

The Alan Turing Institute

Research Associate/Senior Research Associate – Development of Machine Learning Methods for Clinical Trials

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There has never been a more significant time to work in data science and AI. There is recognition of the importance of these technologies to our economic and social future: the so-called fourth industrial revolution. The technical challenge of keeping our data secure and private has grown in its urgency and importance. At the same time, voices from academia, industry, and government are coming together to debate how these technologies should be governed and managed.

The Alan Turing Institute, as the UK's national institute for data science and artificial intelligence, plays an important part in driving forward advances in these technologies in order to change the world for the better.

The Institute is named in honour of Alan Turing, whose pioneering work in theoretical and applied mathematics, engineering and computing is considered to have laid the foundations for modern-day data science and artificial intelligence. The Institute's goals are to undertake world-class research, apply its research to real-world problems, driving economic impact and societal good, lead the training of a new generation of scientists, and shape the public conversation around data and algorithms.

After launching in 2015 with government funding from EPSRC and five founding universities, the Institute has grown an extensive network of university partners from across the UK and launched a number of major partnerships with industry, public and third sector. Today it is home to more than 500 researchers, a rapidly growing team of in house research software engineers and data scientists and a business team.

BACKGROUND

The Alan Turing Institute in partnership with the MRC Clinical Trials Unit at UCL is offering an exciting job at the interface of machine learning and biostatistics. This is an opportunity for a data scientist, machine learning researcher or statistician with interests both in the development of machine learning methodology and in medical research to join Professor Chris Holmes and Dr Karla Diaz-Ordaz's causal machine learning research group.

More information about the project can be found here: <https://www.turing.ac.uk/research/research-projects/statistical-machine-learning-randomized-clinical-trials-mrc-ctu>

MRC Clinical Trials Unit at UCL (MRC CTU)

The MRC CTU is a centre of excellence for clinical trials, meta-analyses and epidemiological studies. It is committed to strengthening and expanding the evidence base for healthcare nationally and internationally. It also develops methodology to improve the design, conduct and analysis of clinical studies, and hosts one of the MRC's eight regional Hubs for Trials Methodology Research. The MRC CTU currently employs around 230 staff. Further details can be found at its website: <http://www.ctu.mrc.ac.uk/>.

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ROLE PURPOSE

Clinical trials are the gold standard for testing treatments (drugs, surgical procedures, or other health interventions) in clinical care. Because we rely on trial results for treatment approvals, the UK government has earmark methodological developments in clinical trials as an area where the UK aspires to be world-leading.

The post-holder will explore existing, and develop novel, machine learning methods for two of the challenges faced by clinical trials. These are:

1. Treatment effect heterogeneity and subgroup discovery: identifying which patients may benefit from treatment. The aim is to use data from large randomised trials to develop novel statistical machine learning methods for the identification of treatment effect heterogeneity in clinical trials, as well as building counterfactual predictive models leading to personalised treatment effects. Retrospective analysis in clinical trials enables the data-

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driven detection of subgroups of patients who may benefit from a particular course of treatment, thereby providing the basis for future trials.

2. Improving quality assurance processes. Clinical trials typically involve patients recruited and followed up by multiple sites (usually hospitals). Trial monitoring is a necessary task in all clinical trials where the central trial team assesses performance at each site. Poor performance indicators are aggregated in a pre-specified way; if a threshold is exceeded, the trial team then visits the site to ensure that all applicable ethical and regulatory requirements, guaranteeing participants' safety and data robustness, are being adhered to. However, currently there is doubt that this process adequately targets sites at risk of non-adherence. The aim of this project is to explore AI / machine learning approaches to identify and predict which sites within an ongoing clinical trial are underperforming or at risk of non-adherence, using centrally held patient-reported data, and previous longitudinal site monitoring data, which includes time-series data and free text. These predictions will assist in the prioritisation and planning of monitoring actions (e.g. site visits).

Particular attention will be paid to issues around interpretability, reproducible research, methods validation and the assessment of false discovery rates.

Successful candidates should have a strong quantitative background and preferably a strong machine learning and statistics background and be eager to do research at the interface of AI and clinical trials.

ORGANISATIONAL POSITION

The postholder will be based at the Alan Turing Institute, and work closely with senior collaborators at the Alan Turing Institute and the MRC Clinical Trials Unit (MRC CTU) at UCL.

