

Geographic Data Science – Lecture I

Introduction

Dani Arribas-Bel

Today

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

This course

Quiz

- Can you think of a real-world context where data and statistics are being used to make a difference?
- Have you ever heard the term "Big Data"?
- Have you ever heard the term "Data Science"?
- Have you ever written a line of computer code?

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

...but in a fun way!

Philosophy

- (Lots of) methods and techniques
 - General overview
 - Intuition
 - Very little math
 - Lots of ways to continue on your own
- Emphasis on the application and use
- Close connection to "real world" applications

Logistics - Website

<http://darribas.org/gds17>

GDS17

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ENVS363/563

Geographic Data Science

Welcome to Geographic Data Science, a course taught by Dr. Dani Arribas-Bel in the Autumn of 2017 at the University of Liverpool.

The timetable for the course is:

- Lectures: *Mondays* 9:00am-10:00am, [SCTH-MR](#)
- Computer Labs: *Mondays* 11:00am-1:00pm, [ENG-HHTC](#)

Locations

- [SCTH-MR](#): South Campus Teaching Hub, Main Room [[Map](#)]
- [ENG-HHTC](#): Harrison Hughes Building (Engineering), Computer lab (top floor) [[Map](#)]

Logistics – Format

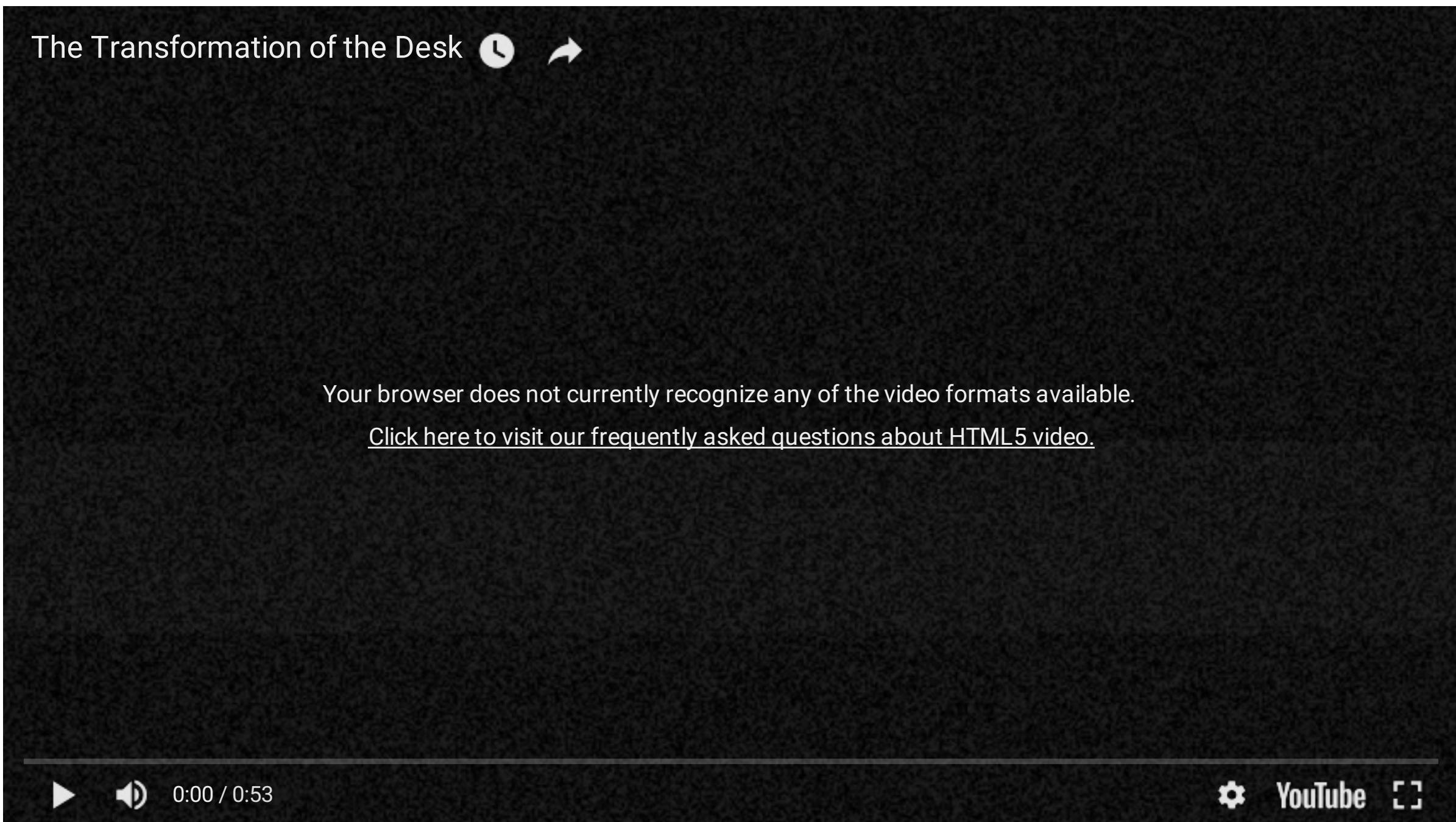
11 weeks of:

