

The Alan Turing Institute

RESEARCH ASSOCIATE, Economic Networks and Transaction Data – Methodological Improvements (ONS Turing Strategic Partnership)

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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 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 several 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 'Finance and economics' programme brings together leading experts in data science, machine learning, finance and the social sciences, from both academia and industry to tackle the most challenging questions by producing world-leading research with significant impact. We inform public policy and enable trusted, research-led thought leadership. The programme works closely with government and the industry to exploit the potential of new technologies in the financial sector and economic research, and to position the UK as the leader in these areas.

We have recently secured a two-year strategic partnership with the Office for National Statistics (ONS) with the aim of developing cutting-edge machine learning and data science tools and working on unique national statistics data sets to gain new insights into the broader economy. We have jointly identified an exciting portfolio of projects on:

- 1) Economic Networks and Transaction Data
- 2) Economic Nowcasting
- 3) Synthetic Data and Privacy Preservation

Each project balances the need to develop the tools and methodology that will enable our partners and their stakeholders to build a broad picture of the UK economy with the desire to gain insight into what's happening now in specific areas of the economy.

Our aim is to build close research links between our two organisations, and to yield significant research output and tangible benefits in the short-to-medium-term. It is our shared goal that these initial two-year projects will serve as a starting point for a longer-term, multi-faceted relationship. We share the ambitious and exciting goal of advancing economic data science and mapping the economy in real-time for the benefit of the UK's economy, society and population. As the national institute for data science and artificial intelligence, the Turing's credentials and potential for success in this area are clear. We are the destination for developing and testing cutting-edge data science capabilities

The Alan Turing Institute

and have the capability to convene and generate a critical mass on key areas of interest at the nexus between academia and government.

The Turing are hiring a team of six Research Associates to support and enable the delivery of the three research projects under the direction of the Turing Programme Director, and the project PIs. The team will collectively have a broad range of expertise, and we will be hiring based on varied skills required for each specific challenge.

ROLE PURPOSE

This role will be part of the Economic Networks and Transaction Data project. This project will build understanding of networked data through a combination of data processing for financial transactions data held by the ONS, economic modelling and forecasting using data from the whole economic system, and the development of methods for efficiently reducing the dimensionality and complexity of network-generated data.

The role will focus on 'Challenge three'. This research challenge seeks to provide methodological improvements for working with network and high-dimensional economic data, in order to provide accurate and informative aggregates for policy decisions and forecasts. When analysing high-dimensional panels of macroeconomic or financial time series state-of-the-art methods tend to suffer from at least two main limitations.

Firstly, they often consider only linear dependencies. In contrast, real such time series are interconnected through a complex network of dependencies, and this network can display systemic risky behaviour. Secondly, the way in which factors affect data is seldom modelled, and typically only fully pervasive factors that affect all time series with similar magnitude are considered. In contrast, real such time series are collections of heterogeneous time series with different types of series influences by a diverse range of factors.

Furthermore, traditional theoretical models in economics and finance assume that in large ecosystems the influence of a few individual agents is negligible. Yet in large economic and financial panels there often exist one or more subsets of time series that influence the entire cross-section. For example, with a few time series leading on other time series which can be viewed as lagging behind the leading series. One potential modelling approach is to suppose that the set of agents can be partitioned into clusters, such that within clusters there are no consistent lead-lag relationships, while across clusters there exist stable lead-lag relationships.

The envisioned research will combine methods from machine learning and network analysis to reveal such hidden factors in the analysis of two types of high-dimensional data sets, with the aim of revealing complex relationships inherent within the data and improving forecasting accuracy. The first type of data is a network capturing pairwise interactions, such as cross-sectoral networks of input-output connections. The second type is a panel of economic time series, where the network structure can be examined by considering the correlations between different data streams

The candidate will join a vibrant team of researchers and will have opportunities to engage with projects / experts. These will include Sam Cohen, Gesine Reinert, Doyne Farmer, Terry Lyons, François Lafond & Mihai Cucuringu (Oxford), Vasco Carvalho (Cambridge), Aureo de Paula & Lars Nesheim (UCL), and Lukasz Szpruch (Edinburgh). The Research Associate will act as a linchpin and key interface between our two organisations and will play a key role in both delivering and bringing to life our research across the partner and amongst the Turing community.

