The Alan Turing Institute

Rethink government with data science and AI

Dr Cosmina Dorobantu

Deputy Director, Public Policy Programme

Agenda

1. Why should researchers be interested in data science for policy?
2. How is The Alan Turing Institute trying to help?
3. What can data science and AI do for policymakers?

Data science and AI have enormous potential to make government better


Tailor education to the needs of each child


Reduce street crime


Fit healthcare to each patient

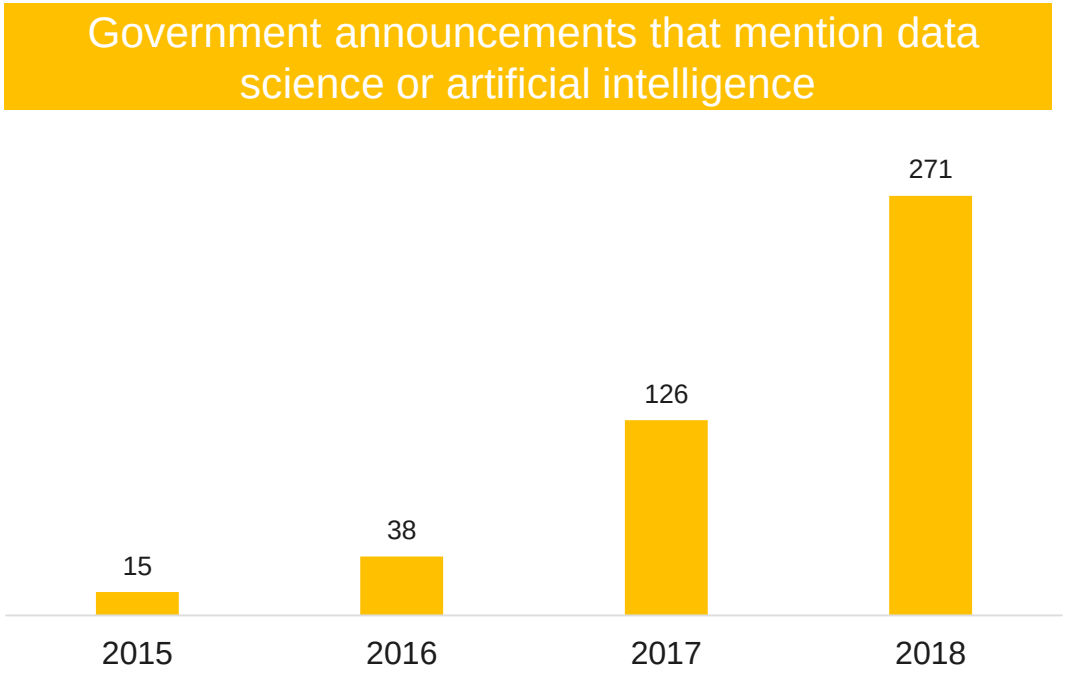

Alleviate the cost of financial crises


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



Source: UK Government's News and Communications website -- https://www.gov.uk/search/news-and-communications

... and a strong recognition from Ministers of the potential of these technologies for the public sector

"*We want the public sector to understand AI [...] There are huge opportunities for government to capitalise on this exciting new technology to improve lives.*"

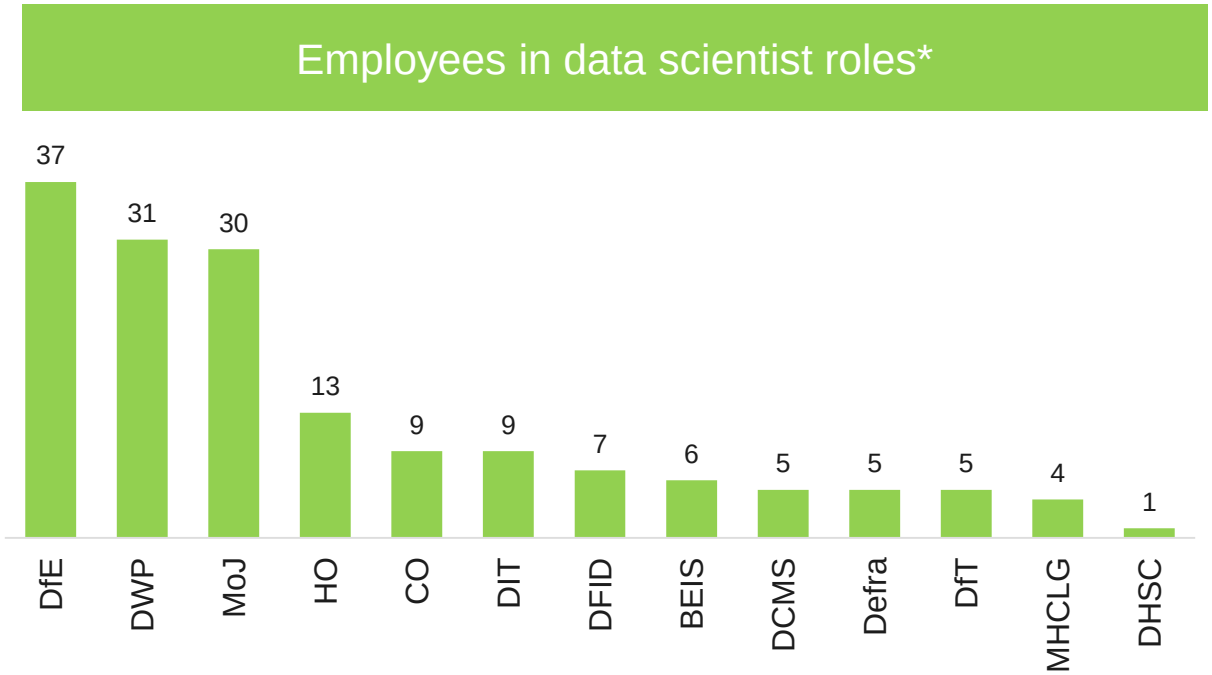
Source: Ministerial Forward, *A guide to using artificial intelligence in the public sector*, 10 June 2019

Despite the interest, governments around the world have a history of struggling with technological innovation

... and they will struggle with data science and AI for the same reasons they struggled with earlier digital systems

Lack of in-house expertise

In the UK, 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.