- 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

Logistics – Content

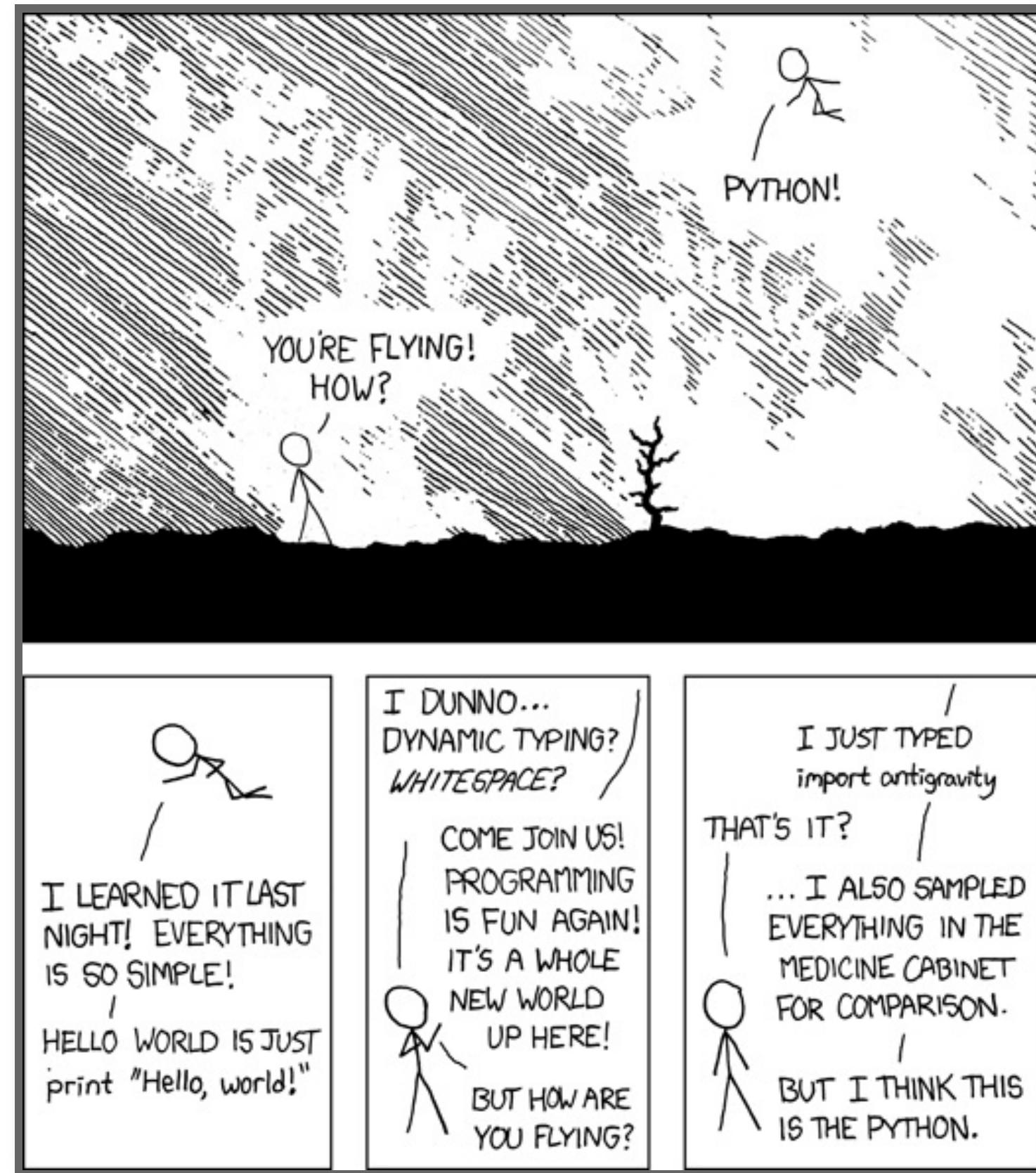
- Weeks 1–3: "big picture" lectures + introduction to computational tools (learning curve)
- Weeks 4–8: "meat" of the course (lots of concepts packed)
- Weeks 9–11: catch up + prepare an awesome Assignment II

