

Geographic Data Science - Lecture I

Introduction

Dani Arribas-Bel

Today

- This course
- The (geo-)data revolution
- (Geo-)Data Science

This course

Quiz

- Have you ever heard the terms "**Big Data**" and "**Data Science**"?
- Have you ever written a line of computer code?
- How would you define in one sentence "**Data Science**"?
- Do you think "**Geographic Data Science**" is closer to GIS or Statistics?

More stats than a GIS course, more GIS than a stats course...

...but in a fun way!

Structure

11 weeks of:

- **Prep. materials:** videos, podcasts, articles... 1h. approx.
(most recommended!)
- **1h. Lecture:** concepts, methods, examples
- **2h. Computer practical:** hands-on, application of
concepts, Python (highly *employable*)
- **Further readings:** how to go beyond the minimum

IMPORTANT: Week 7 has no class! [Labs are booked so I
recommend you spend the lab time working on your first
assignment]

Website

<http://darribas.org/gds15>

gds15



ENVS363/563

Geographic Data Science

Welcome to Geographic Data Science, a course taught by Dr. Dani Arribas-Bel in the Autumn of 2015 at the University of Liverpool.

The timetable for the course is:

- **Lectures:** Thursdays - 12:30/13:30, [MATH-029](#) .
- **Computer Labs:** Thursdays - 15:00/17:00, [CTL-6-PCTC-Blue](#) (with the exception of Week 3, Thursday Oct. 15th, which is at [GUILD-SUTC](#) and [ELEC-304](#)).

Locations

- [MATH-029](#) : Mathematics Building, Room 029, Building Ref: 206 Grid. Ref: E6 on the campus map.
- [CTL-6-PCTC-Blue](#) : Central Teaching Laboratory, PC Centre, Blue Zone. Building Ref: F6 on campus map.
- [GUILD-SUTC](#) : Guild of Students, Pc Centre. Building Ref: 406. Grid Ref: D4 on campus map.
- [ELEC-304](#) : Electrical Engineering, Room 304. Building Ref: 235. Grid Ref: E7 on the campus map.

Philosophy

- (Lots of) **methods** and techniques
 - General overview
 - Intuition
 - Very little math
- Emphasis on the **application**
- Close connection to "real world" applications
- **FUN**

Assignments

- Mark based on two assignments, due:
 1. Week 8 (50%)
 2. Week 13 (50%)
- Coursework
- Equivalent to 2,500: report with **code, figures** (e.g. maps), and **text**

The (geo-)data revolution

The (geo-)data revolution

Exciting times to be a:

- Geographer
- Map fan
- Data fan

The world is being "datafied"...

"Datafication"

Quantification of phenomena through the systematic recording of data

"taking all aspects of life and turning them into data" Cukier & (Mayer-Schoenberg)

Examples: credit transactions, public transit, tweets, facebook likes, spotify songs, etc.

"Datafication"

Many implications:

- Opportunities for optimization of systems (Industrial IoT, planning systems...)
- **Window** into human **behaviour** (this course)
- Issues with **intentionality** and **privacy**
- ...

Why now?

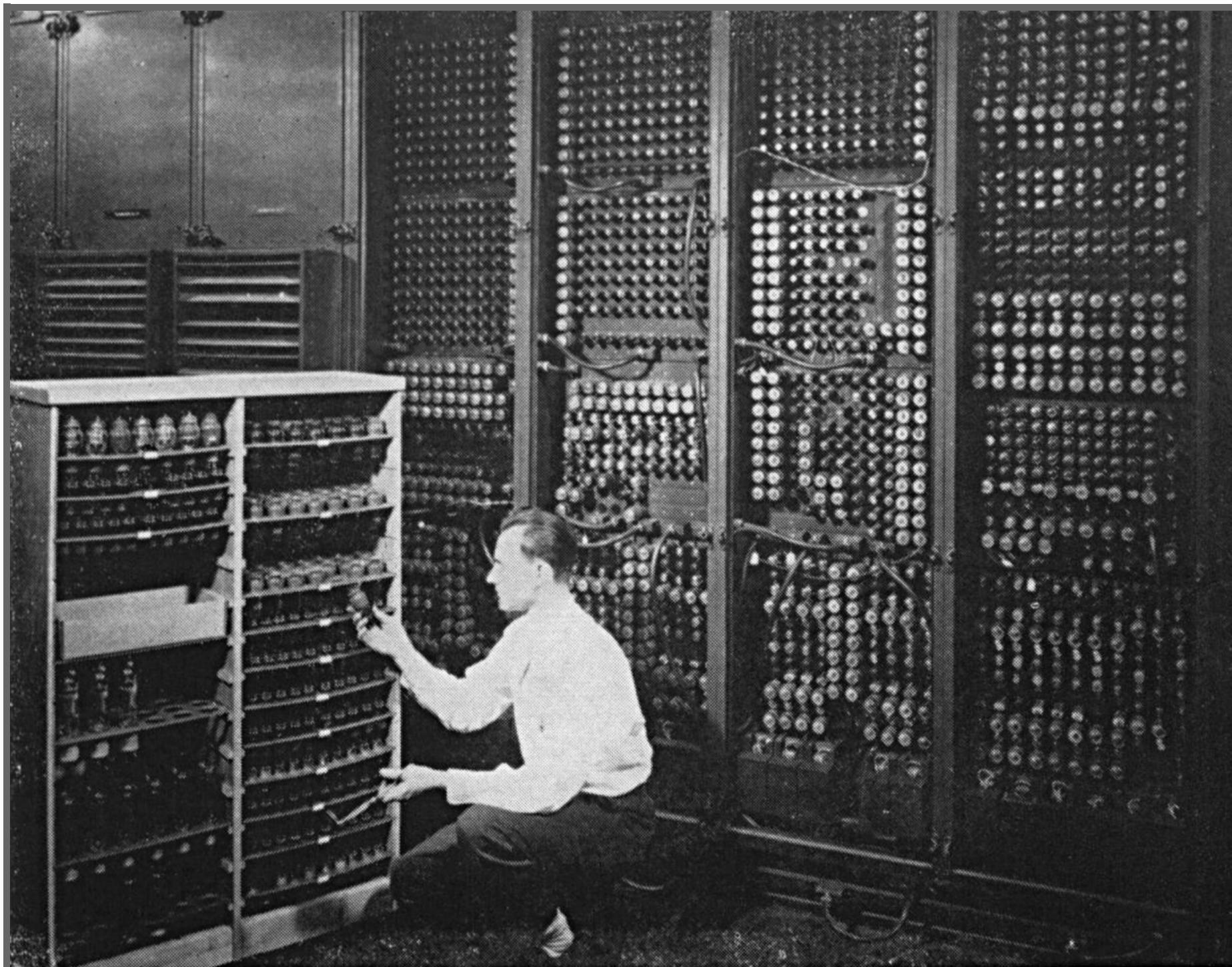
Why now?