Governments will struggle with data science and AI for the same reasons they struggled with earlier digital systems

- Lack of in-house expertise
- Inability to pay salaries that match the private sector
- Difficulties in evaluating the work contracted out to private providers
- Cultural barriers amplified by past IT disasters

Independent academic researchers have a duty to help governments maximise the potential of data science and AI

The Alan Turing Institute

Stanford
Human-Centered
Artificial Intelligence

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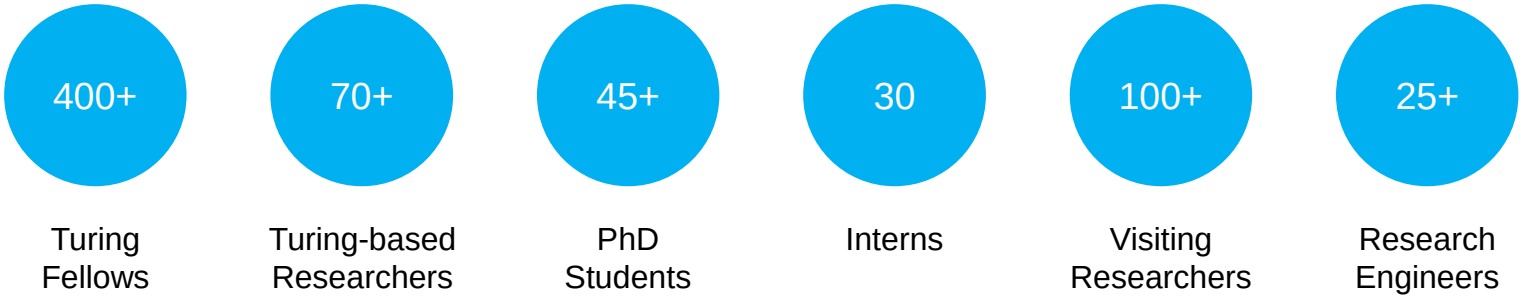
The Turing is UK's national institute for data science and AI

... and has unequalled access to expertise in these domains



Figures as of September 2019

In May 2018, we launched the public policy research programme

News

The Alan Turing Institute launches a new research programme in data science and AI for public policy, led by Professor Helen Margetts

Posted on 9th May 2018 **News**

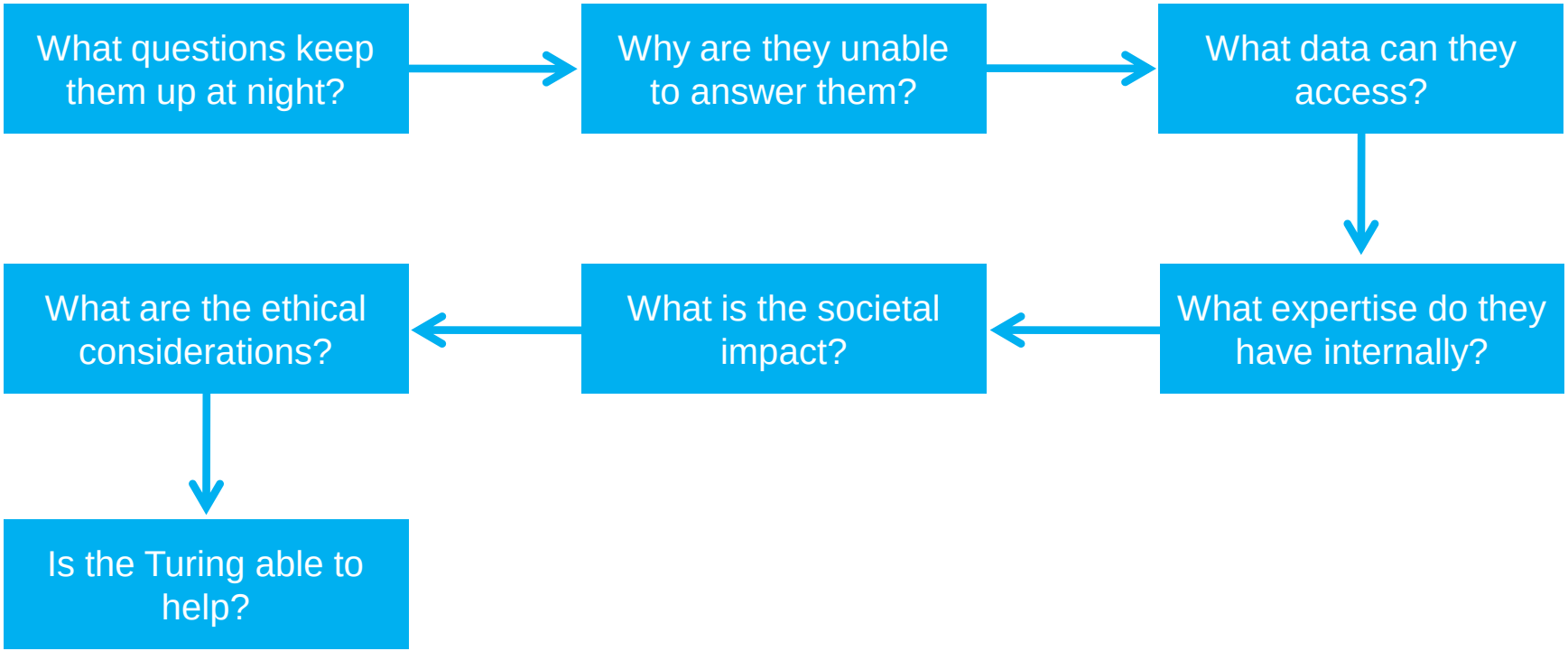
Government has fostered and embraced important advances in technology, from critical investment in the iPhone and the internet, to early adoption of large-scale computer systems in the 1960s. Today, government is a major holder of data, which data science and artificial intelligence (AI) can harness to improve the design and provision of public services as well as to inform policy-making across all levels of government.

