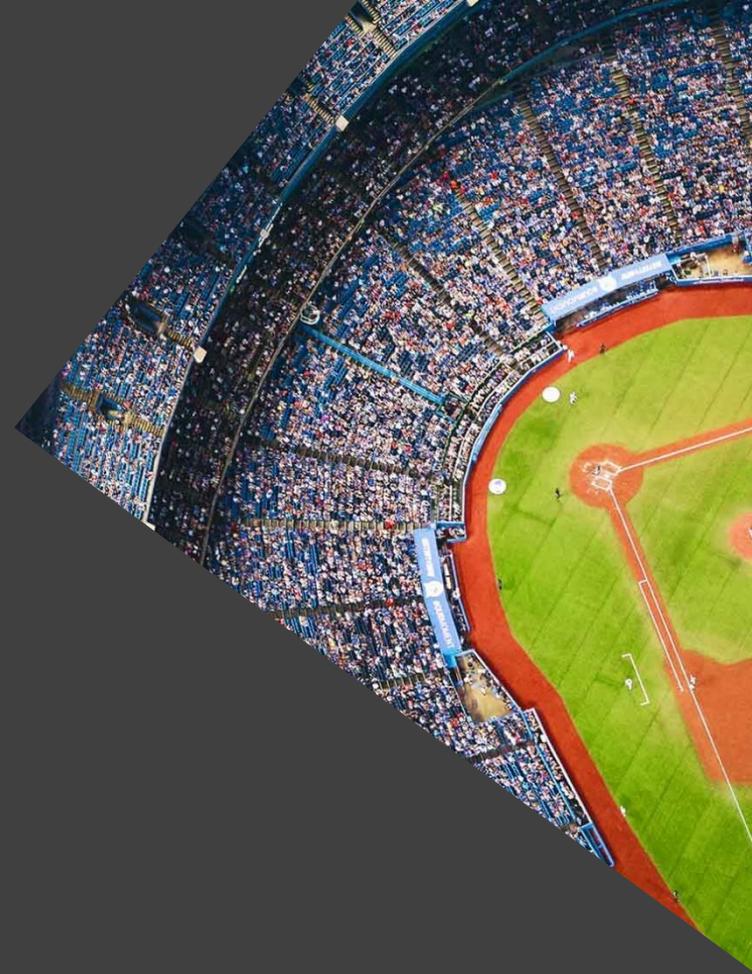


# The Alan Turing Institute

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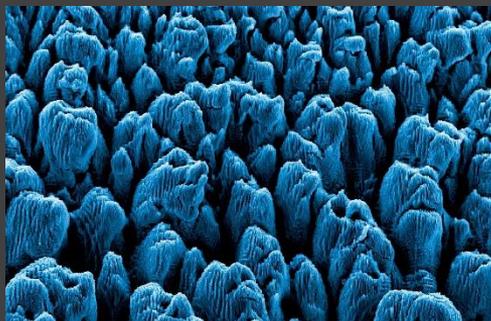
What the new frontiers of  
data science and AI may  
mean for social research

Adrian Smith  
Institute Director & Chief Executive



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What's new?



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**More data**



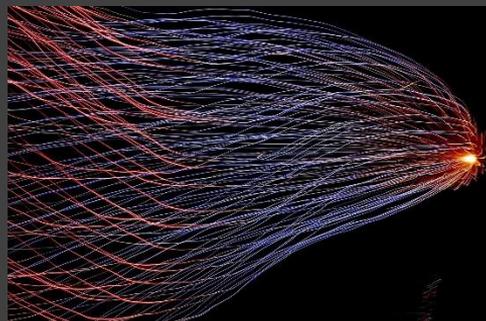
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**More access**



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**More computing  
power and storage**



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**More insight through  
algorithms**

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Opportunities but also issues



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Access



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Privacy



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Security



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Ethics



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Governance



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Trade-offs: e.g.  
privacy vs prosperity

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# Hyper-entrepreneurial state-surveillance capitalism

2011 WeChat super app

2015 Mobile payments

2015 Biometric database

2017 National AI plan for 2030

2022 Social credit score

Source: AI Super-Powers, Kai-Fu Lee



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Overview  
**The Alan Turing  
Institute**





