Geographic Data Science - Lecture II

(New) Spatial Data

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"Yesterday"

- Introduced the (geo-)data revolution
  - What is it?
  - Why now?
- The *need* of **(geo-)data science** to make sense of it all

Today

- Traditional data: refresher
- New sources of spatial data
- Challenges
- (Cool) examples

Good old spatial data

Good old spatial data

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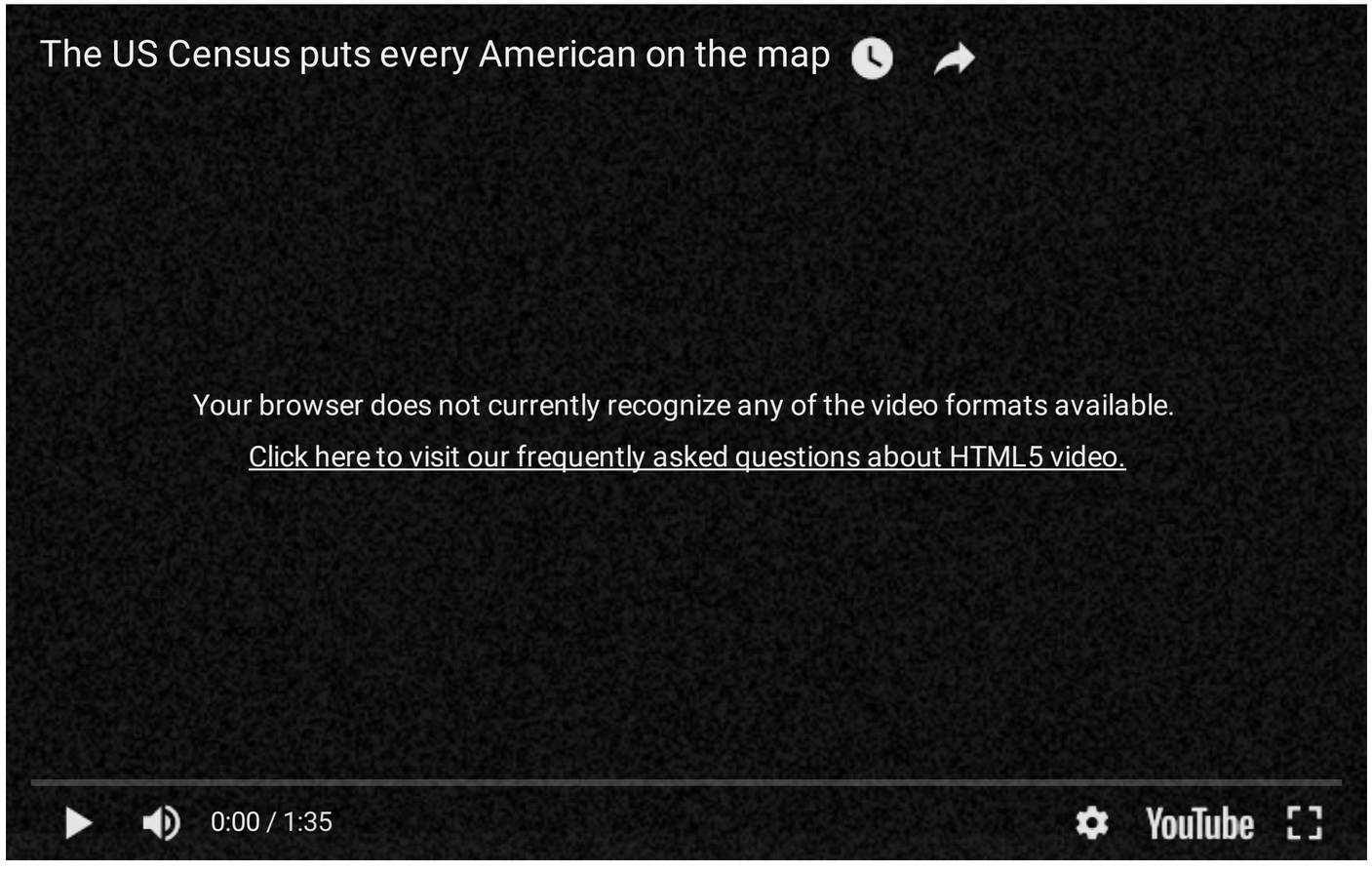


