

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

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

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?

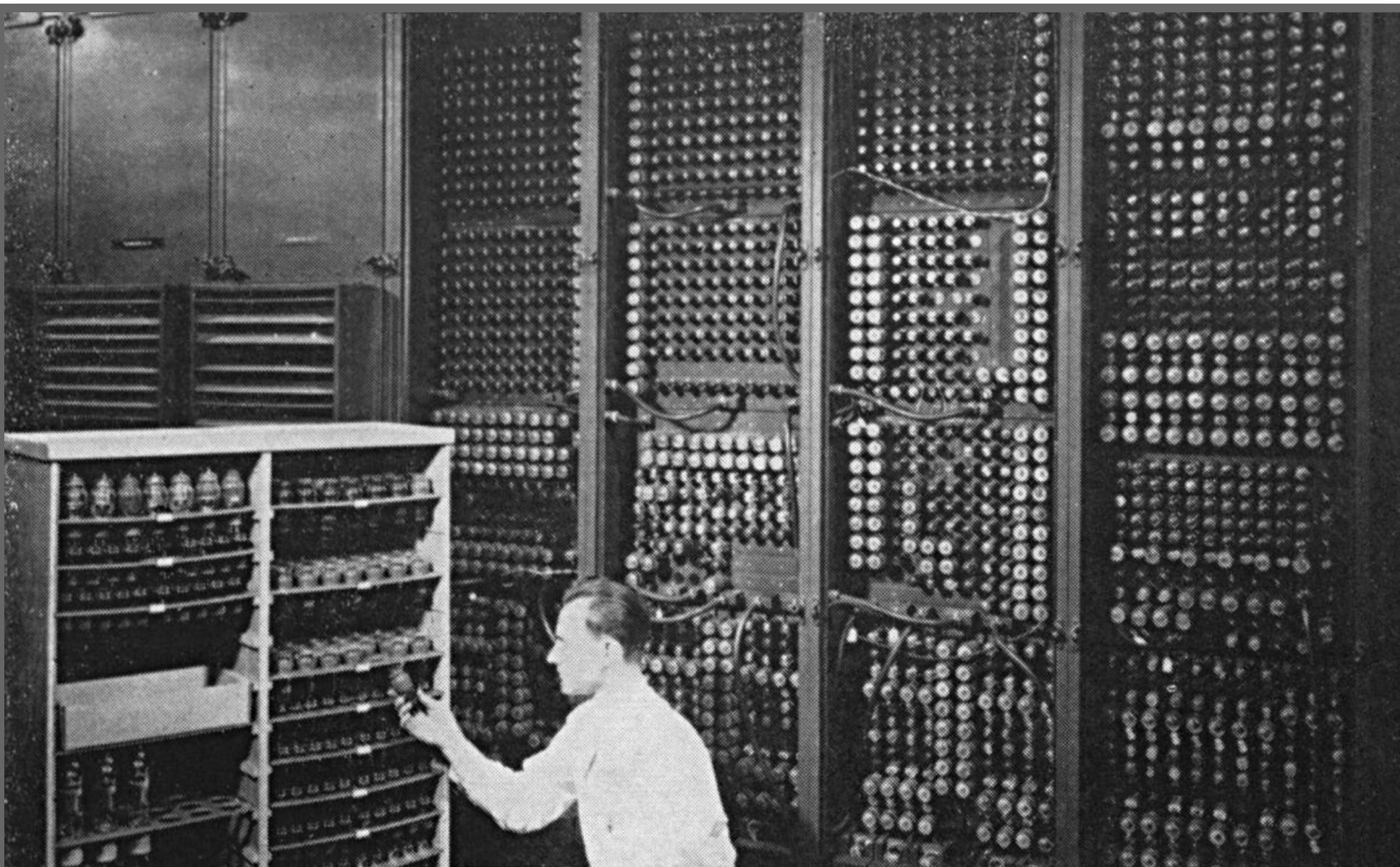
Why now?

Advances in:

- Computing power
- Communication
- Geospatial technology

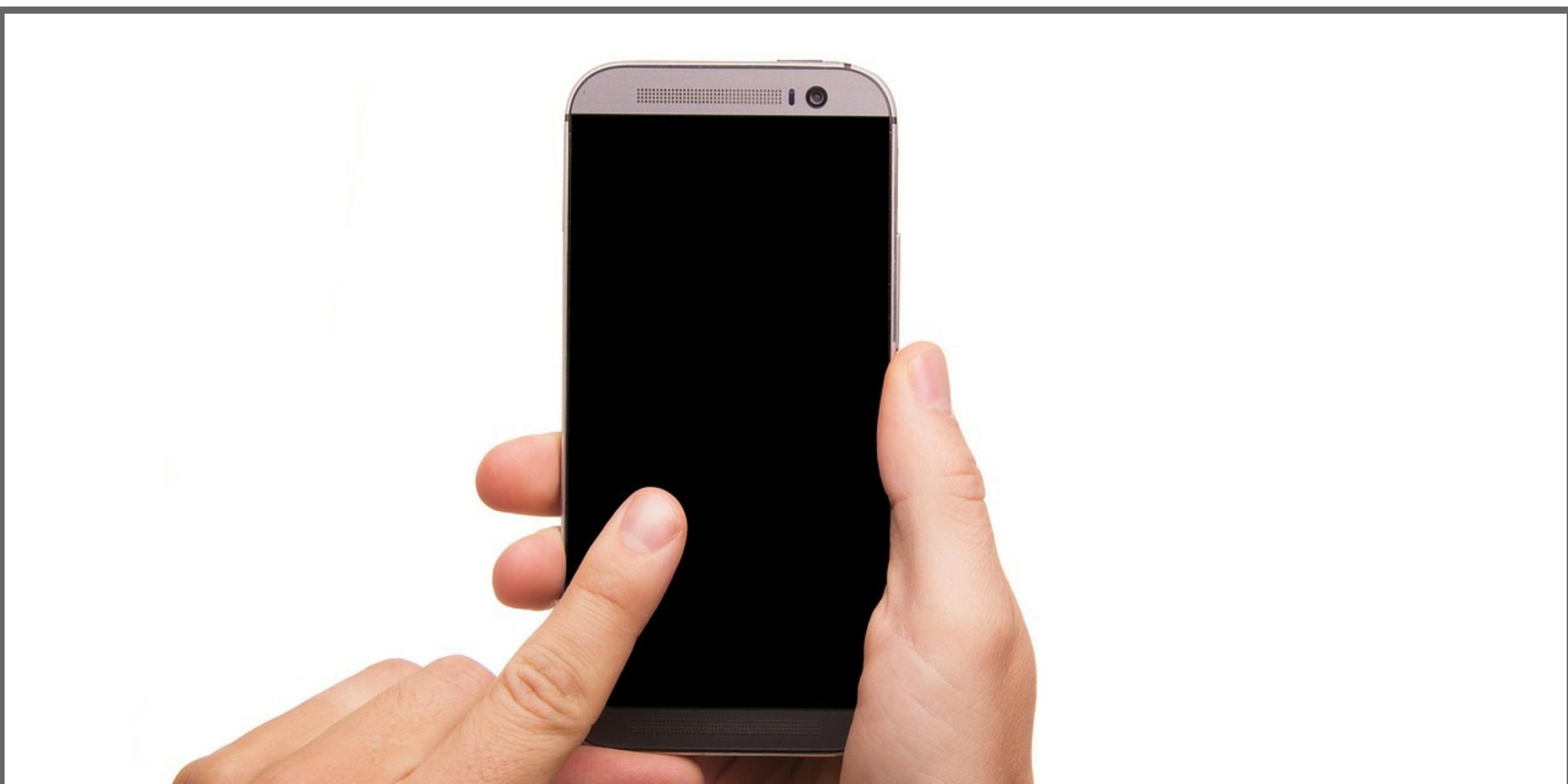
Why now? -->
Computing power

Source



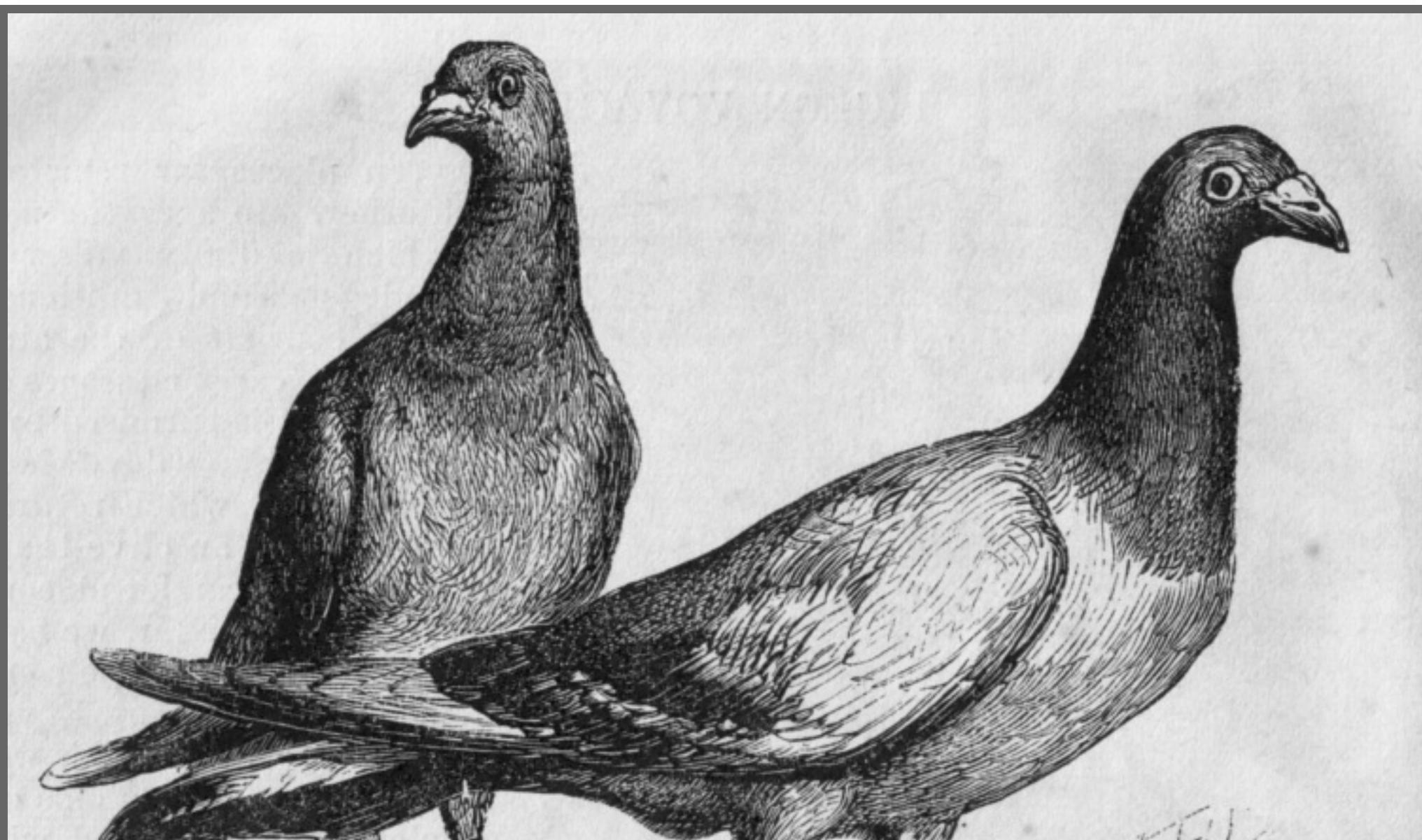