The successful candidate will be a key member of the project team, playing a central part in shaping the project, assuming responsibility for its successful delivery, conducting research, and taking primary responsibility for the writing of academic manuscripts, both of novel research and tutorial papers giving guidance to the clinical trial community. These will represent the project's main deliverables. Other important components of the role include engagement in collaborative and knowledge-sharing activities with other clinical trial researchers and CTUs, and organising activities aimed at communicating project findings to academic and stakeholder audiences.

Depending on the background of the successful candidate, there will be opportunities for undertaking appropriate training in Clinical Trial design, conduct and analysis.

The post holder will:

- Explore the potential of new statistical machine learning methods to improve the learning opportunities from clinical trials;
- Undertake analyses using machine learning methods on existing trials data held within the MRC CTU;
- Present research findings through academic papers and presentations at academic and professional conferences, and to contribute to the external visibility of both institutes;
- Participate in the organisation of research workshops and other events.

The post holder will be expected to work collaboratively with the senior investigators from across the Turing and MRC CTU as well as with external partners on the project. At the same time, you will be given the personal freedom to develop and pursue innovative research ideas.

DUTIES AND AREAS OF RESPONSIBILITY

Key duties:

- To take initiatives in the planning and execution of research;
- To conduct data analysis: including preparing the data (cleaning, feature engineering, visualization, etc);
- To assist or lead on the data study groups (Turing Institute datathons) associated with this collaboration ;
- To ensure the validity and reliability of data at all times;
- To maintain accurate and complete records of all findings;
- To undertake any training and or professional development;
- To prepare material for presentation in oral and poster formats;

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- To draft publications and prepare them for submission to refereed journals;
- To write and publish articles in peer-reviewed journals/digests that highlight findings from research ensuring consistency with the highest standards of academic publication and showcasing the Institute's research leadership;
- To contribute to writing bids for research grants;
- To supervise practical work and advise students/other researchers associated with the project on techniques;
- To take responsibility for organising resources and effective decision making in support of research;
- To attend relevant workshops and conferences as necessary;
- To deliver training materials (slides, notes, and presentations) and related activities as required as part of collaboration work.

Other duties:

- To work in close co-operation with the principal investigator and collaborators on the project;
- To provide regular updates on progress to the team;
- To undertake appropriate administration tasks;
- Support the Principal Investigator and research group in the design and development of the research programme.

If appointed at a Senior Research Associate level, the post-holder will have additional responsibilities, such as:

- To oversee the work of other Research Associates who are conducting research in related areas.
- To define the research direction in collaboration with the PIs of the project;
- Extend, transform and apply knowledge acquired from scholarship to research and appropriate external activities;
- Assist and then lead in the preparation of proposals and applications to external bodies, e.g. for funding and contractual purposes;
- Present data and findings to the study team or for other audiences, using appropriate media and platforms;
- Support externally funded research projects, and to identify and work with senior colleagues to develop research ideas and contribute to funding proposals.

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PERSON SPECIFICATION

<p align="center">Skills and Requirements</p> <p align="center">Post holders will be expected to demonstrate the following</p>	<p align="center">Essential (E)</p> <p align="center">Desirable (D)</p>	<p align="center">Tested at application(a)</p> <p align="center">Tested at interview (i)</p>
Education/Qualification		
Research Associate/Senior Research Associate level: Holds a PhD or equivalent level of professional qualification in a field with significant element of computational statistics or statistical machine learning.	E	A
Knowledge and Experience		
Experience in the development and/or application of statistical machine learning methods.	E	A,I
Experience in managing, structuring, and analysing research data.	E	A,I
Fluency in one or more modern statistical programming languages used in research in data science and artificial intelligence (preferable R or Python).	E	A,I
Interest and/or knowledge of methodological (statistical or AI) advances in medical applications or clinical trials.	E	I
Ability to rapidly assimilate new computational and statistical ideas and techniques on the job and apply them successfully.	E	A,I
Computational statistics, particularly Bayesian modelling and Bayesian statistics and graphical methods and data visualisation.	D	A
Experience in producing reliable software and reproducible research (e.g. version control such as Git, literate analysis tools such as Jupyter and Rmarkdown).	D	A
An understanding of clinical trials, particularly the statistical methods used to analyse data from clinical trials.	D	I
Communication		
Excellent written and verbal communication skills, including experience in the visual representation of quantitative data, the ability to write for publication, present research proposals and results, and represent the research group at meetings.	E	A,I
Ability to communicate complex information clearly	E	I
Teamwork and Motivation		
Ability to work with others, especially postdocs, research assistants and PhD students.	E	A

