**The Alan Turing Institute**

**RESEARCH LEAD – FUNDAMENTAL RESEARCH IN AI FOR PHYSICAL SYSTEMS**

**THE ALAN TURING INSTITUTE**

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 purpose is to make great leaps in data science and AI research to change the world for the better. Its goals are to advance world-class research and apply it to national and global challenges, build skills for the future by contributing to training people across sectors and career stages, and drive an informed public conversation by providing balanced and evidence-based views on data science and AI.

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**

Currently, Turing is undergoing a restructuring, moving towards a challenge-led model with three Grand Challenges (Environment & Sustainability, Health, Defence & National Security). This will be supported by a cross-cutting Fundamental Research in Data Science and Artificial Intelligence priority area. This new Turing 2.0 model focuses on world-class science and innovation and aims to generate high-quality research and translate it into real-world impact and deployment.

We are looking for highly skilled, experienced Research Leads to lead and enable the delivery of this ambitious work, initially centred around developing AI for Physical Systems. Within the Fundamental Research area, we will provide foundational theory, methods and tools to advance the state-of-the art of the use of Artificial Intelligence to model, predict and control physical systems. The aim is to develop the next generation of fundamental ML and AI methods, tools and theory to enable modelling, prediction and control of physical systems. To achieve this, we are creating a multi-disciplinary, mission-driven team which will collaborate with national & international centres of excellence to achieve its goals. Initially, we will be focusing on three strands.

**Strand 1**: Probabilistic and Generative Models for modelling & prediction of Physical Systems.

Recent developments in machine learning technology have shown much potential in learning intricate data distributions arising from physical systems. We will explore how the confluence of generative models, neural operators and novel encoder / decoder architectures can be used effectively to learn representations of physical processes exhibiting complex phenomena across multiple spatio-temporal scales and over complex geometries. We also seek to develop new approaches to uncertainty quantification, data assimilation and active learning in the context of generative modelling paradigms.

**Strand 2:** Bridging the divide between data-driven & mechanistic models.

We seek to address the long-standing challenge of guiding machine learning models with physical knowledge, moving beyond the current approaches to hybrid modelling. Driven by specific application areas, we will explore new methods for

learning under equivariance, physics-guided learning, as well as better understand generalisation & zero-shot learning in the context of physical systems.

**Strand 3:** Accelerating large-scale computational simulations through machine learning.

The computational cost of large-scale multi-physics and multi-scale simulations poses a significant obstacle to their use in inference, design, and optimisation processes which are critical to many applications across science and engineering. Machine-Learning based surrogate models and emulators play a key role in drastically reducing the computational burden. Leveraging recent advances in statistical machine learning, we will develop new methods aimed at improving the accuracy and reliability ML-based surrogates. Specific focus will be on robustness under model misspecification, active and online learning and causally consistent emulation.

## ROLE PURPOSE

The Research Lead will be key to delivering internationally leading research in machine learning for the research areas listed above. This role will be part of the Fundamental Research cross-cutting priority area and you will be reporting to the mission lead. The Research Lead will be part of a collaborative, multidisciplinary team of researchers and research engineers, and will be expected to engage with internal and external stakeholders and collaborators to support delivery of this ambitious research programme. You will be expected to contribute to various activities across the three strands, and the grand challenges more broadly. You will be required to manage a small group of Senior Research Associates and other early-career members of the team (e.g., PhD students, interns, etc).

These roles will be based the Alan Turing Institute office in London, where we will hold regular mission and cross-GC meetings, and where they can interact with the wider ATI community.

## DUTIES AND AREAS OF RESPONSIBILITY

- Manage and lead a team of researchers and professional staff to develop and deliver high-quality high-impact research.
- Ensure research project delivery against objectives within allocated budgets and timeframes and ensure efficient management of resources.
- Conduct high-quality research, contributing to the broader research aims of the Fundamental Research priority area.
- Liaise with stakeholders and colleagues to understand and prioritise project goals.
- Contribute to mission-led research in collaboration with team members and Principal Investigators (PIs).
- Be a point of contact, supporting mission leads in engaging with stakeholders regarding projects and deputising in meetings where necessary.
- Take the lead on writing up research findings as they emerge, producing and developing reports and publications in peer-reviewed journals, in collaboration with the research team.
- Lead on the preparation of proposals and applications to external bodies, e.g., for funding and contractual purposes.
- Present, disseminate and explain our work at meetings/events and contribute to both the internal and external visibility of the Institute.
- Take responsibility for driving collaboration with academic experts and broader research partners from across the Turing, and the wider Turing / project community.
- Supervise the work of Senior Research Associates in the team and provide guidance as required.
- Line manage direct reports.
- Contribute to the life of the Institute and support a diverse and inclusive community through embracing the Turing values.
- Adhere to and promote principles of reproducible and ethical data science and ensure secure handling of data and health and safety in all aspects of work.
- Mentor early-career researchers.

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Specific requirements for the role

- Play a leading role in undertaking high-quality research, actively contributing, and steering the broader research. aims of the Fundamental Research Priority Area.
- Be experienced in machine learning and AI in one of the four areas listed above.
- Analyse data and to write computer code.
- Publish papers at relevant venues.
- Engage with stakeholders to ensure that research outcomes can be deployed in the real world.