Code



"Even if you won't be a poet, you need to know how to write"

Python



Python

- General purpose programming language
- Sweet spot between "*proof-of-concept*" and "*production-ready*"
- Industry standard: GIS (Esri, QGIS) and Data Science (Google, Facebook, Amazon, Netflix, The New York Times, NASA...)

Self-directed learning

Prepare for the labs

- I won't be leading/lecturing at the computer labs
- Go over the notebooks before the lecture and the computer lab --> If the first time you see a notebook is at the lab, you won't be able to follow on
- Bring questions, comments, feedback, (informed) rants to class/labs
- Use the **forum** (link on VITAL)
- Collaborate (it's NOT a zero-sum win!!!)

More help!!!

This course is much more about "learning to learn" and problem solving rather than acquiring specific programming tricks or stats wizardry

- Learn to ask questions (but don't expect exact answers all the time!!!)
- Help others as much as you can (the best way to learn is to teach)
- Search heavily on Google + Stack Overflow

Assignments

- Mark (mostly) based on two assignments, due:
 - Week 7 (40%), Week 12 (55%)
 - Coursework
 - Equivalent to 2,500: report (*notebook*) with code, figures (e.g. maps), and text
- Discussion board (5%)

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:

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

Why now?

Advances in:

- Computing power and storage
- Connectivity
- Geospatial technology

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:

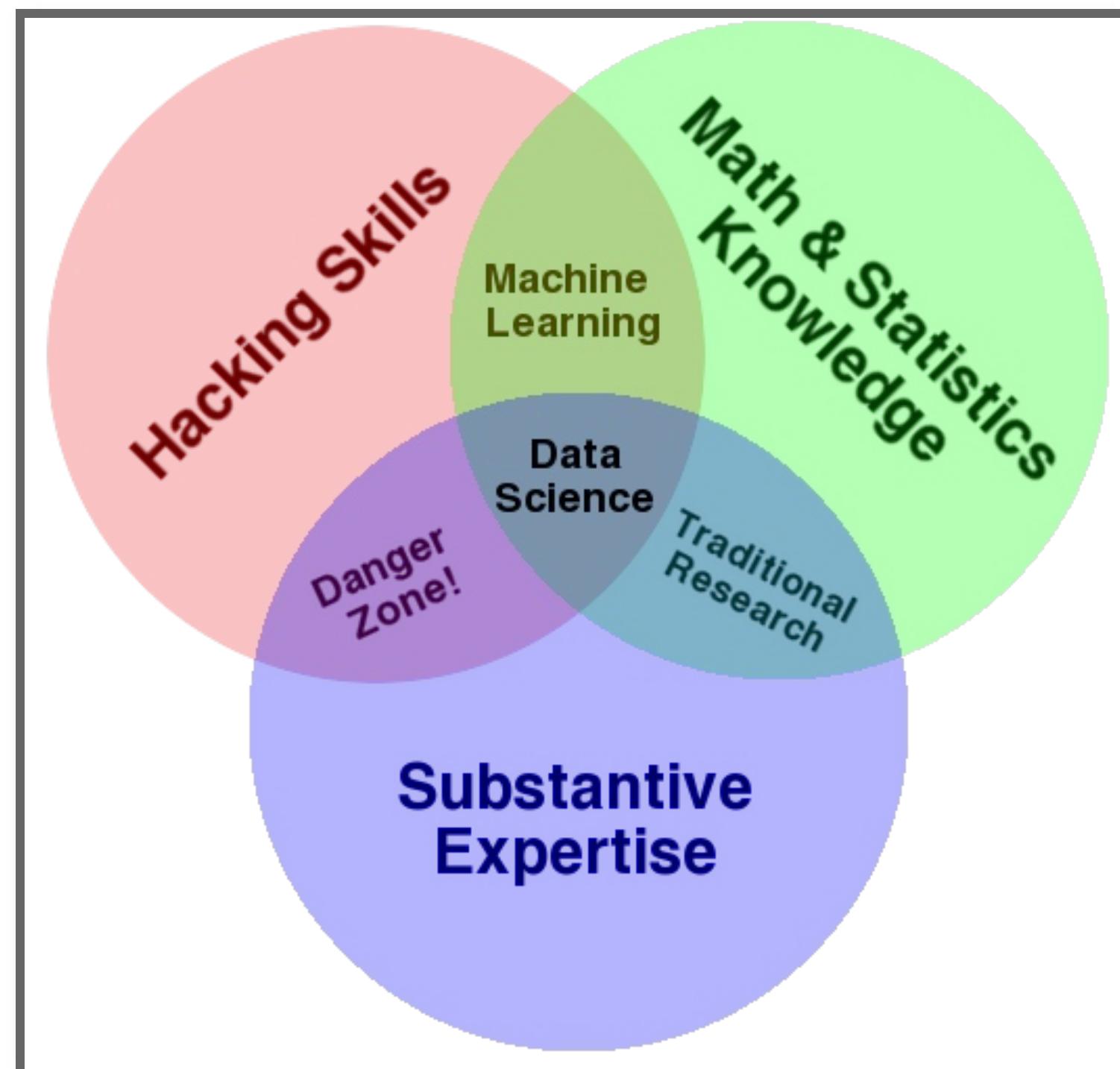
- Data --> Information --> Knowledge --> Action