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## Our goals

- Innovate and develop world-class research
- Real-world problems
- Train the next generation
- Advising policy-makers and public

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Challenges

**Advance data science and AI to...**



---

Revolutionise healthcare



---

Deliver safer, smarter  
engineering



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Manage security in an  
insecure world



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Shine a light on our economy



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Make algorithmic systems  
fair, ethical, and transparent



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Design computers for the  
next generation of algorithms



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Supercharge research in  
science and humanities

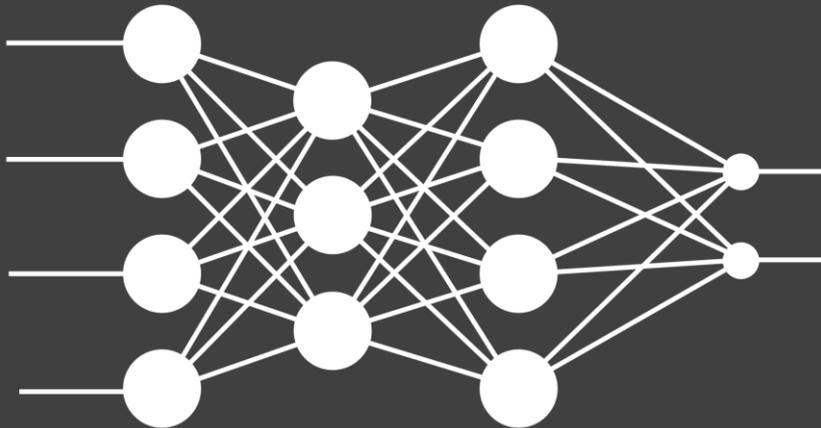


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Foster government  
innovation

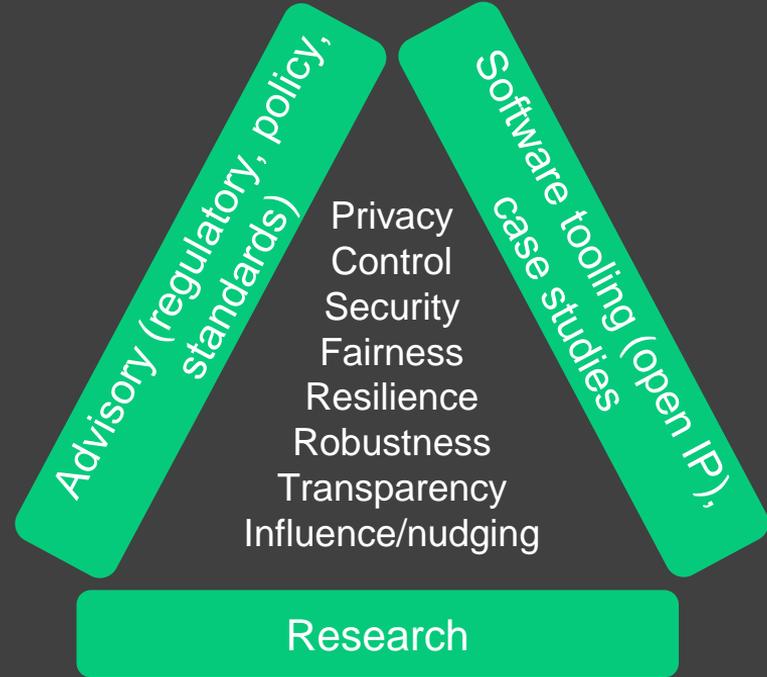
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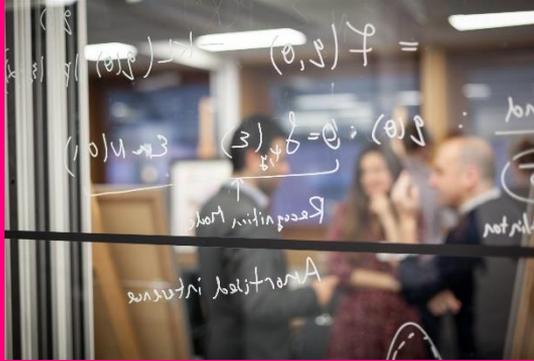
# The magic of machine learning



