Urban Analytics: Progress and Prospects

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What to expect from this talk…

• **Background**
  • Brief introduction to the Turing Institute
• **Definition**
  • The Turing community’s view on the scope and content of a current and future programme in Urban Analytics
• **Examples**
  • Two more detailed case studies of the way urban analytics is developing
• **Discussion**
  • About why any of this matters…
Turing university network
Turing Programmes

- **Artificial intelligence (AI)**
  Advancing world-class research into artificial intelligence, its applications and its implications for society, building on our academic network’s wealth of expertise.

- **Data science at scale**
  Building upon advances in high-performance computer architectures, through algorithm-architecture co-design, with applications including health and life science.

- **Data-centric engineering**
  Bringing together world-leading academic institutions and major industrial partners from across the engineering sector, to address new challenges in data-centric engineering.

- **Urban analytics**
  Developing data science and AI focused on the processes, structure, interactions and evolution of agents, technology and infrastructure within and between cities.

- **Defence and security**
  Collaborating with the defence and security community to deliver an ambitious programme of data science research, to deliver impact in real-world scenarios.

- **Finance and economics**
  Applying data science and AI techniques to how the financial sector and the economy work, and using these insights to address challenges of national and international importance.

- **Health and medical sciences**
  Accelerating the scientific understanding of human disease and improving human health through data-driven innovation in AI and statistical science.

- **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.
Urban Analytics

To set the ball rolling:

“a set of methods that can be used to explore, understand and predict properties and features of … cities” (Mike Batty, 2019 (editorial in Environment and Planning B))
“the government seeks to unleash Britain’s potential to lead the world in the data revolution”
Mapping the underground.

In 2015, the Geospatial Commission commissioned 2.9 million for two pilots (one led by the Greater London Authority in London, the other by Salford Council). The pilots were led by councils who felt the failure of previous schemes looked at creating a national data sharing platform on the location and condition of buried pipes, ducts and cables. Two years were needed to create a platform with comprehensive data on pipes, cables and others assets such as gas, water, electricity, telecommunication, transport and local authorities shared data through a test platform, and took part in a case testing, including live testing of the digital tool at an excavation site.

Satellite data keeps mangrove forests flourishing.

Mangroves are tree species that grow on the coast in tropical regions, and provide ecosystem services such as carbon sequestration and habitat for biodiversity. However, due to the variety of habitats, many species, and because of their rapid growth, mangrove forests can be challenging to monitor.

In cooperation with MantaCloud, the Earth observation Office of Japan has developed deep-learning algorithms to detect mangroves automatically. The platform acts as a rapidly developed tool to monitor mangrove identification.

Responding to Covid-19.

From the raw data of the Covid in England, the data science group led by Duke University developed a model to predict the spread of COVID-19 across the country. The group's models have been used to inform public health policies and have been praised for their accuracy.

To supplement the official information, the group has also analyzed data from social media, such as tweets and Facebook posts. Although this data is not directly related to the epidemiological spread of COVID-19, it can provide insight into public sentiment and behavior during the pandemic. The group's work has been used to inform public health policies and has been praised for its innovation and impact.
Urban Analytics…
Definitions

- Turing Urban Analytics Programme established September 2018

- Two workshops:
  - A blueprint for urban analytics research, Newcastle, 11\textsuperscript{th}-12\textsuperscript{th} April 2019
  - Building a future for the urban analytics blueprint, Bristol, 16-18\textsuperscript{th} Oct 2019
Definitions

Eight priorities identified…

- Modelling and Simulation
- Visual analytics and visualisation
- Data platforms
- Data Science and AI
- Data ethics and public engagement
- Applications
- Validation and uncertainty
- Dynamics
Examples

Digital Twin – Urban Analytics

Rapid Assistance in Modelling the Pandemic (RAMP)
“(N)ational digital twin: a digital model of our national infrastructure which will be able both to monitor our infrastructure in real-time, and to simulate the impacts of possible events, for example, a natural disaster, or a new train line”

The Urban Analytics Digital Twin

SPENSER:
Synthetic Population Estimation and Scenario Projection Model

QUANT Alpha version
Simulating the Impacts of Large Scale Change in UK
Example 1 – Infrastructure Planning

Oxford-Cambridge Expressway: Preferred route announced

12 September 2018
Example 1 – Infrastructure Planning

Example 1 – Infrastructure Planning

Example 1 – Infrastructure Planning

“Is there a pre-existing model of human social behaviour and contacts into which new SEIR type labels for disease state can be introduced, with appropriate statistics for changing these labels?”
Example 2: Digital Twin for COVID-19

1. Infected individuals 'visit' locations
2. Locations become more 'hazardous'
3. Exposure converted into new infections

'Dynamic' microsimulation
Example 2: Digital Twin for COVID-19
Conclusion

- What is Urban Analytics?
- A set of methods, approaches and theories which converts (big) data into real world understanding and policy support
- The world is receptive to these approaches and arguments as never before…
- But still needs ambition, intelligence, creativity and effort to reach new levels of relevance and impact