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The Alan Turing Institute
The national institute for data science and artificial intelligence
Building on a strong scientific legacy

- Alan Turing’s pioneering work in theoretical and applied mathematics, engineering and computing are considered to be the key disciplines comprising the field of data science.

- “I propose to consider the question, “Can machines think?”…”

In 1950 Turing published his seminal paper, *Computing Machinery and Intelligence*, which is credited with laying the foundations for the development and philosophy of artificial intelligence.
Institute goals

- Innovate and develop world-class research in data science and artificial intelligence
- Apply our data science research to real-world problems, supporting the creation of new products, services and jobs
- Train the next generation of data science and artificial intelligence leaders
- Thought leadership: advising policy-makers and shaping the public conversation around data
Challenges

Advance data science and artificial intelligence to…

1. Revolutionise healthcare
2. Deliver safer, smarter engineering
3. Manage security in an insecure world
4. Shine a light on the economy
5. Make machine decisions fair, transparent, and ethical
6. Design computers for the next generation of algorithms
7. Supercharge research in science and humanities
8. Foster government innovation
The Institute’s growing list of universities

UNIVERSITY OF CAMBRIDGE  UNIVERSITY OF EDINBURGH  UNIVERSITY OF OXFORD  UCL  WARWICK

UNIVERSITY OF BIRMINGHAM  UNIVERSITY OF EXETER  UNIVERSITY OF LEEDS  NEWCASTLE UNIVERSITY  UNIVERSITY OF SOUTHAMPTON

Queen Mary University of London
The Institute’s growing list of partners
Presenters: Rakshit Kapoor, Chief Data Officer
**Vision:** Become a truly “data driven” organization – generate valuable insights from well-managed data assets

**Data Strategy**

1. Customer Centricity
2. Actionable Analytics
3. Data Quality Improvements
4. Commercialising our Data
5. Data Simplification
6. Talent & Culture
Why together: Shine a light on the Economy

“The Alan Turing Institute runs a programme, with funding from HSBC, which aims to use new data to measure economic activity faster and more precisely than was previously possible”

Financial Times, 30 April 2018
Why together: Applying the latest in data science techniques to the field

• Advance Economic data science - an emerging field combining econometrics and data science to address economic research questions.

• HSBC is making data available to Turing researchers, as part of advancing this pioneering new field.

• Develop cutting-edge AI/Machine learning techniques, with an emphasis on using new and innovative forms of data.

• Beginning in October 2018, the programme scope is expanding to research on AI in Finance.
A partnership governed by five objectives

1. Establish an ambitious set of projects addressing **key research challenges**
2. Involve the **best researchers** from across AI/ML and data science
3. Exploit new data sources using **innovative techniques**
4. Ensure findings are **disseminated** through a full range of academic, policy, and commercial channels
5. Train the **next generation** of finance and economic data science leaders
Established Turing-HSBC research projects

- Regional evolution of economic activity
- Production networks and growth forecasts
- Immigration and labour markets
- Technology and labour markets
Turing-HSBC-ONS Economic Data Science Awards 2018

• Competitive funding call for projects of 6-24 months duration, beginning in October 2018, led by a researcher from one of the Turing’s partner universities. The call invited applications with high potential for impact and results within 6-9 months.

• HSBC are contributing data and Comms support. ONS are contributing data and staff resource. Turing are contributing Research Engineer expertise.

• 27 applications were received from around Britain, involving international collaborators from 5 other countries (Germany, Italy, Belgium, Singapore, USA).
Turing-HSBC-ONS Awardees

10-12 months duration
- Letting text speak to economic data
- Causal effects in social networks
- News sentiment indicators for assessing the UK’s economic growth

12-15 months duration
- Detecting anomalies in networks: the case of VAT
- Forecasting with large datasets in the presence of structural change
- Learning tools for land use analysis and decision support

18-19 months duration
- Dimensions of labour supply in the gig economy
- Skill-based network modelling of industrial diversification paths for UK cities
- Specialisation, wages, and inequality in a changing world of work
Next Steps for the Partnership

New Director & Expansion of Programme to include financial services
• Cutting-edge AI / ML solutions for problems ranging from fraud detection to portfolio hedging
• Predictability using high-frequency data
• Uncertainty quantification for risk models
• Distribution ledger technology
• Security in the era of open banking

Data science training
• Turing PhDs at HSBC – inaugural student in post, more to follow
• Senior exec education on ML / AI – first installment delivered in 2018: “Pragmatic / realistic and applicable”

New research programmes to be launched
• Counterfactual explanations
• Electric Vehicles and future cities
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Appendix: Project detail
Regional evolution of economic activity

Vasco Carvalho
University of Cambridge

Understanding how economic outcomes in different regions are linked and how shocks spread.
Current measurements GDP

- **Gross Domestic Product** = measure of economic activity by residents of a country
- Three approaches:
  - **Income approach**: GDP = consumption + investment + government spending + net exports
  - **Expenditure approach**: GDP = labour income + corporate profits + investment income + other income
  - **Production approach**: GDP = gross value of output (sales) – value of intermediate consumption = value added
- Disadvantages:
  - Currently measured with surveys, questionnaires, and imputations (e.g., “imputed rent”, imputing the value of the rent that homeowners pay to themselves).
  - Delay of several months to publish figures, and several revisions afterwards
  - At regional level, delay of 18 months, with the most granular data by local authority and year
- Data science will revolutionise these methods from the 1950s, e.g. HMRC could calculate production approach from VAT applications
Investigating the impact new technology has on employment and output.

One strand of this work is looking at modelling the adoption of computers since the middle of the 20th century. The other strand of this work focuses on the effects of cheaper electricity in the US over the early 20th century.
**Vertical axis:** Recovery of employment for a given recovery of output of 5%

**Horizontal axis:** Peak year of US recessions.

**Lines:** average and 95% confidence interval for the first 7 recoveries and the last 3.

**Model:** firms use recent recessions as an opportunity to fire workers, invest in computers, and not hire back those workers.

Presented at several conferences this year (Computational Economics and Finance Conference in Milan, June 2018; Danish Central Bank in September 2018; Banque de France in November 2018).