

# The Alan Turing Institute

## SENIOR RESEARCH ASSOCIATE, 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 Senior Research Associates to support 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.

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**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 primary purpose of these roles is to conduct internationally leading research, and they will be part of the Fundamental Research cross-cutting priority area. The senior research associates 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. The senior research associates will lead on and work closely with other research associates and team members on various activities across the three strands, and the grand challenges more broadly. The senior research associates may be required to manage and/or provide leadership and mentorship of junior team members, such as PhD students, interns or other early-career members of the team.

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**

- Undertake high-quality research, contributing to the broader research aims of the Fundamental Research grand challenge
- Contribute to research in collaboration with team members and Principal Investigators (PIs).
- Provide technical leadership and project management for research projects, ensuring successful outcomes
- Horizon scanning across relevant fields for new advancements and methodology
- Work with GC leadership and other stakeholders and colleagues to define, understand and prioritise the research direction and project goals.
- Be a point of contact, supporting PIs in engaging with stakeholders regarding projects and deputising in meetings where necessary.
- Take the lead on writing up 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 early-career researchers in the team and provide guidance as required
- Line manage direct reports if required
- 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.

Specific requirements for the role:

- Play a leading role in undertaking high-quality research, actively contributing, and steering the broader research aims of the Environment & Sustainability Grand Challenge.
- Be experienced in machine learning and AI in one of the four areas listed above
- Analyse data and write computer code

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- 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	Essential (E) Desirable (D)	Tested at application (a) Tested at interview (i)
Post holders will be expected to demonstrate the following:		
<b>Education/Qualification</b>		
A PhD (or equivalent experience and/or qualifications) in a relevant area, e.g., machine learning, AI, computer science, mathematics, statistics, physics, engineering, environmental science.	E	A
<b>Knowledge and Experience</b>		
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/I
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
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 in line management, overseeing and supervising more junior colleagues' work	D	A/I
Experience in scientific mentoring of junior team members (PhD students or research associates).	D	A/I
<b>Communication</b>		
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
Ability to write research reports and papers in styles accessible to both academic and lay audiences.	D	A/I
<b>Analysis and Research</b>		
Ability to carry out research independently and take the lead on research direction in collaboration with the PIs	E	A/I

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<b>Project Management &amp; Project Delivery</b>		
Ability to initiate, plan and prioritise research projects and ensure effective use of research resources	D	I
Proactive approach to managing stakeholders and their requirements and identifying opportunities for collaboration	D	A/I
Wiling to seek opportunities to make improvements and be proactive in identifying sources of funding/income	D	A/I
<b>Teamwork and Motivation</b>		
Ability to work effectively both as part of a team and in cross collaboration with other teams as required by the role	E	I
<b>Decision- Making Processes and Outcomes</b>		
Ability to advise on available options for decisions that affect operational processes, considering any risks	D	I
<b>Other Requirements</b>		
Commitment to EDI principles and to the Organisation values	E	I

# The Alan Turing Institute

## 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](mailto:recruitment@turing.ac.uk).

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

**Interviews are expected to take place from 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 £55,184 - £63,971 plus excellent benefits, including flexible working and family friendly policies, <https://www.turing.ac.uk/work-turing/why-work-turing/employee-benefits>.

## **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 building a diverse community and would like our leadership team to reflect this. We therefore welcome applications from the broadest spectrum of backgrounds.

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](mailto: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](mailto:HR@turing.ac.uk).***