Why now? -->
Computing power

Source



Why now? -->
Communication

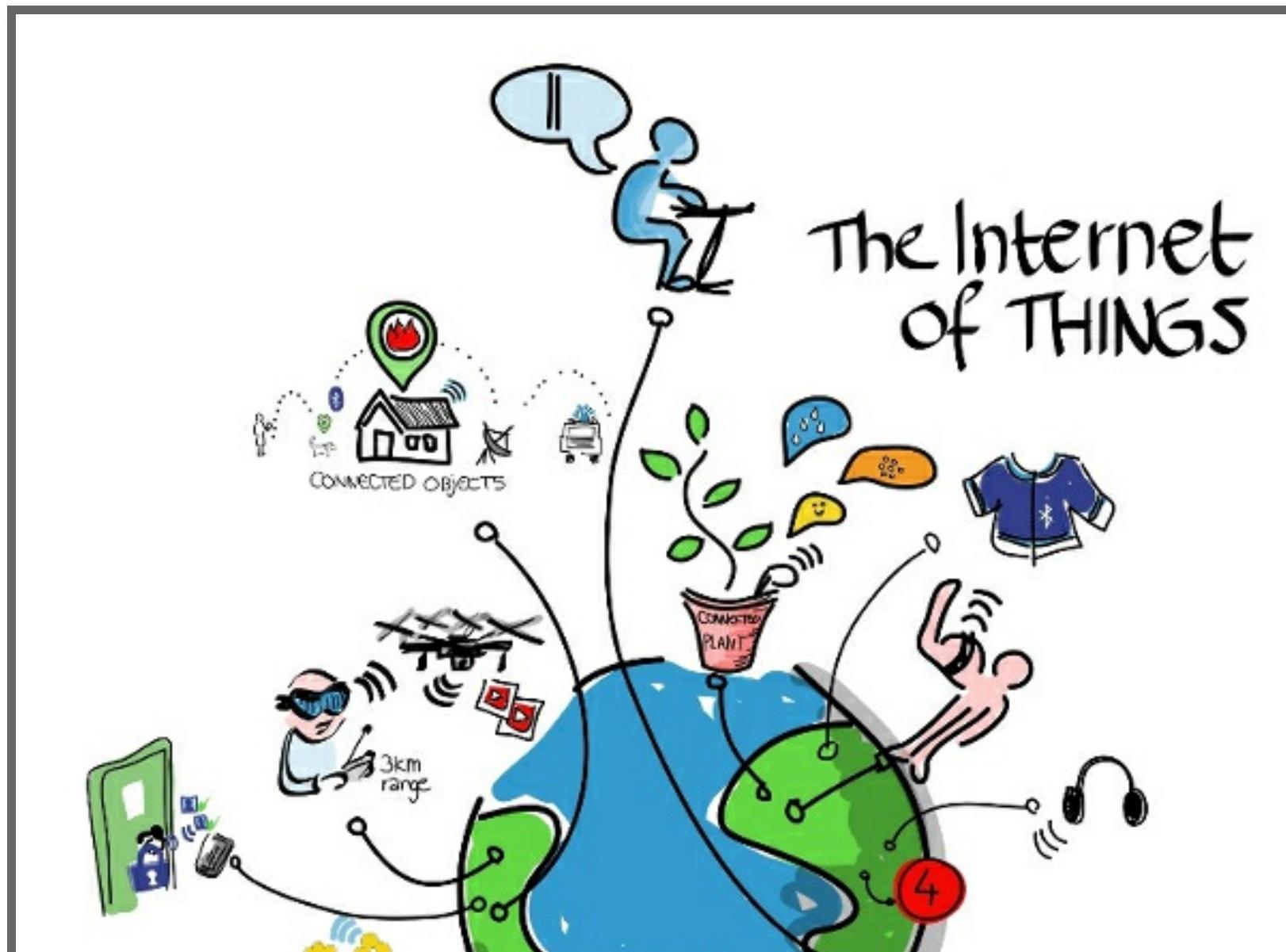
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Why now? -->

