: Implement and rigorously evaluate optimisation techniques to improve algorithm efficiency and robustness through comprehensive validation protocols.
- Benchmarking and Profiling: Systematically benchmark algorithms against clinical and computational performance metrics and apply profiling techniques to identify and address bottlenecks in speed and memory usage.
- Debugging and Bug Fixing: Diagnose and resolve software issues across the algorithmic pipeline, including errors in signal input, feature extraction, or integration logic. Maintain software stability through timely bug fixes and codebase improvements.
- Testing and Continuous Integration: Develop and maintain automated testing pipelines to ensure reproducibility and reliability of algorithm outputs, and support continuous integration practices across the software lifecycle.
- Research and Validation: Conduct extensive validation studies, including robust statistical analyses, to assess algorithm performance against clinical benchmarks and research objectives.
- Documentation and Reporting: Prepare thorough technical documentation and academic manuscripts that detail algorithm design, methodologies, and performance outcomes.
- Interdisciplinary Collaboration: Work collaboratively with clinicians, data scientists, and industry partners to ensure the seamless integration of algorithms into clinical workflows and on-device implementations.
- Industry Engagement: Liaise with industry stakeholders to export algorithms in the requisite formats for on-device deployment, ensuring adherence to external technical specifications and standards.
- Quality Assurance: Establish and maintain stringent quality control procedures to ensure algorithm compliance with current regulatory and research standards.

- Mentorship and Leadership: Provide expert guidance and technical leadership to junior researchers and team members, fostering a collaborative and innovative research environment.
- Data Analysis and Insight Generation: Utilise advanced analytical techniques to generate novel insights from healthcare data.
- Stakeholder Engagement: Collaborate with stakeholders across various departments to ascertain their data requirements and deliver tailored data solutions.
- Knowledge Dissemination: Participate in the dissemination of research findings through publications and presentations, including attendance at international conferences, thereby contributing to the broader academic community.
- Scientific Publication: Lead or contribute to the scientific publication of academic works, ensuring the rigour and clarity of the research presented.
- Academic Presentations: Deliver presentations to fellow academics, effectively sharing insights and fostering knowledge exchange.
- Attention to Detail and Compliance: Maintain meticulous attention to detail, uphold a strong work ethic, and ensure strict adherence to patient data protection and confidentiality protocols.
- Data Quality Management: Uphold high standards of data quality within both source systems and processed datasets, providing expert advice on mitigating the effects of poor data quality and promoting best practices.
- Research Support: Provide comprehensive support to other research staff as required. Please note that responsibilities outlined are not exhaustive, and additional duties may be required appropriate to the grade in line with organisational needs.

# **SELECTION CRITERIA**

You will be asked to upload a CV and supporting statement as part of your online application.

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 <u>https://www.jobs.ox.ac.uk/cv-and-supporting-statement</u> for further guidance on writing an effective supporting statement.

### **Qualifications, Skills and Experience**

#### ESSENTIAL

- 1. Academic Qualifications: A PhD or equivalent in a relevant discipline (e.g. signal processing, biomedical engineering, or applied mathematics) demonstrating strong theoretical foundations.
- 2. Signal Processing Expertise: Proven experience in developing, implementing and maintaining signal processing algorithms in a clinical or biomedical setting, ideally in the context of cardiotocography, fetal heart rate analysis, or fetal ECG data.
- 3. Algorithm Management and Development: Demonstrated ability to manage, maintain, and further develop complex signal processing algorithms, specifically time series signals.
- 4. Programming Proficiency: Extensive experience in Python and C++, with a proven track record of implementing, debugging, and maintaining complex signal processing and algorithmic solutions. Familiarity with profiling tools, version control (e.g. Git), and software development best practices (e.g. code modularity, test coverage, continuous integration).
- 5. Al Implementation: Practical experience in integrating artificial intelligence algorithms using standard packages such as TensorFlow and PyTorch.
- 6. Research and Validation Skills: Experience in designing and executing rigorous validation studies, including robust statistical analyses, performance benchmarking, and stress testing under edge-case scenarios.
- 7. Software Robustness and Debugging: Demonstrated ability to identify, debug, and resolve software issues in algorithmic pipelines, including use of testing frameworks, logging tools, and systematic issue tracking (e.g. GitHub Issues or JIRA).