Data Science

Methods, tools and techniques to turn data into actionable knowledge

Data Science

Source: Drew Conway



Data Science

Statistics + ...

- 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)

Some examples...

Frequently Bought Together



+



+



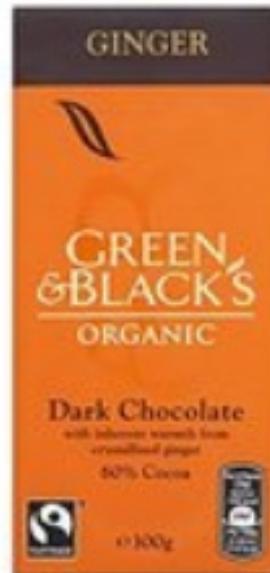
Total price: £32.97

Add all three to Basket

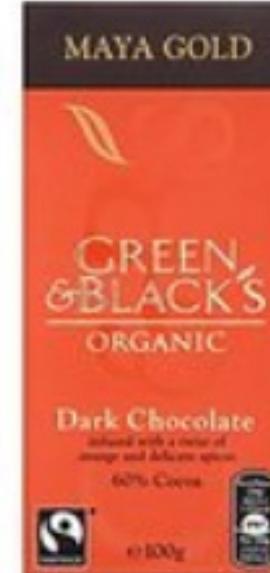
i These items are dispatched from and sold by different sellers. [Show details](#)

- 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

Free Online Dating | OkCupid - Mozilla Firefox (Private Browsing)

Free Online D... https://www.okcupid.com

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?
You can take us to go.

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...

London Neighbourhood Guide - Airbnb Neighbourhoods - Mozilla Firefox

London Neigh... +

Airbnb, Inc. (US) https://www.airbnb.co.uk/locations/london/neighbourhoods

Where are you going? Browse

Sign Up Log In Help List Your Space

Cities > London Saved Neighbourhoods 0

Find a Neighbourhood in London

What kind of neighbourhood are you looking for?

Dining × 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.

