Data Matters Festival

Big data, data science and official statistics

Tom Smith, @_datasmith
Director, ONS Data Science Campus

Data Science Campus

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Office for National Statistics

Economy

GDP
Inflation
Labour market
+++

People

Population
Census
Incomes
+++

World

Trade
Sustainable Development Goals
+++

Data Science Campus creation

"Although **better use of [data]** has the potential to transform the provision of economic statistics, ONS will need to **build up its capability** to handle such data.

This will take some time and will require not only **recruitment of a cadre of data scientists** but also **active learning and experimentation**.

That can be facilitated through **collaboration with relevant partners** – in academia, the private and public sectors, and internationally."

Independent Review Economic Statistics
Professor Sir Charles Bean, 2016, p.11

FINANCIAL TIMES

HOME WORLD US COMPANIES MARKETS OPINION WORK & CAREERS LIFE & ARTS

ONS 'unicorn' campus reimagines how to measure Britain

Statisticians experiment with using Google Street View, shipping data and VAT returns

The Data Science Campus in Newport © Gareth Iwan Jones/FT

13 Save to myFT

AUGUST 3, 2017 by Chris Giles in Newport, Wales

The inflatable rainbow unicorns near the entrance of its new £17m Data Science Campus are a jokey nod to the ambitions of Britain's statistics office.

Here in Newport, South Wales, in a wing designed to look like the office of a Silicon Valley company, the Office for National Statistics is trying to imagine the future of measuring Britain.

“The 21st Century has brought new challenges in the analysis of data, and it is increasingly apparent that solutions to these are both statistical and computational. This has led to a great demand for people both in industry and in research who are able to draw upon the mathematics of both computation and probability to make sense of the large amounts of data that are collected in order to solve major problems.

Data science is an interdisciplinary response to this demand”

- University of Warwick

London Transport workers manually examine over 4 million tickets to identify most and least popular routes, March 1939

Gerry Cranham/Fox Photos/Hulton Archive/Getty Images

The longer a decision-maker has to wait for the statistics, the less useful they are likely to be

Professor Sir Charles Bean (2016)

Review of UK economic statistics

Faster indicators of the economy

Fig 1. UK GDP Growth Rate

Early Indicators

Early Intervention

Fig 2. ONS National Accounts Publication Timetable

-6%

Change in UK GDP between first quarter of 2008 and second quarter of 2009

5 years

Length of time from 2008 for the UK economy to return to pre-recession size

£12b

Estimated value for earlier identification of 2008 downturn

Business value added tax (VAT) returns

- Expenditure and turnover diffusion indices
- Reporting behaviour
- Available up to 1 month before GDP

VAT due in this period on **sales** and other outputs	1
VAT due in this period on **acquisitions** from other **EC Member States**	2
Total VAT due **(the sum of boxes 1 and 2)**	3
VAT reclaimed in this period on **purchases** and other inputs (including acquisitions from the EC)	4
Net VAT to be paid to HMRC or reclaimed by you **(Difference between boxes 3 and 4)**	5
Total value of **sales** and all other outputs excluding any VAT. **Include your box 8 figure**	6
Total value of **purchases** and all other inputs excluding any VAT. **Include your box 9 figure**	7
Total value of all **supplies** of goods and related costs, excluding any VAT, to other **EC Member States**	8
Total value of all **acquisitions** of goods and related costs, excluding any VAT, from other **EC Member States**	9

HM Revenue & Customs

Road traffic data

- Highways England sensor data
- Average speeds
- All-England and English ports
- By vehicle length
- Available 2 months before GDP

Shipping Automated Information System (AIS) data

- Marine and Coastguard Agency, ORBCOMM, Global Platform
- Ship tracking data
- Port traffic frequency
- Time in port
- Real time

Monday 12 December 2016

Monday 19 December 2016

Sunday 25 December 2016

Sunday 1 January 2016

FINANCIAL TIMES

UK COMPANIES TECH MARKETS GRAPHICS OPINION WORK & CAREERS LIFE & ARTS HOW TO SPEND IT

nomic growth

ppers unfazed by Brexit as UK il sales jump

UK house price growth weakest in seven years

Slowing UK productivity rings alarm bells

fastFT UK economic growth + Add to myFT

Economy lost momentum in first quarter, ONS 'big data' show

New system based on VAT returns aims to be early warning for looming problems

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Economics

Faster Indicators for U.K. Point to Modest Decline in Turnover

By Andrew Atkinson and Fergal O'Brien
April 15, 2019, 10:28 AM GMT+1

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MARCH 20 2019, 12:01AM, THE TIMES

