DATA COLLECTION

Petra Isenberg

Slides originaly by WESLEY WILLETT

VISUAL ANALYTICS

WHERE DOES DATA COME FROM?

We tend to think of data as a thing…

in a database…

somewhere…

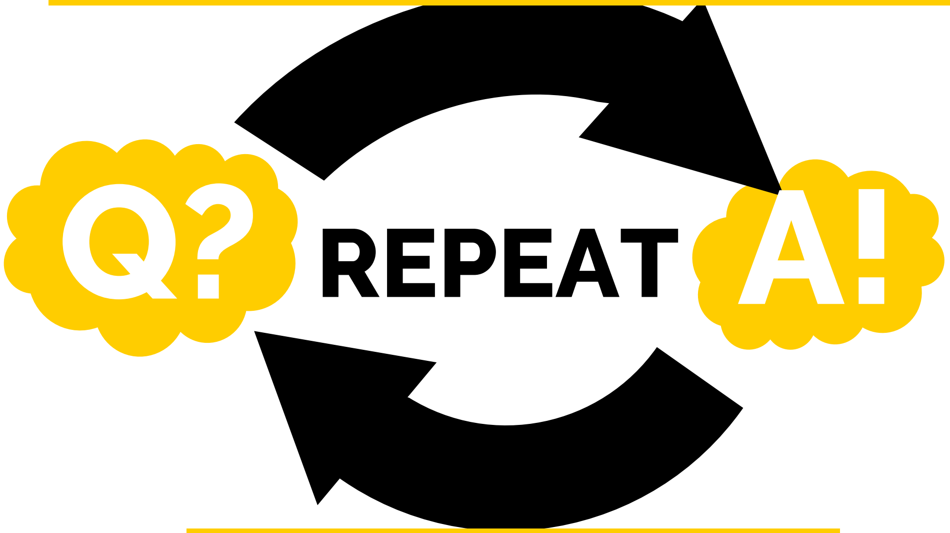
WHY DO YOU NEED DATA?

(HINT: Usually, because you have a question you need to answer!)

DATA → ANSWERS

ANALYSIS IS A CYCLE

GATHERING DATA,
APPLYING STATISTICAL TOOLS, AND
CONSTRUCTING GRAPHICS TO
ADDRESS QUESTIONS



INSPECT "ANSWERS" AND
ASSESS NEW QUESTIONS

(SOMETIMES YOU'LL ALREADY START WITH DATA...)

"EXPLORATORY DATA ANALYSIS"

JOHN TUKEY

We already saw this...

(...BUT OFTEN YOU <u>START</u>
WITH A QUESTION AND NEED
TO COLLECT DATA TO FIT IT)

CHOOSING A QUESTION

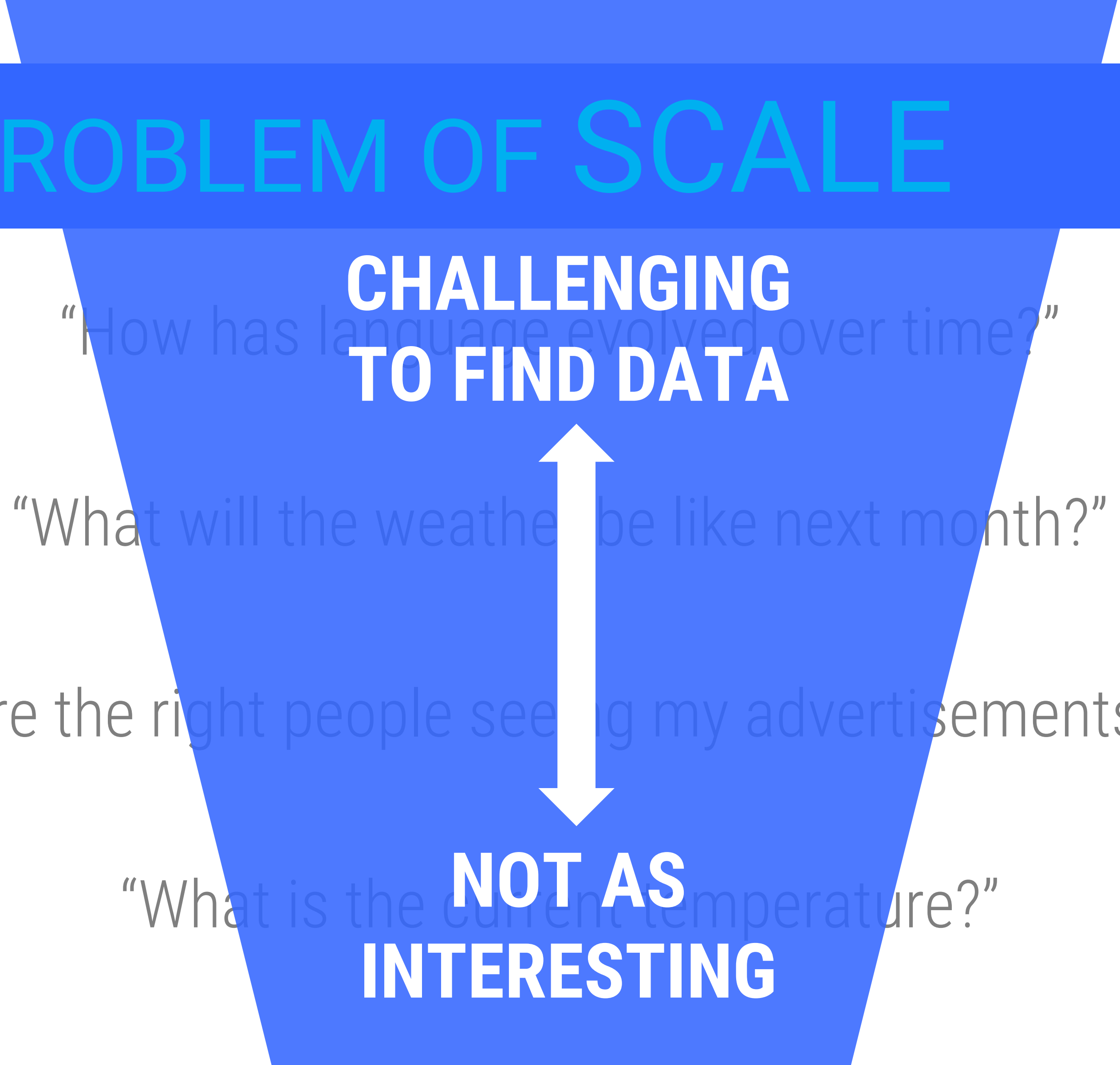
“How has language evolved over time?”

“What will the weather be like next month?”

“Are the right people seeing my advertisements?”

“What is the current temperature?”

A PROBLEM OF SCALE



CHALLENGING TO FIND DATA

“How has language evolved over time?”

“What will the weather be like next month?”

“Are the right people seeing my advertisements?”

“What is the current temperature?”

NOT AS INTERESTING

HOW TO OBTAIN DATA?

COLLECT IT

- OBSERVATION
- SURVEYS
- LOGGING
- SENSORS
- CROWDSOURCING

FIND OR EXTRACT IT

- OPEN CORPUSES
- DATA RETAILERS
- APIS
- SCRAPING THE WEB

GENERATE IT

- SIMULATIONS

ALL OF THESE HAVE

PROS/CONS

THIS LIST IS NOT EXHAUSTIVE

This lecture is intended to expose you to just a few useful data sources and collection methods.

COLLECTING DATA

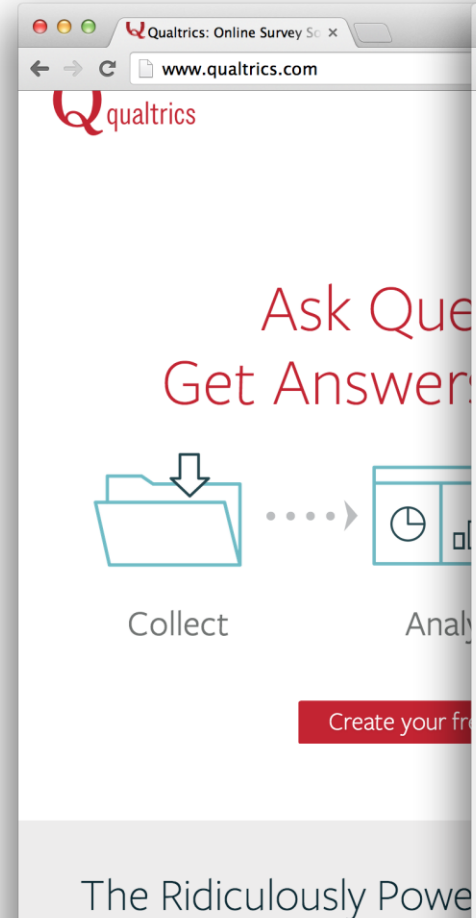
Choosing the best way to capture information you need.

SURVEYS

Paper surveys / In person interviews

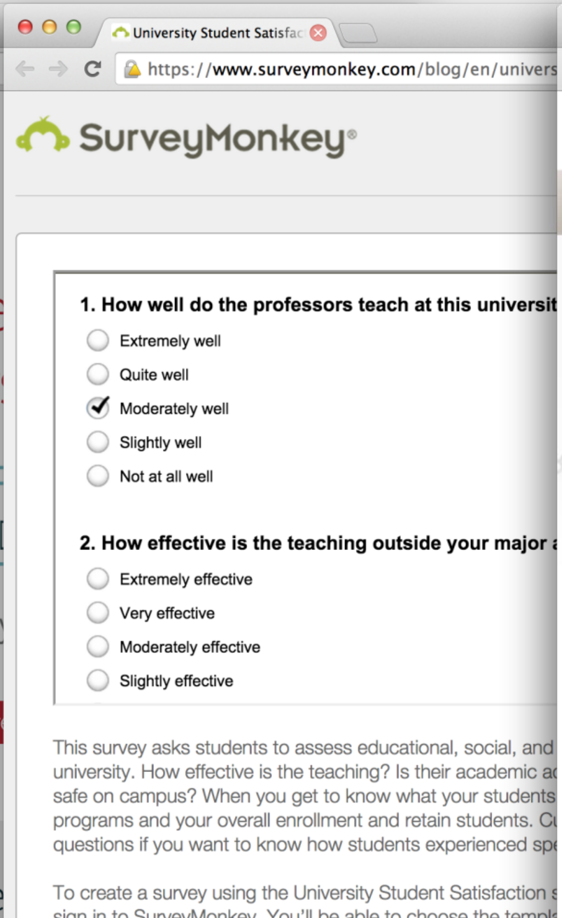
STILL ONE OF THE BEST WAYS TO GET DETAILED DATA OR DATA ABOUT SENSITIVE SUBJECTS

SURVEYS ONLINE



Ask Que
Get Answer

The Ridiculously Powe



University Student Satisfac
https://www.surveymonkey.com/blog/en/univers
SurveyMonkey®

1. How well do the professors teach at this universit

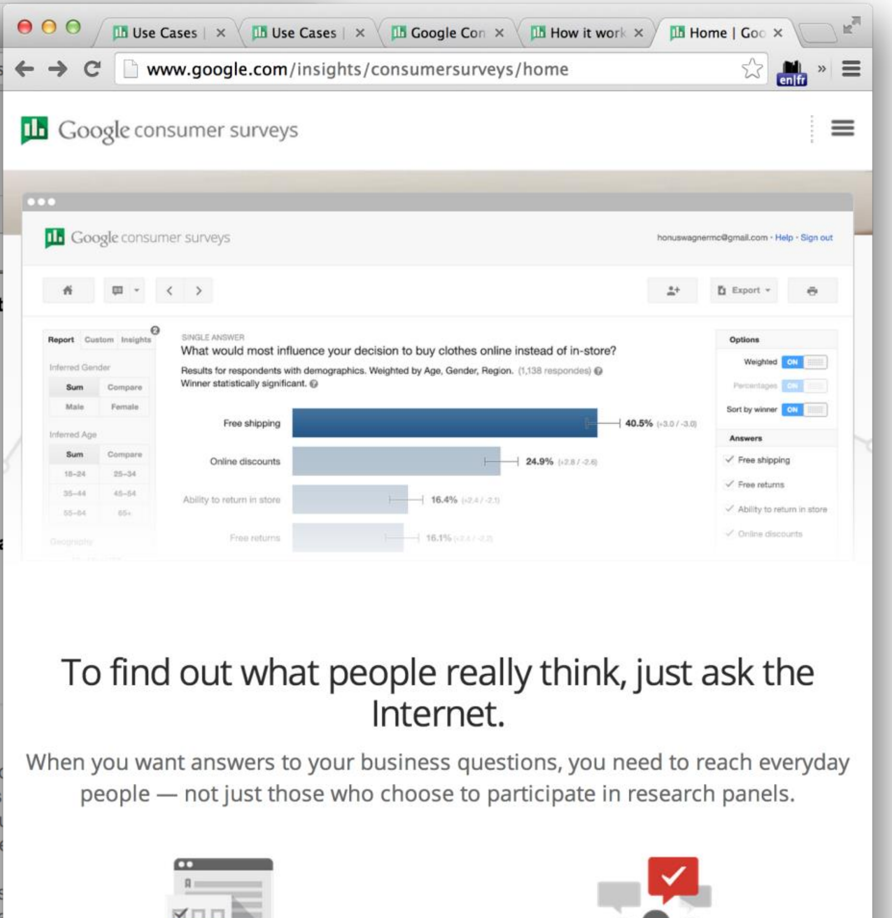
○ Extremely well
○ Quite well
☑ Moderately well
○ Slightly well
○ Not at all well

2. How effective is the teaching outside your major a

○ Extremely effective
○ Very effective
○ Moderately effective
○ Slightly effective

This survey asks students to assess educational, social, and university. How effective is the teaching? Is their academic ac safe on campus? When you get to know what your students programs and your overall enrollment and retain students. Cu questions if you want to know how students experienced spe

To create a survey using the University Student Satisfaction s sign in to SurveyMonkey. You'll be able to choose the templa



SINGLE ANSWER

What would most influence your decision to buy clothes online instead of in-store?

Results for respondents with demographics. Weighted by Age, Gender, Region. (1,138 respondes)

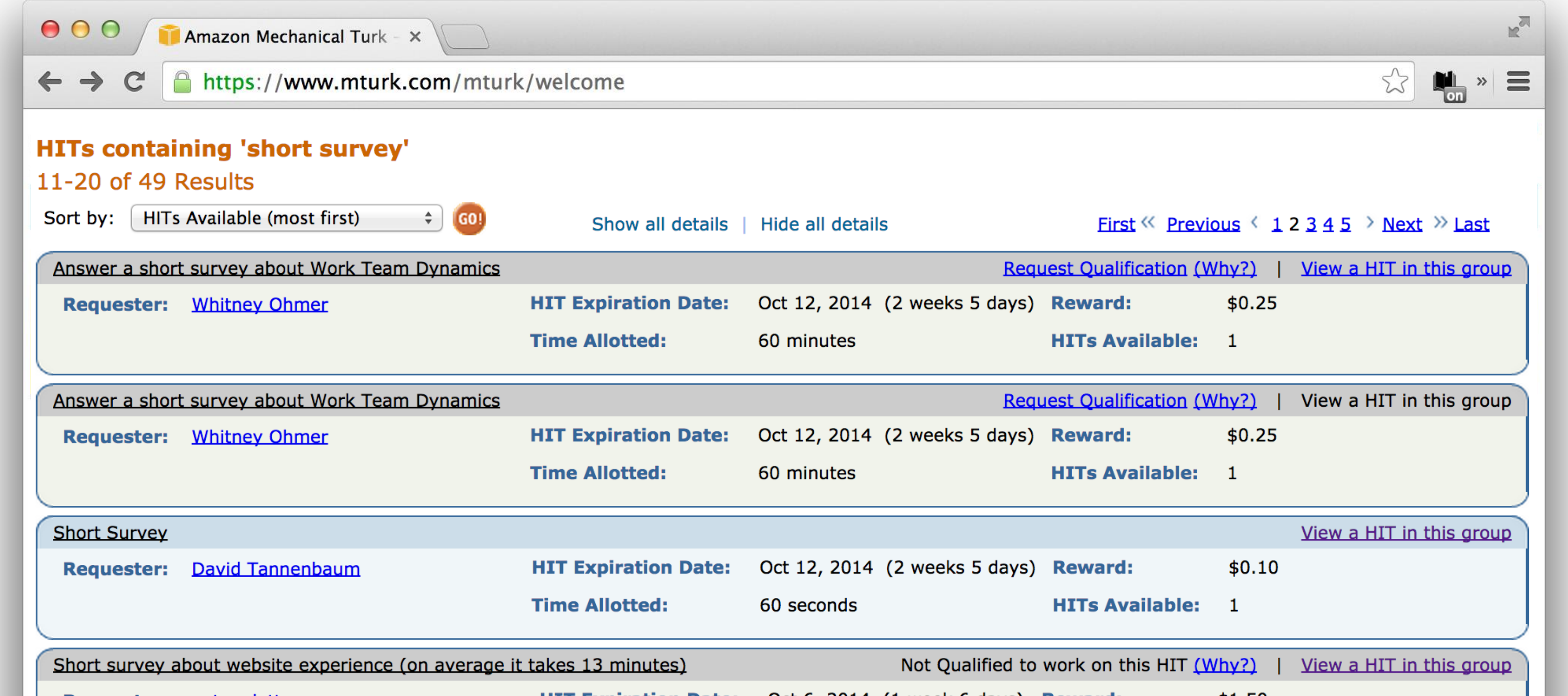
Winner statistically significant.