DUTIES AND AREAS OF RESPONSIBILITY

- Apply state-of-the-art and novel data science and artificial intelligence techniques emerging from the Institute and elsewhere to the business-inspired research challenges of the Turing partnerships:
 - Develop methods for utilising financial transaction data in a national statistics context
 - Contribute to the development of input-output network models, including estimation of these models from disparate data sources.
 - Develop data-science tools and pipelines to provide economic indicators at various levels of geographic and temporal aggregation, to an industrial standard.
 - Enable data sharing between organisations and different departments within an organisation.

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- Scope, pilot and deliver high quality research activity in partnership with partner stakeholders, and under the Direction of the Principal Investigator and Programme Director:
 - Understand which data are, or might be, available; and collect and manage this data.
 - Perform analyses, which might include: building statistical models; applying machine learning techniques; building models and simulations; or applying optimisation techniques.
 - Drive the development of mathematical and statistical techniques for the inference of large, sparsely observed networks.
 - Document processes for effective and efficient reuse across multiple domains.
- Drive collaboration with academic experts and broader research partners from across the Turing and the wider Turing community
- Publish and disseminate high-quality research papers and publications detailing research output and project case-studies.
- Become part of the broader partnership team and be expected to engage on a regular basis with the partner.

Other duties

The successful candidate may be expected to:

- Present, disseminate and explain our work at various events, including academic events, internal and external events hosted by Turing and/or the partner. A discretionary budget for travel / attending conferences is available.
- Contribute to the life of the Institute and support its community.

QUESTIONS

If you have any questions, please contact Tony Zemaitis, Finance and Economics Research Project Manager on FinanceandEconomicsProgramme@turing.ac.uk

Please note that applications sent directly to this email address will not be accepted.

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PERSON SPECIFICATION

<p style="text-align: center;">Skills and Requirements</p> <p style="text-align: center;">We are seeking candidates with a broad range of experience and who can be flexible in some areas.</p>	<p style="text-align: center;">Essential (E)</p>	<p style="text-align: center;">Tested at application(A)</p>
	<p style="text-align: center;">Desirable (D)</p>	<p style="text-align: center;">Tested at interview(I)</p>
Education		
Research Associate level: PhD in Mathematics, Statistics, Economics, Operations Research, Computer Science or closely related discipline.	E	A
Research Assistant level: Near completion of a PhD or equivalent level of professional qualification in Mathematics, Statistics, Economics, Operations Research, Computer Science or closely related discipline.	E	A
Knowledge and Experience		
A solid background in one or more of the following: Probability Theory, Stochastic Analysis and Control, Bayesian Inference and Probabilistic Machine Learning, mathematical Modelling of collective behaviour of interacting systems and rigorous agent-based modelling.	E	A
Experience in design, development and implementation of research software libraries, ideally using one of the following: Python, R, Julia and their associated frameworks.	E	A&I
Track record of the ability to initiate, develop and deliver high quality research aligned with the research strategy indicated by the PI and any industrial stakeholders and to publish in peer reviewed journals and conferences.	E	A&I
Hands-on experience with Machine Learning methods	E	A/I
Demonstrated enthusiasm and ability to rapidly assimilate new computational and mathematical ideas and techniques on the job, at a more than superficial level, and apply them successfully.	D	A/I
A PhD in a quantitative field, or publication record showing equivalent experience, with demonstrated sustained intellectual leadership in an area of relevance.	E	A
Track record of outstanding research and in delivering impact appropriate to career stage	E	A
Ability to create and promote a collegial and collaborative approach to interdisciplinary research activities.	D	A/I
Excellent written and verbal communication skills, including experience in publishing research papers, code libraries or technical reports and giving presentations or classes on technical subjects.	E	A/I
Communication		
<ul style="list-style-type: none"> • The ability to initiate, plan, organise, implement and deliver programmes of work to tight deadlines. • Good effective communication (oral and written) skills, presentation and training skills, including the ability to explain technical concepts to technical and non-technical audiences. • Good interpersonal skills and ability to work as part of a team. 	E	I