Even a skip-counter like me agrees economic indicators need updating

DAVID SMITH

Today I want to take you away from the Alice in Wonderland world of Brexit, populated by strange creatures often called Steve or John, and deal with something that will still be important long after the dust has settled. My interest was piqued

The Telegraph HOME | NEWS | S

Business

Economy | Companies | Opinion | Open economy | Markets | Alex | Telegraph

FTSE 100 ▲	FTSE 250 ▲	GBP/USD ▼	GBP/EUR ▲	BRENT OIL ▼
7523.07 +0.85%	19908.02 +0.36%	$1.2943 -0.31%	€1.1543 +0.09%	$74.20 -0.07%

PREMIUM

Business

Early warning indicators not flashing red: few signs of economic slowdown in March

How do we improve environmental statistics? Using image data for local measures

OpenStreetMap road network data

17 million StreetView images

Percentage trees for each image

Urban vegetation map

Aim: Generate a scalable, consistent, automated, **urban vegetation index**

Outcome: An end-to-end processing pipeline.

Making use of: **17 million images** from **Google Street View** for 112 cities in the UK.

… **OpenStreetMap** road network data
… Deep **image segmentation** methods

Enter your postcode or click on the map to explore

cf23 5ee

— Cardiff average **13%**

Ninian Road is the **182nd** greenest street out of **3,219** in **Cardiff**

Share

Aerial photography for green space statistics

vNDVI (48.3%)

GLI (63.7%)

VARI (48.1%)

HSV (16.2%)

Lab(a*) (2.5%)

Lab(a*b*) (3.3%)

Data Science Campus
Initial results using Neural
62% of garden space in Gr
Show this thread
Green spaces in residential gardens
Christopher Bonham | July 23, 2019
A United Nations report showed that in 2014 approximately 54% of the population were living in towns and cities, with this figure projected to increase to 70% by the middle of the next century.
Identifying and understanding the features of urban green spaces (such as residential gardens) is therefore becoming of greater importance, given their environmental and emotional benefit.
Current approaches often assume residential gardens are almost exclusively covered by natural vegetation and do not take in to account urban areas such as steps, patios and paths.
We collaborated with Ordnance Survey (OS) to improve the current approach to identifying the proportion of vegetation for urban residential gardens in Great Britain. We used remote sensing and machine learning techniques with high-quality aerial and satellite imagery to test approaches. From the results, a tool to classify the contents of an image with accuracy – a neural network classifier was developed.
The initial results obtained using this approach estimate that 62% of garden in Great Britain is vegetation. Data sampled from Cardiff and Bristol suggest residential gardens in these areas contain approximately 54% and 45% vege respectively.
The methods and results presented in this report are from early research
Data Science Cam
We've worked with current approach
ow.ly/aDhH50v8K
Show this
live needle
@cliveneedle
ant new use of big data analys
s authority shows huge overe
Crucial for #ClimateEmergenc
ng. Useful for @inheritEU
David South
@DSChallenges
A great initiative from the UK's Of
Statistics Data Science Campus! W
sanctuary to make the most of urb
"Green spaces in residential garder
Campus". #greendata
Green spaces in residential gardens
datasciencecampus.ons.gov.uk
12:38 PM · Jul 23, 2019 · Twitter for iPhone
ONS develops algorithm to tell how green Britain's gardens to help tackle flooding and CO2 levels
'I have the same tune on repeat. It makes you want to go into battle'
England hockey goalkeeper Maddie Hinch talks about ho... Read more
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By Charles Hymas, HOME AFFAIRS EDITOR
Britain's official statisticians have developed an algorithmic technology that can measure how green are all our gardens in a bid to help combat flooding and reduce pollution and CO2.
Within any town or city, the Office for National Statistics (ONS) will be able to pinpoint the proportion of vegetation in each and every garden versus the amount of paving, patios, decking or rockery.
It is critical with the onset of climate change because it will enable planners to establish how well each town and city's vegetation can soak up carbon dioxide and withstand flooding. Town planners can then adapt public policies to encourage residents to make their gardens greener.
The more vegetation gardens have, then the more cities and towns are
ECOLOGIST
THE JOURNAL FOR THE POST-INDUSTRIAL AGE
gardens only two thirds green
Culture
Lifestyle
More concrete than greenery in city gardens
Ben Webster Environment Editor
There is more concre
in the average garde
because homeowners
lawns and flowerbe
according to an officia
ing aerial images.
Less than two thirds
in Britain's towns and ci
by plants, lawns and tree
only 45 per cent of the a
is covered in greenery.
The Office for Natior
data science campus an
Survey studied aerial imag
the amount of green space
idential gardens.
They estimated that 62
garden spaces were covered
tation, a finding the Royal H
al Society described as "disa
because greenery cools cit
flooding and helps wildlife.
The ONS said that green
urban areas, such as reside
dens, were important becau
absorbed carbon, helped reduc
lution and had a positive im
mental health.
The RHS said: "Plants and
can help cool towns and cities ar
gate flooding — things we will se
of as our climate changes."
The News Matrix
The day at a glance
SOCIETY
Only two-thirds of gardens are green
Less than two-thirds of gardens in Britain's towns and cities are covered with greenery such as plants, lawns and trees, analysis suggests. Research by the Office for National Statistics suggest that only 62 per cent of garden spaces are covered with vegetation. The RHS described it as "disappointing".