- 8. Experience conducting algorithm benchmarking and performance profiling, including optimisation for runtime, memory usage, and compatibility with hardware constraints (e.g. for embedded or mobile deployments).
- 9. Interdisciplinary Collaboration: A proven track record of collaborating with clinicians, data scientists, and industry partners to integrate algorithms into clinical workflows and on-device implementations.
- 10. Quality Assurance and Compliance: Familiarity with quality control procedures and regulatory standards applicable to healthcare data and patient information, ensuring adherence to patient data protection protocols.
- 11. Documentation and Reporting: Strong skills in preparing detailed technical documentation and academic manuscripts that clearly articulate algorithm design, methodologies, and performance outcomes.
- 12. Industry Engagement: Experience working with industry partners to export algorithms in specific formats for on-device deployment, including an understanding of external technical specifications and standards.

#### DESIRABLE

Please note that the criteria listed below would be an advantage in this role, but you do not need to meet them to be eligible to apply.

- 1. Advanced Analytical Techniques: Demonstrated capability in utilising advanced analytical methods to generate novel insights from large healthcare datasets.
- 2. Project Leadership: Prior experience in leading multidisciplinary research teams or projects, including mentorship of junior researchers.
- 3. Publication Record: A strong record of publications in peer-reviewed academic journals, and presentations at recognised international conferences.
- 4. Data Management Expertise: Experience in managing high-quality data within both source systems and processed datasets, with a focus on promoting best practices and addressing data quality issues.
- 5. Software and Pipeline Development: Familiarity with the design and implementation of data processing pipelines, especially those tailored for clinical and research applications in healthcare.

### Values and Behaviour

The NDWRH Charter was developed by our staff and students. It is a framework of expected core behaviours and attitudes which focus on positivity and dignity for individuals, their peers, their teams and line managers. Its aim is to move to greater transparency, trust and respect in the way we interact together, helping to build a more supportive and productive workplace for everyone. The core behaviours are listed below:

- 1. **Excellence**: You proactively seek opportunities to expand your skills, engage in learning outside your normal field, and contribute to improving systems and processes.
- 2. **Working Together**: You promote a collaborative and inclusive environment by actively seeking cross-group interactions, supporting your team, addressing biases, and fostering a welcoming atmosphere for all.
- 3. **Responsibility**: You proactively define deliverables, balance priorities, solve problems creatively, and take responsibility for your decisions and actions.
- 4. **Leadership**: You foster a collaborative, supportive environment by addressing conflicts swiftly, building shared purpose, and understanding and valuing each team member's unique needs and contributions.
- 5. **Trust, Ethics & Integrity**: You are impartial and fair in decision-making, respected for your integrity, encourage ethical discussions, and welcome constructive challenge.
- 6. **Clarity**: You ensure effective, two-way communication by regularly updating your team, assessing and improving communication methods, and designing user-friendly systems for stakeholders.

## **PRE-EMPLOYMENT SCREENING**

### **Standard checks**

If you are offered the post, the offer will be subject to standard pre-employment checks. You will be asked to provide: proof of your right-to-work in the UK; proof of your identity; and (if we haven't done so already) 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 for which you may need us to make appropriate adjustments.

Please read the candidate notes on the University's pre-employment screening procedures at: <u>https://www.jobs.ox.ac.uk/pre-employment-checks</u>

### Hazard-specific / Safety-critical duties

This job includes hazards or safety-critical activities. If you are offered the post, you will be asked to complete a health questionnaire which will be assessed by our Occupational Health Service, and the offer of employment will be subject a successful outcome of this assessment.

The hazards or safety-critical duties involved are as follows:

• Travel outside of Europe or North America on University Business

# **HOW TO APPLY**

### Application

Applications are made through our online recruitment portal. Information about how to apply is available on our Jobs website <u>https://www.jobs.ox.ac.uk/how-to-apply</u>.

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 dependants).

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

Application FAQs, including technical troubleshooting advice is available at: <u>https://staff.web.ox.ac.uk/recruitment-support-faqs</u>

Non-technical questions about this job should be addressed to the recruiting department directly at <u>recruitment@wrh.ox.ac.uk</u>

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

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

### Assessment

Interviews for this post will take place on either Wednesday 18th June or Thursday 19th June. You will be notified by 12th June 2025 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.