Public policy

Working with policy makers on data-driven public services and innovation to solve policy problems, and developing ethical foundations for data science and AI policy making.

Read more

We met with hundreds of policymakers to understand where they should focus their attention



We identified four areas of opportunity, covering the technical as well as the ethical aspects of data science for policy

Use data science and artificial intelligence to inform policymaking

Build ethical foundations for the use of data science and AI in policymaking

Improve the provision of public services

Contribute to policy that governs the use of data science and AI

We hired a team of seven to oversee the programme's activities

Professor Helen Margetts

Political Science

Dr Cosmina Dorobantu

Economics

Pauline Kinniburgh

Finance

Dr David Leslie

Philosophy & Ethics

Christina Hitrova

Law

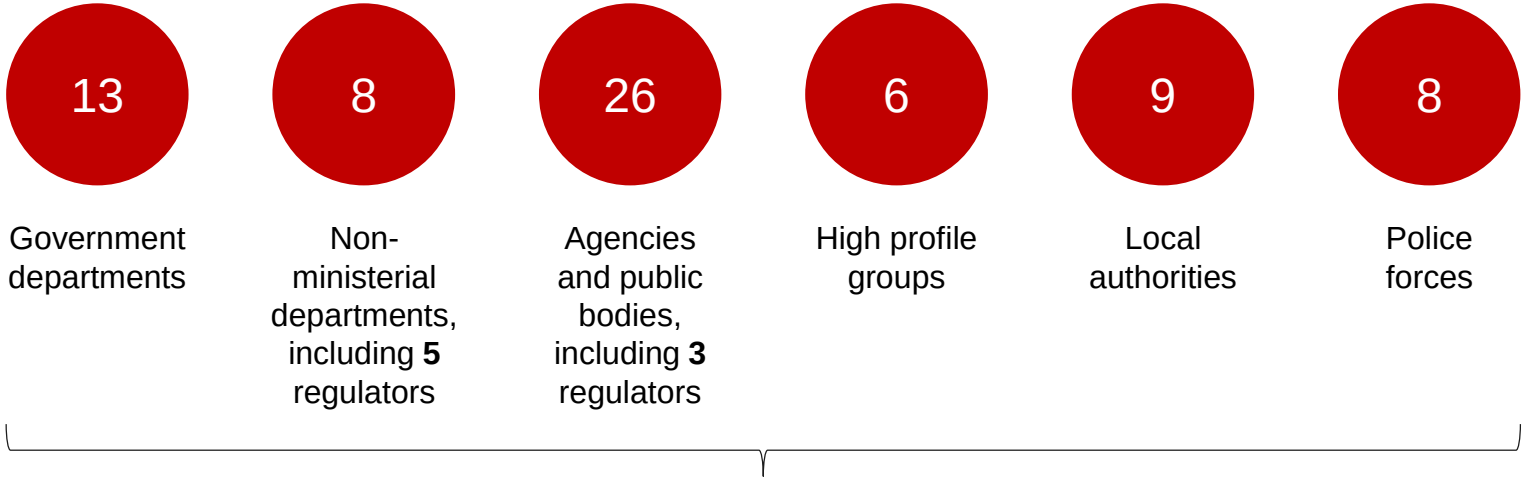
Dr Florian Ostmann

Public Policy

Alexander Harris

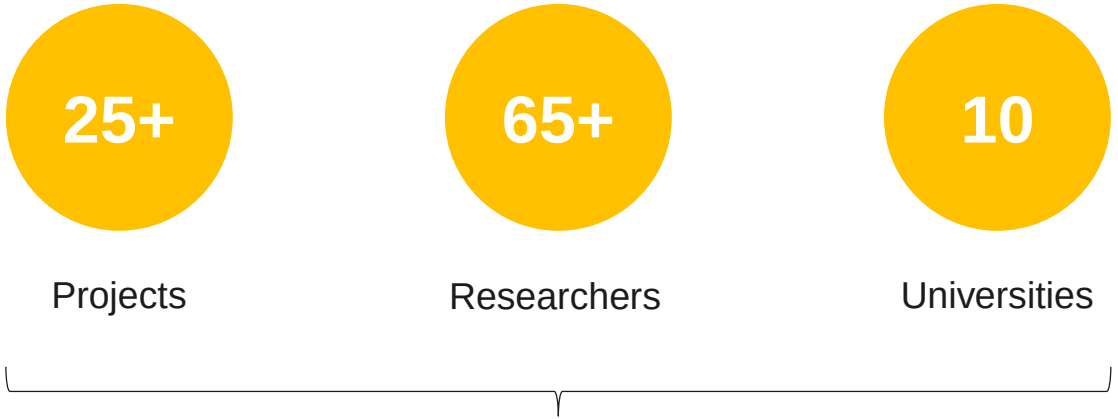
International Relations

Our job is to link the government to the Institute's community of AI researchers



70 public sector organisations reached out to the programme for help

We set up and oversee 25+ research projects, involving more than 65 academic researchers from 10 universities



10,000s of hours of work conducted for the public sector

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Artificial intelligence is not a new field

Greater computing power

Better machine learning algorithms

More data and cheaper storage

Larger investments

... nor is it all that it is hyped up to be

Source: Google Images

Data science and AI are a set of digital technologies that can help policymakers with some tasks

- Simulation and evaluation
- Measurement and detection
- Prediction and forecasting
- Personalisation
- Ethics and governance