Free shipping 40.5% (+3.0 / -3.0)
Online discounts 24.9% (+2.8 / -2.6)
Ability to return in store 16.4% (+2.4 / -2.1)
Free returns 16.1% (+2.4 / -2.2)

To find out what people really think, just ask the Internet.

When you want answers to your business questions, you need to reach everyday people — not just those who choose to participate in research panels.

CROWDSOURCING DATA COLLECTION



HITs containing 'short survey'

11-20 of 49 Results

Sort by: HITs Available (most first) GO!

Show all details | Hide all details

First « Previous ‹ 1 2 3 4 5 › Next » Last

Answer a short survey about Work Team Dynamics — Request Qualification (Why?) | View a HIT in this group

Requester:	Whitney Ohmer	**HIT Expiration Date:**	Oct 12, 2014 (2 weeks 5 days)	**Reward:**	$0.25
		Time Allotted:	60 minutes	**HITs Available:**	1

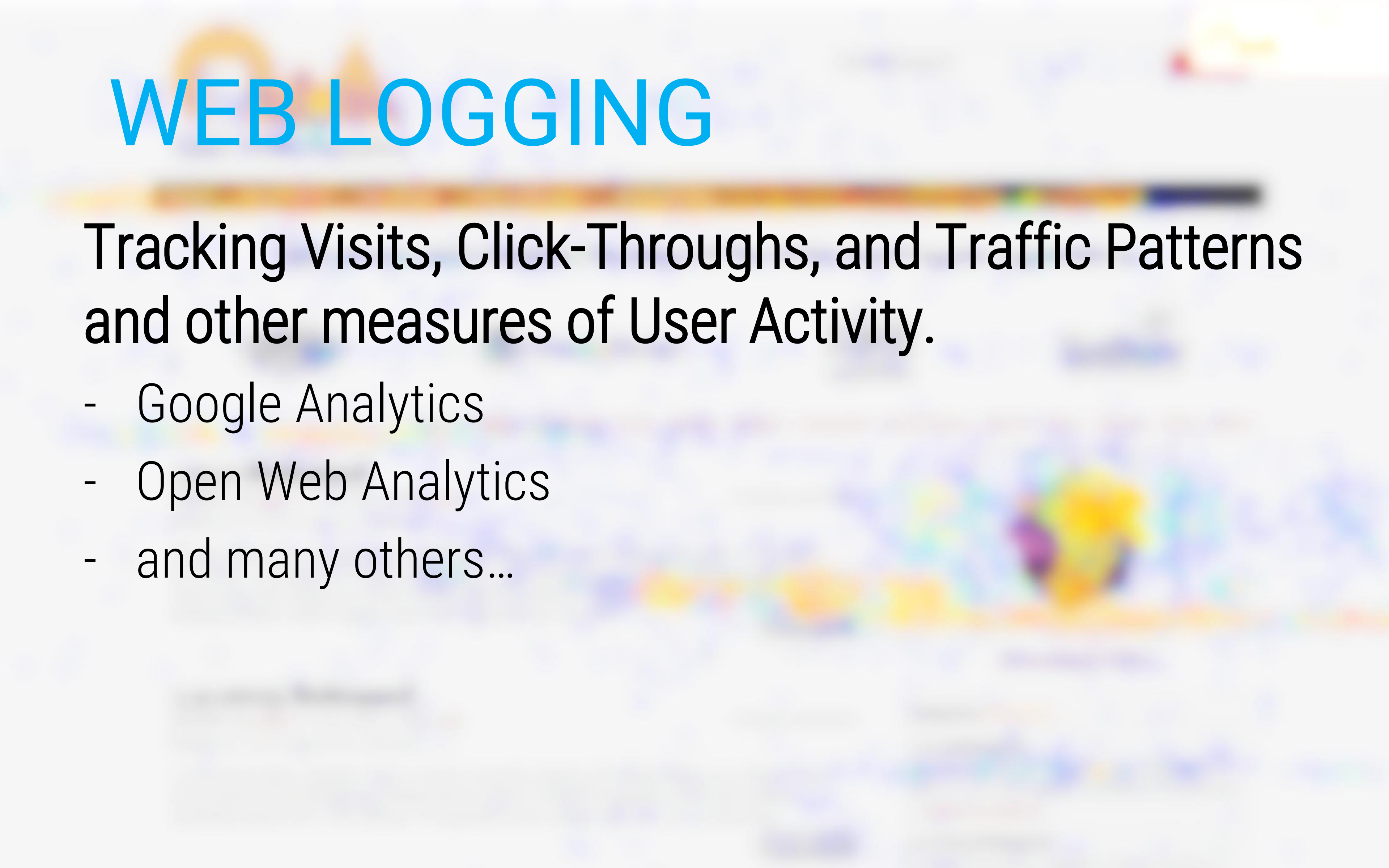
Answer a short survey about Work Team Dynamics — Request Qualification (Why?) | View a HIT in this group

Requester:	Whitney Ohmer	**HIT Expiration Date:**	Oct 12, 2014 (2 weeks 5 days)	**Reward:**	$0.25
		Time Allotted:	60 minutes	**HITs Available:**	1

Short Survey — View a HIT in this group

Requester:	David Tannenbaum	**HIT Expiration Date:**	Oct 12, 2014 (2 weeks 5 days)	**Reward:**	$0.10
		Time Allotted:	60 seconds	**HITs Available:**	1

Short survey about website experience (on average it takes 13 minutes) — Not Qualified to work on this HIT (Why?) | View a HIT in this group

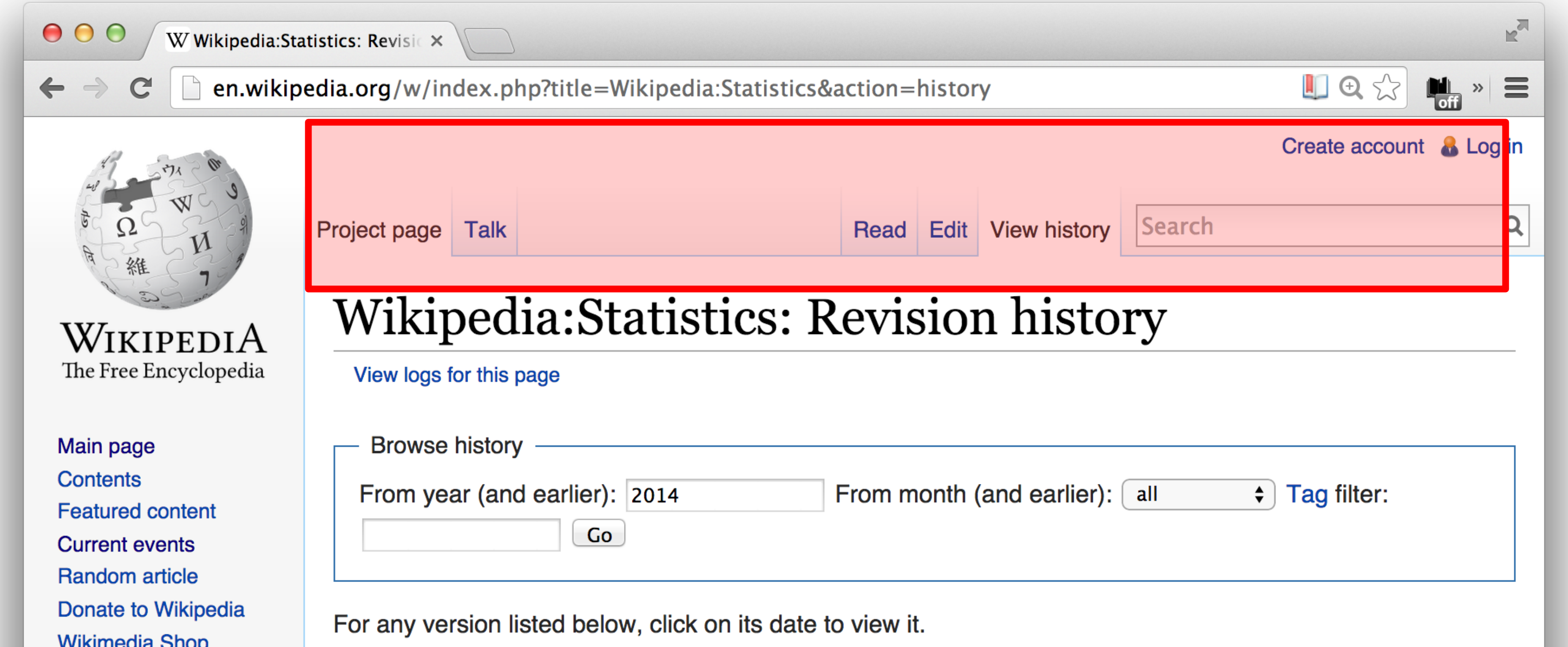


WEB LOGGING

Tracking Visits, Click-Throughs, and Traffic Patterns and other measures of User Activity.

- Google Analytics
- Open Web Analytics
- and many others…

EDITS & ACCESSS LOGS ON WIKIPEDIA



Wikipedia:Statistics: Revisi

en.wikipedia.org/w/index.php?title=Wikipedia:Statistics&action=history

Create account Log in

Project page Talk Read Edit View history Search

Wikipedia:Statistics: Revision history

View logs for this page

Browse history

From year (and earlier): 2014 From month (and earlier): all Tag filter: Go

For any version listed below, click on its date to view it.

SENSORS

- Weather stations
- Personal activity trackers
- Cameras
- Mobile phones

HOW TO OBTAIN DATA?

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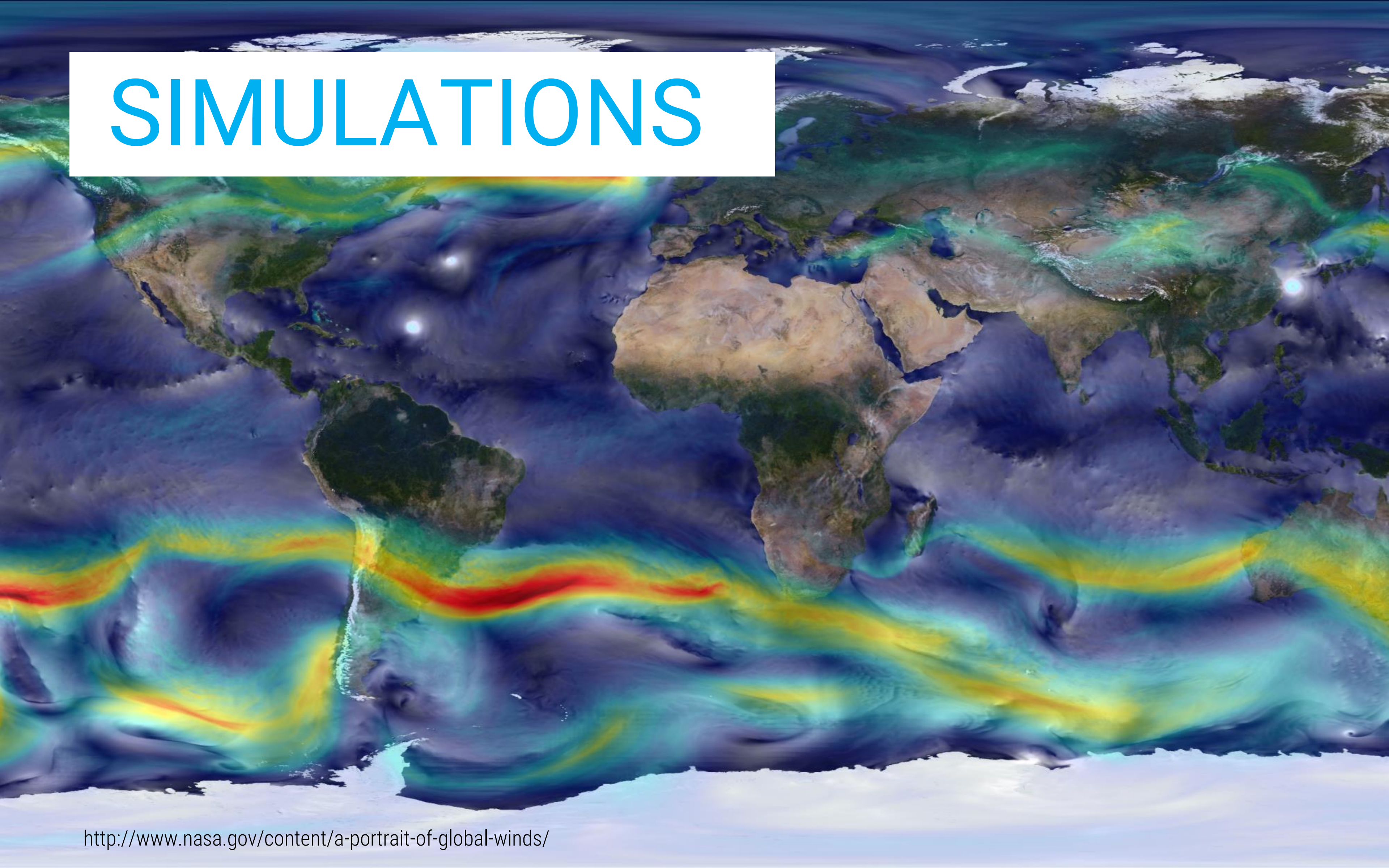
GENERATE IT