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Ability to direct the work of a small research team and motivate others to produce a high standard of work	D (E for senior level)	A
Ability to lead one's own work independently, including planning and execution, and to collaborate productively as part of a team.	E	A
Ability to encourage research culture in others	D	A,I
Planning and Organising		
Ability to organise and prioritise own work with minimal supervision	E	A
Initiative and Problem Solving		
Creative approach to problem solving	D	A,I
Analysis and Research		
Ability to carry out original research and to produce published research papers	E	A
Previous experience of conducting studies of related literature and research to support the design and implementation of projects	E	A
Previous experience and ability of developing reports, ensuring conceptual relevance, comprehensiveness, and currency of information	E	A
Ability to identify, develop and apply new concepts, techniques and methods	E	A
Other Requirements		
Commitment to meeting deadlines	E	A
Flexible attitude towards work	E	A,I
Commitment to EDI principles and to the Organisation values	E	I

Please note that job descriptions cannot be exhaustive, and the post-holder may be required to undertake other duties, which are broadly in line with the above key responsibilities

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The Alan Turing Institute is committed to equality diversity and inclusion and to eliminating discrimination. All employees are expected to embrace, follow and promote our [EDI Principles](#) and [Rules of the Game](#)



Respect – We treat everyone with respect, dignity and kindness and acknowledge the experiences, skills and contributions of others.

Trust - We communicate openly and honestly to support an environment where we have trust in each other.

Transparency – We seek to ensure that everyone understands the how and the why of our decisions and actions. We take on board to feedback when those decisions are challenged.

Inclusivity – We are committed to continuously learning how to be more inclusive by listening to those facing barriers.

Leadership – We recognise creating an inclusive, diverse and equitable institute requires leadership from all. We stand up and speak out when change is needed.

Integrity – We recognise that how we work is as important as our outputs and seek to exemplify best practice in all our decisions.

APPLICATION PROCEDURE

If you are interested in this opportunity, please click the apply button below. You will need to register on the applicant portal and complete the application form including your CV, covering letter and contact details for your referees.

Along with a CV and covering letter, please submit a research output to support your application, for us to read before the interview. This might be a link to a selected research or technical paper, a technical blog post or a chapter of a thesis or dissertation, but we particularly encourage applicants to submit a link to a public version control tool such as GitHub containing an example analysis script or research software library you have made a significant contribution to.

If you have questions about the role or would like to apply using a different format, please contact them on 020 3862 3575, or email recruitment@turing.ac.uk.

Secondments from University partners are welcome.

CLOSING DATE FOR APPLICATIONS: 29 November 2020

TERMS AND CONDITIONS

This full-time post is offered on a fixed-term basis for two years. The annual salary is £35,000 - £41,000 (dependent on skills and experience) plus excellent benefits, including flexible working and family friendly policies, <https://www.turing.ac.uk/work-turing/why-work-turing/employee-benefits>

For appointments at the senior associate level the salary range is £42,000 - £49,000

Please note candidates who have not yet been officially awarded their PhD will be appointed as Research Assistant within the salary range £32,000-£34,000 per annum.

This job description is written at a specific time and is subject to change as the demands of the Institute and the role develop. The role requires flexibility and adaptability, and the post holder needs to be aware that they may be asked to perform tasks and be given responsibilities not detailed in this job description.

EQUALITY, DIVERSITY AND INCLUSION

The Alan Turing Institute is committed to creating an environment where diversity is valued, and everyone is treated fairly. In accordance with the Equality Act, we welcome applications from anyone who meets the specific criteria of the post regardless of age, disability, ethnicity, gender reassignment, marital or civil partnership status, pregnancy and maternity, religion or belief, sex and sexual orientation.

Reasonable adjustments to the interview process can also be made for any candidates with a disability.

Please note all offers of employment are subject to continuous eligibility to work in the UK and satisfactory pre-employment security screening which includes a DBS Check.

Full details on the pre-employment screening process can be requested from HR@turing.ac.uk.