Advances in:

- Computing power
- Communication
- Geospatial technology

Why now? --> Computing power

Source



Replacing a bad tube meant checking among ENIAC's 19,000 possibilities.

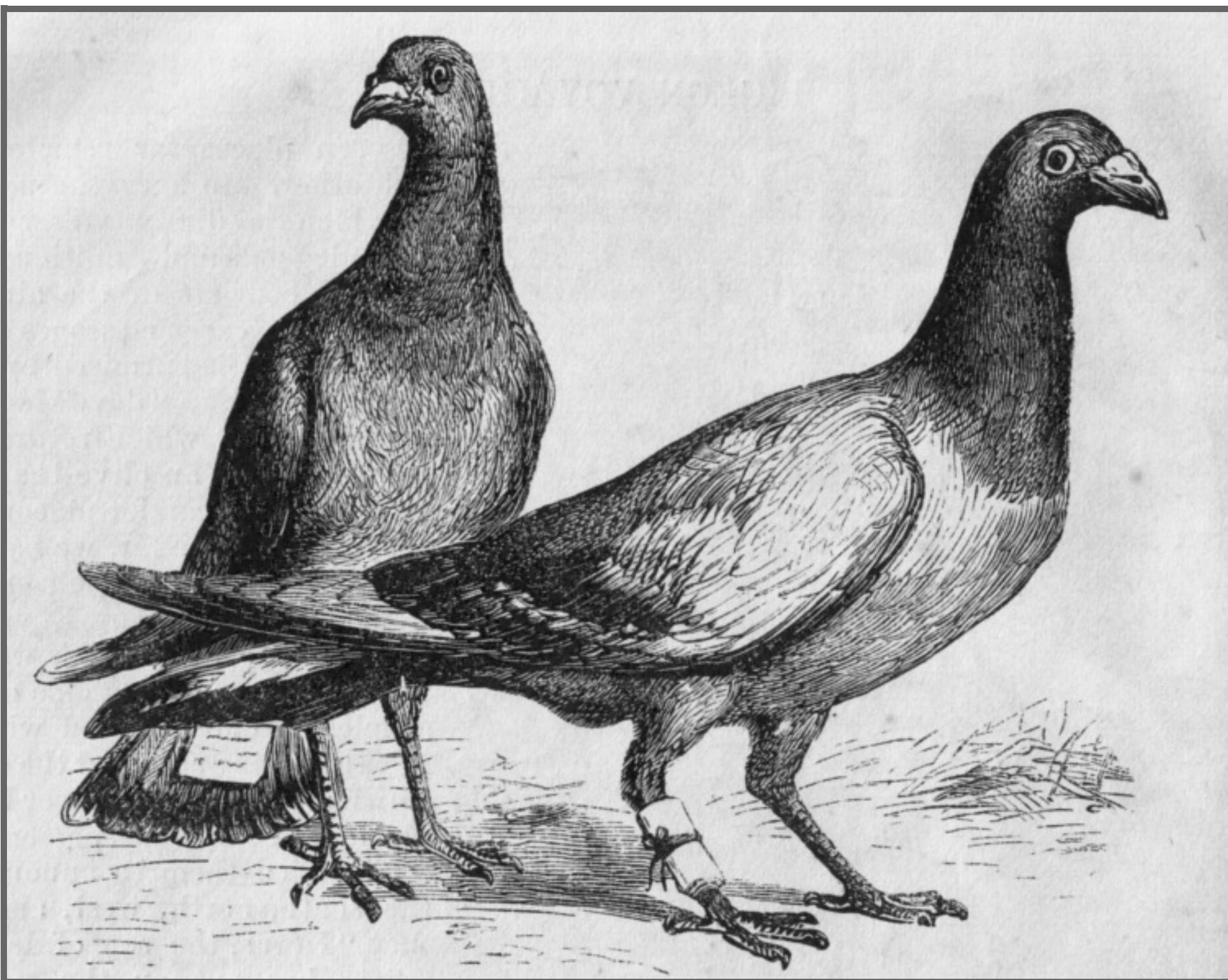
Why now? --> Computing power

[Source](#)