Communication

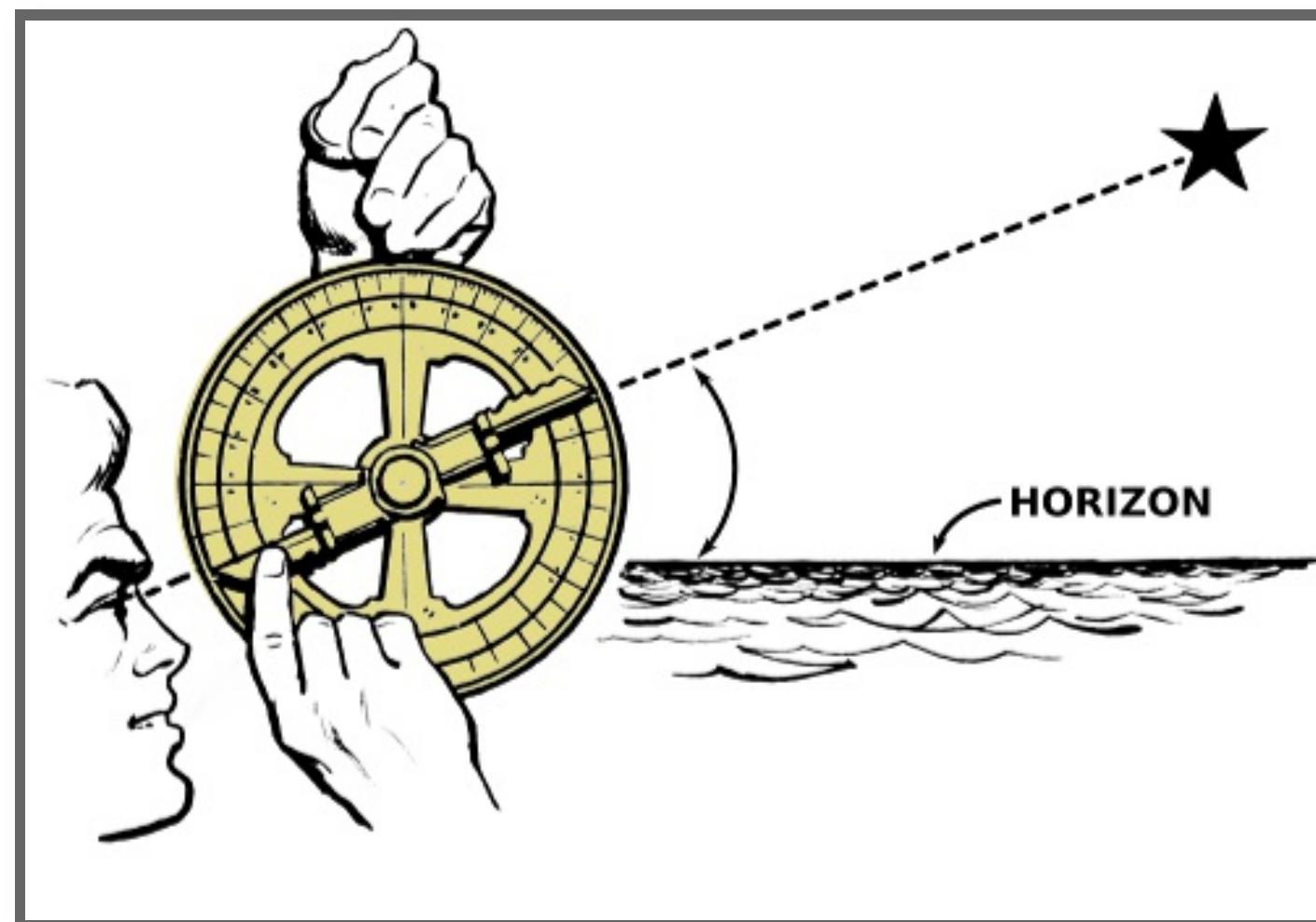
Source



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

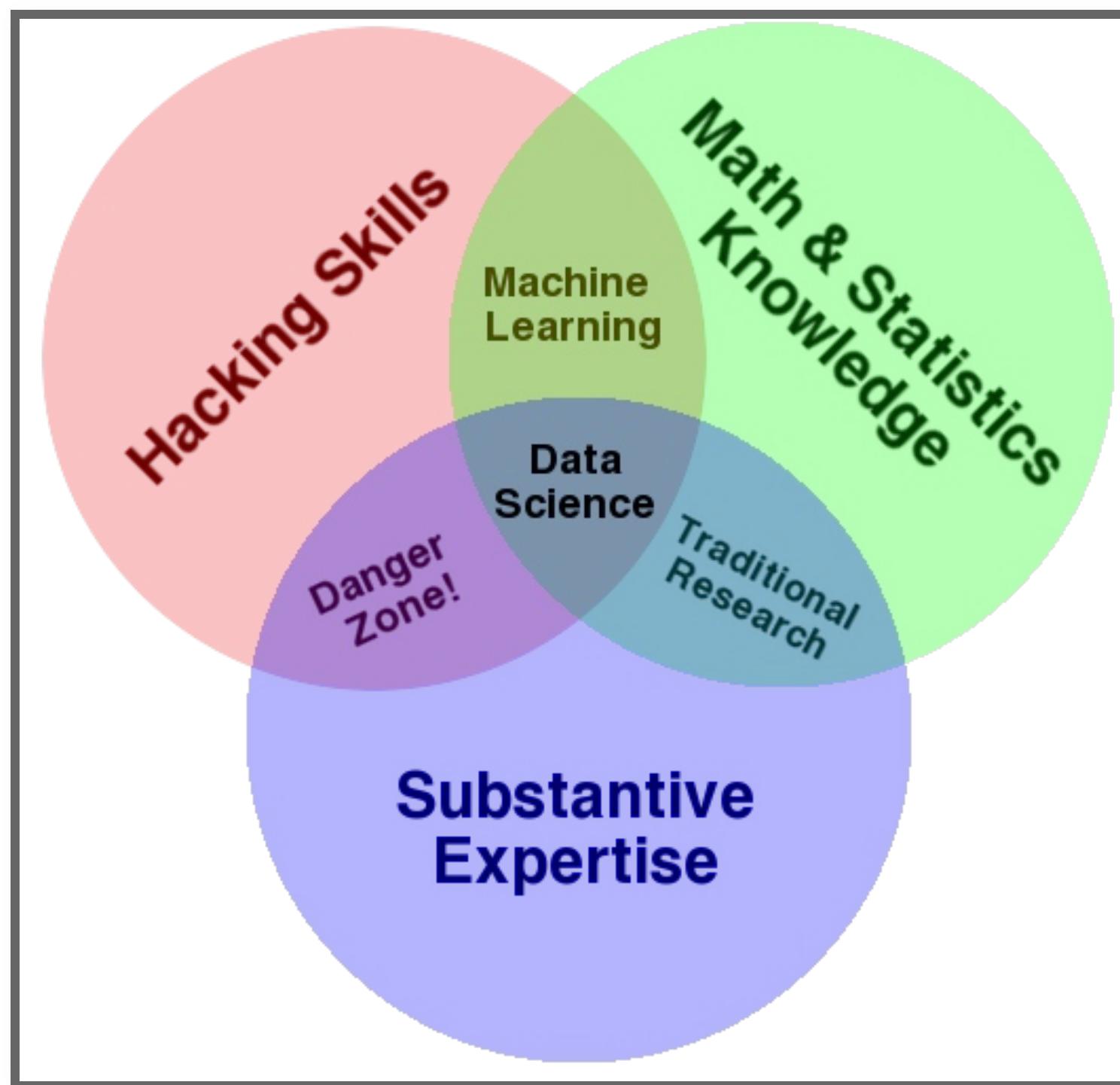
*Methods, tools and techniques to turn data into
actionable knowledge*

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...

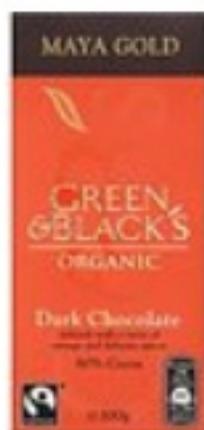
Frequently Bought Together



+



+



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)
 15
£10.40



Green and Black's Organic
Dark Chocolate Maya Gold
100 g (Pack of 5)
 5
£10.95



Green and Black's Organic
Dark Chocolate 100 g
(Pack of 5)
 22
£8.20

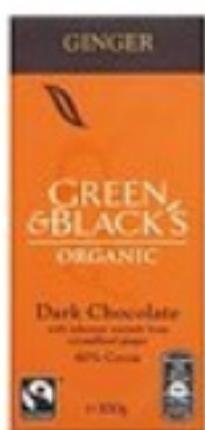


Vivani Organic Dark
Chocolate with 85% Coco
100 g (Pack of 5)
 25
£11.95

Frequently Bought Together



+



+



Total price: £32.97

Add all three to Basket

Amazon

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Have an account?

[Sign in](#)

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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WANT TO DRIVE WITH UBER?