**Yes?**

# Safe & ethical AI to enable innovation





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Convener



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Scientific diversity



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Collaborative focus



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## Public debate

- Memories of GM and MMR
- How to promulgate awareness and understanding



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## Public debate

- Agency? e.g. Centre for Data Ethics and Innovation
- RSA - Democratising decisions about technology: A toolkit (for institutions and citizens)

---

# Turing's Public Policy Programme

by Professor Helen Margetts



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# Data science and AI have enormous potential to make government better



Tailor education to the needs of each child



Reduce crime



Fit healthcare to each patient



Alleviate the cost of financial crises



Prevent traffic deaths



Intervene early for children at risk

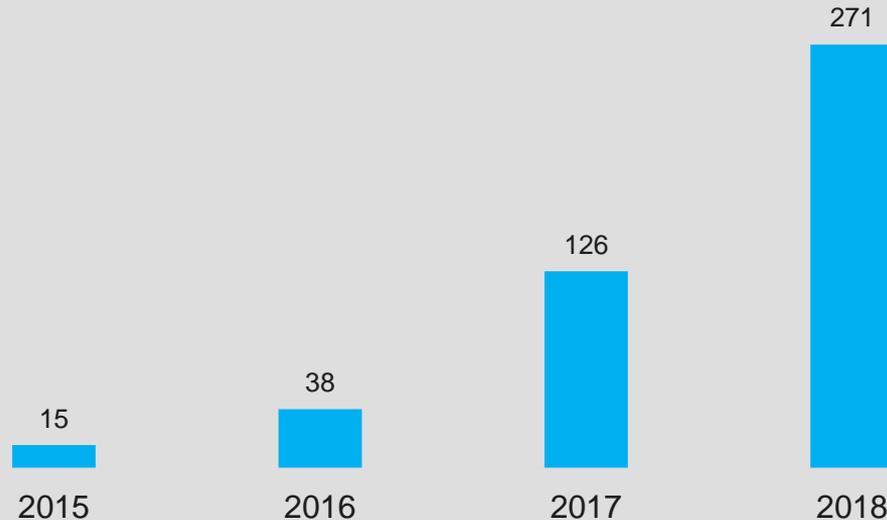


Making government more efficient, fair, responsive, prescient, and sustainable

---

In the UK, the past few years have seen exponential growth in government's interest in data science and AI

Government announcements that mention data science or artificial intelligence



# Government departments are building their own, in-house data science expertise



\*The figures only reflect data scientists who have LinkedIn profiles.

Source: self-reported data on LinkedIn, accessed on 30 October 2019.

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# Technology transfers happen within a department...

**BEIS**

How can we identify the people who are at risk of ending up in fuel poverty?



How can we identify which start-ups have high growth potential?

---

# ...when it would be more efficient for it to happen across departmental lines

**BEIS**

How can we identify the people who are at risk of ending up in fuel poverty?



**DWP**

How can we identify vulnerable people and those with multiple problems early?

**MHCLG**

How can we identify vulnerable groups (e.g. those at risk from domestic violence, rough sleeping, homelessness)?

**CO**

How can we identify users with multiple complex needs?

How can we identify which start-ups have high growth potential?

- ✓ Greater methodological overlap
- ✓ Avoids duplication
- ✓ Economies of scale from a centralised approach

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# £1m yearly investment from the Turing to link the government to the Institute's community of 500+ AI researchers