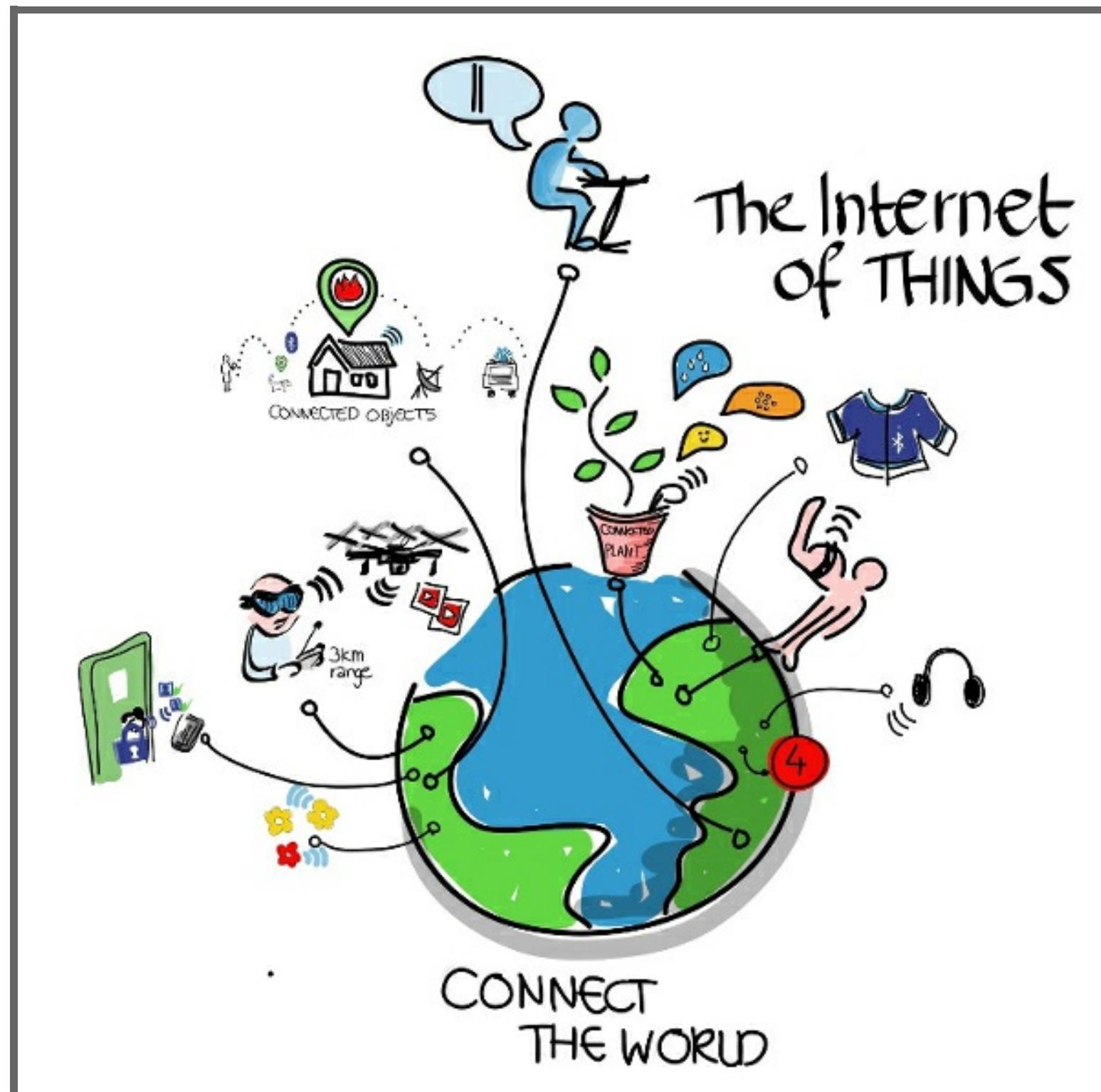
Why now? -->
Communication

Source



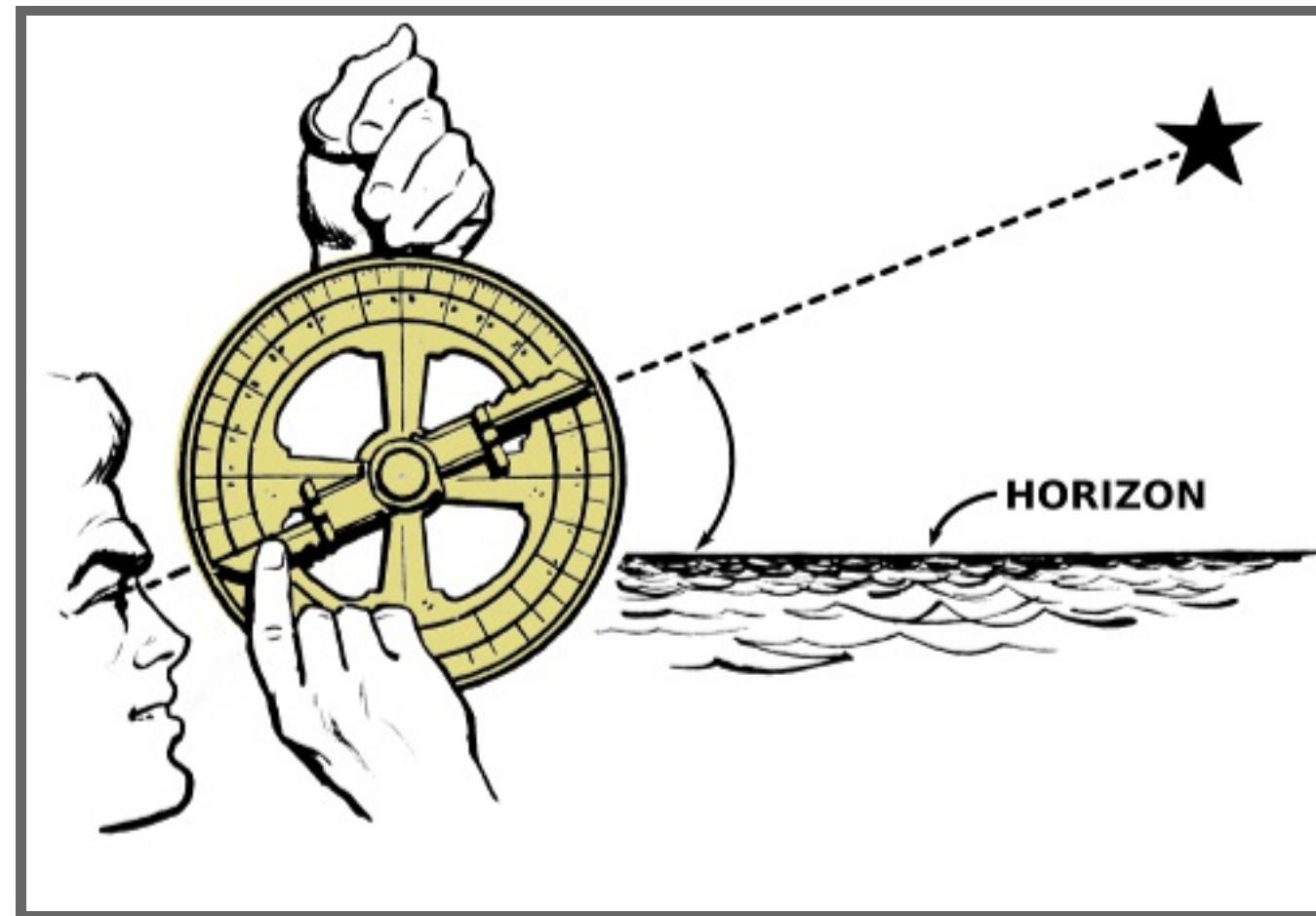
Why now? --> Communication

Source



Why now? --> Geospatial technology

Source



Why now? --> Geospatial technology

Source



The (geo-)data revolution

The confluence of the three (computing, communication and geospatial) is creating large amounts of data.