BECOME A DRIVER

X

≡ MENU

LOG IN

SIGN UP

U B E R

L O N D O N

FARE ESTIMATE +

LONDON ✕

+

-

Map data ©2015 Google

TERMS OF USE

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 ▾

Saved

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

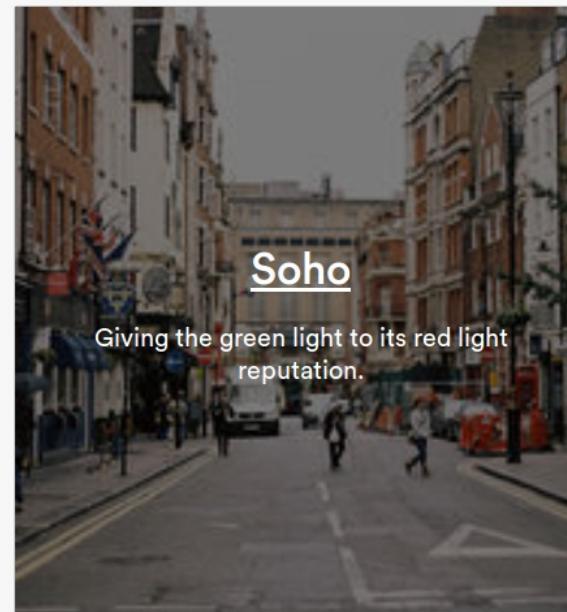
Museums & the Arts 10

Peace & Quiet 7

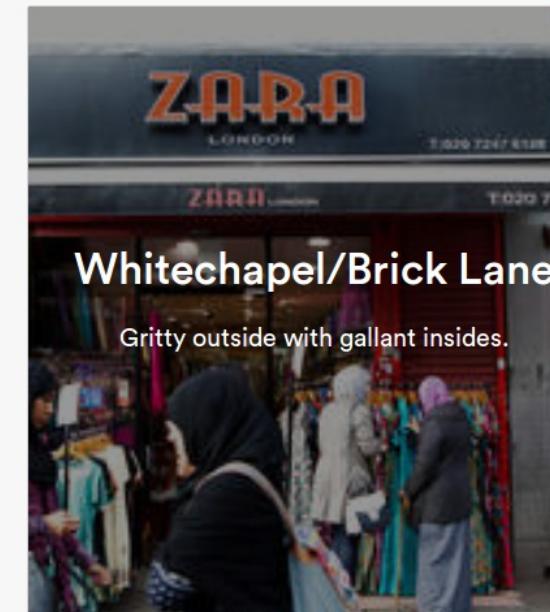
Along the River Thames 5

West End 7

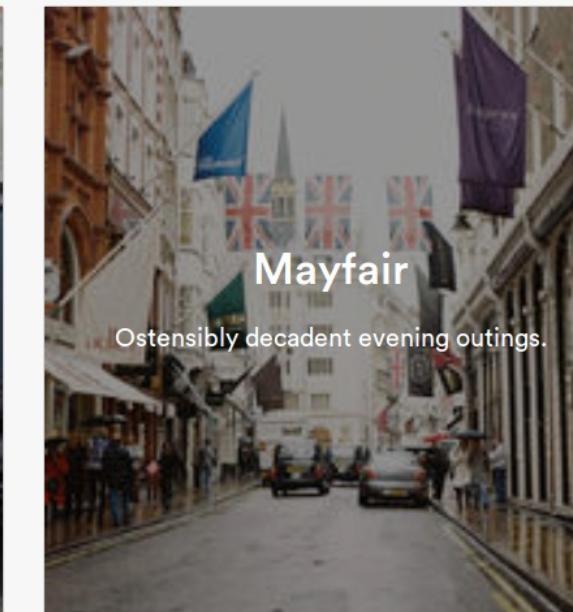
23 neighbourhoods match Dining. [See all listings](#)



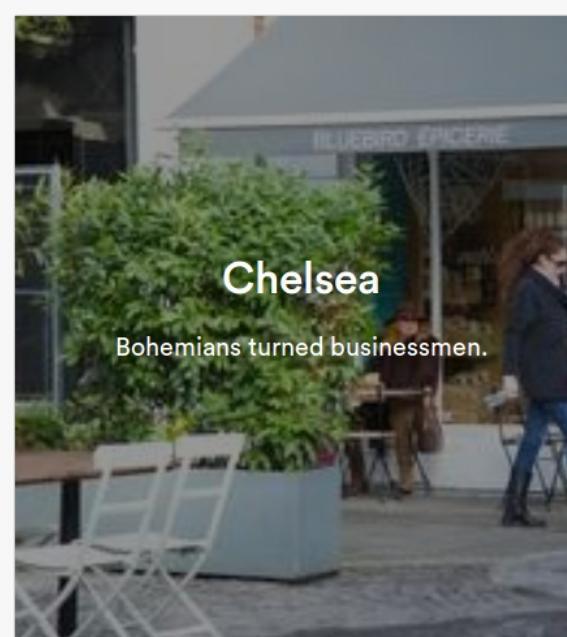
Giving the green light to its red light reputation.
Eclectic • Open-minded • China Town • Lgbt Friendly



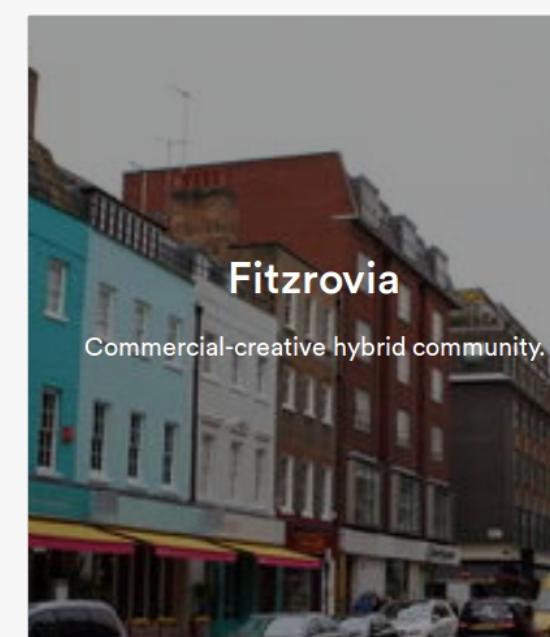
Buzzing • Curry • Arty • Graffiti



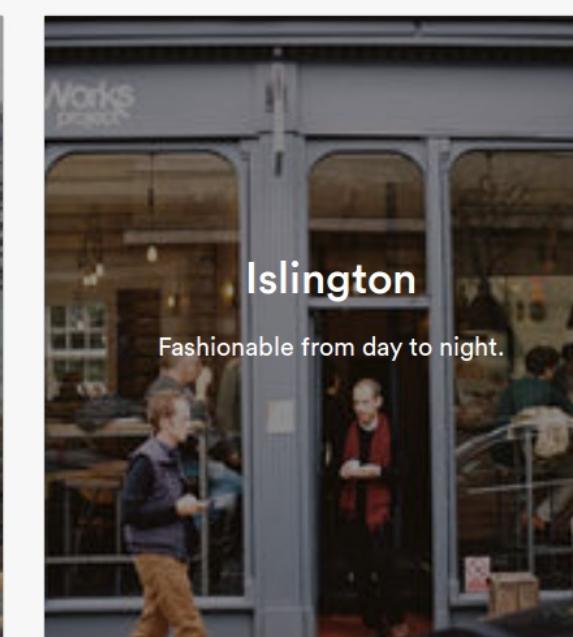
Ostensibly decadent evening outings.
Luxury Shopping • Ballrooms • Heart Of London • Fashionable



Bohemians turned businessmen.



Commercial-creative hybrid community.



Fashionable from day to night.