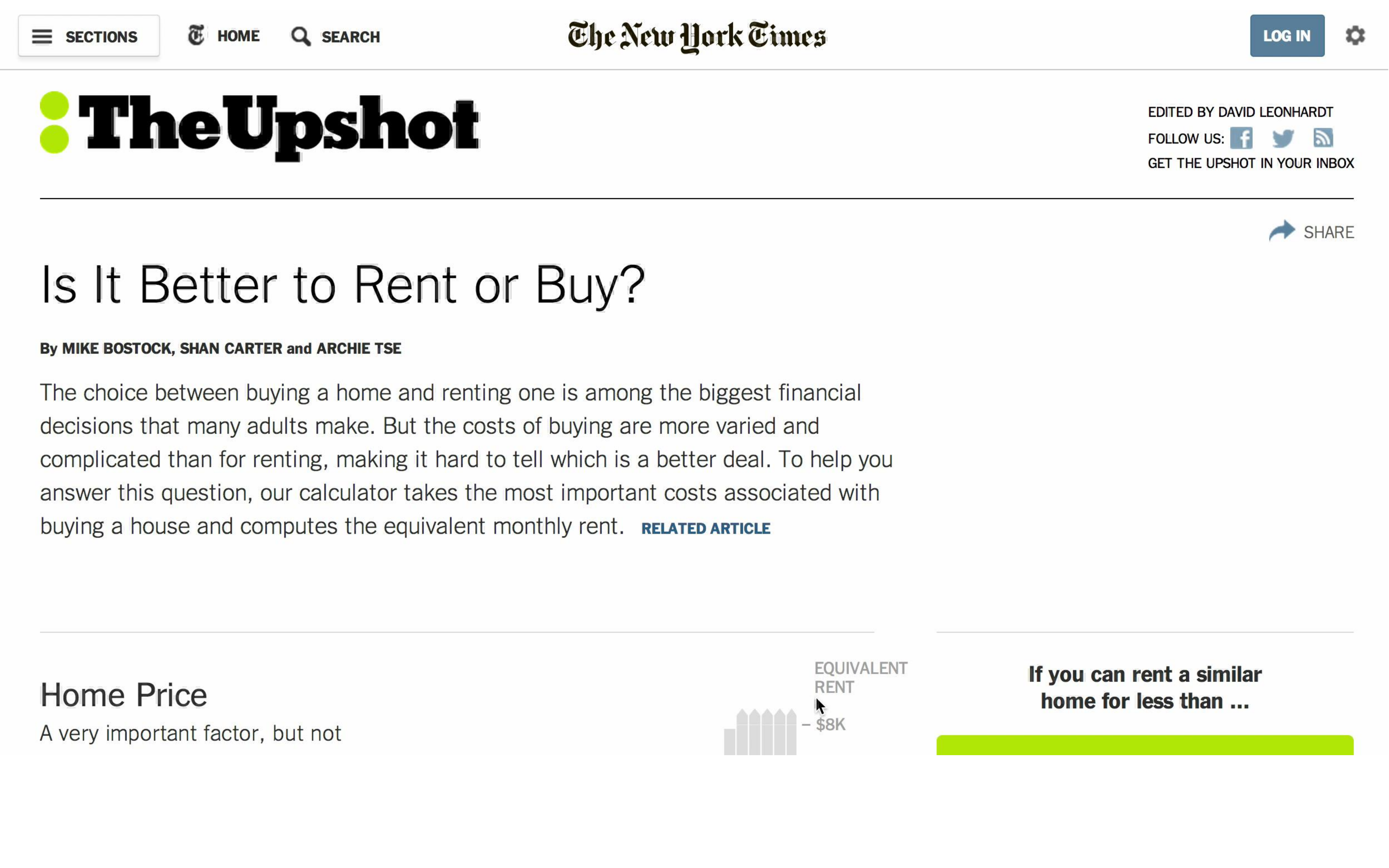
- SIMULATIONS

GENERATING DATA

SIMULATIONS



http://www.nasa.gov/content/a-portrait-of-global-winds/



TheUpshot

EDITED BY DAVID LEONHARDT
FOLLOW US:
GET THE UPSHOT IN YOUR INBOX

Is It Better to Rent or Buy?

By MIKE BOSTOCK, SHAN CARTER and ARCHIE TSE

The choice between buying a home and renting one is among the biggest financial decisions that many adults make. But the costs of buying are more varied and complicated than for renting, making it hard to tell which is a better deal. To help you answer this question, our calculator takes the most important costs associated with buying a house and computes the equivalent monthly rent. RELATED ARTICLE

Home Price

A very important factor, but not

If you can rent a similar home for less than ...

HOW TO OBTAIN DATA?

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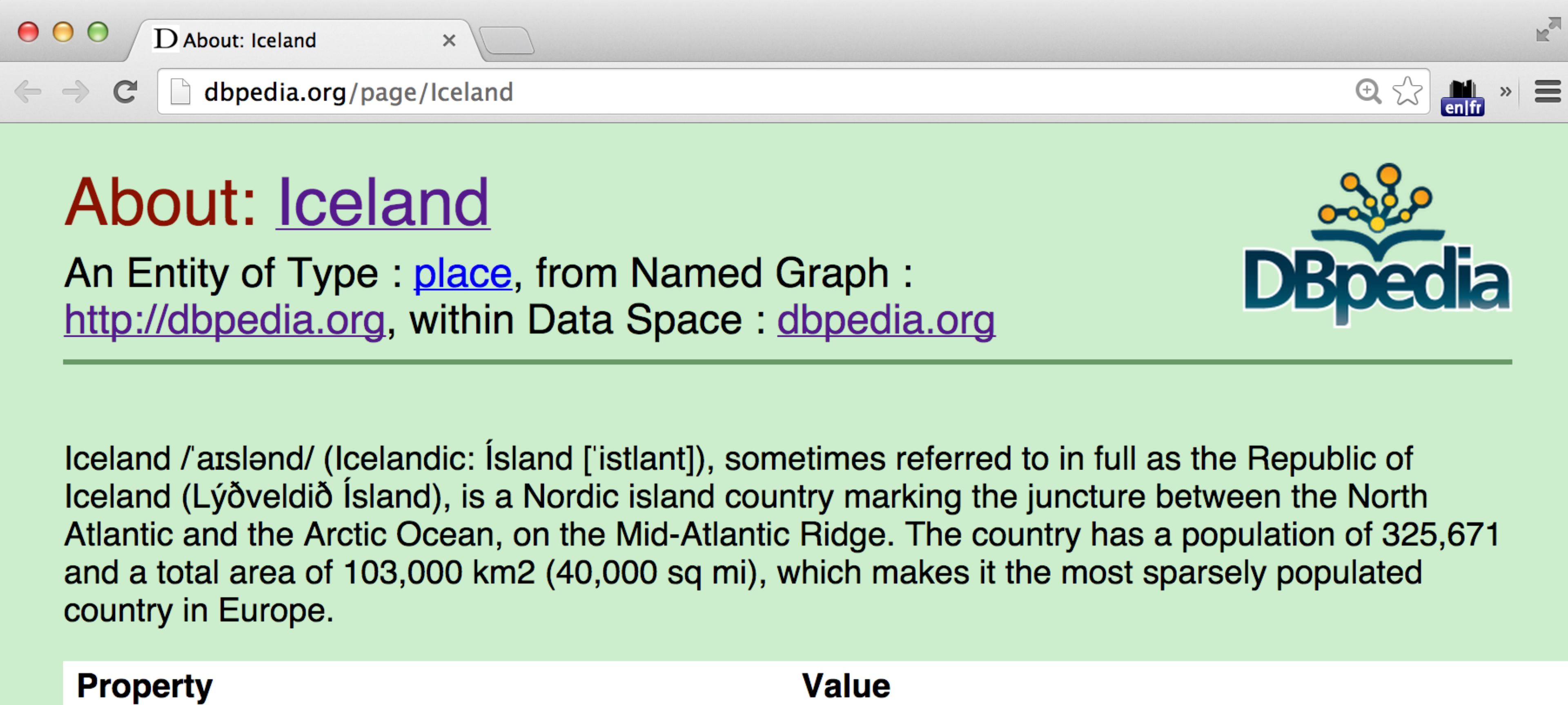
FINDING AND EXTRACTING EXISTING DATA

LARGE OPEN CORPUSES

DBPEDIA



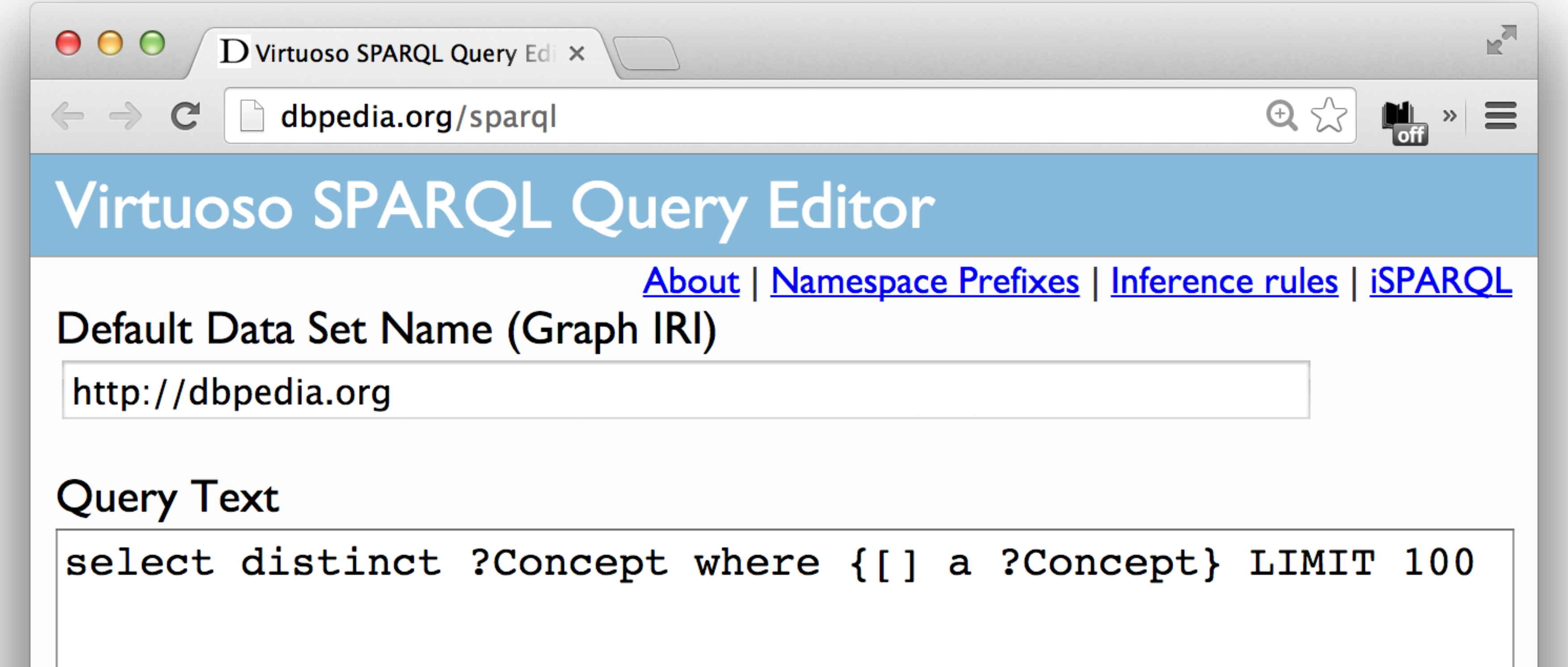
About: Iceland

An Entity of Type : place, from Named Graph : http://dbpedia.org, within Data Space : dbpedia.org

Iceland /ˈaɪslənd/ (Icelandic: Ísland [ˈistlant]), sometimes referred to in full as the Republic of Iceland (Lýðveldið Ísland), is a Nordic island country marking the juncture between the North Atlantic and the Arctic Ocean, on the Mid-Atlantic Ridge. The country has a population of 325,671 and a total area of 103,000 km2 (40,000 sq mi), which makes it the most sparsely populated country in Europe.

Property	Value

QUERYING DBPEDIA



Virtuoso SPARQL Query Editor

About | Namespace Prefixes | Inference rules | iSPARQL

Default Data Set Name (Graph IRI)

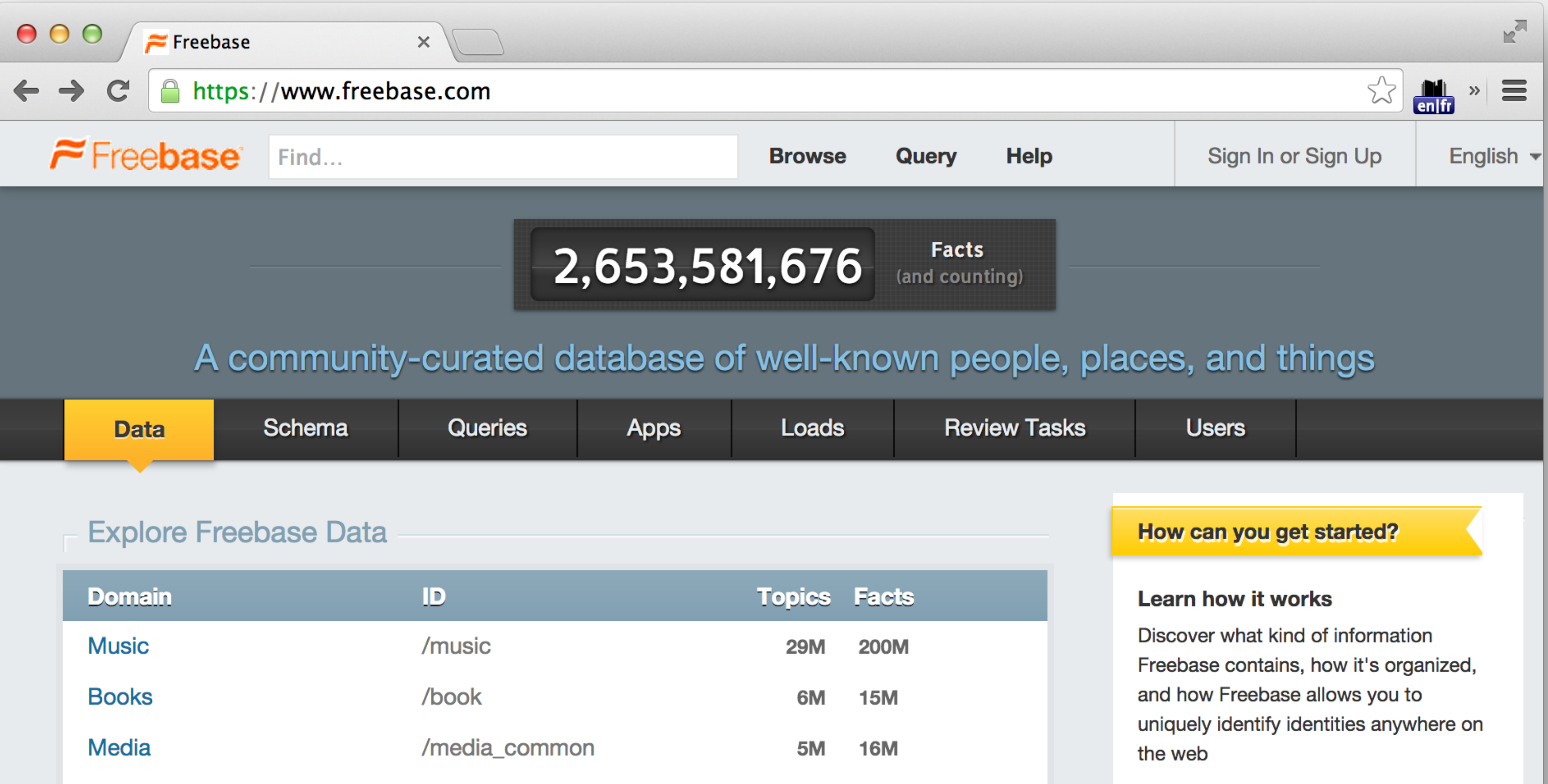
http://dbpedia.org

Query Text

```
select distinct ?Concept where {[] a ?Concept} LIMIT 100
```

Ended in 2014

FREEBASE



2,653,581,676 Facts (and counting)