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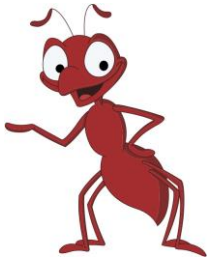
Agent computing allows us to model complex, interdependent systems



In a policy context, agent computing gives us the ability to understand these systems better than ever

Traffic modelling

- Old way: density = *f* (population, roads, economy)
- New way: model each vehicle, road, emergent jams

Military operations

- Old way: casualties = *g* (red, blue, rules of engagement)
- New way: model each soldier, weapon, bullet

Financial market and macroeconomic models

- Old way: representative agent model with aggregate data
- New way: use microdata on consumers and firms

Source: Rob Axtell, ABM Policy Applications, October 2018

... and create digital replicas of our economies that we can run experiments on without hurting anyone

Start with 120 million workers. Replicate the characteristics of the US private sector:

- 6,000,000 firms (with employees)
- 3,000,000 job changers each month
- 100,000 startups each month
- 20,000 largest firms employ half of workers
- 1 firm with 1,000,000 employees

Source: Rob Axtell, ABM Policy Applications, October 2018

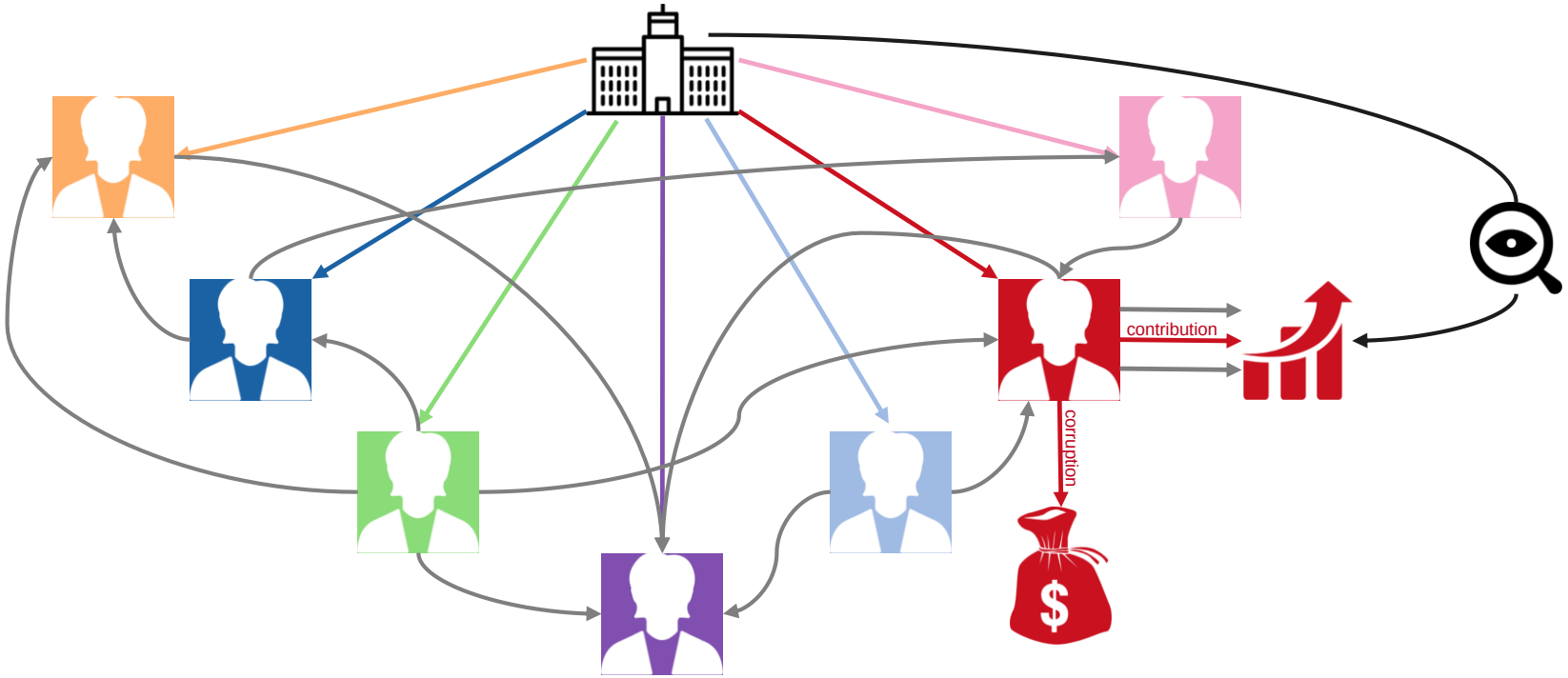
We are using agent computing to help developing countries reach the sustainable development goals

https://www.turing.ac.uk/research/research-projects/policy-priority-inference

Setting policy priorities is not a trivial process

- Governments establish policy goals
  - Internal political agreements, imitating successful countries, discretionary choices, international consensus, societal pressures, etc.
- Not a trivial process
  - Growing number of indicators (232 indicators monitor the 17 SDGs)
  - Policies interact with each other (network of spillovers)
  - Design ≠ implementation
- Data do not reveal policy priorities
  - Key to evaluate and prescribe policies

We use an agent computing approach to capture interdependencies between policy areas



The model

development indicators
(initial conditions)

network
(spillovers)

development goals
(multidimensional targets)

priorities/allocations
(design)

corruption
(implementation)

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A crude introduction to machine learning

Dog

D∂g

Algorithm

Quantity of data

Quality of data

Variation in data

... and a terrible joke

A machine learning algorithm walks into a bar.

The bartender asks ”what will you have?”

The algorithm says...

“what is everyone else having?”