Good old spatial data (+)

Traditionally, datasets used in the (social) sciences are:

- Collected for the purpose --> **carefully** designed
- **Detailed** in information ("*...rich profiles and portraits of the country...*")
- **High quality**

Good old spatial data (-)

But also:

- Massive enterprises ("*...every single person...*) --> **costly**
- But **coarse** in resolution (to preserve pricacy they need to be aggregated)
- **Slow**: the more detailed, the less frequent they are available

Examples

- Decenial census (and census geographies)
- Longitudinal surveys
- Customly collected surveys, interviews, etc.
- Economic indicators
- ...

New sources of (spatial) data

New sources of (spatial) data

Tied into the (geo-)data revolution, new sources are appearing that are:

- **ACCIDENTAL** --> created for different purposes but available for analysis as a side effect
- Very diverse in nature, resolution, and detail but, potentially, much more **detailed** in both space and time
- Quality also varies greatly

New sources of (spatial) data

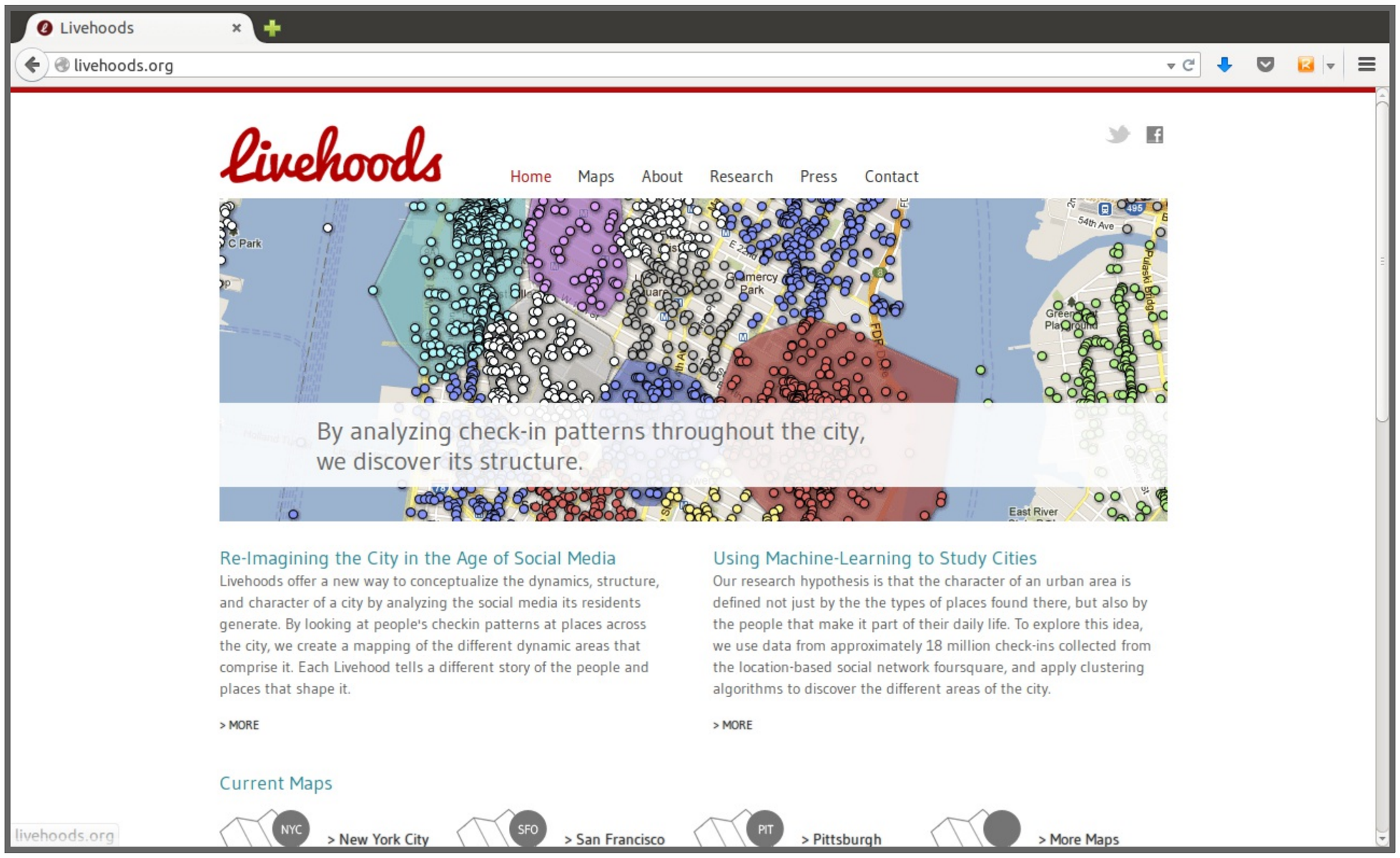
We can split them at three levels, based on how they originate:

- [**Bottom up**] "Citizens as sensors"
- [**Intermediate**] Digital businesses/businesses going digital
- [**Top down**] Open Government Data

Citizens as sensors

- Technology has allowed widespread adoption of sensors (bands, smartphones, tablets...)
- (Almost) every aspect of human life is subject to leave a digital trace that can be collected, stored and analyzed
- Individuals become content/data creators (sensors, *Goodchild, 2007*)
- *Why relevant for geographers?* --> Most of it (80%?) has some form of spatial dimension

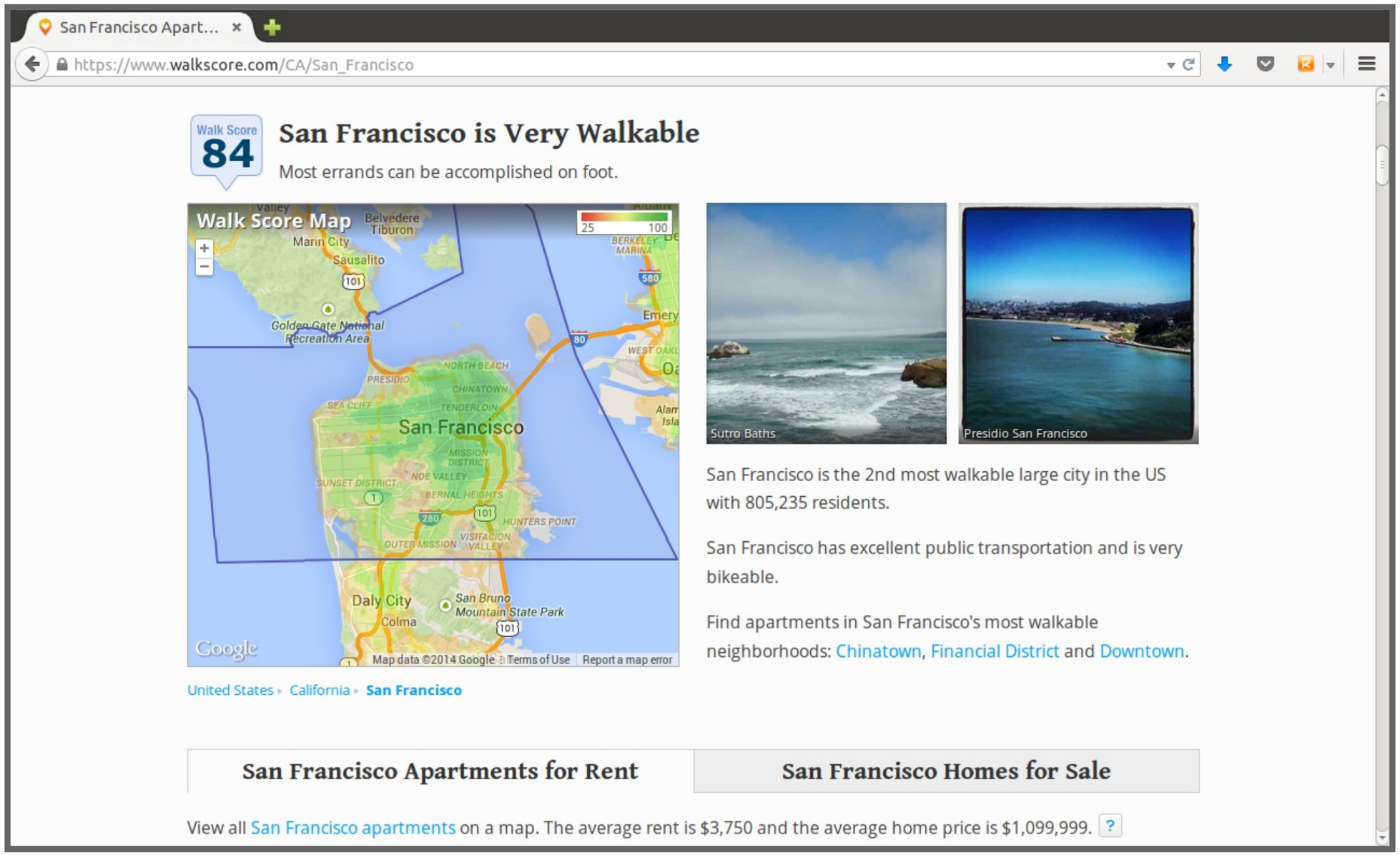
Example: Livehoods



Businesses moving online

- Many of the elements and parts of bussiness activities have been computerized in the last decades
- This implies, without any change in the final product or activity per se, a lot more digital data is "available" about their operations
- In addition, enirely new business activities have been created based on the new technologies ("internet natives")
- Much of these data can help researchers better understand how cities work