A community-curated database of well-known people, places, and things

Explore Freebase Data

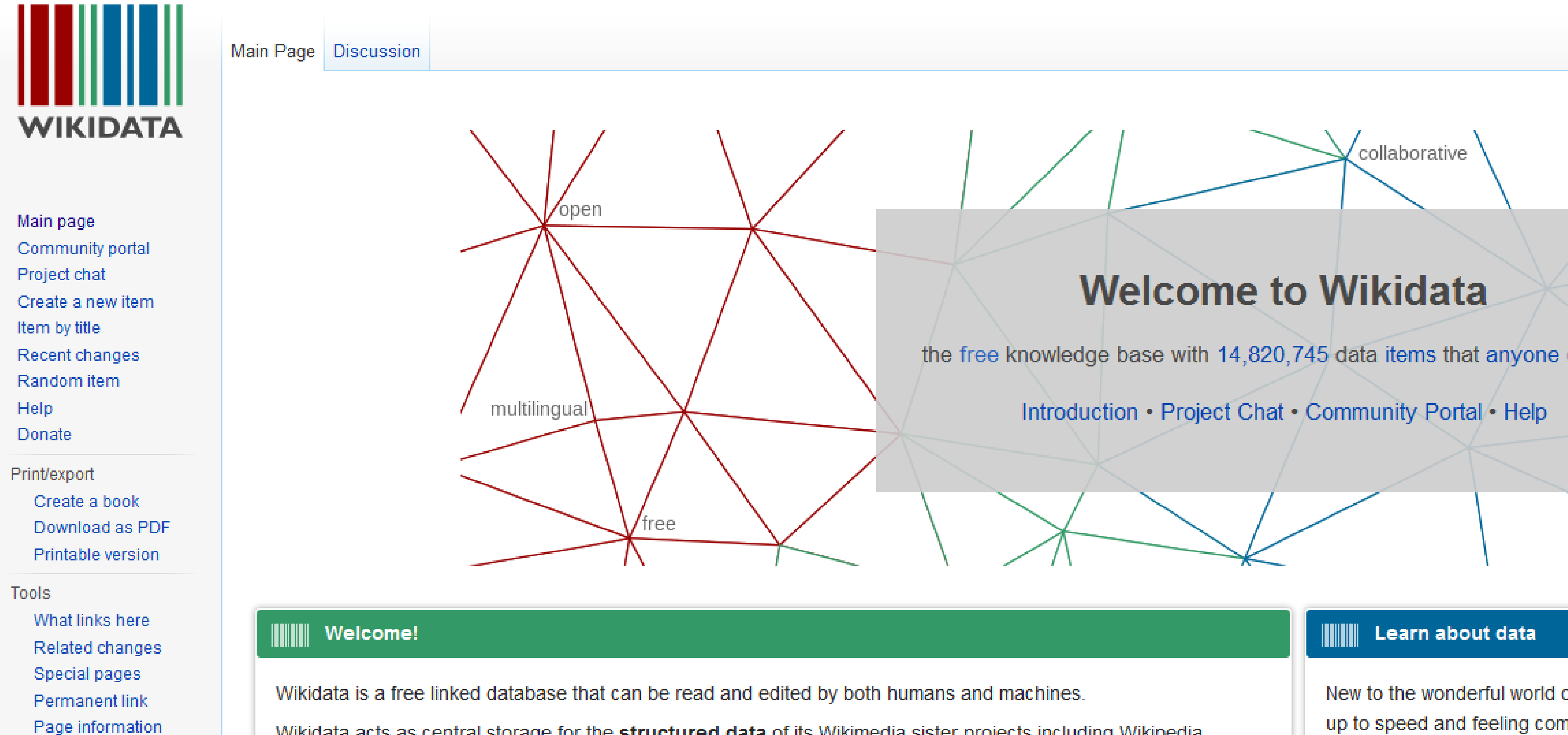
Domain	ID	Topics	Facts
Music	/music	29M	200M
Books	/book	6M	15M
Media	/media_common	5M	16M

How can you get started?

Learn how it works

Discover what kind of information Freebase contains, how it's organized, and how Freebase allows you to uniquely identify identities anywhere on the web

WIKIDATA



Welcome to Wikidata

the free knowledge base with 14,820,745 data items that anyone

Introduction • Project Chat • Community Portal • Help

Welcome!

Wikidata is a free linked database that can be read and edited by both humans and machines.

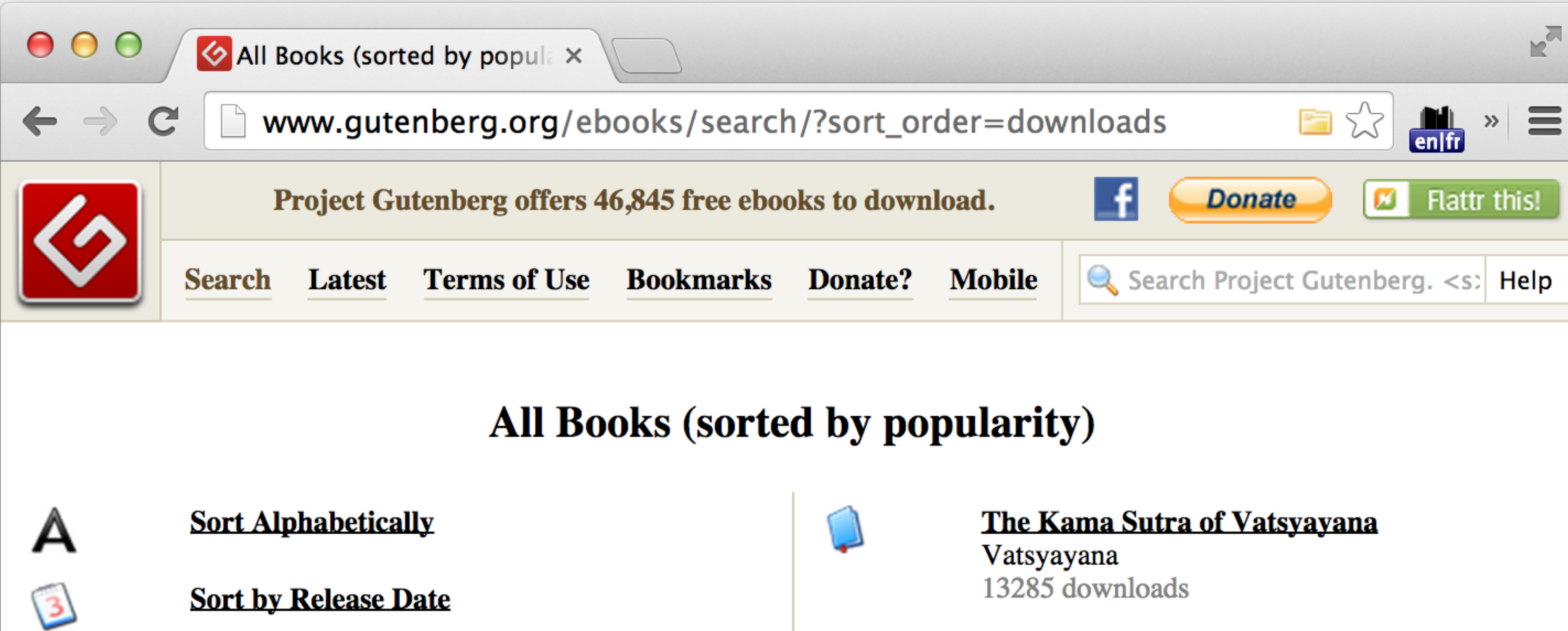
Wikidata acts as central storage for the **structured data** of its Wikimedia sister projects including Wikipedia

Learn about data

New to the wonderful world o

up to speed and feeling com

PROJECT GUTENBERG



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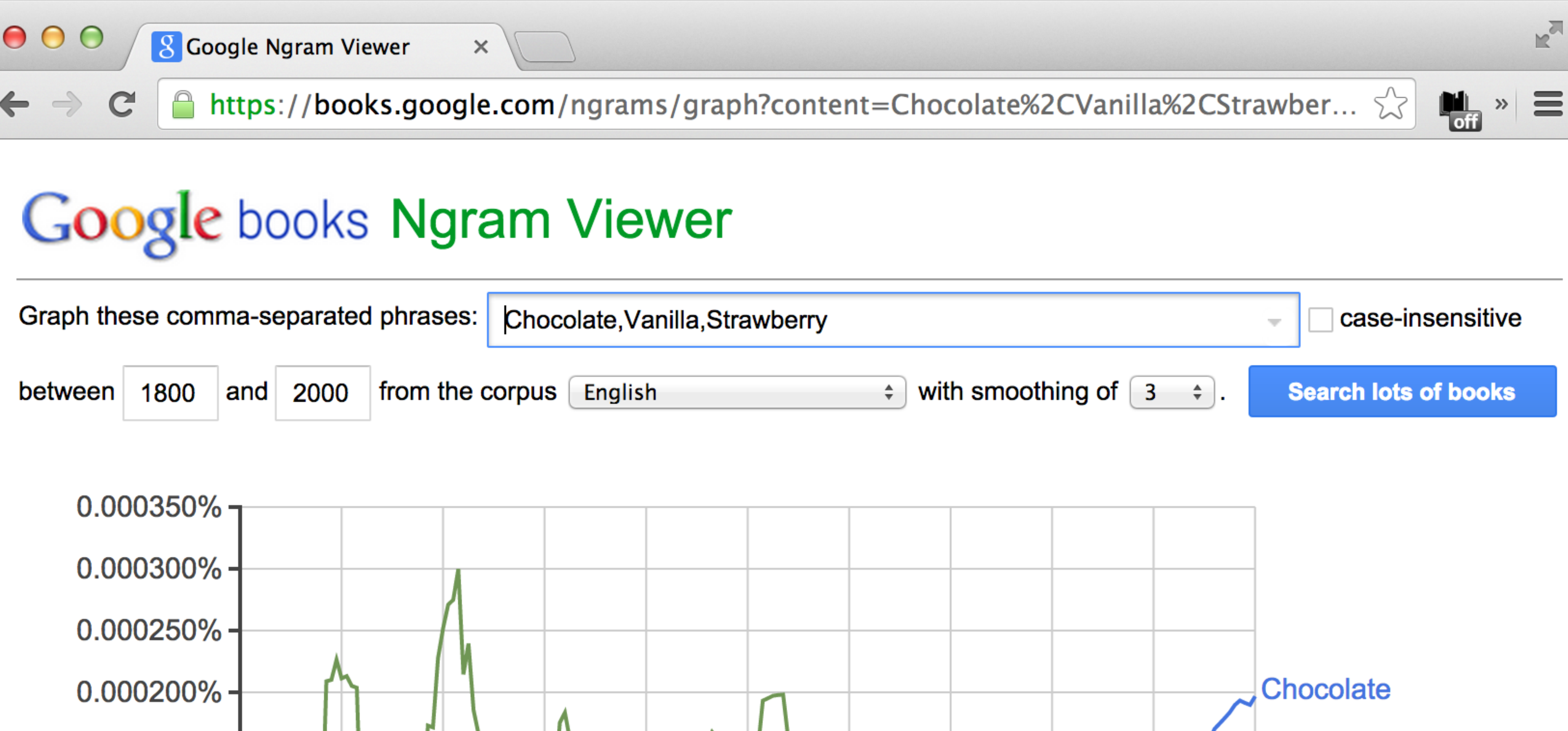
Vatsyayana
13285 downloads

GOOGLE N-GRAMS



Google Ngram Viewer

https://books.google.com/ngrams/graph?content=Chocolate%2CVanilla%2CStrawber...

Google books Ngram Viewer

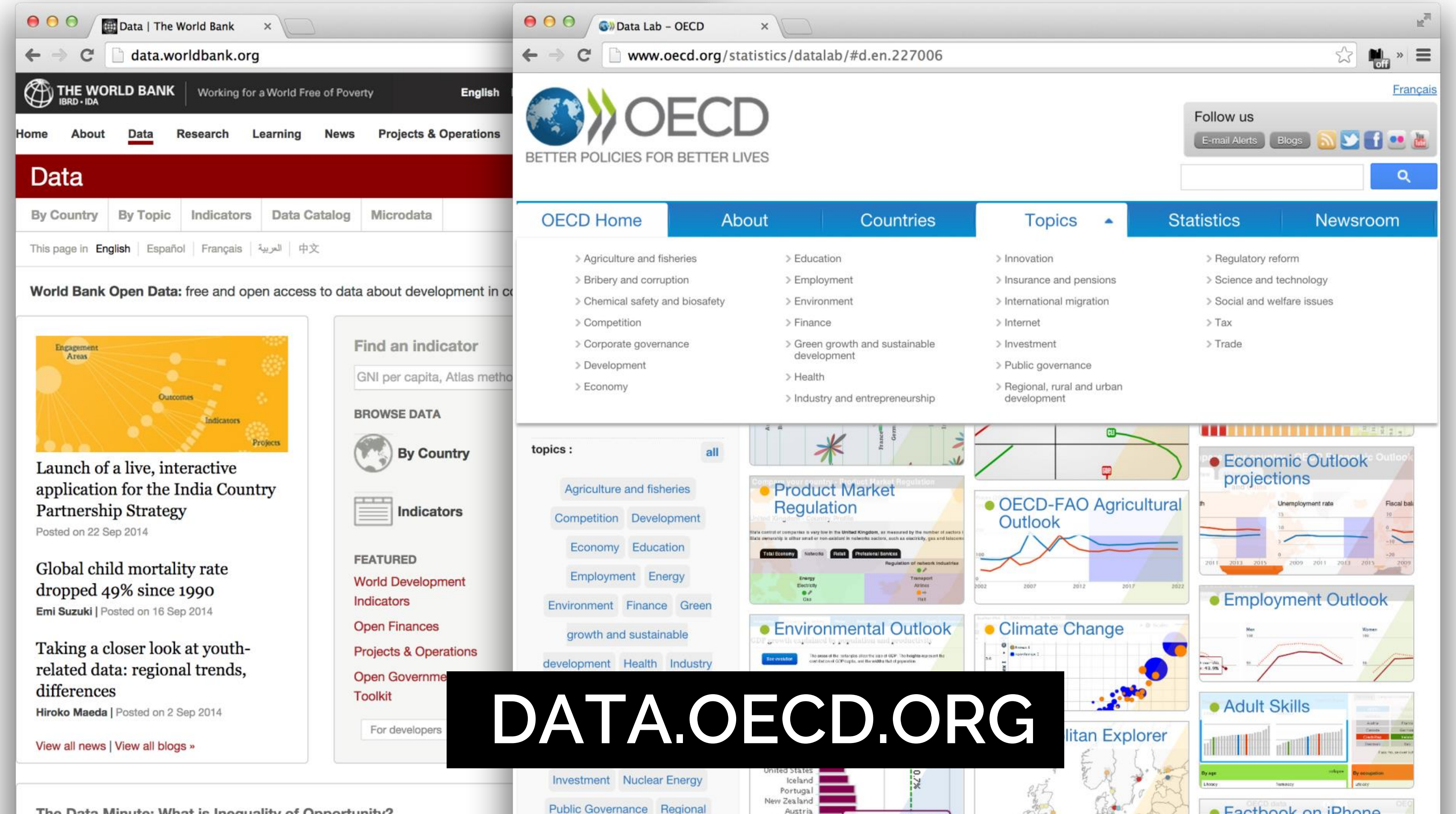
Graph these comma-separated phrases: Chocolate,Vanilla,Strawberry □ case-insensitive

between 1800 and 2000 from the corpus English with smoothing of 3 . Search lots of books

FINDING AND EXTRACTING EXISTING DATA

GOVERNMENT AND INTERNATIONAL DATA INITIATIVES

DATA.WORLDBANK.ORG



Data | The World Bank

data.worldbank.org

THE WORLD BANK IBRD · IDA Working for a World Free of Poverty English

Home About Data Research Learning News Projects & Operations

Data

By Country | By Topic | Indicators | Data Catalog | Microdata

This page in English | Español | Français | العربية | 中文

World Bank Open Data: free and open access to data about development in co

Launch of a live, interactive application for the India Country Partnership Strategy

Posted on 22 Sep 2014

Global child mortality rate dropped 49% since 1990

Emi Suzuki | Posted on 16 Sep 2014

Taking a closer look at youth-related data: regional trends, differences

Hiroko Maeda | Posted on 2 Sep 2014

View all news | View all blogs »

The Data Minute: What is Inequality of Opportunity?