Now, data in itself is not very valuable:

- Data --> Information --> Knowledge --> Action

Data Science

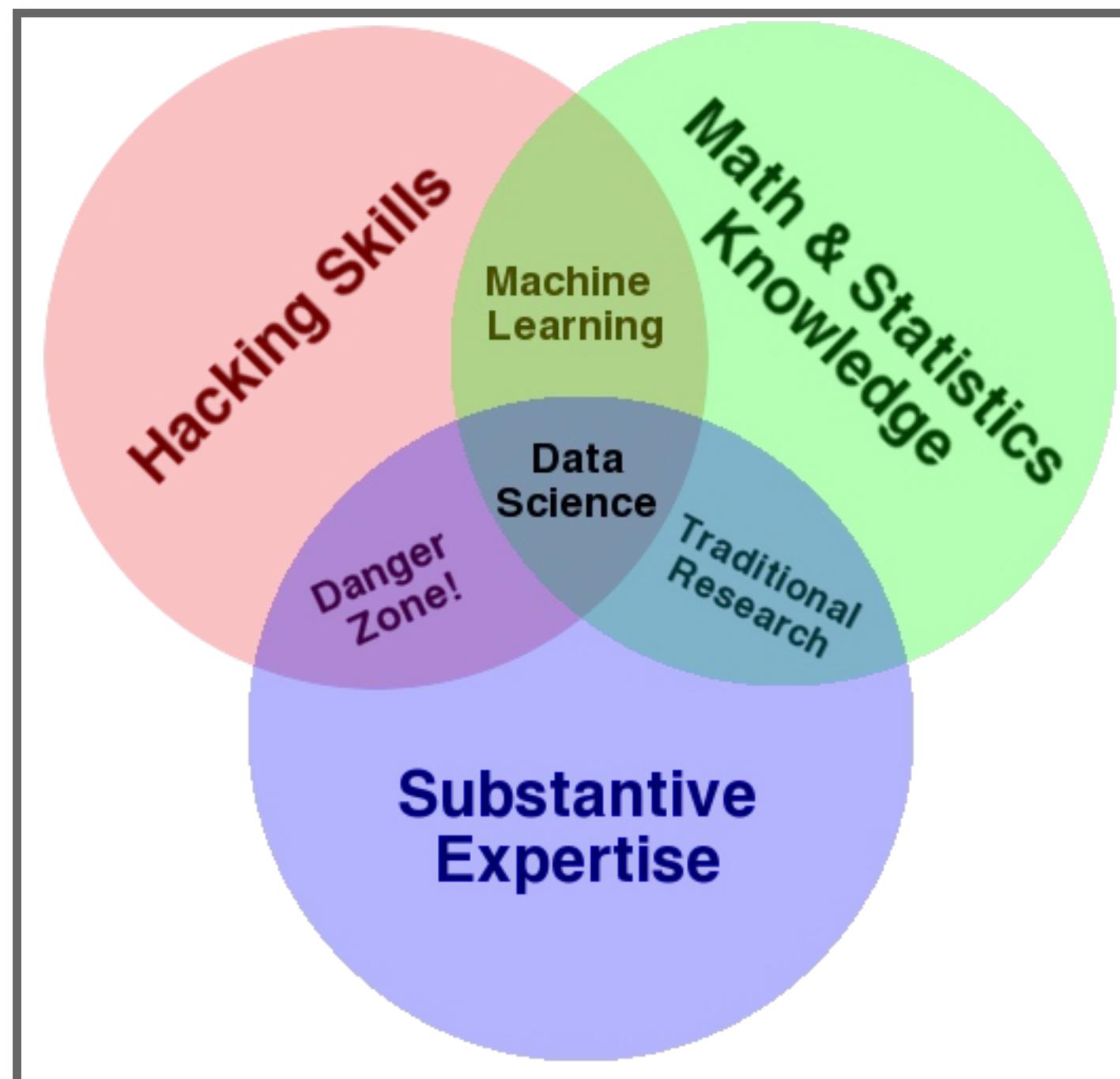
Methods, tools and techniques to turn data into actionable knowledge

But wait, isn't statistics just that?

Not only...

Data Science

Source: Drew Conway



Data Science

Statistics is a *very* important part of DS...

... but not the only one:

- **Computational tools** --> Programming (hence this course's tutorials!)
- **Communication skills** --> "Story telling" (hence this course's assignments)
- **Domain expertise** --> Theories about why the data are the way they are (hence the rest of your degree)

Data Science

- Not all new (standing on the shoulders of giants)
- "The data becomes key part in the product"
- Focus on actionability and solving particular problems

Some examples...

Frequently Bought Together



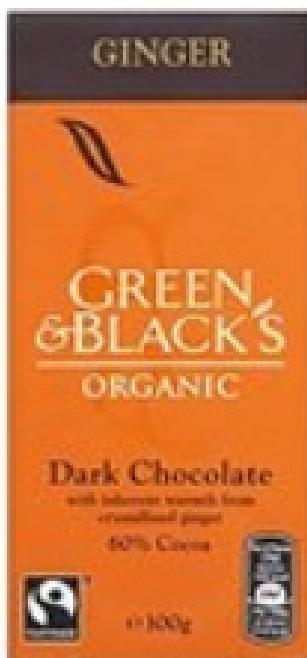
Total price: £32.97

Add all three to Basket

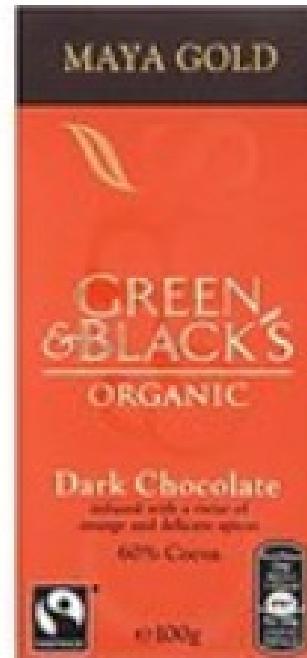
i These items are dispatched from and sold by different sellers. [Show details](#)

- This item:** Green and Black's Organic Dark Chocolate 85 Percent Cocoa 100 g (Pack of 5) £11.62 (£2.32 / 100 g)
- [Green and Black's Organic Ginger Dark 100 g \(Pack of 5\) £10.40](#) (£2.08 / 100 g)
- [Green and Black's Organic Dark Chocolate Maya Gold 100 g \(Pack of 5\) £10.95](#) (£2.19 / 100 g)

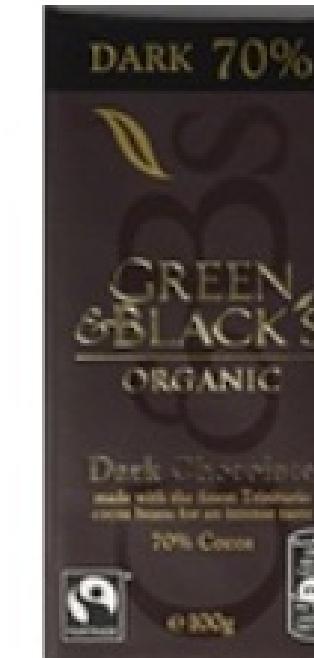
Customers Who Bought This Item Also Bought