**OTHER DUTIES**

- Travel may be necessary to meet the requirements of the role.
- Teaching may be required as part of collaboration work.

Please note that job descriptions cannot be exhaustive, and the postholder may be required to undertake other duties, which are broadly in line with the above key responsibilities. This job description is written at a specific time and is subject to changes as the demands of the Institute and the role develop.

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| PERSON SPECIFICATION | | |
|---|---|---|
| **Skills and Requirements**<br><br>Post holders will be expected to demonstrate the following: | **Essential (E)**<br><br>**Desirable (D)** | **Tested at application (a)**<br><br>**Tested at interview (i)** |
| **Education/Qualification** | | |
| A PhD (or equivalent experience and/or qualifications) in a relevant area, e.g., machine learning, AI, computer science, mathematics, statistics, physics or engineering. | E | A |
| **Knowledge and Experience** | | |
| A solid background in Statistical Machine Learning and/or Scientific Machine Learning, with specific experience in two or more of the following: probabilistic and generative modelling, neural operators, surrogate modelling, uncertainty quantification for ML models, the application of ML modelling to physical systems. | E | A/I |
| Experience in developing research software codes and libraries (in Python or Julia), ideally with experience in writing code for GPU through frameworks such as Tensorflow, Pytorch, JAX, Flux, etc. | E | A |
| Track record of the ability to initiate, develop and deliver high quality research aligned with the mission's research strategy any external stakeholders and to publish in peer reviewed journals and conferences. | E | A/I |
| Track record of outstanding research and in delivering impact appropriate to career stage | E | A/I |
| Evidence of high-quality publication(s) in a relevant field commensurate with your career stage | E | A |
| Previous experience of line management and supervising more junior colleagues | E | A/I |
| Proactive approach to managing stakeholders and their requirements and identifying opportunities for collaboration | E | A/I |
| Experience using GitHub to manage and share code repositories created using Git | D | A |
| Experience in scoping and investigating independent research questions within a given overarching theme | D | A/I |
| Experience of advising on available options for decisions that affect operational processes, considering any risks | D | I |
| **Communication** | | |
| Excellent written and verbal communication skills including the ability to present complex or technical information, and to communicate effectively with diverse audiences | E | A/I |
| **Analysis and Research** | | |
| Ability to carry out research independently and take the lead on research direction in collaboration with the PIs | E | A |
| **Project Management & Project Delivery** | | |
| Ability to initiate, plan and prioritise research projects and ensure effective use of research resources. | E | I |

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|---|---|---|
| Adapts project plans and delivery processes to meet the Turing's needs and identifies ways of improving standards. Learns from feedback and takes action to resolve any complaints. | E | I |
| Wiling to seek opportunities to make improvements and be proactive in identifying sources of funding/income | D | I |
| **Teamwork and Team Development** | | |
| Ability to work effectively both as part of a team and in cross collaboration with other teams as required by the role | E | I |
| Undertakes and evaluates regular staff performance reviews and appraisals, dealing with any performance issues and developing team members where needed. | E | I |
| **Planning and Organising** | | |
| Effectively manages budgets, sets performance standards and regularly monitors and reviews them, whilst ensuring team outputs align with expectations. | E | I |
| **Other Requirements** | | |
| Commitment to EDI principles and to the Organisation values | E | I |

**OUR VALUES**

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 Our Values.



## Our values

**Trust**
We create an environment where we have trust and can be trusted

**Inclusivity**
We expect our Turing community to contribute to a culture that is inclusive and free of barriers

**Respect**
We all have different roles, priorities and challenges but our shared purpose is the same

**Leadership**
Leadership is everyone's business; Turing leaders set the right tone and lead by example

**Transparency**
Everyone should understand the how and the why of our decisions and actions

**Integrity**
We are all ambassadors for the Turing's mission of changing the world for the better

**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 and covering letter.
The covering letter should address:

- Why you are applying for this position
- How you qualify for this position (see criteria under "Person Specification")
- A concrete research project (within the scope of this position) you would like to pursue (max. 2 pages plus references)
- Publication list (if not covered in CV)

If you have questions about the role or would like to apply using a different format, please contact us on 020 3862 3536 or email recruitment@turing.ac.uk.

**CLOSING DATE FOR APPLICATIONS: Sunday 15 September 2024 at 23:59 (LONDON, UK BST)**

**Interviews are expected to take place week commencing 30 September 2024.**

**TERMS AND CONDITIONS**

This post is offered on a full time, fixed-term basis for 3 years. Part-time (0.8 FTE) applications can be considered. The annual salary is £68,135 - £73,813 plus excellent benefits, including flexible working and family friendly policies, https://www.turing.ac.uk/work-turing/why-work-turing/employee-benefits

*The Alan Turing Institute is based at the British Library, in the heart of London's Knowledge Quarter. We expect staff to come to our office at least 4 days per month. Some roles may require more days in the office; the hiring manager will be able to confirm this during the interview.*

**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.

We are committed to making sure our recruitment process is accessible and inclusive. This includes making reasonable adjustments for candidates who have a disability or long-term condition. Please contact us at adjustments@turing.ac.uk to find out how we can assist you.

***Please note all offers of employment are subject to obtaining and retaining the right 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***.***