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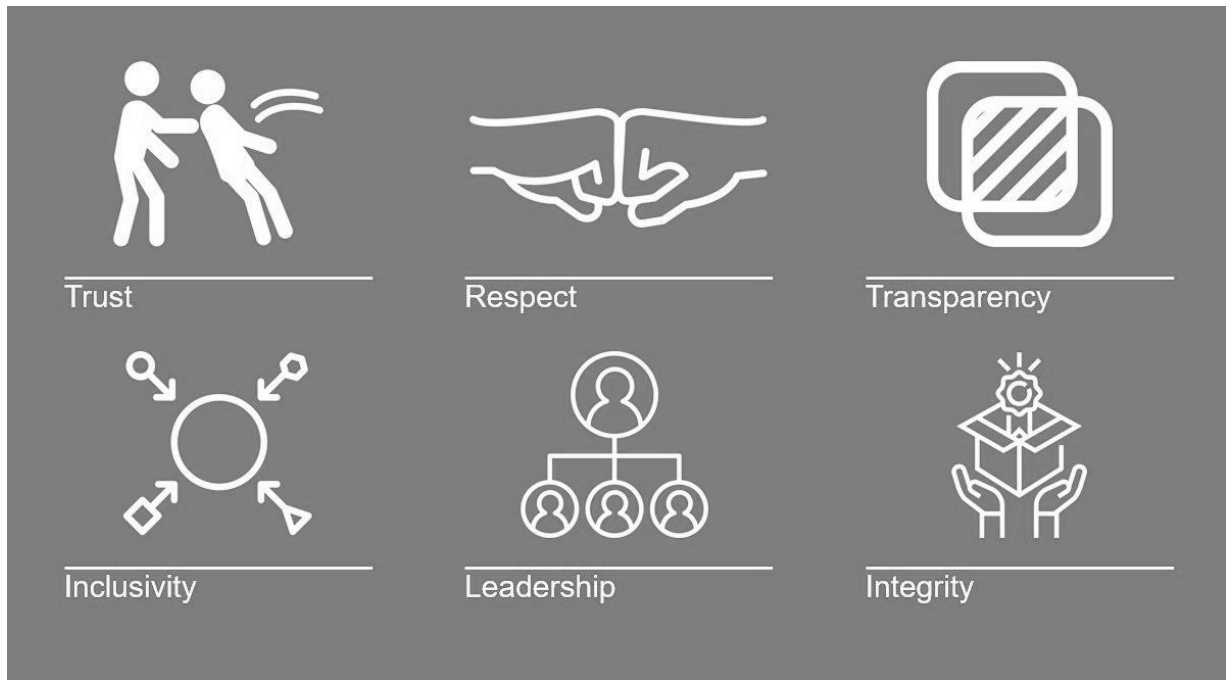
<ul style="list-style-type: none"> • A developing track record in producing high quality academic publications. • Ability to write research reports and papers in styles accessible to both academic and lay audiences. 	D	I
Teamwork and Motivation		
The ability to work in a team and interact professionally within a team of researchers and PhD students from a variety of professional backgrounds.	D	I
Other Requirements		
Commitment to meeting deadlines	E	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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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 [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 and covering letter. If you have questions about the role or would like to apply using a different format, please contact them on 0203 862 3340, or email recruitment@turing.ac.uk.

CLOSING DATE FOR APPLICATIONS: 03 OCTOBER 2021 at 23.59

TERMS AND CONDITIONS

This full-time post is offered on a two year fixed-term basis with an expected starting date of 1st January 2022. The annual salary is £37,000-£42,000 (depending on experience) plus excellent benefits, including flexible working and family friendly policies, <https://www.turing.ac.uk/work-turing/why-work-turing/employee-benefits>

Candidates who have not yet been officially awarded their PhD will be appointed as Research Assistant within the salary range £34,500 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.

PARTNER SECURITY CLEARANCE

Successful candidates must pass a disclosure and barring security check carried out by the partner organisation. Successful candidates must meet the security requirements before they can be appointed. The level of security needed is security check.

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.