Find a Neighbourhood in London

AirBnb neighborhoods

Dining X

Artsy 7

Nightlife 9

Shopping 15

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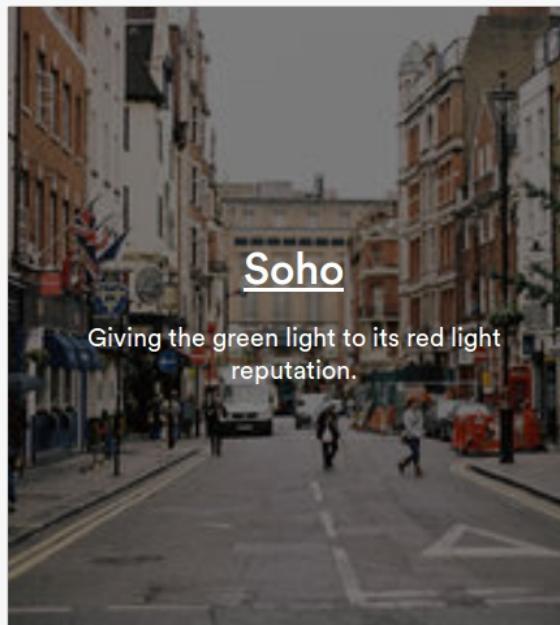
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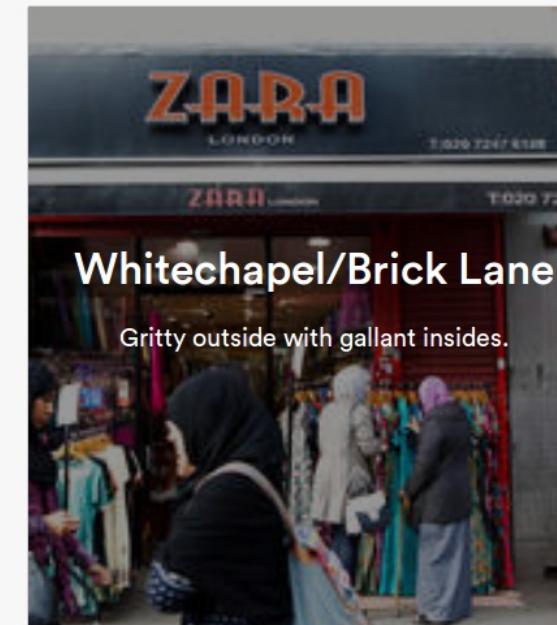
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Soho

Giving the green light to its red light reputation.

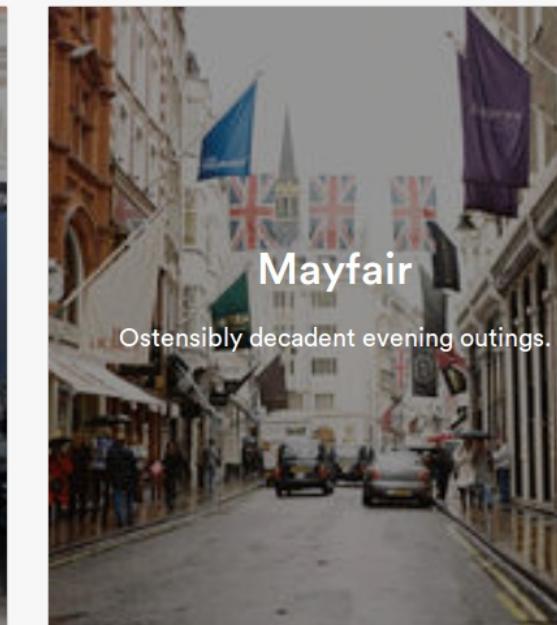
Eclectic • Open-minded • China Town • Lgbt Friendly



Whitechapel/Brick Lane

Gritty outside with gallant insides.

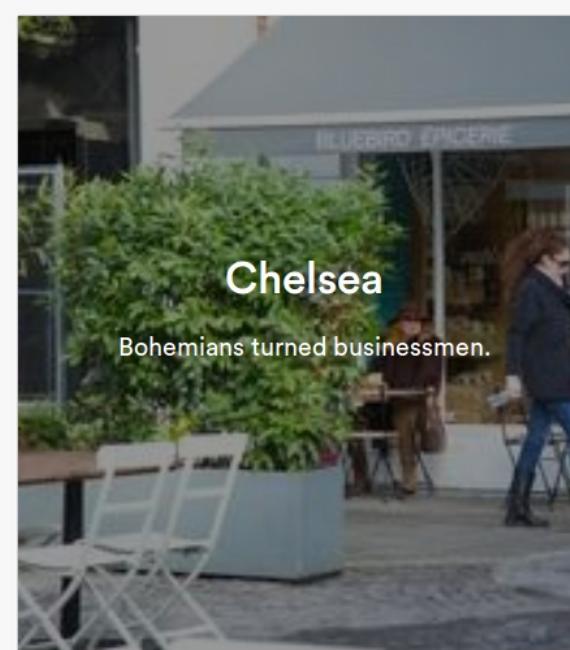
Buzzing • Curry • Arty • Graffiti



Mayfair

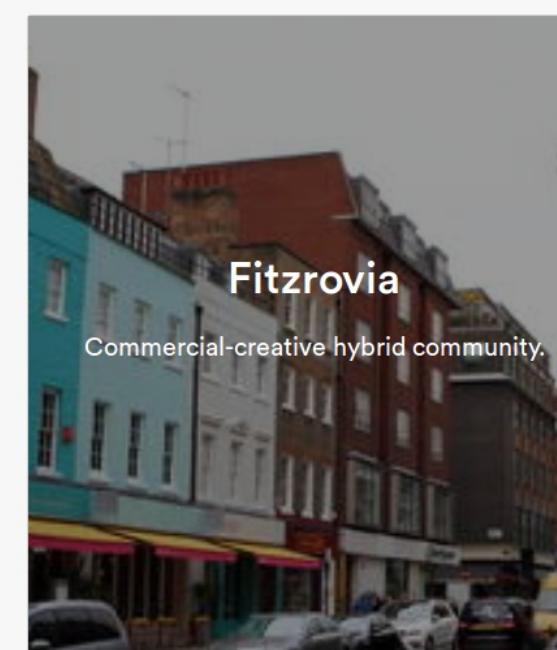
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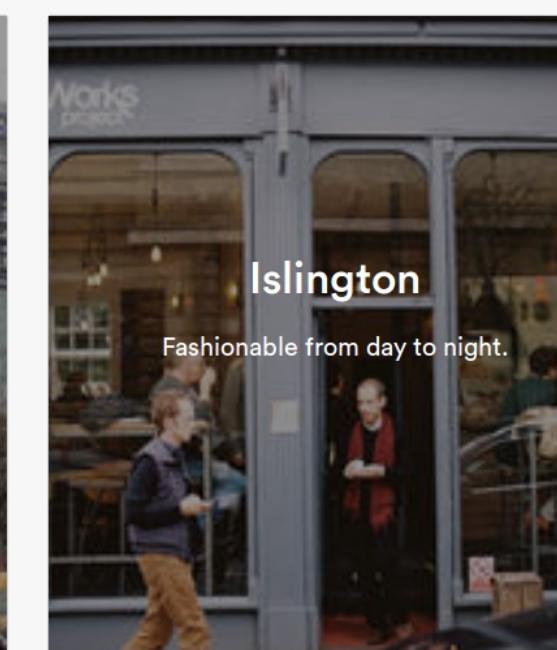
Chelsea

Bohemians turned businessmen.