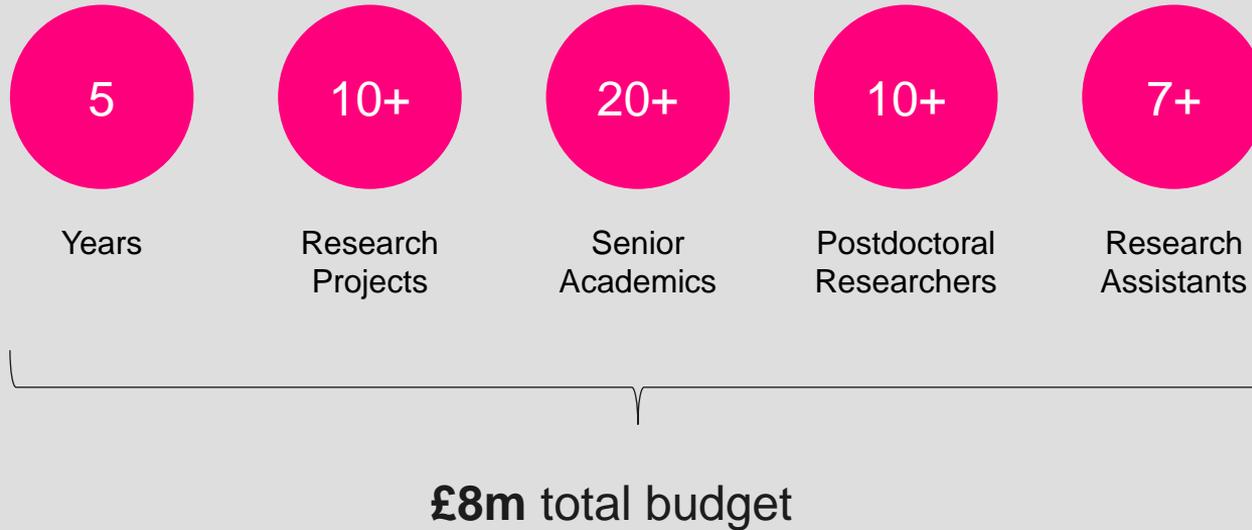
**70** public sector organisations reached out to the programme for help

# An £8m investment from UKRI's Strategic Priorities Fund allowed us to set up a programme of work in criminal justice

	Measurement and detection	Prediction and forecasting	Simulation and evaluation	Personalisation	Ethics and governance
Criminal justice and home affairs					
Economic and financial affairs					
Social welfare					
Health					
Democracy and community engagement					
Environment					
Transport, energy, and telecommunications					
Education and training					
Defence and security					

---

# Spanning over 5 years, the investment funds an extensive research programme



# The research covers all areas of the criminal justice system and informs policy in three government departments



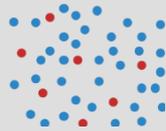
Ministry  
of Justice



Home Office



Department for  
Digital, Culture,  
Media & Sport



**Identify  
harmful  
behaviour**

- Quantifying online hate speech
- Identifying modern slavery patterns



**Enforcing  
the law**

- Simulating the dynamics of police demand
- Analysing free text police data



**Ensuring  
justice is  
served**

- Evaluating complex evidential data



**Rehabilitate  
offenders**

- Learning machines to minimise reoffending
- Measuring bias in probation risk scores



**Foundational  
projects**

- Mapping the data landscape
- Building an ethical framework
- AI explainability

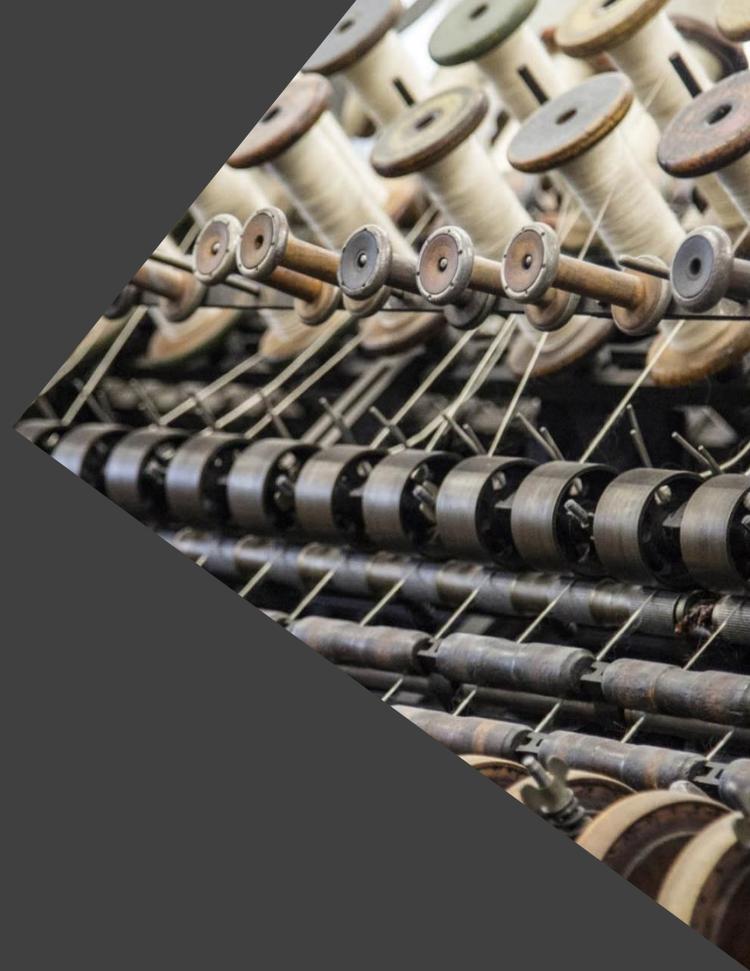
# The programme's work in criminal justice can be extended to other policy areas