Example: Walkscore

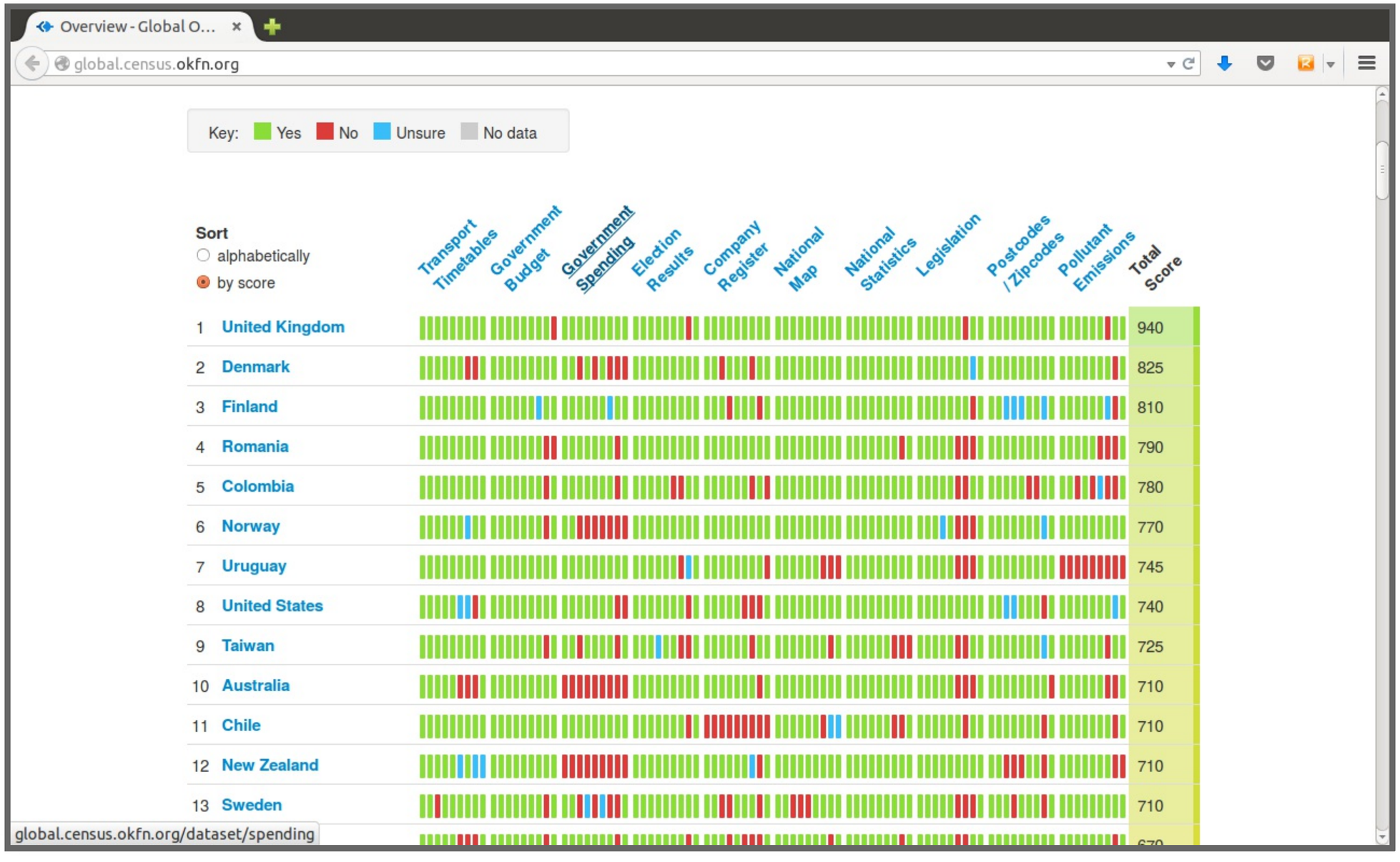


Open data for open governments

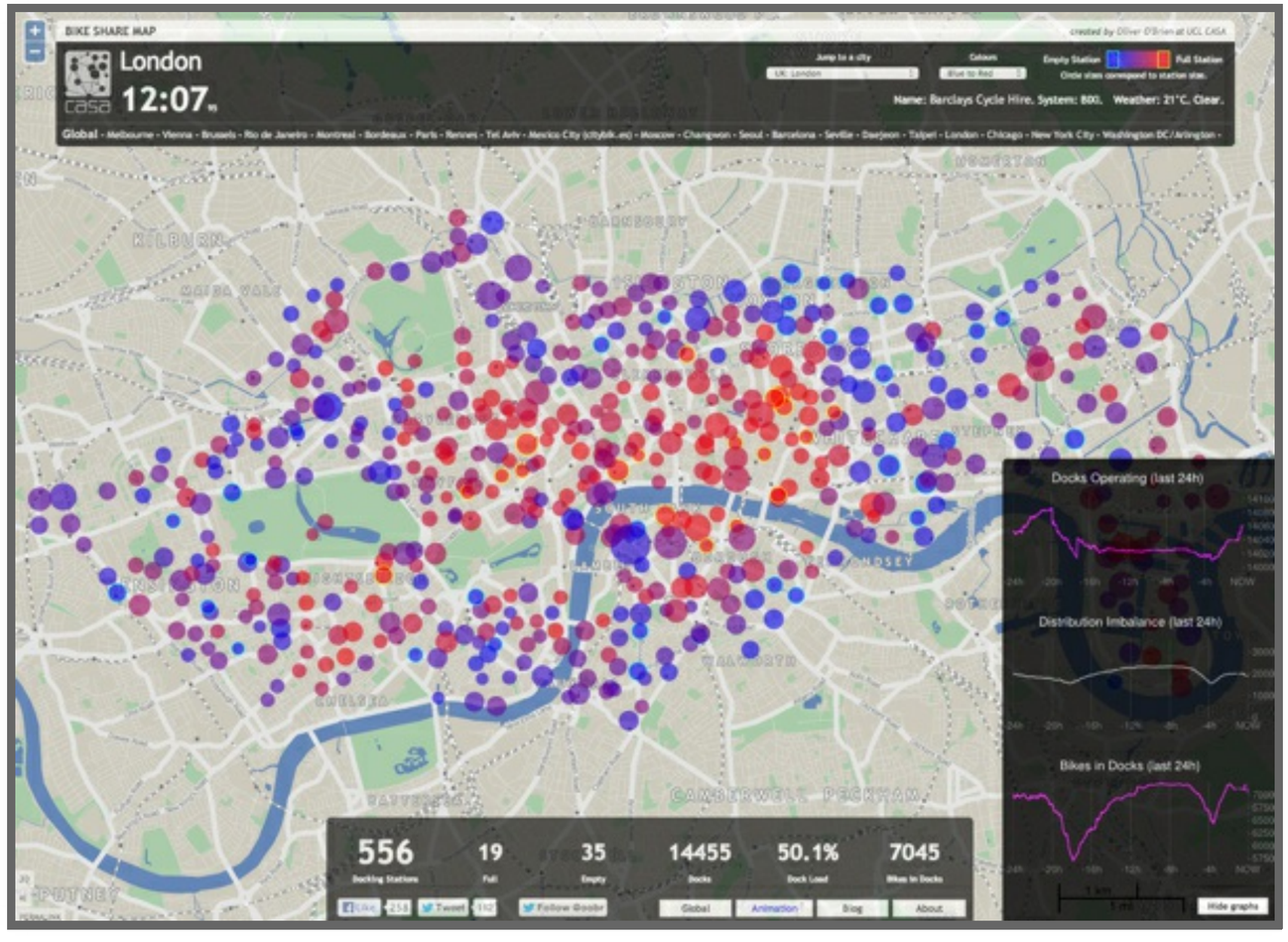
Government institutions release (part of) their internal data in open format. Motivations (Shadbolt, 2010):

- Transparency and accountability
- Economic and social value
- Public service improvement
- Creation of new industries and jobs

Global Open Data Index'14



Example: BikeShare Map



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Class Quiz

Class Quiz

In pairs, 2 minutes to discuss the origin of the following sources of (geo-)data:

- Geo-referenced tweets --> Bottom-up
- Land-registry house transaction values --> Open Government
- Google maps restaurant listing --> Digital businesses
- ONS Deprivation Indices --> Traditional (not accidental!)
- Liverpool bikeshare service station status --> Open Government Data

Challenges

Challenges

- Bias
- Technical barriers to access
- The need of new methods

Bias

- Traditionally, data used by urban researchers meets some quality standards (representativity, accuracy...)
- The *accidental* nature means new data sources will not always meet such standards
- This implies researchers need to have extra care and put more thought into what conclusions they can reach from analyses with new sources of data
- In some cases, bias can even run in favour of researchers, but this should never be taken for granted

Technical barriers to access

- Much of these data are available
- However, their accidental nature makes them not be *directly* available
- Usually, a **different set of skills** is required to tap into their power
  - Basic programming
  - Computing literacy (understanding of the internet, APIs, databases...)
  - Software savvy-ness (a.k.a. "go beyond Word and Excel")

(New) Methods

The nature of these data is not exactly the same as that of more traditional datasets. For example:

- Spatial aggregation: Polygons Vs. Points
- Temporal aggregation(frequency): Decadal Vs. Real-time

Some of this does not "play well" with techniques employed traditionally to analyze data in Geography.