Find an indicator

GNI per capita, Atlas metho

BROWSE DATA

By Country

Indicators

FEATURED

World Development Indicators

Open Finances

Projects & Operations

Open Governme Toolkit

For developers

Data Lab - OECD

www.oecd.org/statistics/datalab/#d.en.227006

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Français

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- Agriculture and fisheries
- Bribery and corruption
- Chemical safety and biosafety
- Competition
- Corporate governance
- Development
- Economy
- Education
- Employment
- Environment
- Finance
- Green growth and sustainable development
- Health
- Industry and entrepreneurship
- Innovation
- Insurance and pensions
- International migration
- Internet
- Investment
- Public governance
- Regional, rural and urban development
- Regulatory reform
- Science and technology
- Social and welfare issues
- Tax
- Trade

topics : all

Agriculture and fisheries, Competition, Development, Economy, Education, Employment, Energy, Environment, Finance, Green growth and sustainable development, Health, Industry, Investment, Nuclear Energy, Public Governance, Regional

Product Market Regulation

OECD-FAO Agricultural Outlook

Economic Outlook projections

Environmental Outlook

Climate Change

Employment Outlook

Adult Skills

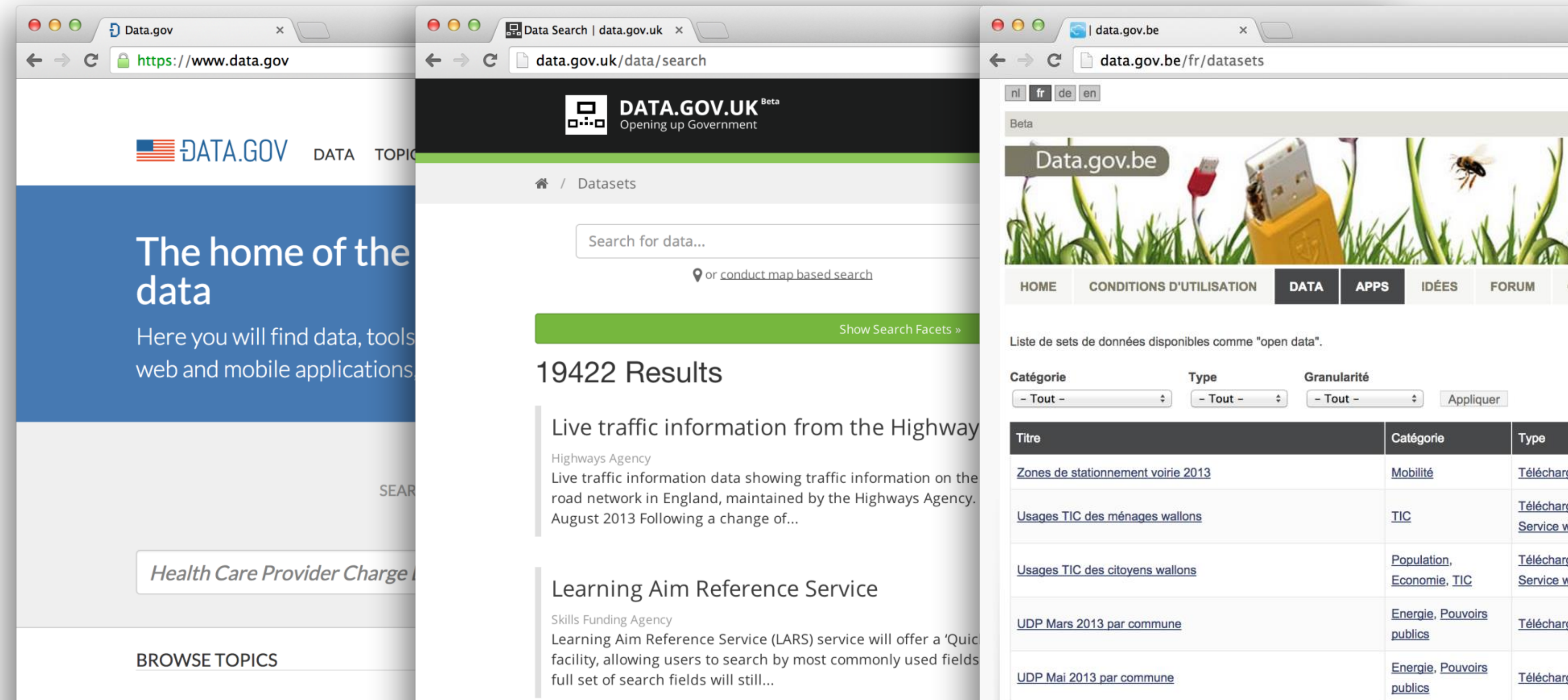
litan Explorer

Factbook on iPhone

DATA.OECD.ORG

GOVERNMENT INITIATIVES

WWW.DATA.GOV (US) **DATA.GOV.UK** **DATA.GOV.BE**



The home of the data

Here you will find data, tools web and mobile applications

19422 Results

Live traffic information from the Highway

Highways Agency

Live traffic information data showing traffic information on the road network in England, maintained by the Highways Agency. August 2013 Following a change of...

Learning Aim Reference Service

Skills Funding Agency

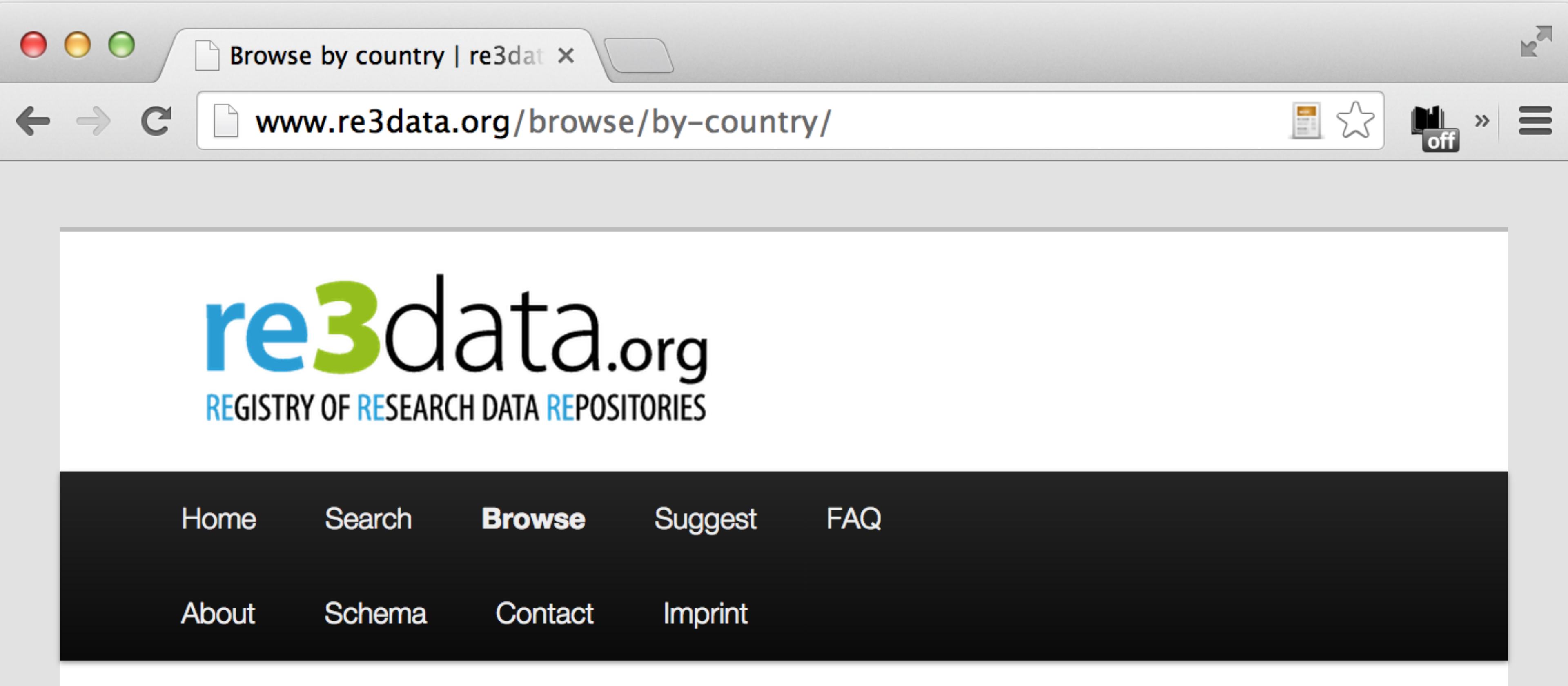
Learning Aim Reference Service (LARS) service will offer a 'Quic facility, allowing users to search by most commonly used fields full set of search fields will still...

Liste de sets de données disponibles comme "open data".

Catégorie: - Tout -
Type: - Tout -
Granularité: - Tout -
Appliquer

Titre	Catégorie	Type
Zones de stationnement voirie 2013	Mobilité	Téléchar
Usages TIC des ménages wallons	TIC	Téléchar Service w
Usages TIC des citoyens wallons	Population, Economie, TIC	Téléchar Service w
UDP Mars 2013 par commune	Energie, Pouvoirs publics	Téléchar
UDP Mai 2013 par commune	Energie, Pouvoirs publics	Téléchar

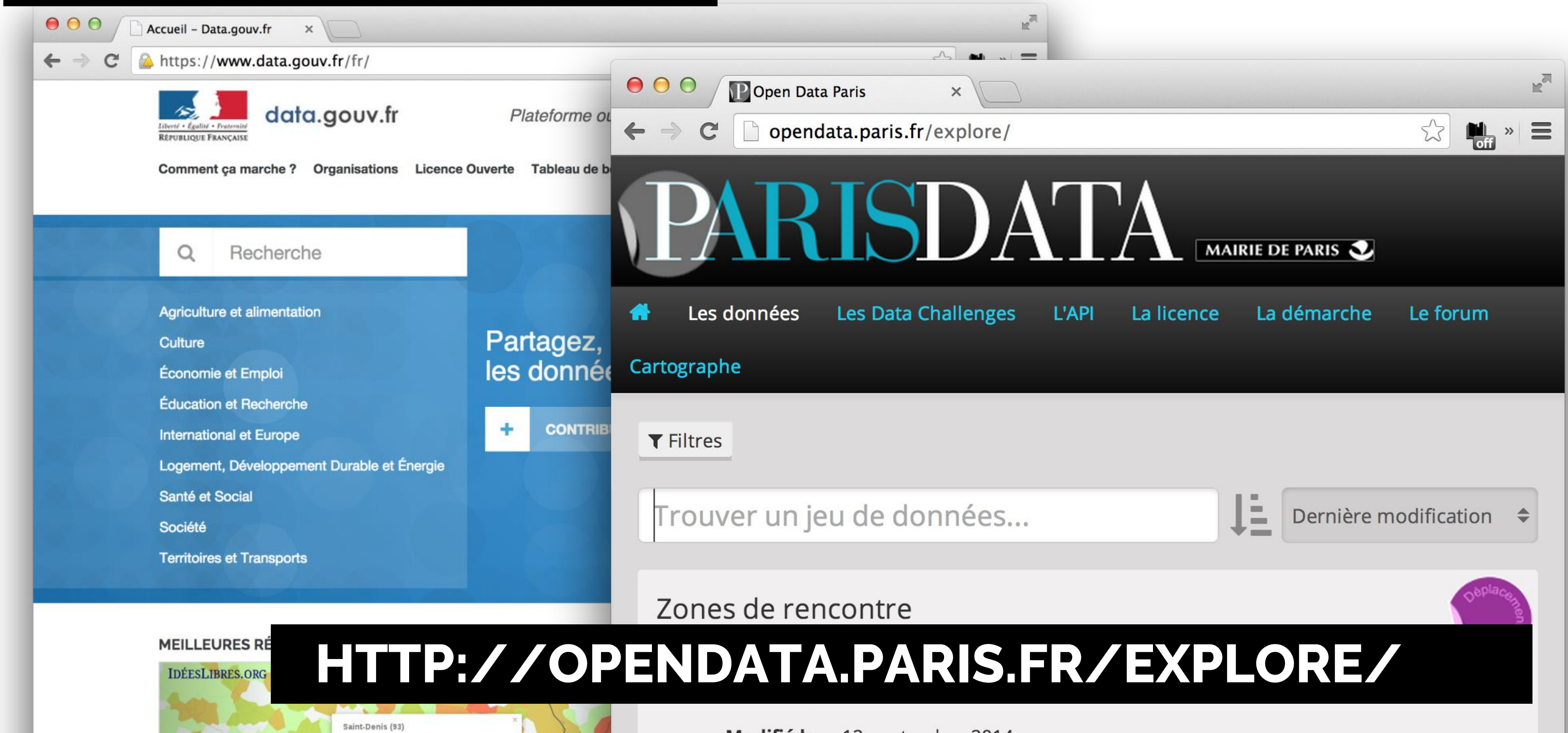
NEW DATA INITIATIVES JUST TO TRACK ALL THE DATA INITIATIVES



Browse by country | re3dat
www.re3data.org/browse/by-country/
off
re3data.org
REGISTRY OF RESEARCH DATA REPOSITORIES
Home
Search
Browse
Suggest
FAQ
About
Schema
Contact
Imprint

INITIATIVES IN FRANCE

HTTP://DATA.GOUV.FR



HTTP://OPENDATA.PARIS.FR/EXPLORE/

FINDING AND EXTRACTING EXISTING DATA

OTHER PUBLIC DATA REPOSITORIES

MORE REPOSITORIES OF PUBLIC DATA SETS

VISUALIZING.ORG
http://visualizing.org/data/browse

AMAZON PUBLIC DATA HOSTING
http://aws.amazon.com/publicdatasets/

GOOGLE PUBLIC DATA
http://www.google.com/publicdata/directory

KAGGLE
https://www.kaggle.com/

FINDING AND EXTRACTING EXISTING DATA

DATA RETAILERS

DATA RETAILERS

FACTUAL
http://www.factual.com/

Dawex
https://www.dawex.com/en/

Datamean
https://datmean.com/

Weather stations, …

AND AGAIN, THERE ARE MANY, MANY MORE…

FINDING AND EXTRACTING EXISTING DATA

APIS

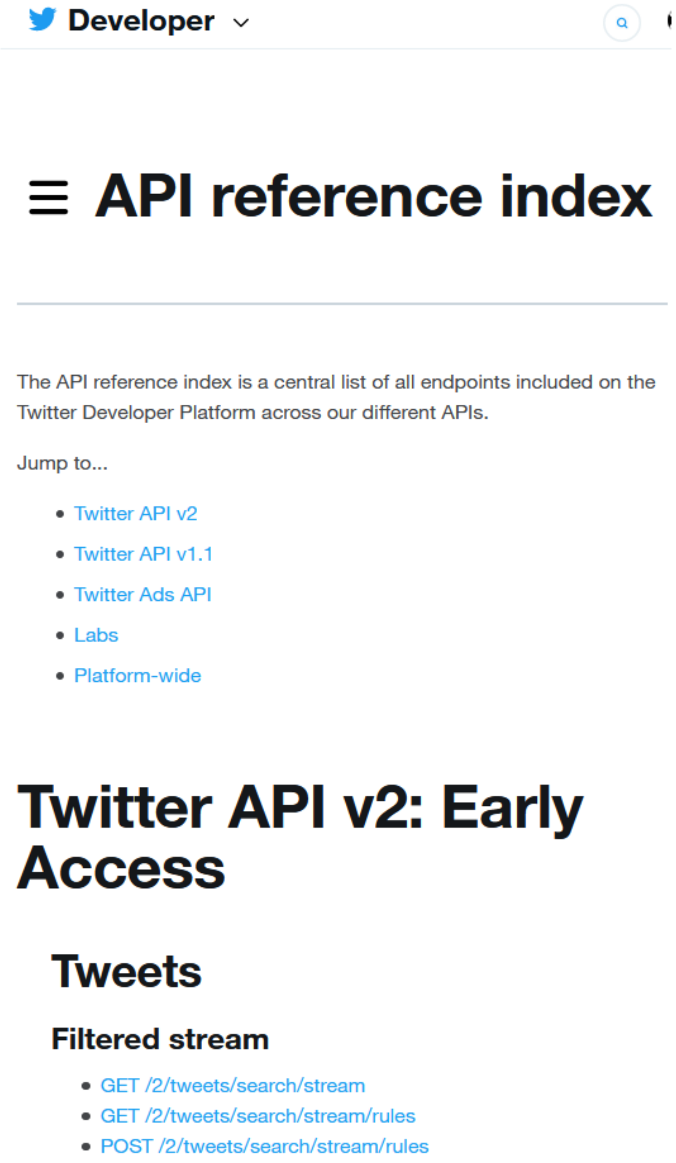
TWITTER

Streaming APIs (live data by users and by topics)

The "Firehose" (all of live twitter)

Complete Archives via "Gnip" and eventually (maybe) the US Library of Congress

HTTPS://DEV.TWITTER.COM



≡ API reference index

The API reference index is a central list of all endpoints included on the Twitter Developer Platform across our different APIs.