	Measurement and detection	Prediction and forecasting	Simulation and evaluation	Personalisation	Ethics and governance
Criminal justice and home affairs	Hate speech	Bias in probation risk scores	Simulating police demand	Learning machines	AI explainability
	↓	↓	↓	↓	↓
Economic and financial affairs					
Social welfare					
Health					
Democracy and community engagement					
Environment					
Transport, energy, and telecommunications					
Education and training					

---

# Living with Machines

by Professor Ruth Ahnert



# Overview

– Examine how tech altered human existence in the 19<sup>th</sup> century, by using cutting-edge 21<sup>st</sup> century tech

...burn and Co., Conduit-street, and news vendors throughout the Kingdom.

On Saturday, January 6th, was published, and sent postage free, price 10s., on fine paper, (10 quarto pages) the First Number of a new Volume of

## THE COUNTRY LITERARY CHRONICLE

AND WEEKLY REVIEW. It consists of an analysis, with interesting extracts, of all popular and costly new books; contains a great variety of original matter, Criticisms on the Fine Arts, Drama, and Public Amusements; Biographical Memoirs of Eminent Persons; Occasional Articles on Foreign Literature; Original Poetry, Literary and Scientific Intelligence, Anecdotes, and a Brief Summary of Politics—Every volume is complete within itself, and affords a favourable opportunity for new subscribers

These works are free from political or theological bias, and are particularly desirable for the libraries of respectable families.—The vol. for 1820, price 11. 7s. 6d. is now ready; and the Index to the vol. may be seen at any respectable Booksellers.

Published by Limbird, 355, Strand, where prospectuses may be had; and sold by all Newsmen and Venders of Periodical Publications.

4th Edition, price 2s.

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containing the Speeches and Memoirs of her Majesty, Messrs. Brougham, Manningham, and Bergami; View of Brandenburg House; of the Interior of the House of Lords; of the Queen's presence in the House of Lords; and of her Majesty's Entrance into Jerusalem. Ruled Tables for Accounts. List of Bankers, Stamps, &c. &c.

Sold by Smeeton, St. Martin's Church-yard; of whom may be had The TRIAL of the QUEEN, complete in 2 vols. 8vo. price 14s. boards, (or in 26 numbers, price 6d. each), embellished with numerous Portraits, Views, &c.

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Monologues, Prologues, comic songs, with a rare and valuable collection of the most famous comic songs. The third volume. W. OXBERRY, of the Strand. Printed for W. Simpkin, St. Dunstons-lane, and W. Gifford, St. Pauls-church-yard. Price 1s. 6d. per volume.

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Books just published

**SPEC**  
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Preface.  
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This day is published

# Overview

– Central theme speaks directly to present debates on how society can accommodate the 4<sup>th</sup> industrial revolution

... and new readers throughout the

On Saturday, January 11th, was published, and sent postage free, price 10s., on fine paper, (10 quarts to pages) the First Number of

## THE COUNTRY LITERARY CHRONICLE

It consists of an analysis, with interesting extracts, of all popular and costly new books; contains a great variety of original matter, Criticisms on the Fine Arts, Drama, and Public Amusements; Biographical Memoirs of Eminent Persons; Occasional Articles on Foreign Literature; Original Poetry, Literary and Scientific Intelligence, Anecdotes, and a Brief Summary of Politics—Every volume is complete within itself, and affords a favourable opportunity for new subscribers

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GEORGE of religion, civil knowledge during with a fine portrait last illness of his of her late Majesty a poetical appendix by Thomson, 7s. had separate, pr