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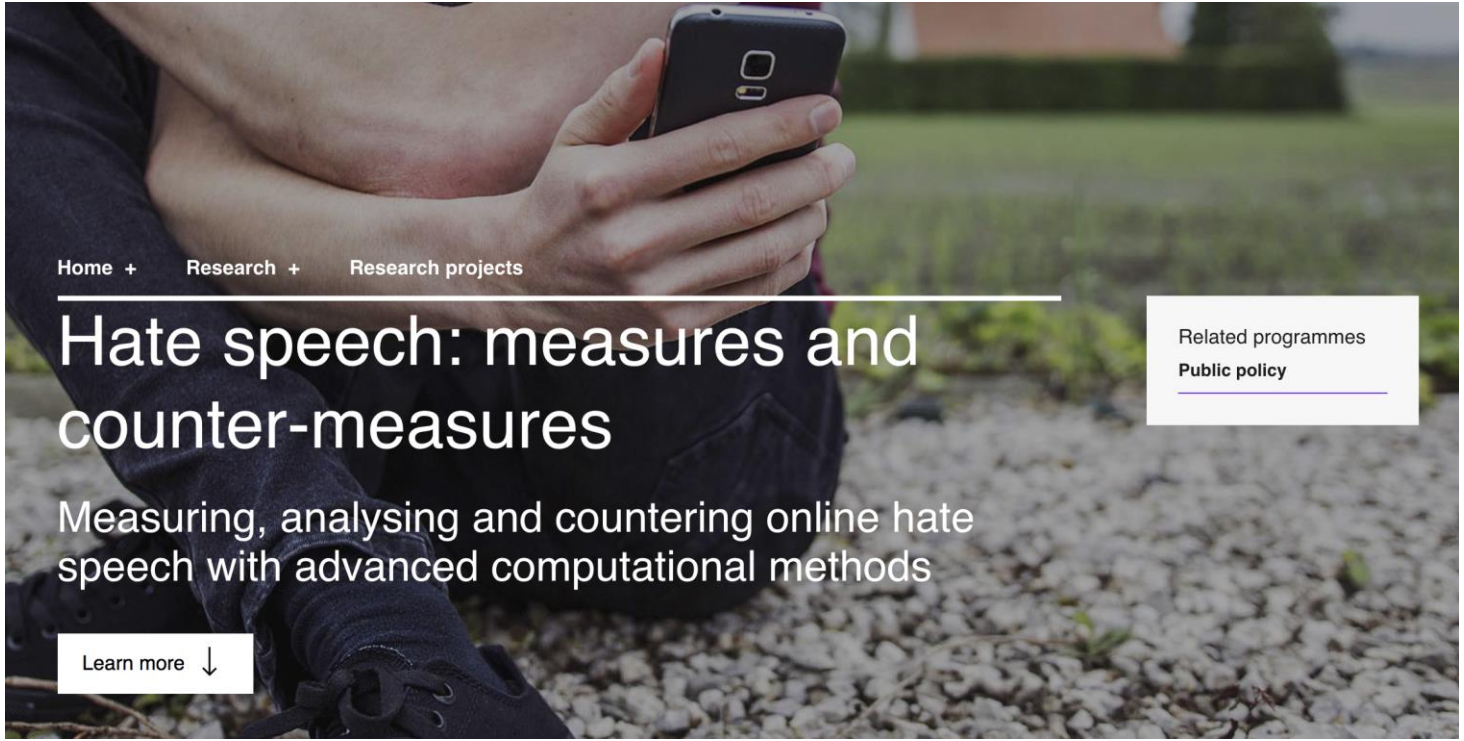
Example Turing project



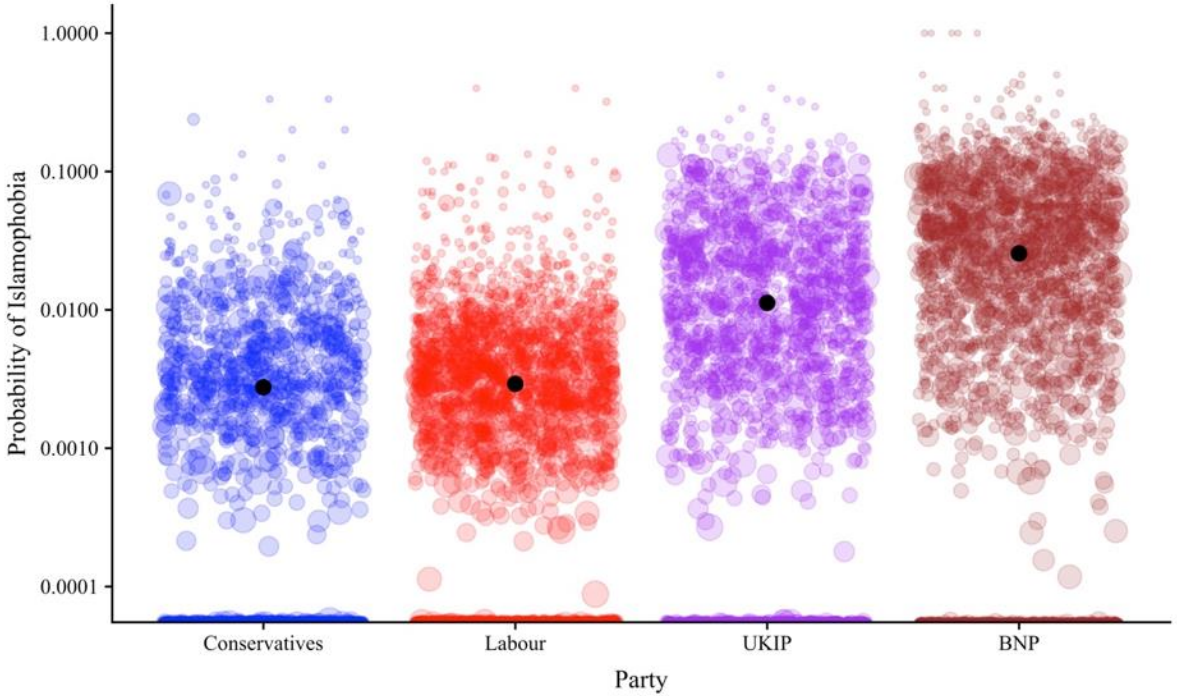
https://www.turing.ac.uk/research/research-projects/hate-speech-measures-and-counter-measures

We are measuring, analysing and countering online hate speech with advanced computational methods

Aims of the project: what don’t we know?