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 <u>https://mcquaig.co.uk/candidate-section/.</u>

You will also be asked to prepare a short presentation. Details of these will be provided to selected candidates.

You can find more information and guidance about the recruitment and selection process at the Nuffield Department of Women's & Reproductive Health at <a href="https://www.wrh.ox.ac.uk/candidate-briefing">https://www.wrh.ox.ac.uk/candidate-briefing</a>.

# **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: <u>https://compliance.admin.ox.ac.uk/job-applicant-privacy-policy</u>. The University's Policy on Data Protection is available at: <u>https://compliance.admin.ox.ac.uk/data-protection-policy</u>.

### The University's policy on retirement

The University operates an Employer Justified Retirement Age (EJRA) for very senior research posts at **grade RSIV/D35 and clinical equivalents E62 and E82**, which with effect from 1

October 2023 will be 30 September before the 70<sup>th</sup> birthday. The justification for this is explained at: <u>https://hr.admin.ox.ac.uk/the-ejra.</u>

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

There is no normal or fixed age at which staff in posts at other grades 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 cuttingedge. 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 <u>www.ox.ac.uk/about/organisation</u>.

### Nuffield Department 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 <u>Athena Swan Charter</u> and holds an institutional Silver Athena Swan award. NDWRH holds a departmental Gold 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, flexible working options, travel discounts including salary sacrifice schemes for bicycles and electric cars and other discounts. Staff can access a huge range of personal and professional development opportunities. See <a href="https://hr.admin.ox.ac.uk/staff-benefits">https://hr.admin.ox.ac.uk/staff-benefits</a>

#### **Employee Assistance Programme**

As part of our wellbeing offering staff get free access to Health Assured, a confidential employee assistance programme, available 24/7 for 365 days a year. Find out more <u>https://staff.admin.ox.ac.uk/health-assured-eap</u>

### University Club and sports facilities

Membership of the University Club is free for University staff. It 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 <u>www.club.ox.ac.uk</u> and <u>https://www.sport.ox.ac.uk/</u>.

#### Information for staff new to Oxford

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

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

#### Family-friendly benefits

We are a family-friendly employer with one of the most generous family leave schemes in the Higher Education sector. Our Childcare Services team provides guidance and support on childcare provision, and offers a range of high quality childcare options at affordable prices for staff. In addition to 5 University nurseries, we partner with a number of local providers to offer in excess of 450 full time nursery places to our staff. Eligible parents are able to pay for childcare through salary sacrifice, further reducing costs. See <a href="https://childcare.admin.ox.ac.uk/">https://childcare.admin.ox.ac.uk/</a>. We also subscribe to the Work+Family Space, a service that provides practical advice and support for employees who have caring responsibilities for dependants of all types. See <a href="https://tr.admin.ox.ac.uk/my-family-care">https://tr.admin.ox.ac.uk/my-family-care</a>

#### Supporting disability and health-related issues (including menopause)

We are committed to supporting members of staff with disabilities or long-term health conditions, including those experiencing negative effects of menopause. Information about the

University's Staff Disability Advisor, is at <u>https://edu.admin.ox.ac.uk/disability-support.</u> For information about how we support those going through menopause see <u>https://hr.admin.ox.ac.uk/menopause-guidance</u>

#### Staff networks

The University has a number of staff networks including for research staff, BME staff, LGBT+ staff, disabled staff network and those going through menopause. Find out more at <a href="https://edu.admin.ox.ac.uk/networks">https://edu.admin.ox.ac.uk/networks</a>

### The University of Oxford Newcomers' Club

The University of Oxford Newcomers' Club is 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 <u>www.newcomers.ox.ac.uk</u>.

### **Research staff**

The Researcher Hub supports all researchers on fixed-term contracts. They aim to help you settle in comfortably, make connections, grow as a person, extend your research expertise and approach your next career step with confidence. Find out more <a href="https://www.ox.ac.uk/research/support-researchers/researcher-hub">https://www.ox.ac.uk/research/support-researchers/researchers/researcher-hub</a>

Oxford's Research Staff Society is a collective voice for our researchers. They also organise social and professional networking activities for researchers. Find out more <u>https://www.ox.ac.uk/research/support-researchers/connecting-other-researchers/oxford-research-staff-society</u>