Jump to...

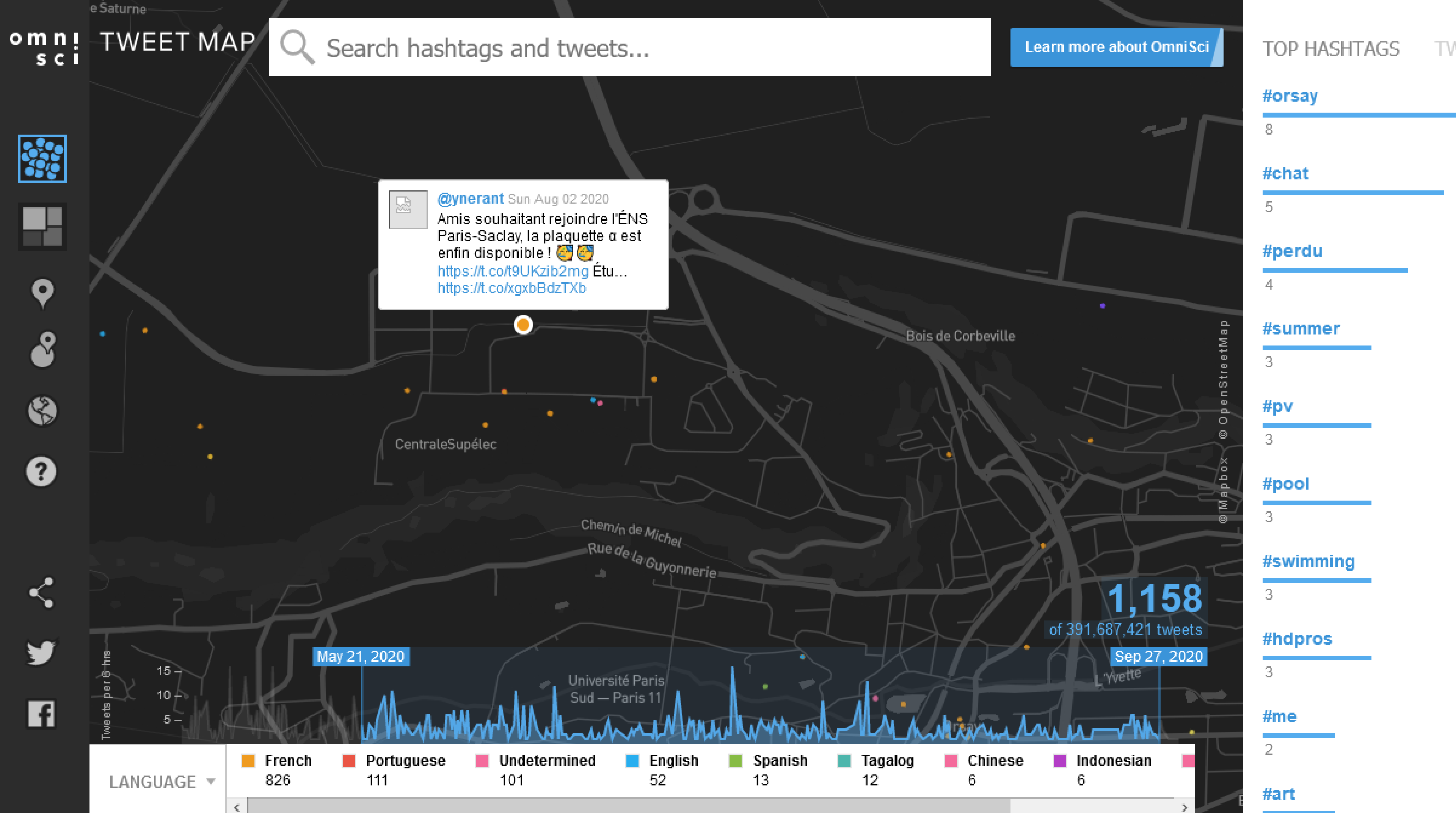
- Twitter API v2
- Twitter API v1.1
- Twitter Ads API
- Labs
- Platform-wide

Twitter API v2: Early Access

Tweets

Filtered stream

- GET /2/tweets/search/stream
- GET /2/tweets/search/stream/rules
- POST /2/tweets/search/stream/rules



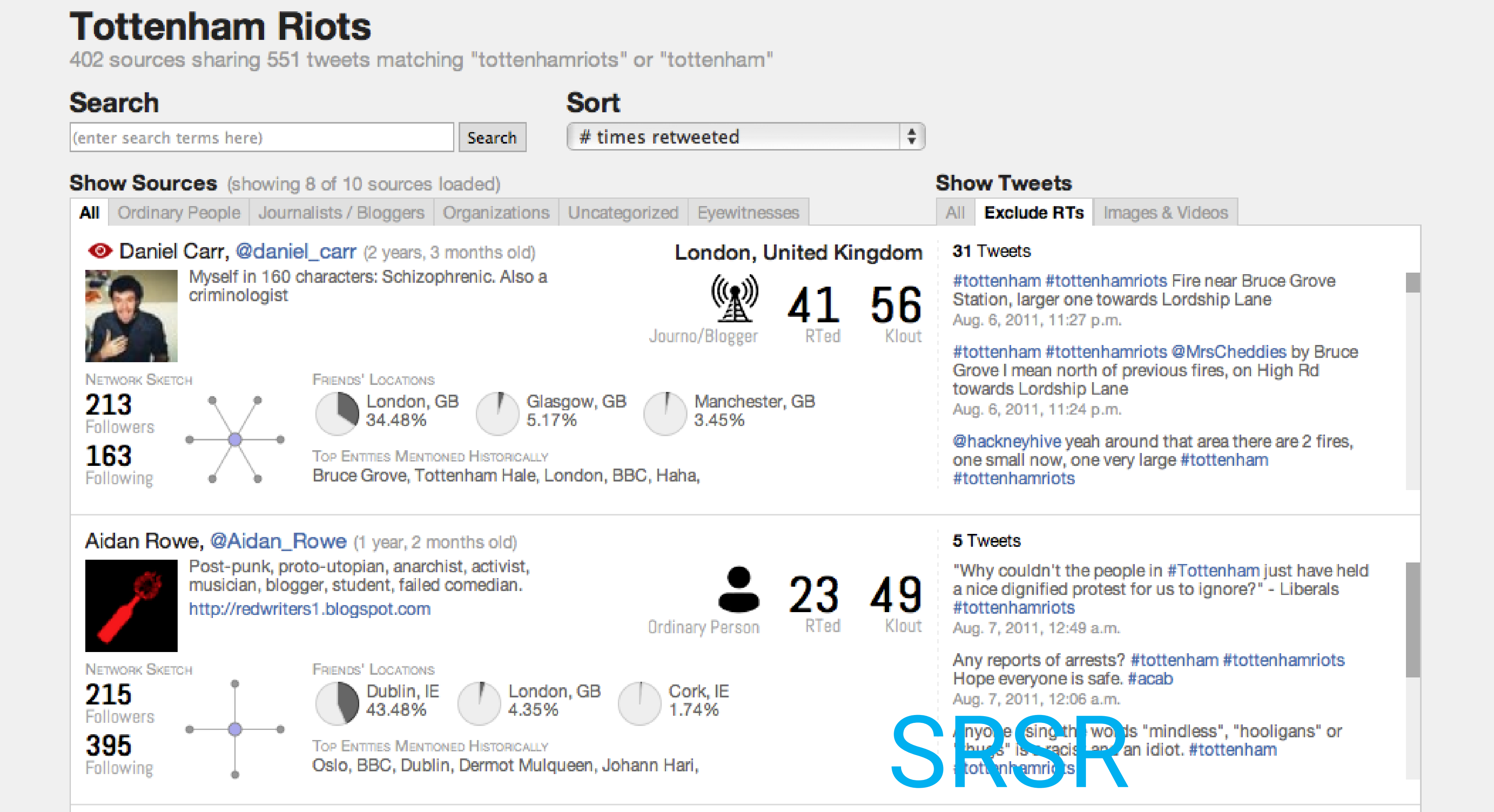
@ynerant Sun Aug 02 2020
Amis souhaitant rejoindre l'ÉNS Paris-Saclay, la plaquette α est enfin disponible ! 🥳🥳 https://t.co/t9UKzib2mg Étu... https://t.co/xgxbBdzTXb

1,158
of 391,687,421 tweets

French	Portuguese	Undetermined	English	Spanish	Tagalog	Chinese	Indonesian
826	111	101	52	13	12	6	6

#orsay	8
#chat	5
#perdu	4
#summer	3
#pv	3
#pool	3
#swimming	3
#hdpros	3
#me	2
#art	

https://www.omnisci.com/demos/tweetmap



Tottenham Riots

402 sources sharing 551 tweets matching "tottenhamriots" or "tottenham"

Search

(enter search terms here) | Search

Sort

times retweeted

Show Sources (showing 8 of 10 sources loaded)

Show Tweets

Daniel Carr, @daniel_carr (2 years, 3 months old)

Myself in 160 characters: Schizophrenic. Also a criminologist

London, United Kingdom

Journo/Blogger — 41 RTed — 56 Klout

Network Sketch: 213 Followers, 163 Following

Friends' Locations: London, GB 34.48%; Glasgow, GB 5.17%; Manchester, GB 3.45%

Top Entities Mentioned Historically: Bruce Grove, Tottenham Hale, London, BBC, Haha,

31 Tweets

#tottenham #tottenhamriots Fire near Bruce Grove Station, larger one towards Lordship Lane
Aug. 6, 2011, 11:27 p.m.

#tottenham #tottenhamriots @MrsCheddies by Bruce Grove I mean north of previous fires, on High Rd towards Lordship Lane
Aug. 6, 2011, 11:24 p.m.

@hackneyhive yeah around that area there are 2 fires, one small now, one very large #tottenham #tottenhamriots

Aidan Rowe, @Aidan_Rowe (1 year, 2 months old)

Post-punk, proto-utopian, anarchist, activist, musician, blogger, student, failed comedian.
http://redwriters1.blogspot.com

Ordinary Person — 23 RTed — 49 Klout

Network Sketch: 215 Followers, 395 Following

Friends' Locations: Dublin, IE 43.48%; London, GB 4.35%; Cork, IE 1.74%

Top Entities Mentioned Historically: Oslo, BBC, Dublin, Dermot Mulqueen, Johann Hari,

5 Tweets

"Why couldn't the people in #Tottenham just have held a nice dignified protest for us to ignore?" - Liberals #tottenhamriots
Aug. 7, 2011, 12:49 a.m.

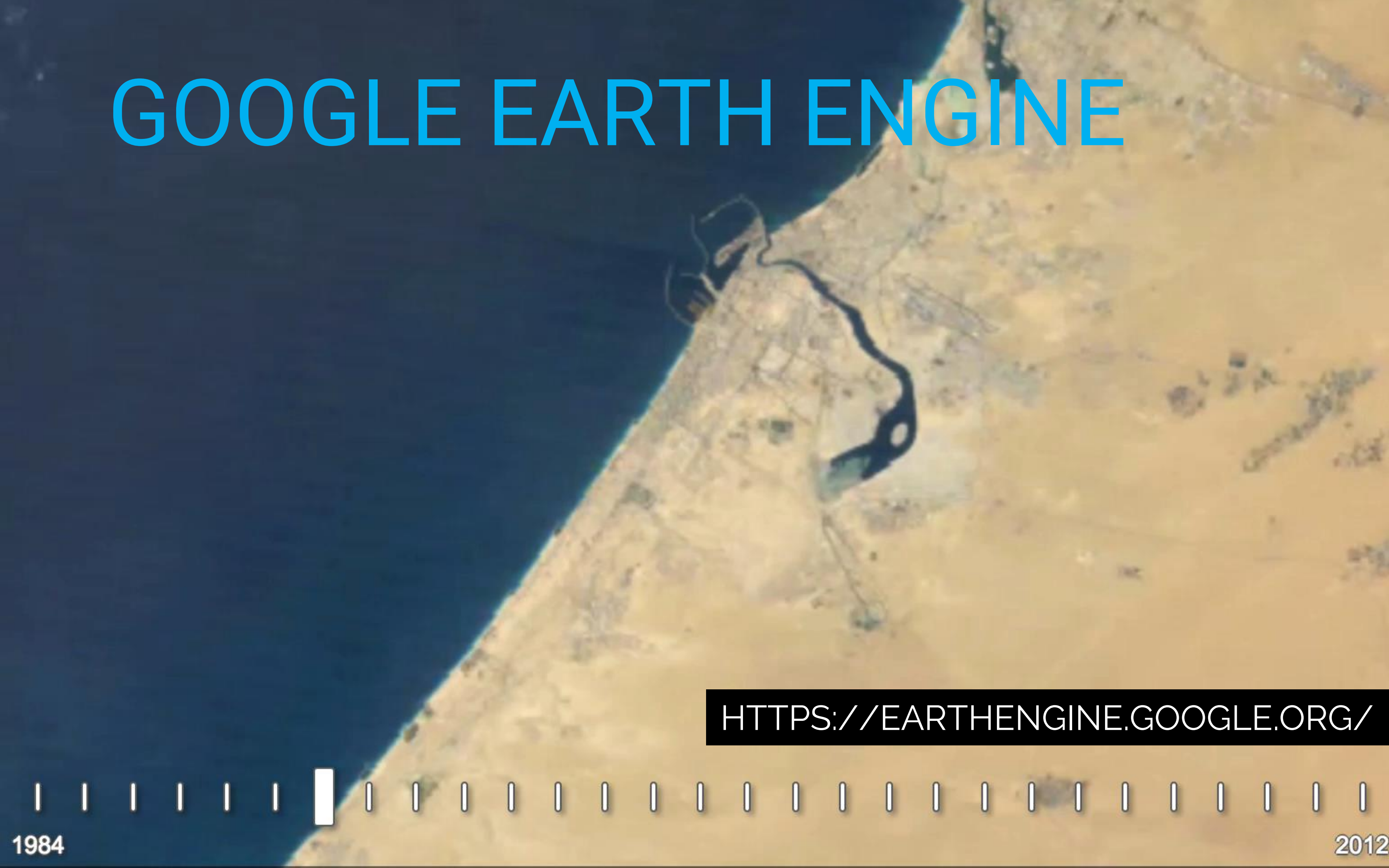
Any reports of arrests? #tottenham #tottenhamriots Hope everyone is safe. #acab
Aug. 7, 2011, 12:06 a.m.