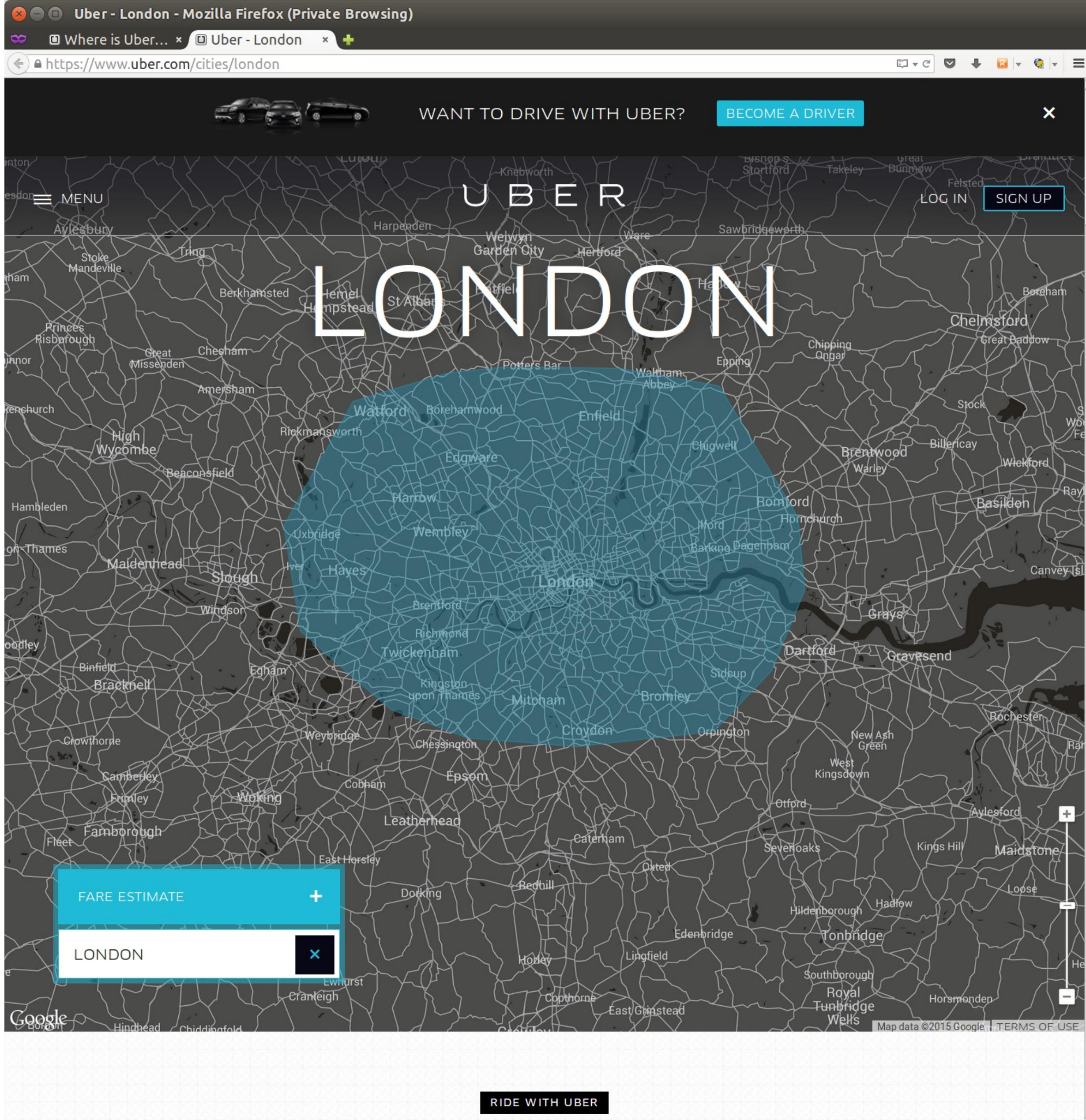
Luxury Shopping • Ballrooms • Heart Of London • Fashionable

Chelsea
Bohemians turned businessmen.

Fitzrovia
Commercial-creative hybrid community.

Islington
Fashionable from day to night.

<https://www.airbnb.co.uk/locations/london/soho>



Penny Ln, Liverpool L18 1DE, UK to University of Liverpool, Liverpool - Google Maps - Mozilla Firefox

Penny Ln, Live...