Crop Map of England (CROME)
Barley - Spring
Beet
Carrot
Linseed - Spring
Maize
Oats - Spring
Onions
Parsnips
Triticale - Spring
Wheat - Spring
Cabbage - Spring
Oilseed - Spring
Potato
Squash
Mixed Crop - Group 1
Barley - Winter
Oats - Winter
Wheat - Winter
Oilseed - Winter
Rye - Winter
Triticale - Winter
Fallow Land
Field beans - Spring
Peas - Spring
Lucerne
Clover
Field beans - Winter
Non-Agricultural Land
Permanent Grassland
Perennial Crops
Water
Woodland
Rural Payments Agency
N
0
50
100 km

Indicator 6.6.1

Change in the extent of water-related ecosystems over time

Sub-Indicator 1 – spatial extent of water-related ecosystems

Global Surface Water Explorer

UNEP, JRC, Google

Based on NASA Landsat Imagery

Global Surface Water Explorer (GSWE)

https://global-surface-water.appspot.com/map and https://www.sdg661.app/

THE GLOBAL GOALS
For Sustainable Development

Payments data for regional indicators

- Identifying rapid, local economic indicators - breakdowns by geography, industry, product, credit / debit card, on-line payment, international
- Collaboration with UK global bank, 2-way secondments
- Rapid estimates of official outputs, using commercial data

Growing Data Science Skills

Level 4 Apprenticeship in Data Analytics:

Two-year programme, 12 months at the Campus followed by 2 x 6 month rotations across ONS

Level 6 Apprenticeship in Data Science:

Three-year programme, approved for England in 2018, launching in England and Wales in 2019

Data Science Faculty:

In-house training unit delivering operational courses in programming (R, Python) and fundamentals of Machine Learning, NLP etc

Accelerator:

12-week mentoring programme for Government analysts delivered with GDS, in parallel with in-house ONS Data Science Academy

Masters in Data Analytics for Government:

2 year part-time MSc in Data Science and Statistics for government analysts, delivered by UCL, Oxford Brookes and University of Southampton. Expanding in 2020/21

Elund Morgan, Minister for Welsh Language and Lifelong Learning and Alexis Fernquest, ONS Data Analytics Apprentice, Nov 2018

Attracting talent tomorrow, Accessing skills today

University research programmes and PhD funding:

Research partnerships with over a dozen universities and the Alan Turing Institute, which additionally hosts the *Data Science for Public Good* joint PhD programme

Centres for Doctoral Training:

7 UKRI, EPSRC and STFC centres for Doctoral Training in AI, Data Science, Statistics and Physics, with PhD co-supervision and Campus placements

Graduate Student Placement Programme:

Three-month MSc thesis and MSc/PhD industry placements at the Campus

Welsh Data Science Graduate Programme:

2 year MSc programme with Welsh Contact Centre Forum that includes three eight month industry placements.

STEM Outreach:

Girls into STEM (Science, Technology, Engineering & Maths) programme for GCSE students; Nuffield Research Placements for A-level students

STEM coding workshop, Newport, August 2018

Developing the next generation of Data Scientists

Further information and tools

- Website https://datasciencecampus.ons.gov.uk/
- First 2 years review https://datasciencecampus.ons.gov.uk/our-first-two-years/

- Code https://github.com/datasciencecampus (open repos)
- Public projects on github https://datasciencecampus.github.io/projects/

- Newsletter https://content.govdelivery.com/accounts/UKONS/bulletins/24efeb9
- Twitter @DataSciCampus

- Contact email datacampus@ons.gov.uk

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