Anyone using the words "mindless", "hooligans" or "thugs" is a racist and an idiot. #tottenham #tottenhamriots

SRSR

[DIAKOPOULOS ET AL. 2012]

GOOGLE EARTH ENGINE



HTTPS://EARTHENGINE.GOOGLE.ORG/

MORE APIS

(APPLICATION PROGRAMMING INTERFACES)

NEW YORK TIMES APIS

http://developer.nytimes.com/

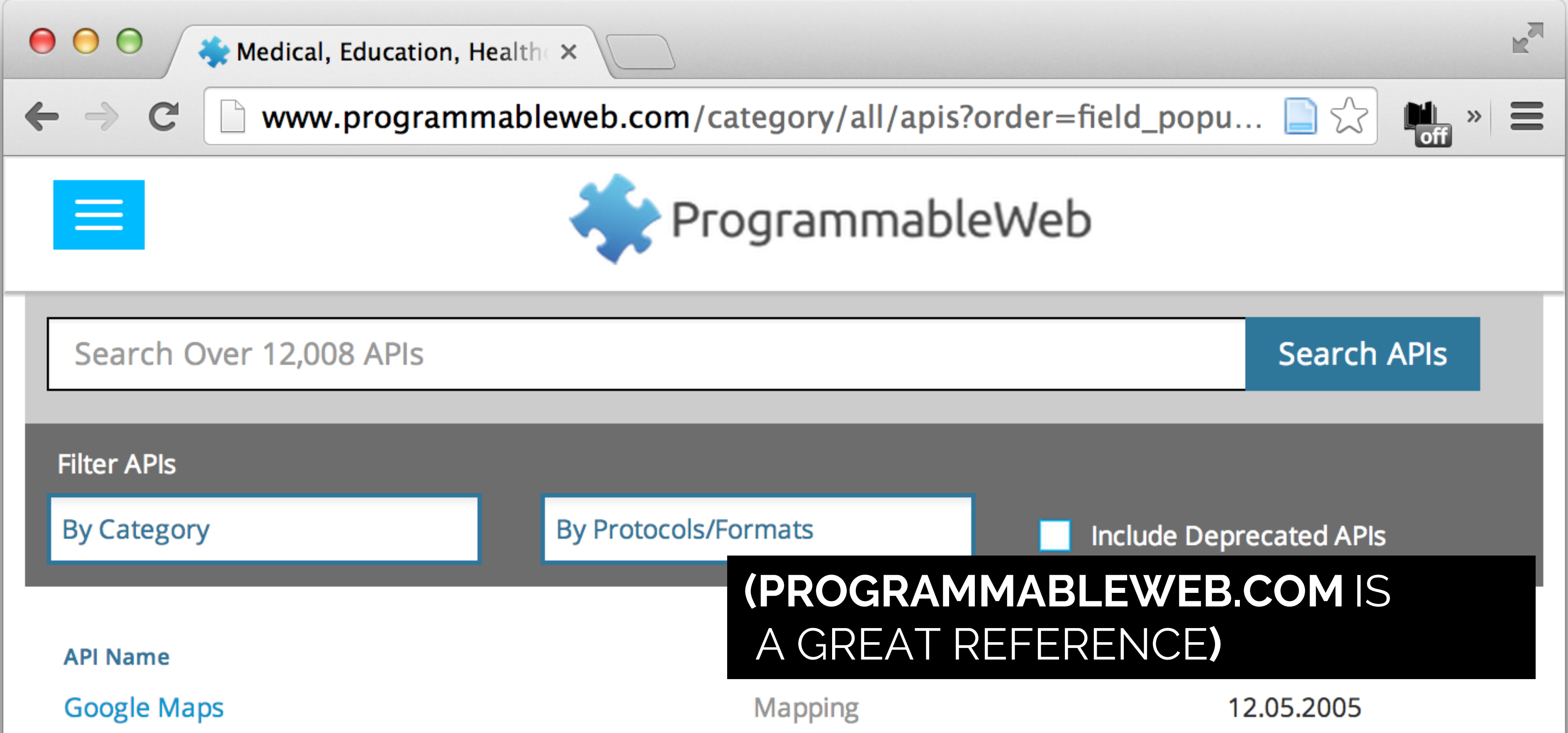
(Archival news articles from 1851, books, movies, geographical, and political data)

OPEN STREET MAP

http://wiki.openstreetmap.org/wiki/API

(Detailed location and map data for the whole world)

AND THE LIST GOES ON!



Medical, Education, Health
www.programmableweb.com/category/all/apis?order=field_popu…
off
ProgrammableWeb
Search Over 12,008 APIs
Search APIs
Filter APIs
By Category
By Protocols/Formats
□ Include Deprecated APIs

API Name		
Google Maps	Mapping	12.05.2005

(PROGRAMMABLEWEB.COM IS
A GREAT REFERENCE**)**

FINDING AND EXTRACTING EXISTING DATA

SCRAPING THE WEB

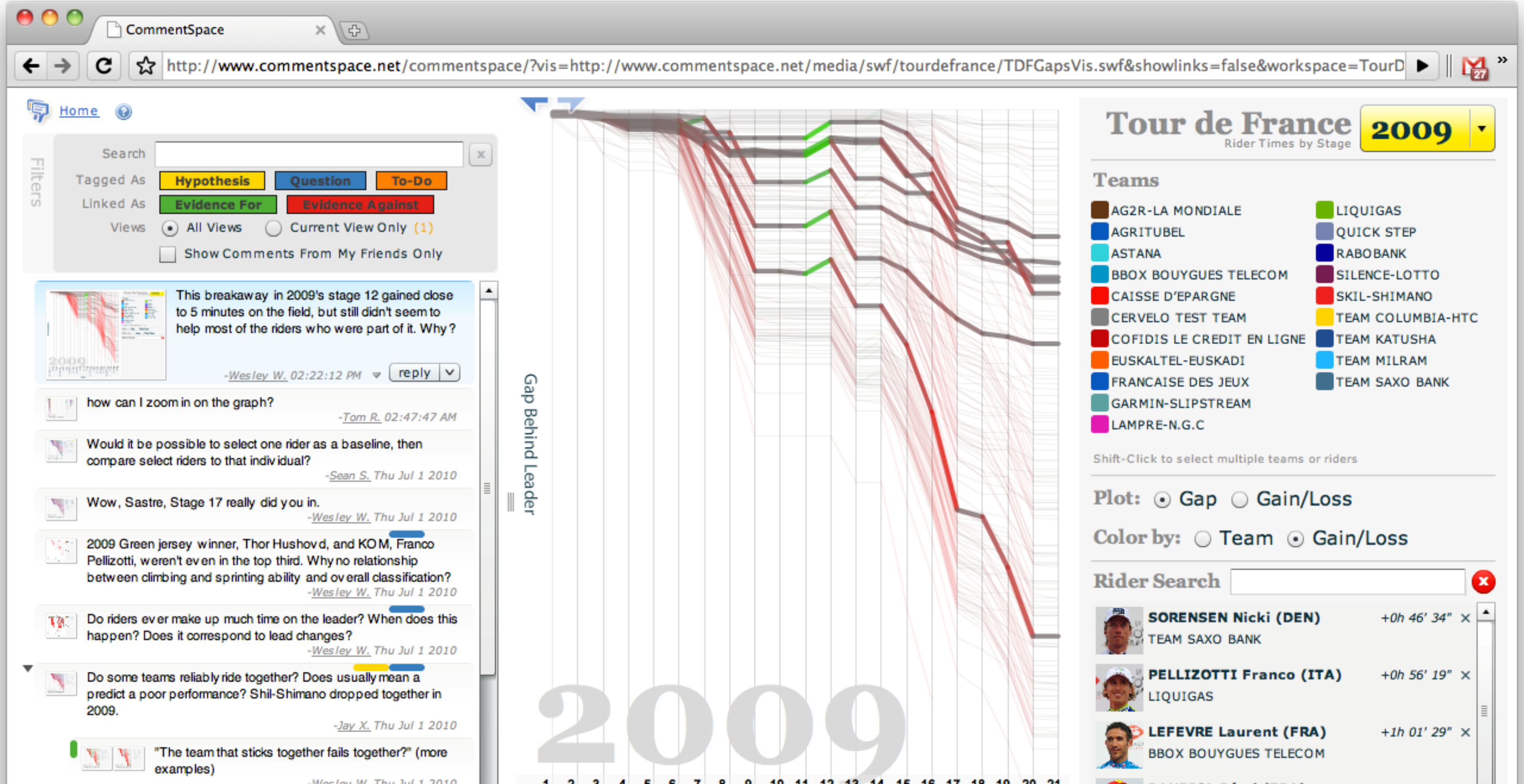
WHY SCRAPE?

No API exists for the data you want
(can’t access the right data, wrong format, etc.)

Simplicity – Usually don’t need to authenticate, no rate-limiting, etc.

Want to capture context of pages or relationship between them.

FOR EXAMPLE...



CommentSpace

http://www.commentspace.net/commentspace/?vis=http://www.commentspace.net/media/swf/tourdefrance/TDFGapsVis.swf&showlinks=false&workspace=TourD

Home

Filters

Search

Tagged As: Hypothesis | Question | To-Do

Linked As: Evidence For | Evidence Against

Views: ● All Views ○ Current View Only (1)

□ Show Comments From My Friends Only

This breakaway in 2009's stage 12 gained close to 5 minutes on the field, but still didn't seem to help most of the riders who were part of it. Why?
-Wesley W. 02:22:12 PM reply

how can I zoom in on the graph?
-Tom R. 02:47:47 AM

Would it be possible to select one rider as a baseline, then compare select riders to that individual?
-Sean S. Thu Jul 1 2010

Wow, Sastre, Stage 17 really did you in.
-Wesley W. Thu Jul 1 2010

2009 Green jersey winner, Thor Hushovd, and KOM, Franco Pellizotti, weren't even in the top third. Why no relationship between climbing and sprinting ability and overall classification?
-Wesley W. Thu Jul 1 2010

Do riders ever make up much time on the leader? When does this happen? Does it correspond to lead changes?
-Wesley W. Thu Jul 1 2010

Do some teams reliably ride together? Does usually mean a predict a poor performance? Shil-Shimano dropped together in 2009.
-Jay X. Thu Jul 1 2010

"The team that sticks together fails together?" (more examples)
-Wesley W. Thu Jul 1 2010

Tour de France 2009
Rider Times by Stage

Teams

AG2R-LA MONDIALE	LIQUIGAS
AGRITUBEL	QUICK STEP
ASTANA	RABOBANK
BBOX BOUYGUES TELECOM	SILENCE-LOTTO
CAISSE D'EPARGNE	SKIL-SHIMANO
CERVELO TEST TEAM	TEAM COLUMBIA-HTC
COFIDIS LE CREDIT EN LIGNE	TEAM KATUSHA
EUSKALTEL-EUSKADI	TEAM MILRAM
FRANCAISE DES JEUX	TEAM SAXO BANK
GARMIN-SLIPSTREAM	
LAMPRE-N.G.C	

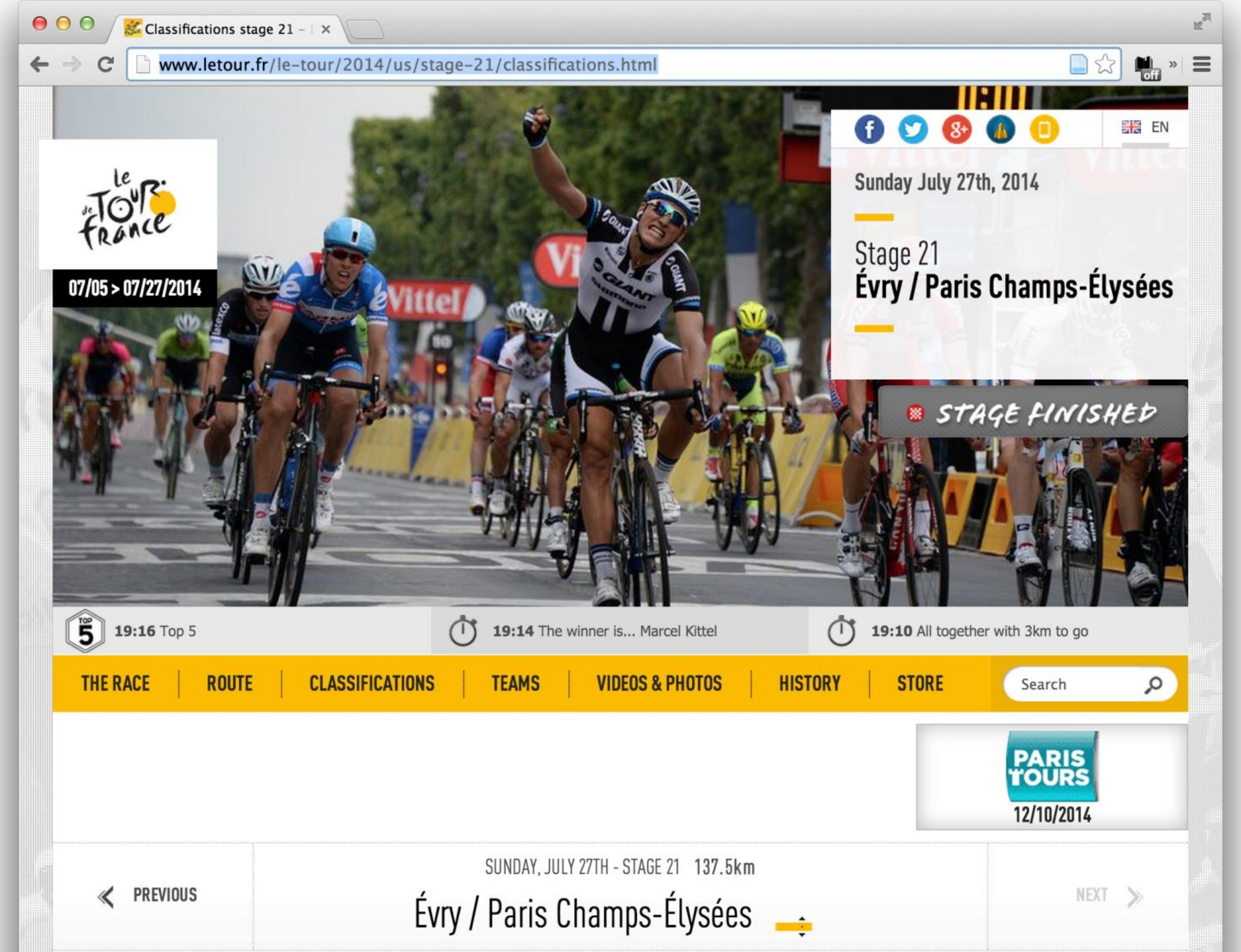
Shift-Click to select multiple teams or riders

Plot: ● Gap ○ Gain/Loss

Color by: ○ Team ● Gain/Loss

Rider Search

SORENSEN Nicki (DEN) TEAM SAXO BANK	+0h 46' 34"	×
PELLIZOTTI Franco (ITA) LIQUIGAS	+0h 56' 19"	×
LEFEVRE Laurent (FRA) BBOX BOUYGUES TELECOM	+1h 01' 29"	×