Fitzrovia

Commercial-creative hybrid community.



Islington

Fashionable from day to night.

Penny Ln, Live... x +

<https://www.google.co.uk/maps/dir/Penny+Ln,+Liverpool+L18+1DE,+UK/University+of+Liverpool,+Liverpool/@53.3974201,-2.9788596,13z>

Walking directions



via A562

49 min

2.4 miles

via terrain

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

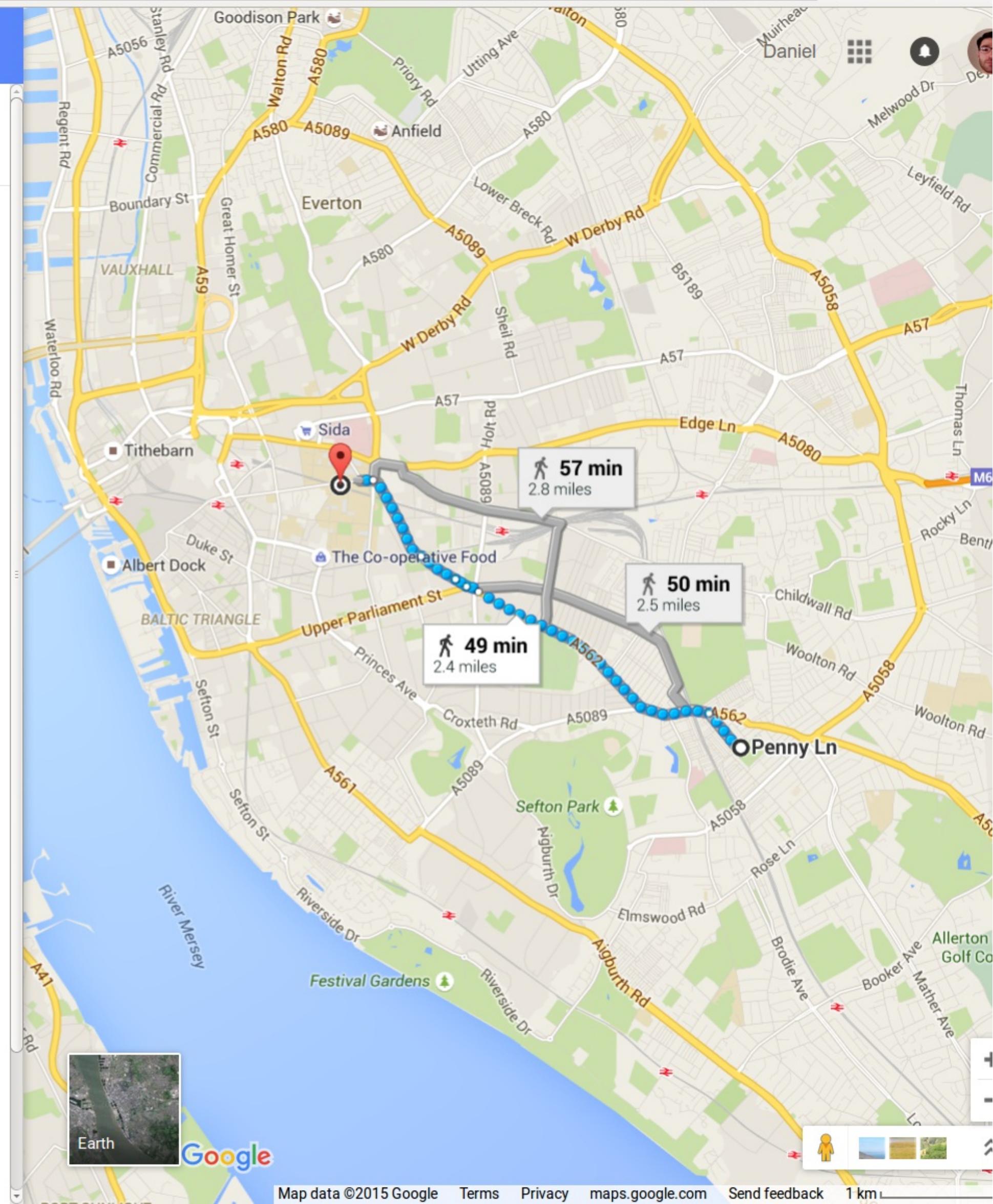
Continue straight onto Brownlow Hill/A5048

Continue to follow Brownlow Hill

325 ft

University of Liverpool

Liverpool, Merseyside L69 3BX, United Kingdom



Penny Ln, Live... x +

<https://www.google.co.uk/maps/dir/Penny+Ln,+Liverpool+L18+1DE,+UK/University+of+Liverpool,+Liverpool/@53.3974201,-2.9788596,13z>

Walking directions



X

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79 ft

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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