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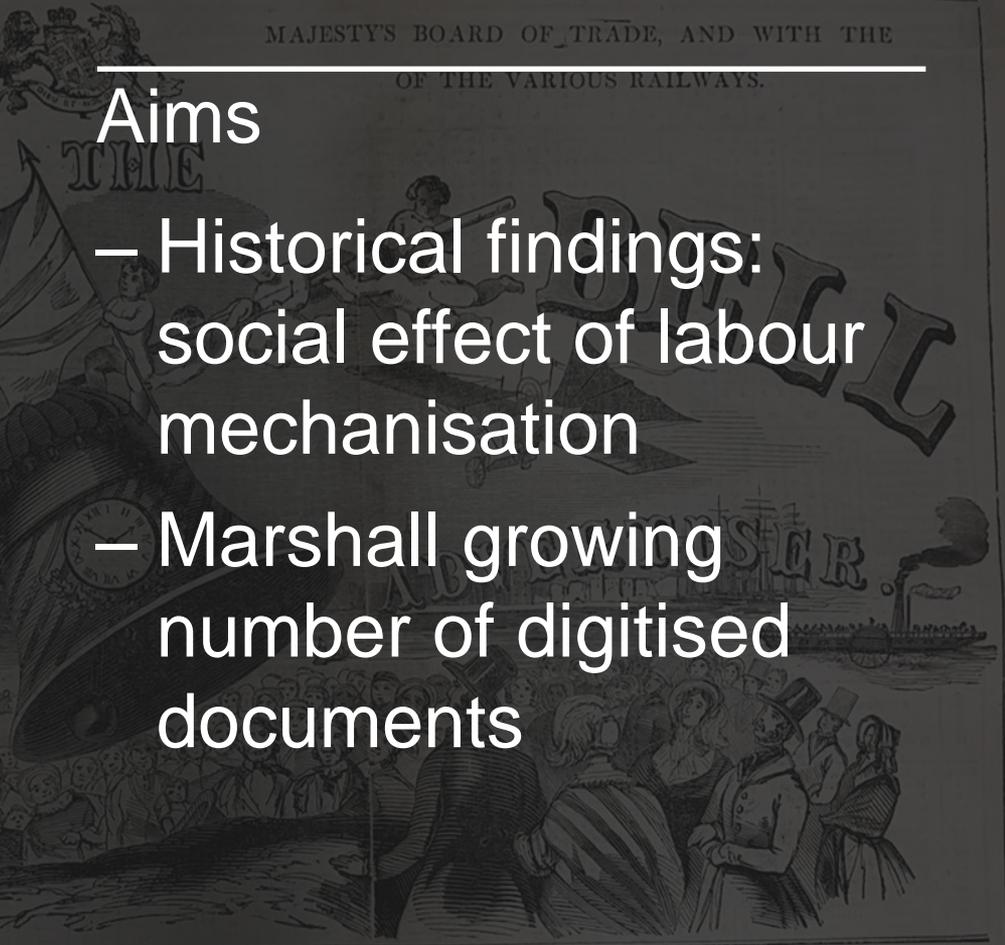
MAJESTY'S BOARD OF TRADE, AND WITH THE  
OF THE VARIOUS RAILWAYS.

# RAILWAY



## Aims

- Historical findings: social effect of labour mechanisation
- Marshall growing number of digitised documents