<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

Show terrain

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
i Continue to follow A562
364 ft

Turn right toward Smithdown Ln
325 ft

Continue onto Smithdown Ln
0.2 mi

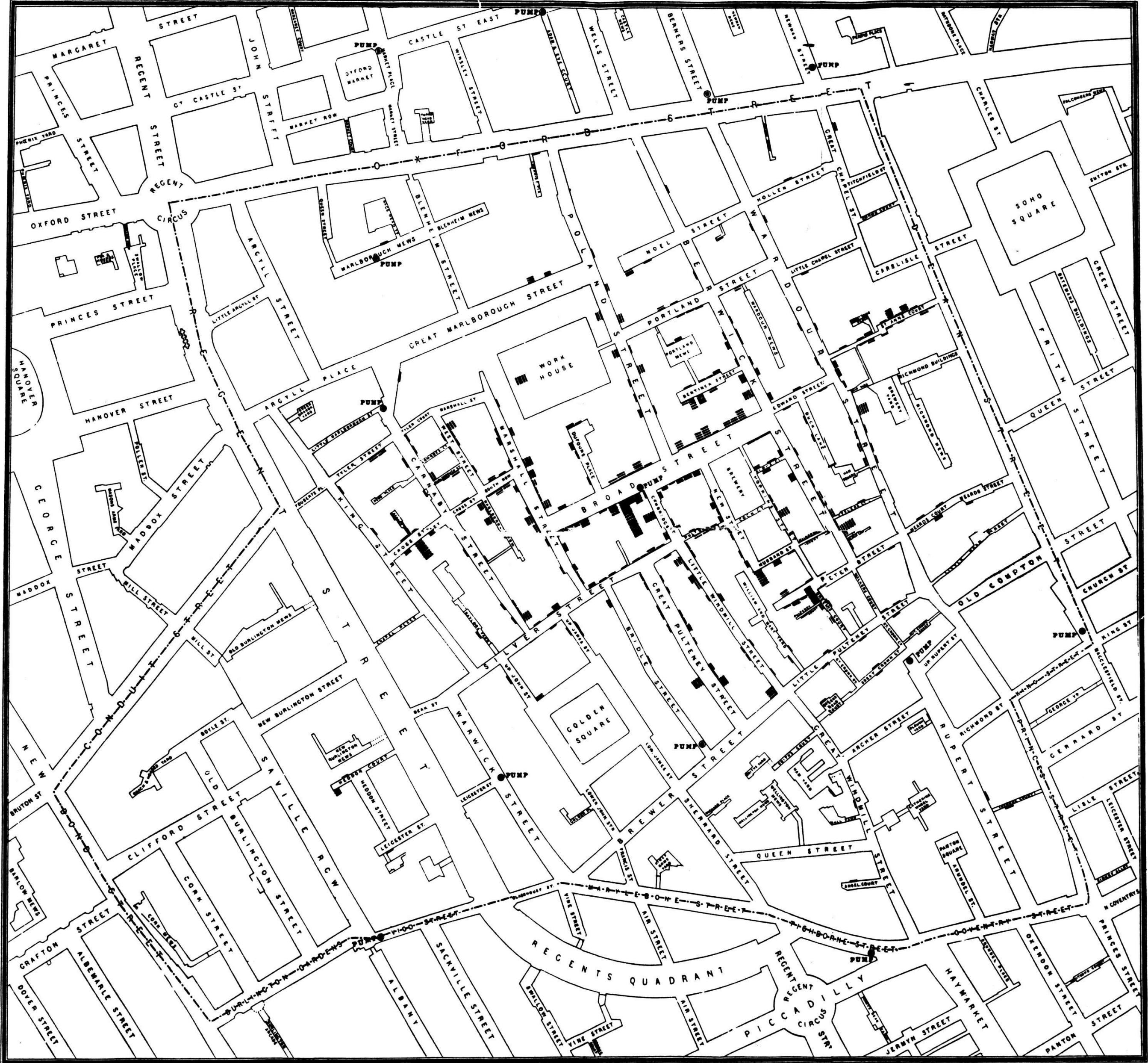
Turn left to stay on Smithdown Ln
0.5 mi

Continue straight onto Brownlow Hill/A5048
i Continue to follow Brownlow Hill
325 ft

University of Liverpool
Liverpool, Merseyside L69 3BX, United Kingdom

The map shows the walking route from Penny Ln to the University of Liverpool. The route starts at Penny Ln and follows the A562 westward through the Baltic Triangle area, passing by Albert Dock and Sida. It then turns inland, crossing the River Mersey, and follows the A562 through Sefton Park and Allerton Park. The route ends at the University of Liverpool. The total distance is 2.4 miles and takes approximately 49 minutes. There are three segments highlighted with walking icons and times: 57 min for 2.8 miles, 50 min for 2.5 miles, and 49 min for 2.4 miles.

Map data ©2015 Google Terms Privacy maps.google.com Send feedback 1 km





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