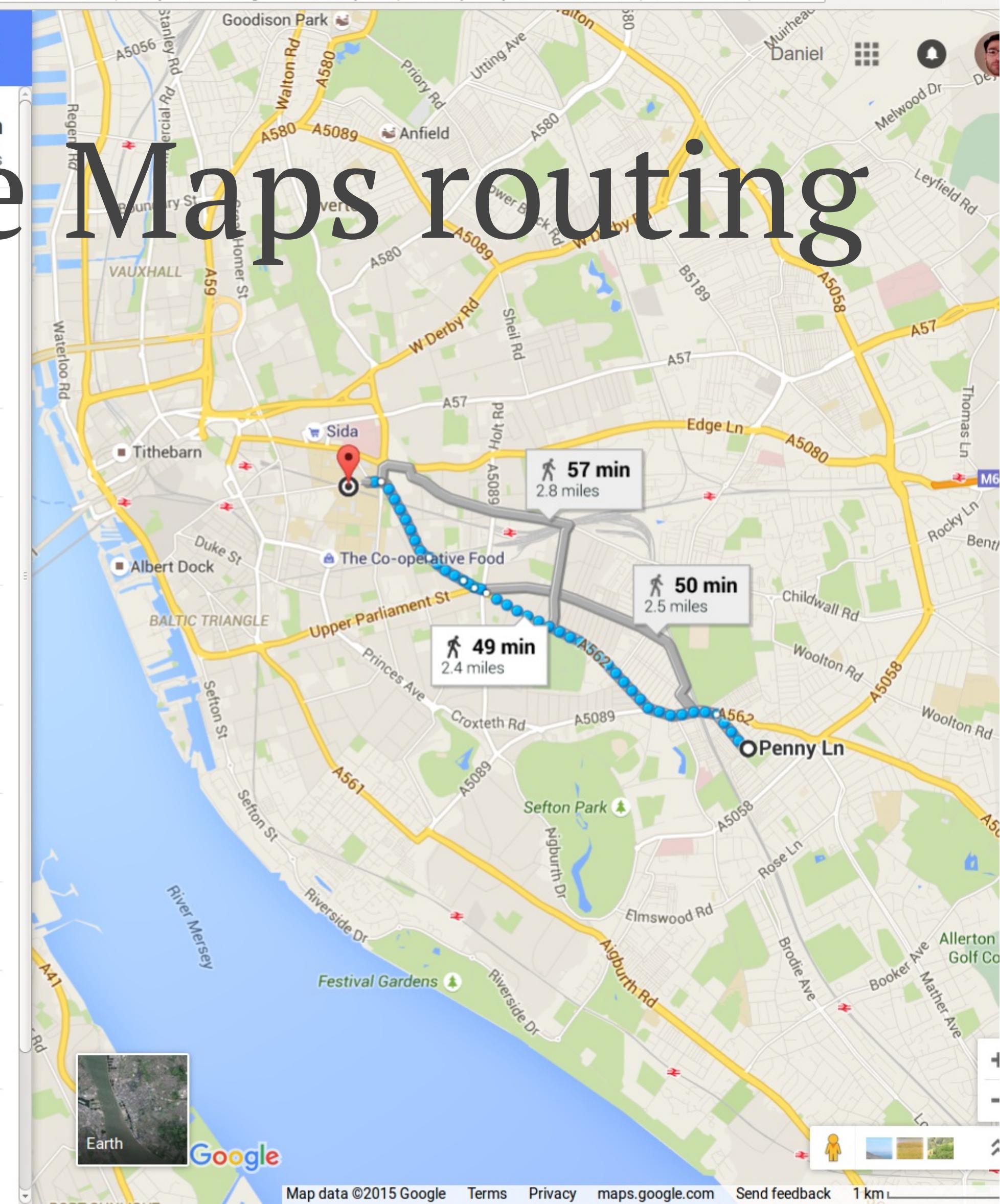
Continue straight onto Brownlow Hill/A5048

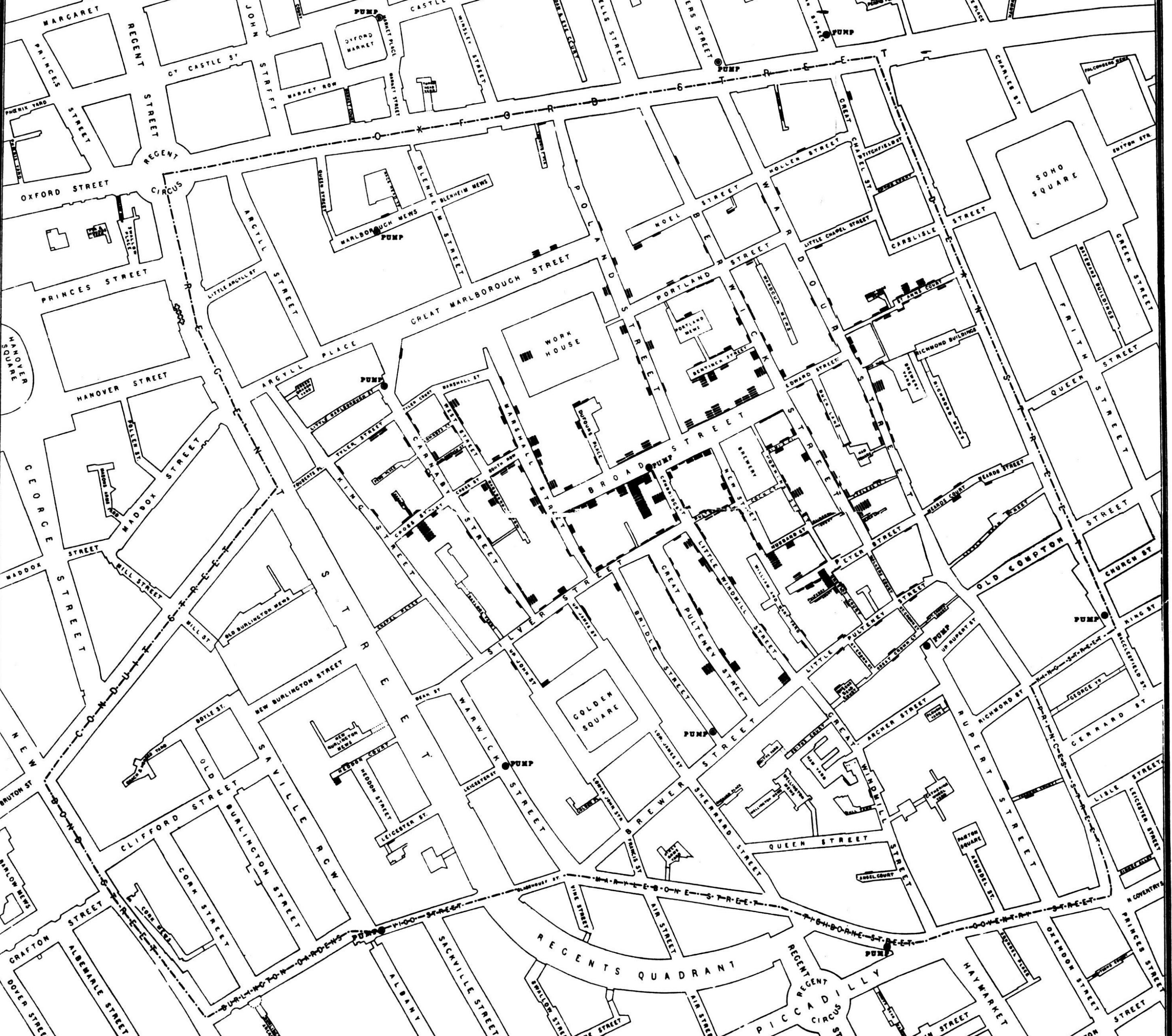
Continue to follow Brownlow Hill

325 ft

University of Liverpool

Liverpool, Merseyside L69 3BX, United Kingdom







John Snow's cholera map



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