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# RAILWAY

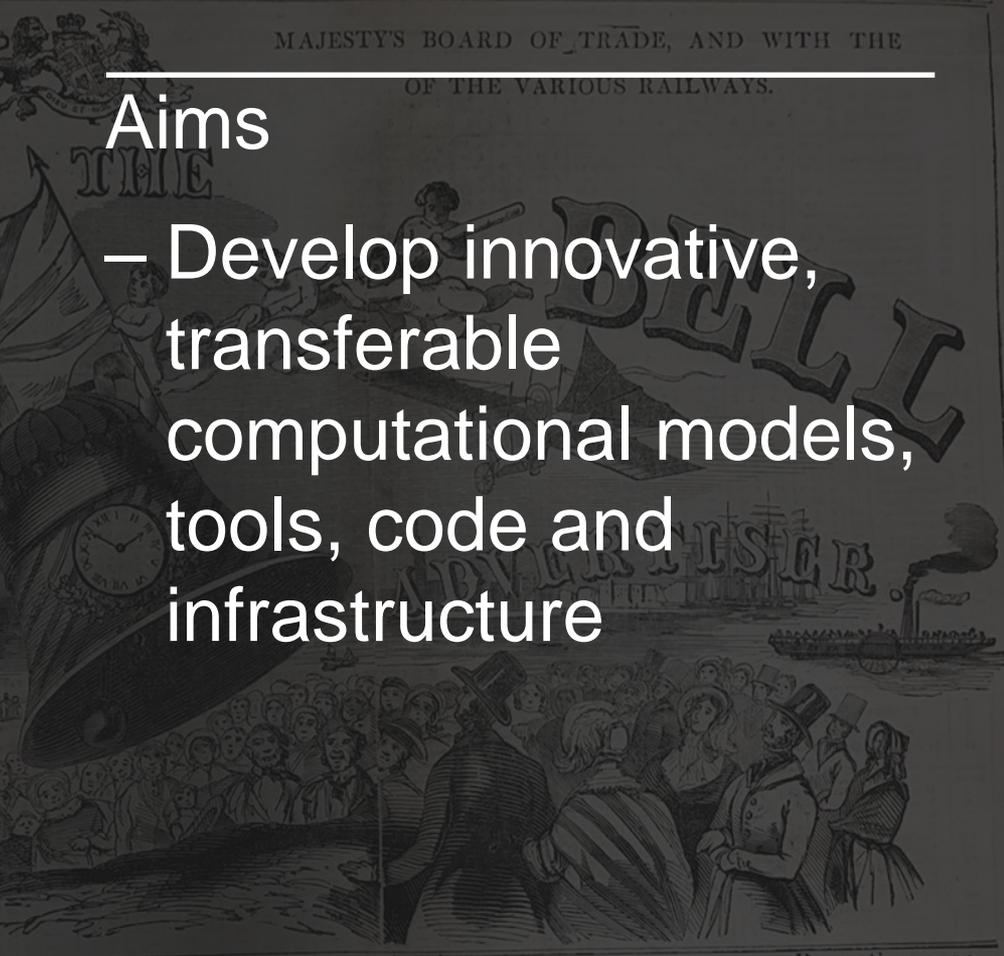


## ILLUSTRATED

MAJESTY'S BOARD OF TRADE, AND WITH THE  
OF THE VARIOUS RAILWAYS.

## Aims

- Develop innovative, transferable computational models, tools, code and infrastructure



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# RAILWAY



MAJESTY'S BOARD OF TRADE, AND WITH THE  
OF THE VARIOUS RAILWAYS.