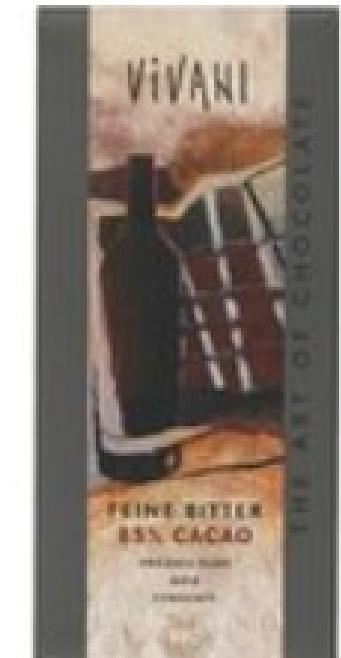
Green and Black's Organic
Ginger Dark 100 g (Pack of
5)



Green and Black's Organic
Dark Chocolate Maya Gold
100 g (Pack of 5)



Green and Black's Organic
Dark Chocolate 100 g
(Pack of 5)



Vivani Organic Dark
Chocolate with 85% Coco
100 g (Pack of 5)



15



5



22



25

Frequently Bought Together



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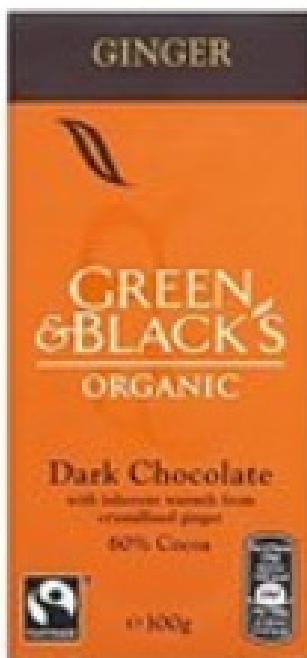
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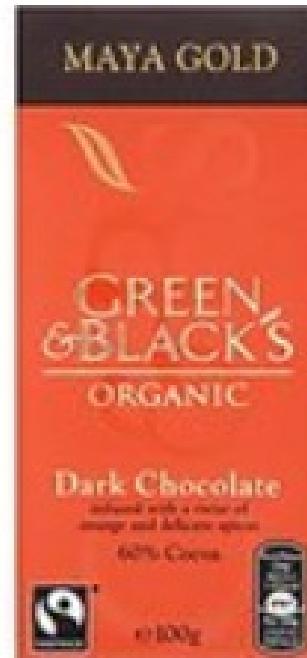
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Amazon

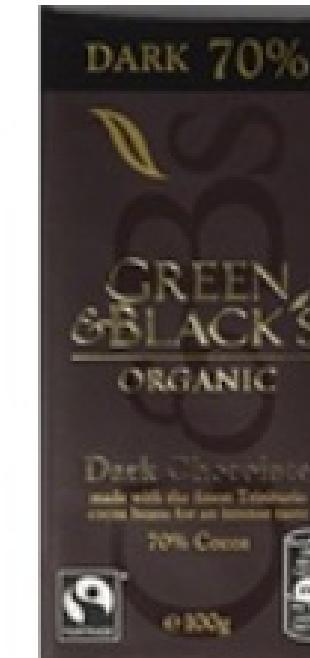
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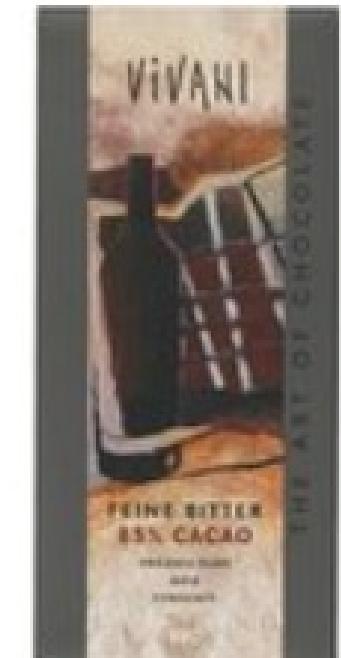
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okcupid

Join the best free dating site on Earth.

I am a

Straight

Woman

Continue



Signing up takes two
minutes and is totally free.



Our matching algorithm helps
you find the right people.



iOS or Android?
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U B E R

L O N D O N

FARE ESTIMATE



LONDON





U B E R L O N D O N

MENU

LOG IN

SIGN UP

FARE ESTIMATE



LONDON



Geo-Data Science

Geo-Data Science

- A (very) large portion of all these new data are inherently **geographic** or can be traced back to some location over space.
- Spatial is special.
- Some of the methods require an explicitly spatial treatment --> (Geo-)Data Science

Some examples...



Where are you going?

Browse

Sign Up Log In Help List Your Space

s > London

Saved Neighbourhoods

Find a Neighbourhood in London

What kind of neighbourhood are you looking for?