- What is online abuse?
- How we can measure it (#MachineLearning)?
- What is the scale and scope of abuse?
- Where, when, and how does it manifest?
- How is it organised?
- Variations (racism, Islamophobia, misogyny, homophobia…)
- What is the effect of receiving AND seeing abuse?
- How can we challenge it – design policy interventions?

Patterns of hate across Twitter followers of different parties



Source: Vidgen, Yasseri & Margetts, ‘Reactive extremism: modelling the impact of terror attacks’ [Forthcoming]

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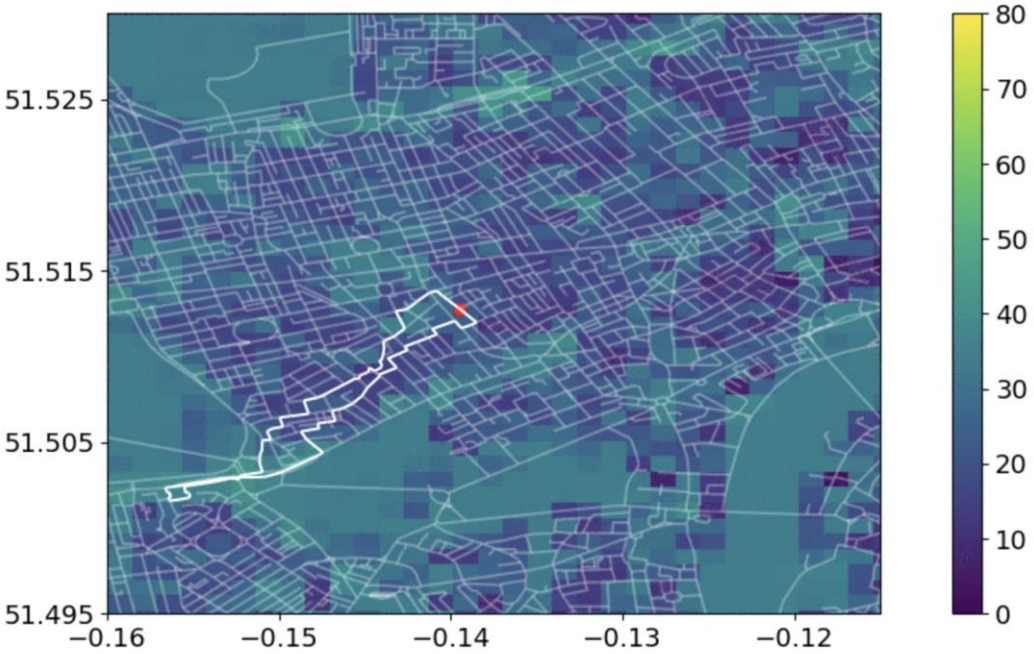
Example Turing project

https://www.turing.ac.uk/research/research-projects/london-air-quality

The project intends to help policymakers and citizens by predicting air quality



48 hour predictions of air quality (NO2) Central London and a running route that changes shape to minimise air pollution.

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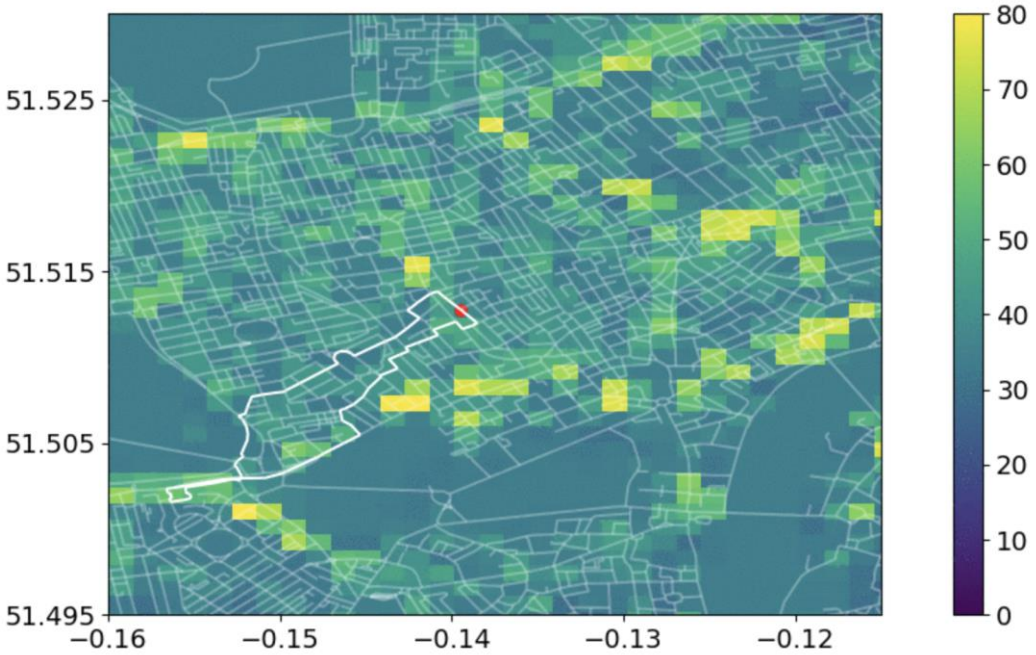

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Private companies are using machine learning to anticipate needs