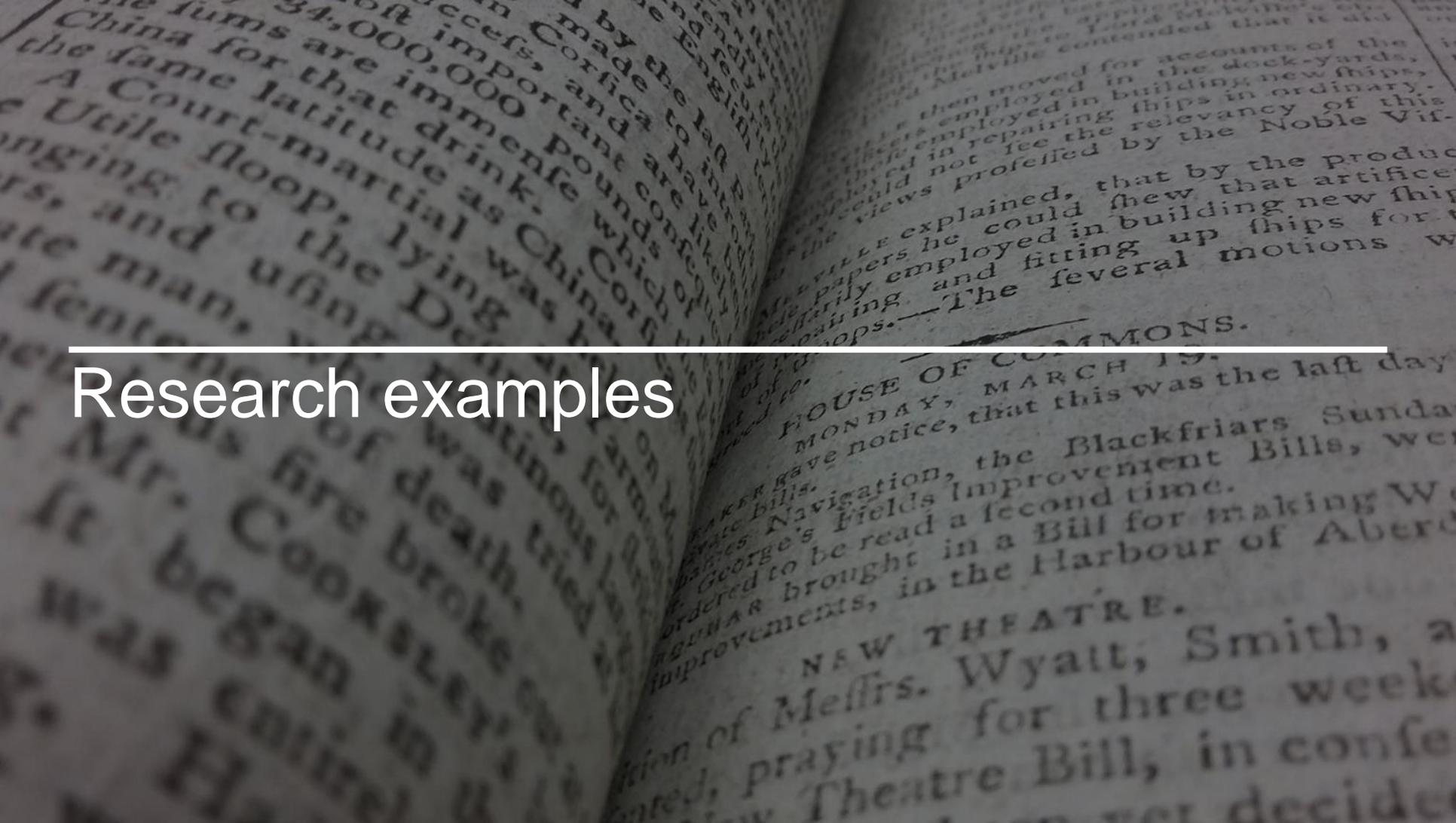
## Aims

- Radical collaboration: challenging discipline-specific assumptions on working together
- Tackle research questions and share outcomes

10th. Do not open the carriage-doors your-  
self, but let the attendant attend to that  
11th. Invalids and decrepid persons con-  
tinuously receive very considerate attention from

---

# Research examples



- How representative is digitised press of 19<sup>th</sup> century press as a whole?
- All press  $\geq$  directories  $\geq$  holdings  $\geq$  digitised
- Create 'environmental scan': digitise press directories to link to existing assets

npd.circulates.circulates

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npd.leaning

conservative

---

# What can we do with that data?

- Filtering: politics, area, price, etc.
- Weighting analyses to adjust for under-representation
- Concept of the environmental scan: contribution to reproducible research

# Machines as agents (of change)

‘The hand-mill gives you society with the feudal lord; the steam-mill society with the industrial capitalist.’

Karl Marx, The Poverty of Philosophy (Ch.2)

**Theory:** Technological Determinism; or, ‘machines drive history’

change there was in the district since then. Except that the railway ran through, the landscape was the same, and except for what the railway had done at Tebey the population was not much bigger. But what an enormous change had taken place in the political life of the people since then. In that day

The Penrith Observer, 6 Oct 1891

**Everyday Language:** Machines seem to have agency over human affairs

**Questions:** -When, where and how, do machines come to be seen as autonomous?

-If machines are ‘agents’, then who has control and who does not?

---

# Machines as agents

1. **Lexicon expansion:** automatically generate terms related to Industrial Revolution
2. **Parsing:** Using syntactic dependency parsing and semantic role labelling to ascertain if agency is assigned to machine
3. **Environmental scan:** cross refer with environmental scan to identify patterns & biases

---

# Implications?

- Awareness/education (Q-step+?)
- Connectivity to big challenges
- Connectivity to Research Software Engineering
- Possible increased government policy interest and funding