Dining X

Artsy 7

Nightlife 9

Shopping 15

Loved by Londoners 11

Touristy 14

Great Transit 13

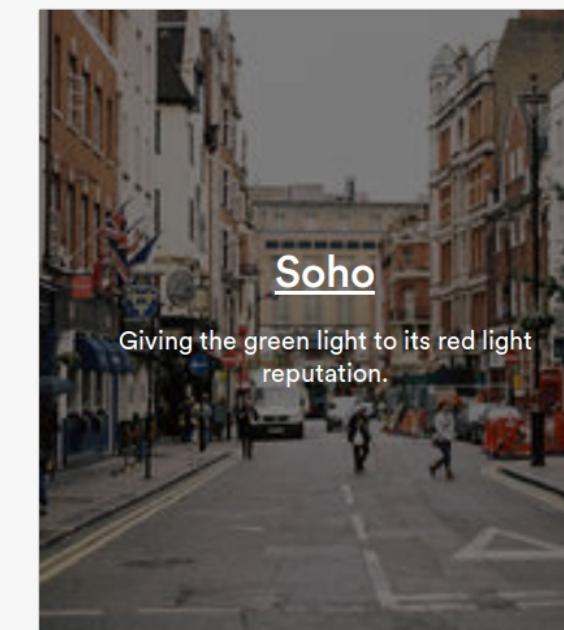
Museums & the Arts 10

Peace & Quiet 7

Along the River Thames 5

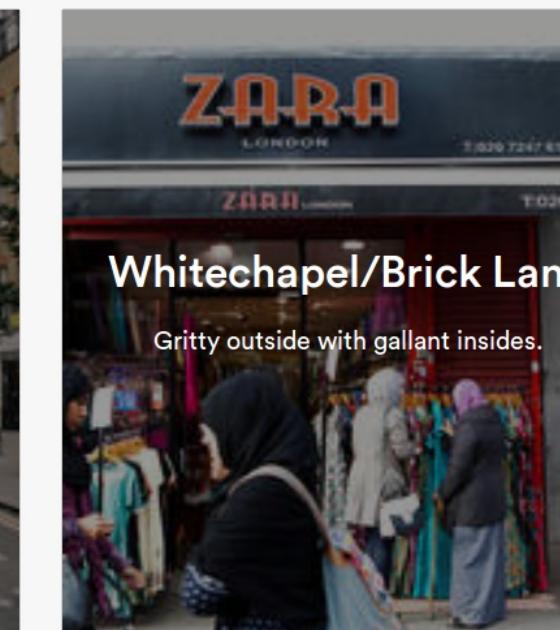
West End 7

23 neighbourhoods match Dining. [See all listings](#)

**Soho**

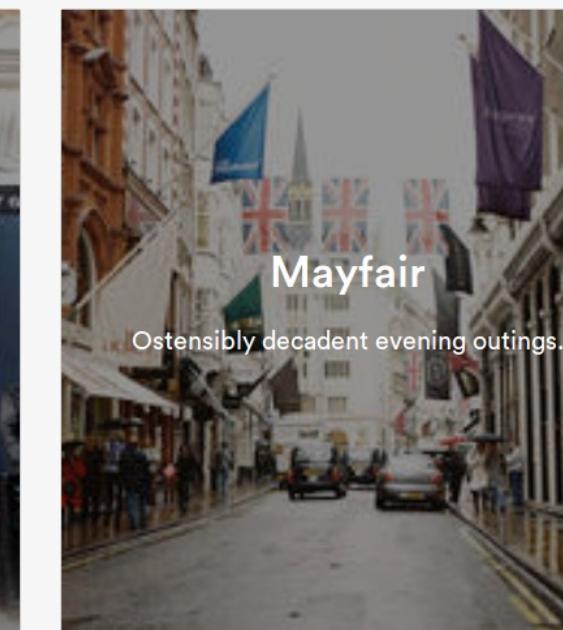
Giving the green light to its red light reputation.

Eclectic • Open-minded • China Town • Lgbt Friendly

**Whitechapel/Brick Lane**

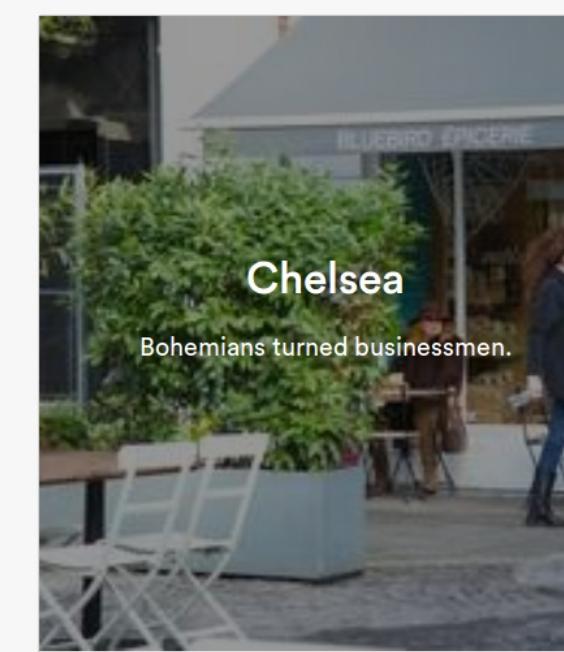
Gritty outside with gallant insides.

Buzzing • Curry • Arty • Graffiti

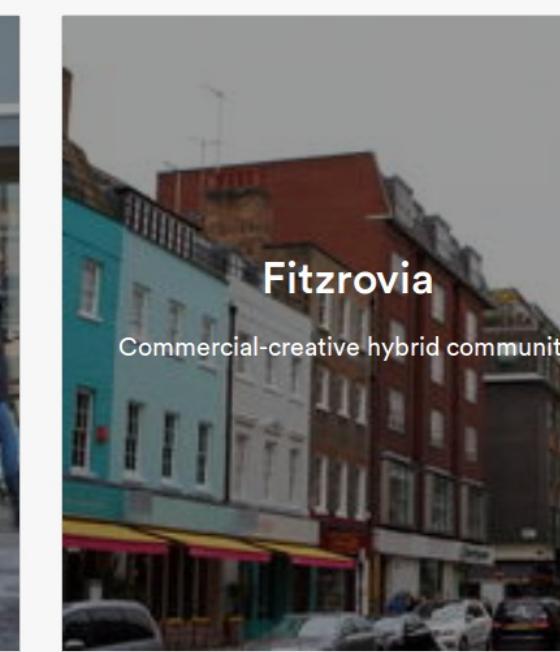
**Mayfair**

Ostensibly decadent evening outings.

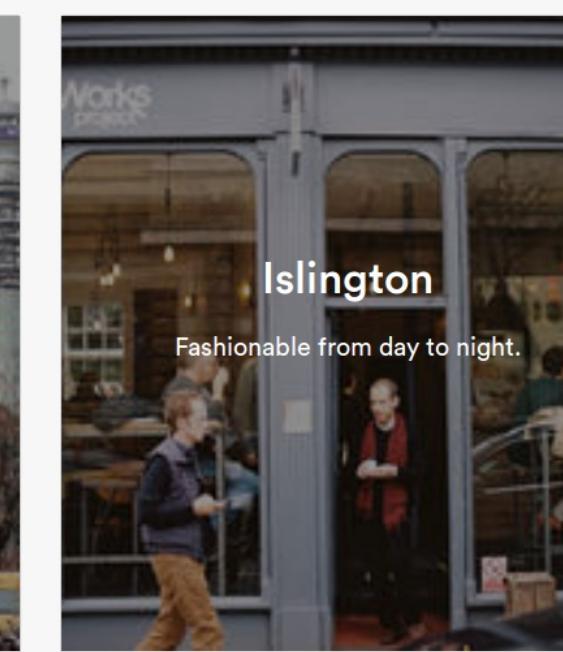
Luxury Shopping • Ballrooms • Heart Of London • Fashionable

**Chelsea**

Bohemians turned businessmen.