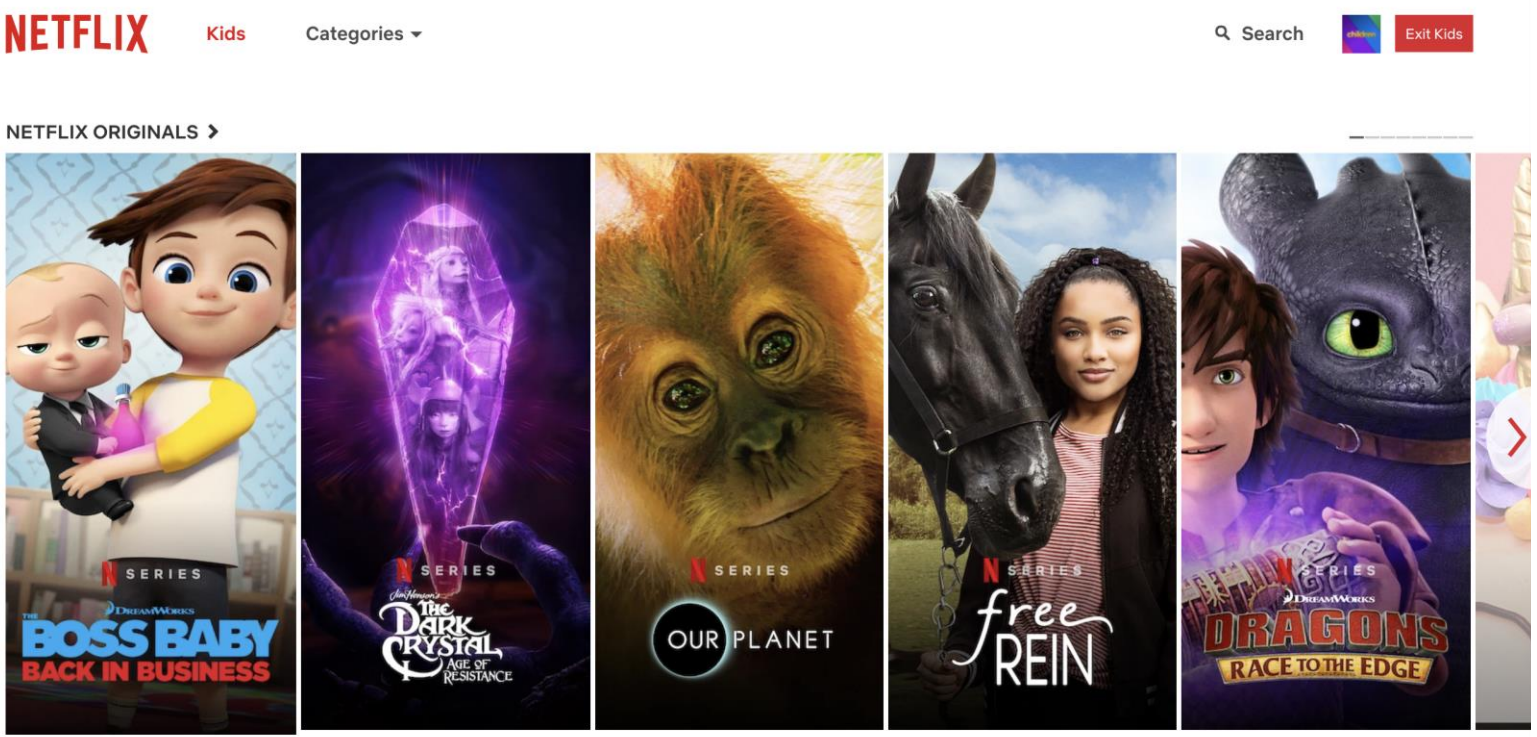
amazon

days

amazon

hours

... and personalise their services



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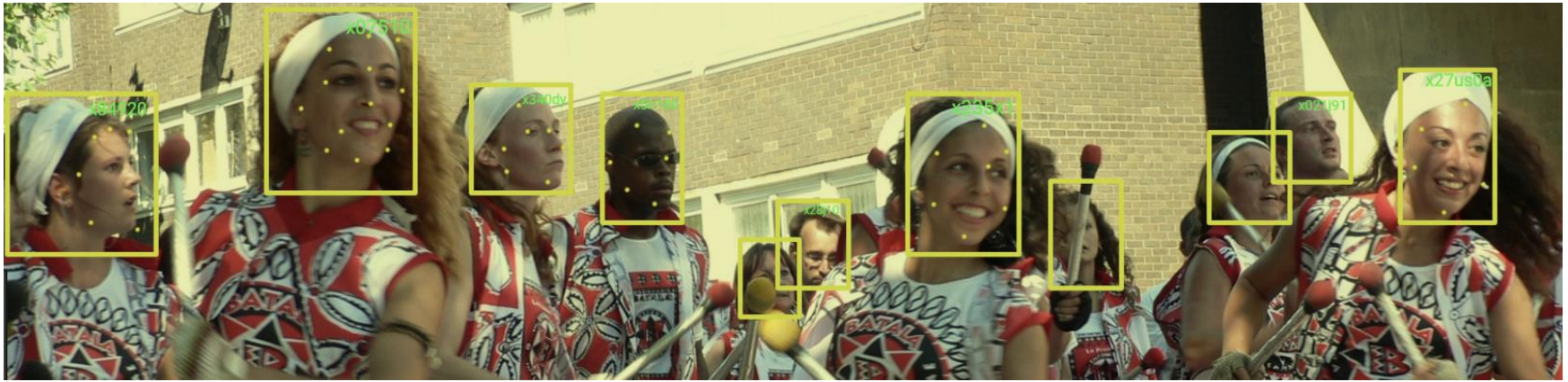
London’s Metropolitan police used facial recognition technology at the Notting Hill Carnival in 2017