(New) Methods

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(New) Methods

To be able to extract as much insight as possible from these new sources of data --> *borrow* techniques from other disciplines, or even *create* new ones

Examples:

- Visualization
- Machine learning

But also others like bayesian inference, network science...

Methods - Visualization

- Display of graphical summaries
- Arguably, not new to Geography, but more emphasis should be put on it
- Powerful to both *obtain* (explore the data) and *communicate* findings (tell stories with data)

Example: Public Transit in Boston

Methods - Machine learning

- Originated in computer science, blended with statistics
- Focus on prediction and pattern recognition
- Two main types of learning:
  - **Supervised**: present the computer some true relationships to "learn" a model, then use the model to infer others where no prediction is available (e.g. Google flu trends)
  - **Unsupervised**: "let the data speak"... and the machine pick up the structure (e.g. Livehoods)

New + Old

Traditional data:

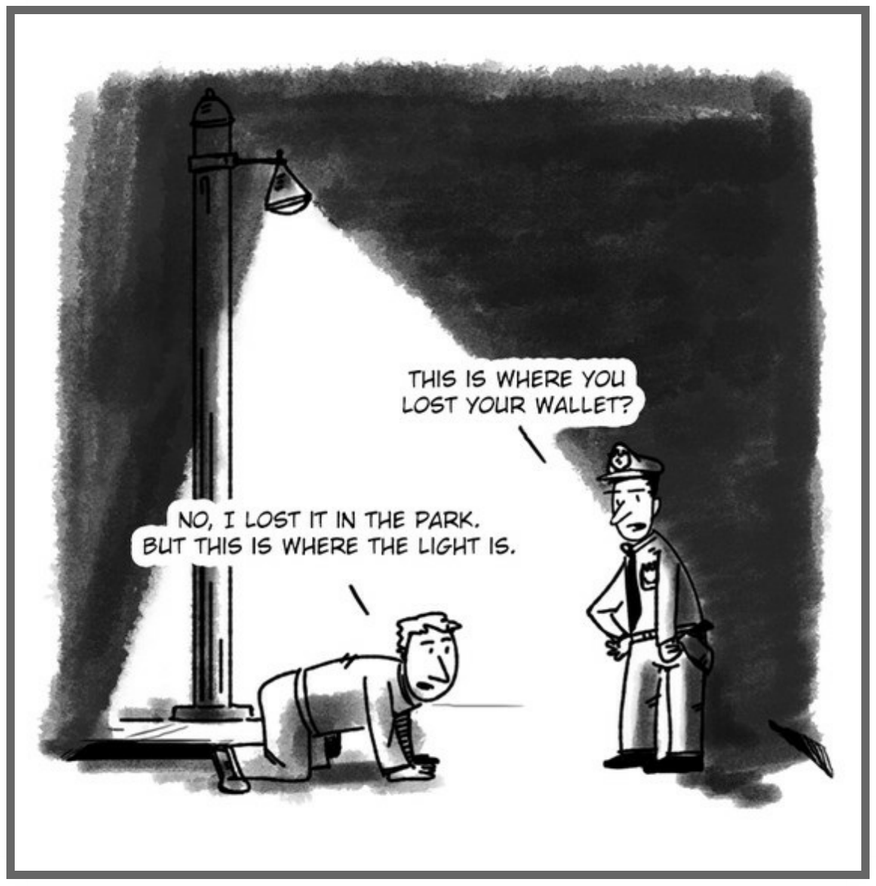
- High quality, detailed, and reliable
- Costly, coarse, and slow

Accidental data:

- Cheap, fine-grained, and fast
- Less reliable, harder to access, and potentially uninteresting

--> 1 + 1 > 2

Avoid the streetlight effect



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