**Fitzrovia**

Commercial-creative hybrid community.

**Islington**

Fashionable from day to night.

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AirBnb neighborhoods

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Walking directions



via A562

49 min

[Show terrain](#)

2.4 miles

Use caution - may involve errors or sections not suited for walking

Penny Ln

Liverpool L18 1DE, UK

↑ Head southwest on Penny Ln toward Russell Rd

79 ft

↗ Turn right onto Russell Rd

0.2 mi

↖ Turn left onto Smithdown Rd/A562

1.3 mi

↖ Slight right to stay on Smithdown Rd/A562

Continue to follow A562

364 ft

↗ Turn right toward Smithdown Ln

325 ft

↑ Continue onto Smithdown Ln

0.2 mi

↖ Turn left to stay on Smithdown Ln

0.5 mi

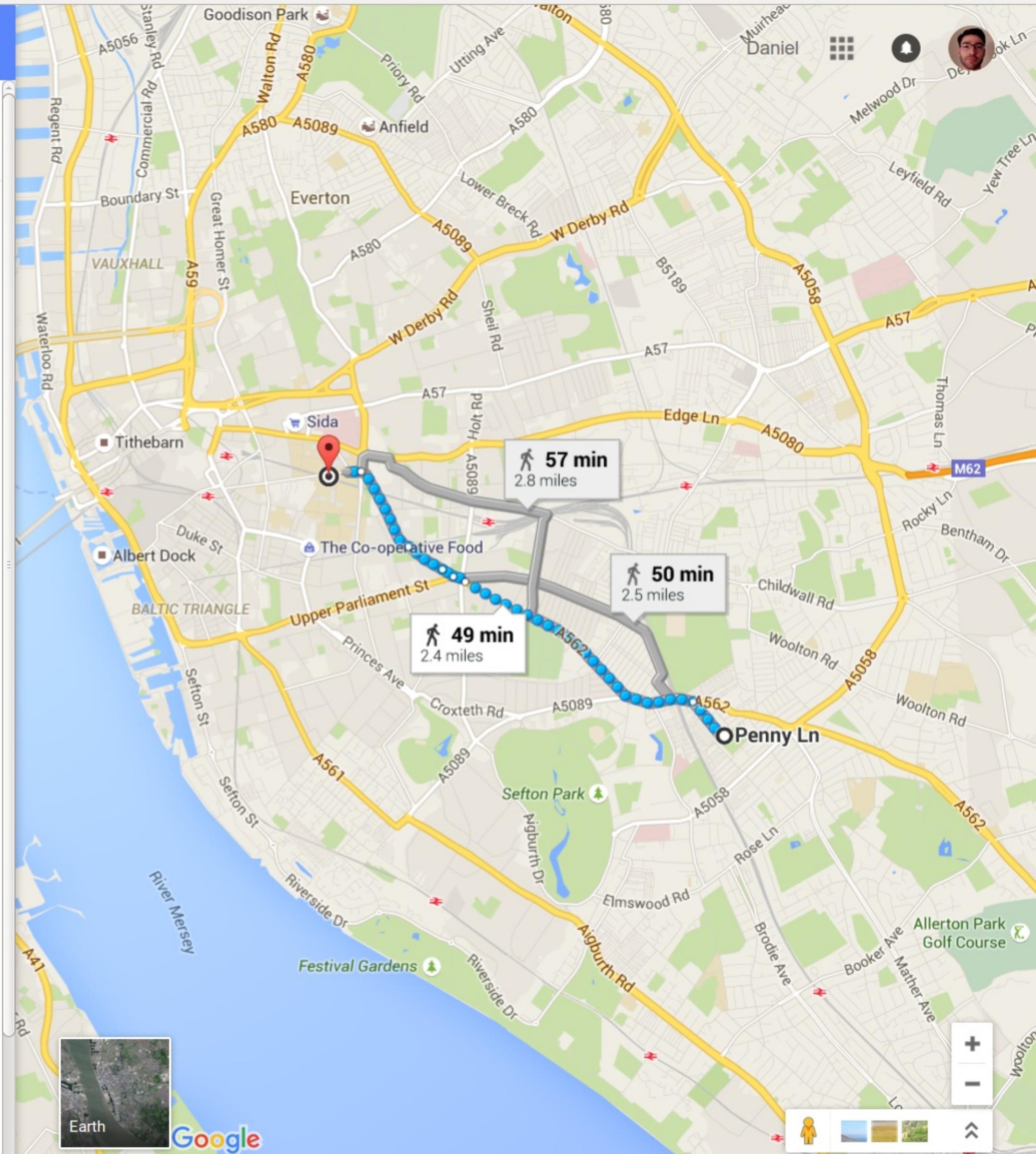
↑ Continue straight onto Brownlow Hill/A5048