We now know that the system performed very poorly

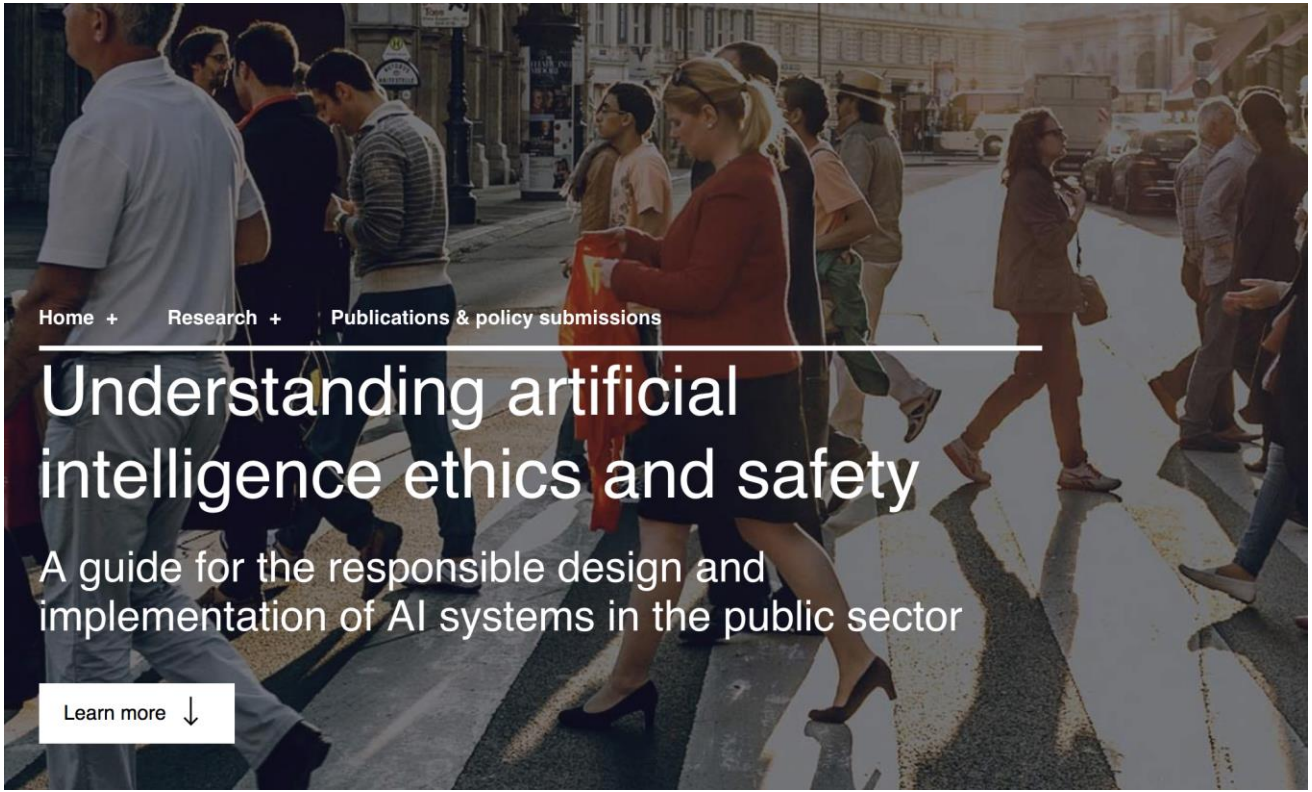
The Notting Hill Carnival has over **1 million** visitors. The stats for the Met's technology:

- **35** total matches
- **30** of them were clear erroneous matches
- **5** people were stopped and IDs
  - only **1** of them was an accurate match to a 'wanted' list
  - ... but the list was **out of date**. The individual was no longer wanted
    - **ZERO** success rate

The Information Commissioner's Office launched an investigation into police forces' use of facial recognition

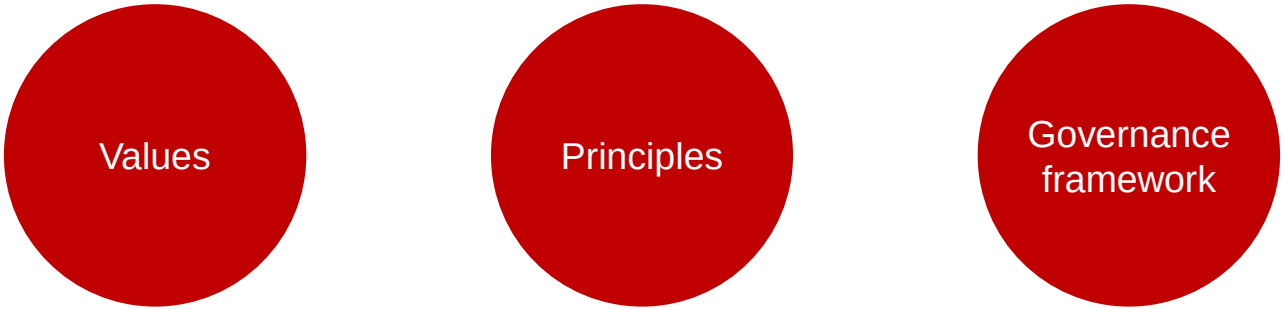
- Lack of transparency about its use
- Proportionality
- Vulnerable people
- How the data is collected and stored
- Differential accuracy
- Right to be forgotten

Example Turing project



https://www.turing.ac.uk/sites/default/files/2019-06/understanding_artificial_intelligence_ethics_and_safety.pdf

It is the most comprehensive guidance in the world on AI ethics for the public sector



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These tasks cut across all policy areas

	Simulation and evaluation	Measurement and detection	Prediction and forecasting	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					

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Take home message

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Economic and financial affairs					
Social welfare					
Health					
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Education and training					

Thank you!

policy@turing.ac.uk