Continue to follow Brownlow Hill

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University of Liverpool

Liverpool, Merseyside L18 2BY, United Kingdom



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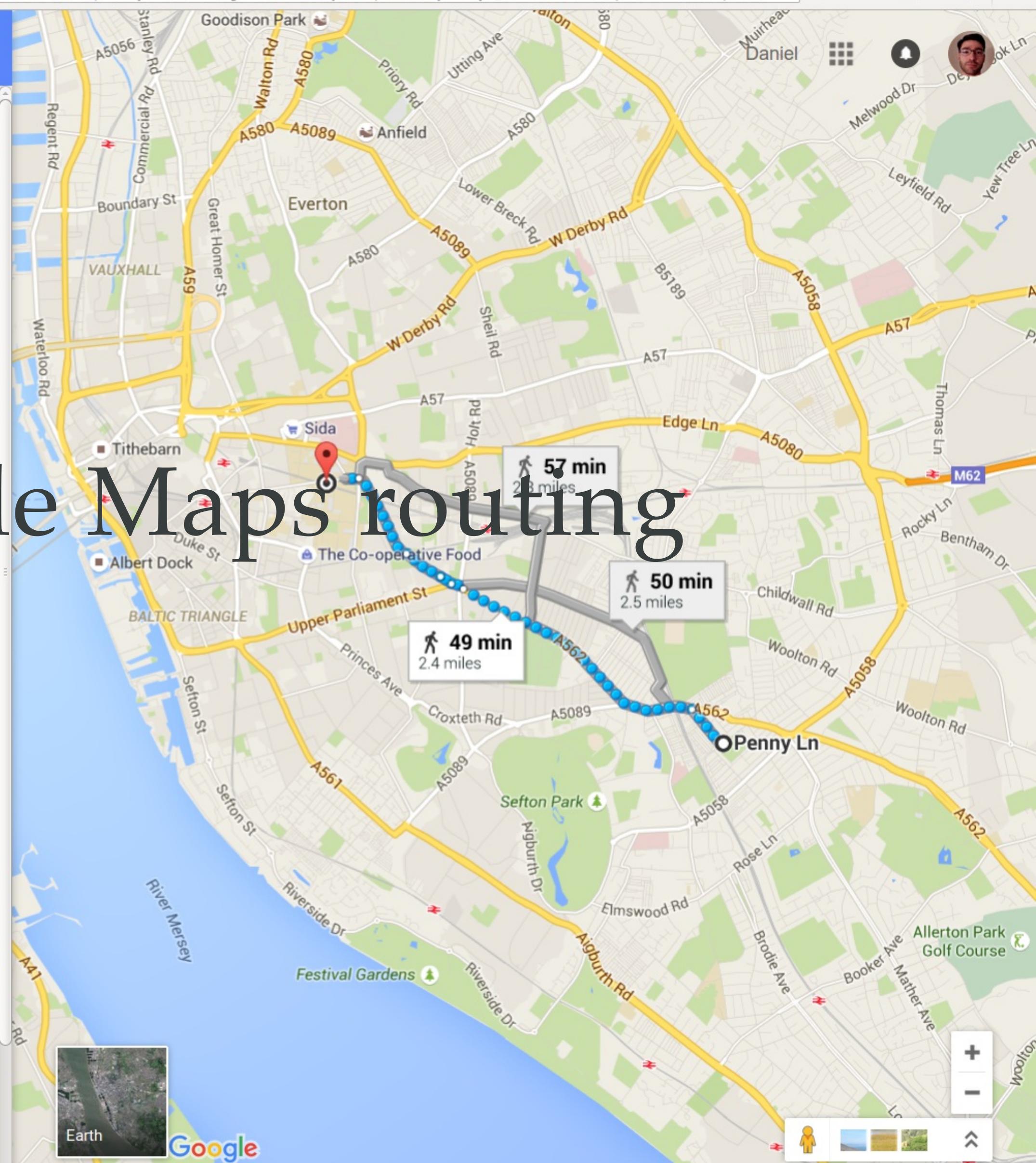
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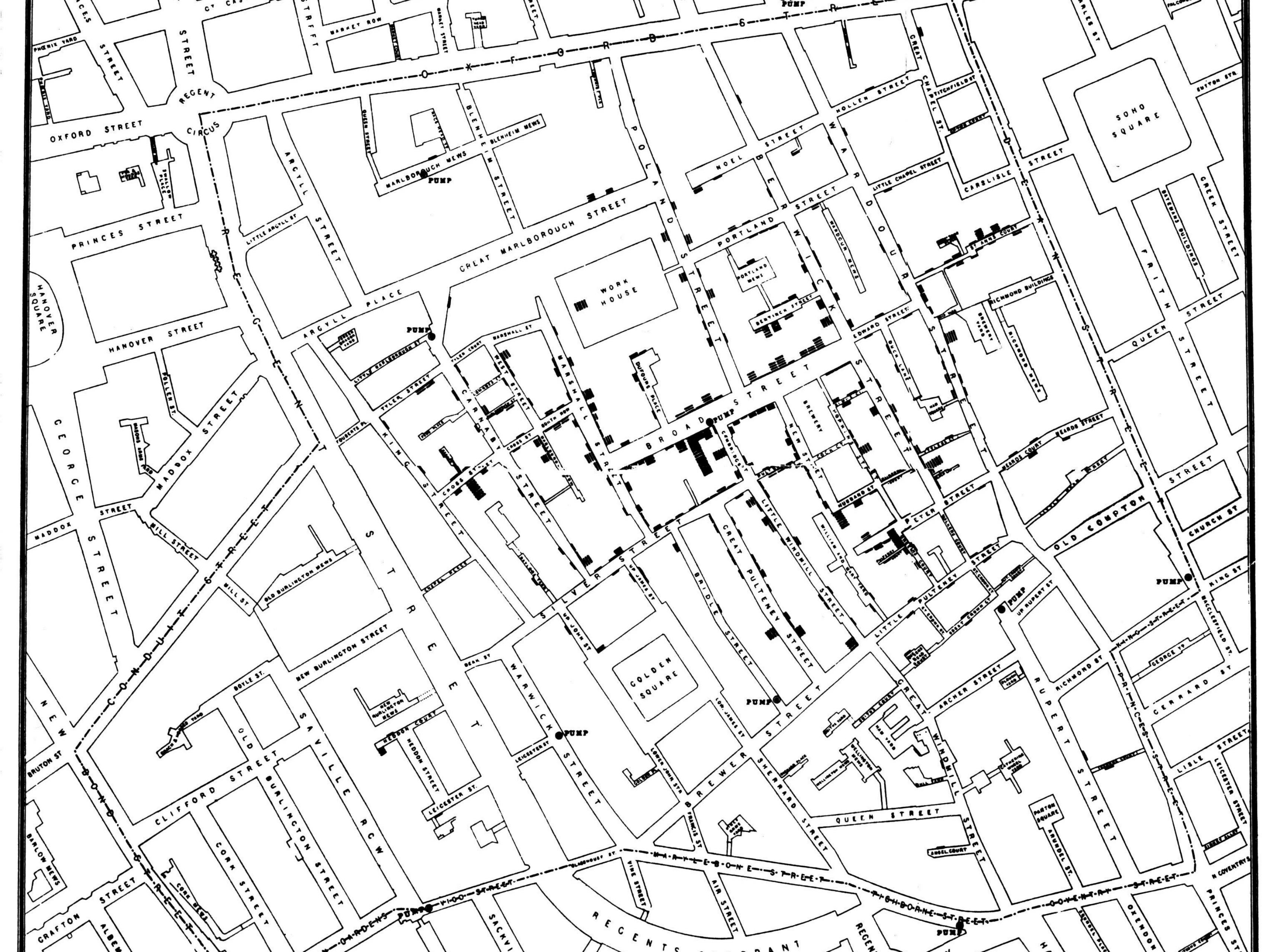
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University of Liverpool

Liverpool, Merseyside L60 2BY, United Kingdom





John Snow's cholera map





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