Classifications stage 21 –

www.letour.fr/le-tour/2014/us/stage-21/classifications.html

07/05 > 07/27/2014

Sunday July 27th, 2014

Stage 21
Évry / Paris Champs-Élysées

STAGE FINISHED

19:16 Top 5

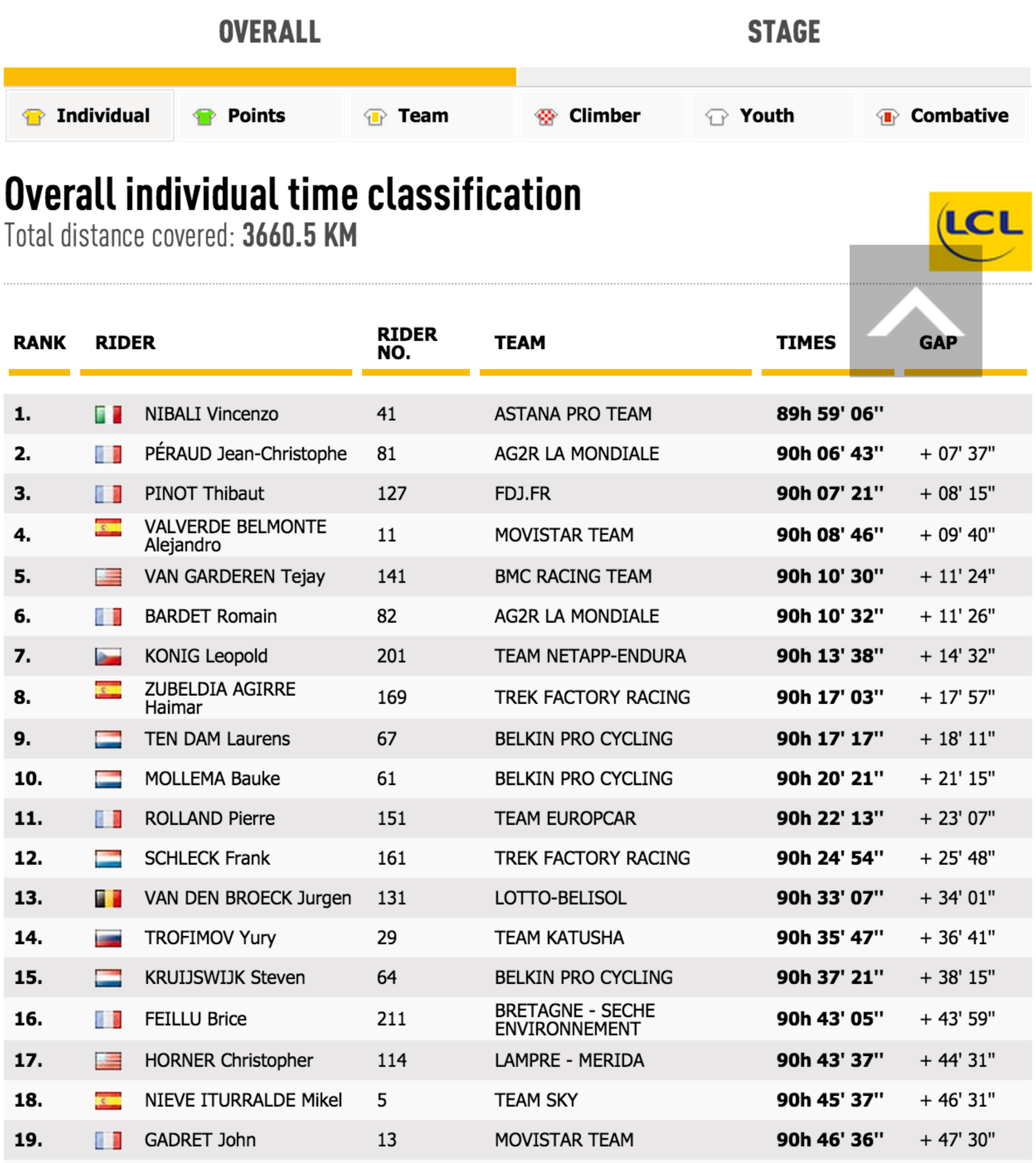
19:14 The winner is... Marcel Kittel

19:10 All together with 3km to go

PARIS TOURS 12/10/2014

SUNDAY, JULY 27TH - STAGE 21 137.5km

Évry / Paris Champs-Élysées



Overall individual time classification

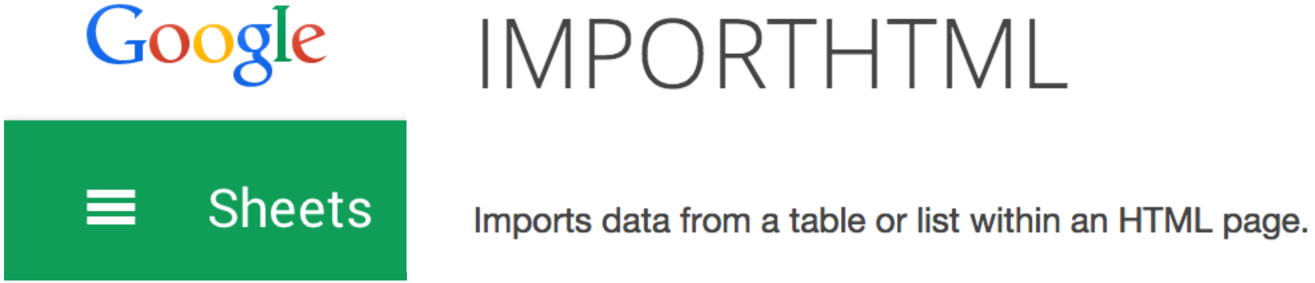
Total distance covered: **3660.5 KM**

RANK	RIDER	RIDER NO.	TEAM	TIMES	GAP
1.	NIBALI Vincenzo	41	ASTANA PRO TEAM	**89h 59' 06''**	
2.	PÉRAUD Jean-Christophe	81	AG2R LA MONDIALE	**90h 06' 43''**	+ 07' 37''
3.	PINOT Thibaut	127	FDJ.FR	**90h 07' 21''**	+ 08' 15''
4.	VALVERDE BELMONTE Alejandro	11	MOVISTAR TEAM	**90h 08' 46''**	+ 09' 40''
5.	VAN GARDEREN Tejay	141	BMC RACING TEAM	**90h 10' 30''**	+ 11' 24''
6.	BARDET Romain	82	AG2R LA MONDIALE	**90h 10' 32''**	+ 11' 26''
7.	KONIG Leopold	201	TEAM NETAPP-ENDURA	**90h 13' 38''**	+ 14' 32''
8.	ZUBELDIA AGIRRE Haimar	169	TREK FACTORY RACING	**90h 17' 03''**	+ 17' 57''
9.	TEN DAM Laurens	67	BELKIN PRO CYCLING	**90h 17' 17''**	+ 18' 11''
10.	MOLLEMA Bauke	61	BELKIN PRO CYCLING	**90h 20' 21''**	+ 21' 15''
11.	ROLLAND Pierre	151	TEAM EUROPCAR	**90h 22' 13''**	+ 23' 07''
12.	SCHLECK Frank	161	TREK FACTORY RACING	**90h 24' 54''**	+ 25' 48''
13.	VAN DEN BROECK Jurgen	131	LOTTO-BELISOL	**90h 33' 07''**	+ 34' 01''
14.	TROFIMOV Yury	29	TEAM KATUSHA	**90h 35' 47''**	+ 36' 41''
15.	KRUIJSWIJK Steven	64	BELKIN PRO CYCLING	**90h 37' 21''**	+ 38' 15''
16.	FEILLU Brice	211	BRETAGNE - SECHE ENVIRONNEMENT	**90h 43' 05''**	+ 43' 59''
17.	HORNER Christopher	114	LAMPRE - MERIDA	**90h 43' 37''**	+ 44' 31''
18.	NIEVE ITURRALDE Mikel	5	TEAM SKY	**90h 45' 37''**	+ 46' 31''
19.	GADRET John	13	MOVISTAR TEAM	**90h 46' 36''**	+ 47' 30''

SOMETIMES YOU DON’T NEED A SCRAPER!

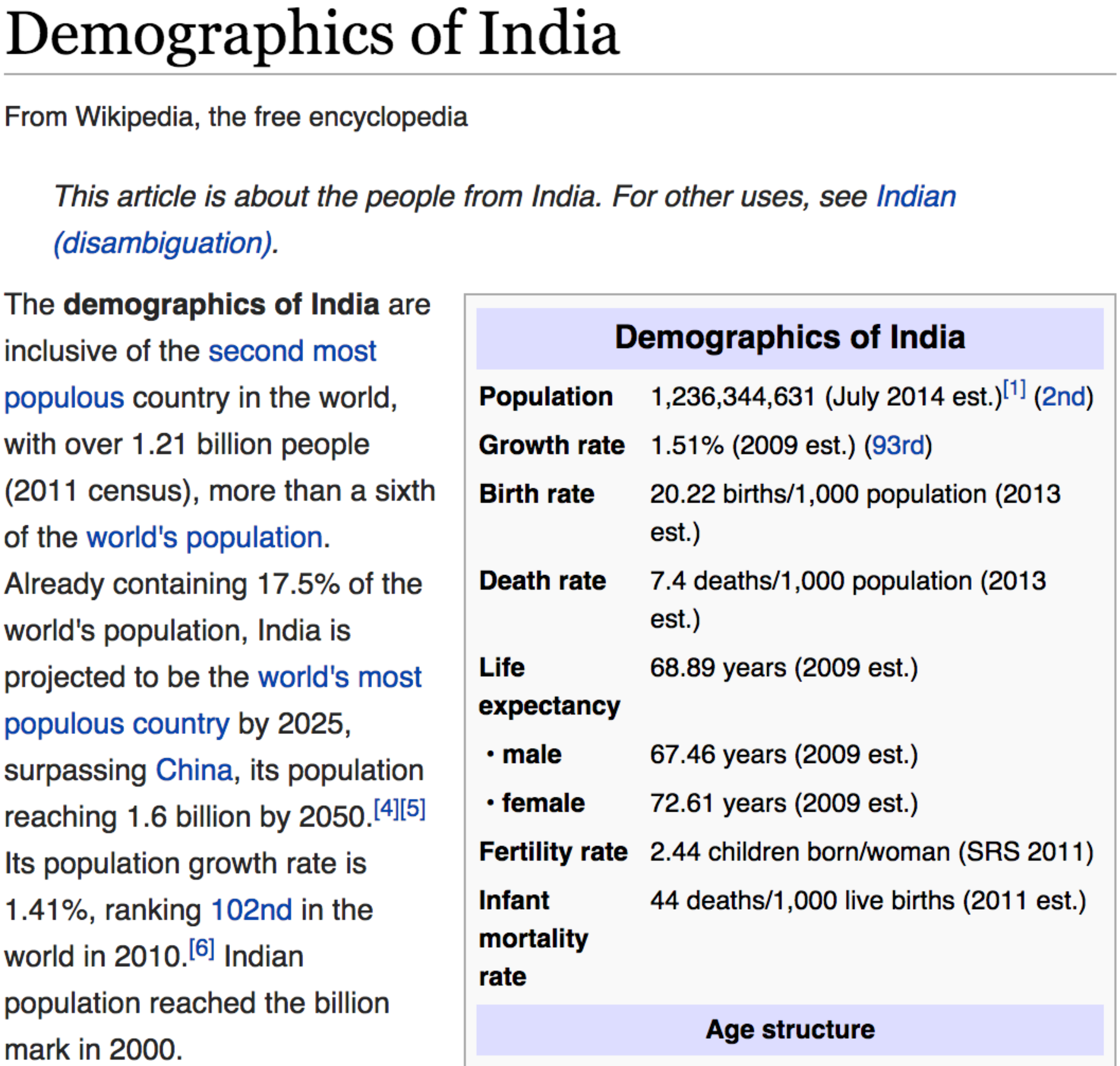
A few tips and tricks…

PULLING DATA TABLES FROM THE WEB



IMPORTHTML

Imports data from a table or list within an HTML page.



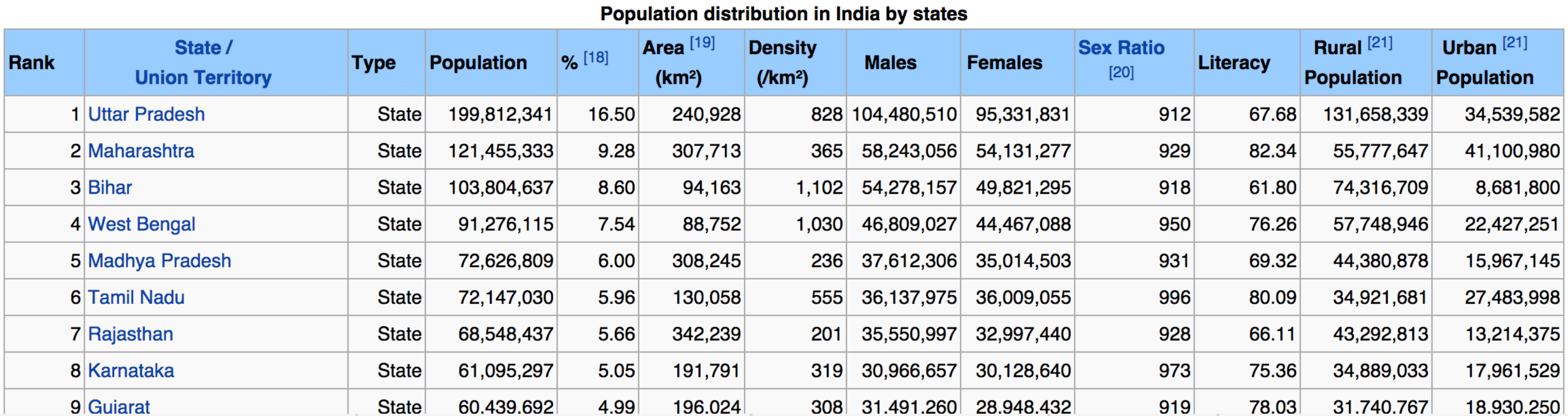
Demographics of India

From Wikipedia, the free encyclopedia

This article is about the people from India. For other uses, see Indian (disambiguation).

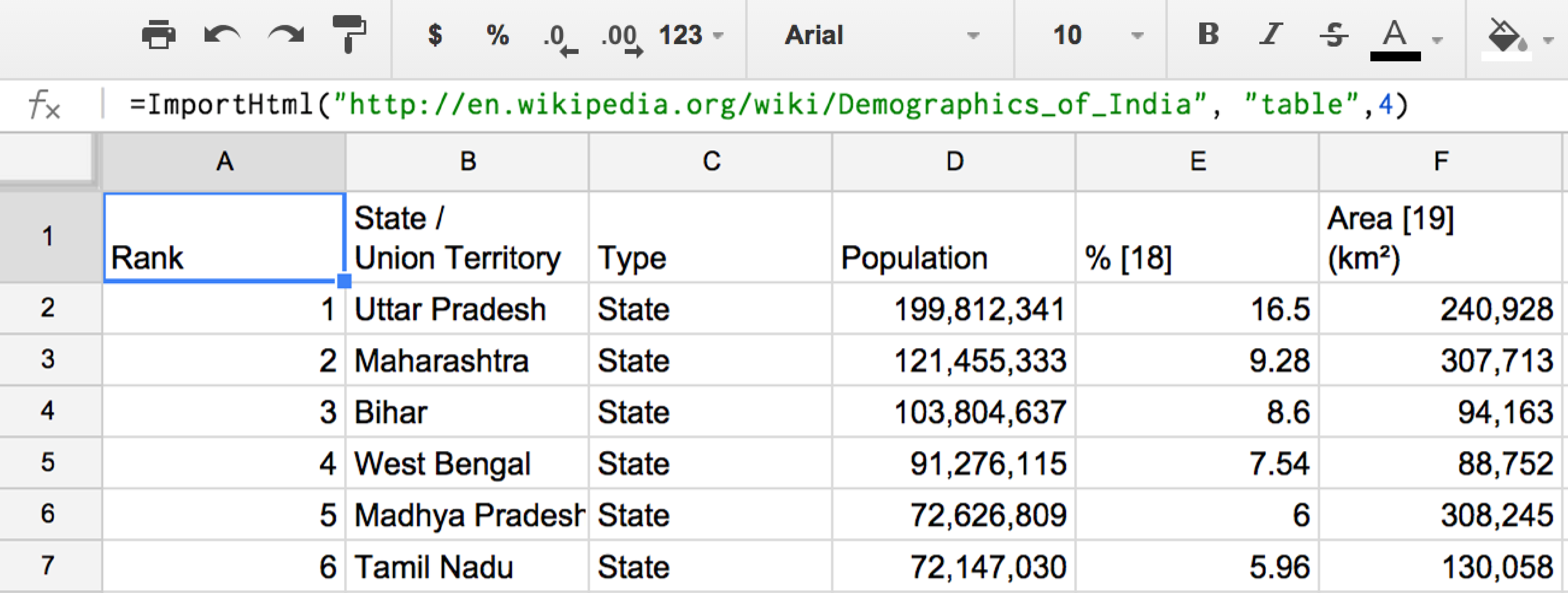
Demographics of India	
Population	1,236,344,631 (July 2014 est.)[1] (2nd)
Growth rate	1.51% (2009 est.) (93rd)
Birth rate	20.22 births/1,000 population (2013 est.)
Death rate	7.4 deaths/1,000 population (2013 est.)
Life expectancy	68.89 years (2009 est.)
• male	67.46 years (2009 est.)
• female	72.61 years (2009 est.)
Fertility rate	2.44 children born/woman (SRS 2011)
Infant mortality rate	44 deaths/1,000 live births (2011 est.)
Age structure	

The **demographics of India** are inclusive of the second most populous country in the world, with over 1.21 billion people (2011 census), more than a sixth of the world's population. Already containing 17.5% of the world's population, India is projected to be the world's most populous country by 2025, surpassing China, its population reaching 1.6 billion by 2050.[4][5] Its population growth rate is 1.41%, ranking 102nd in the world in 2010.[6] Indian population reached the billion mark in 2000.



Population distribution in India by states

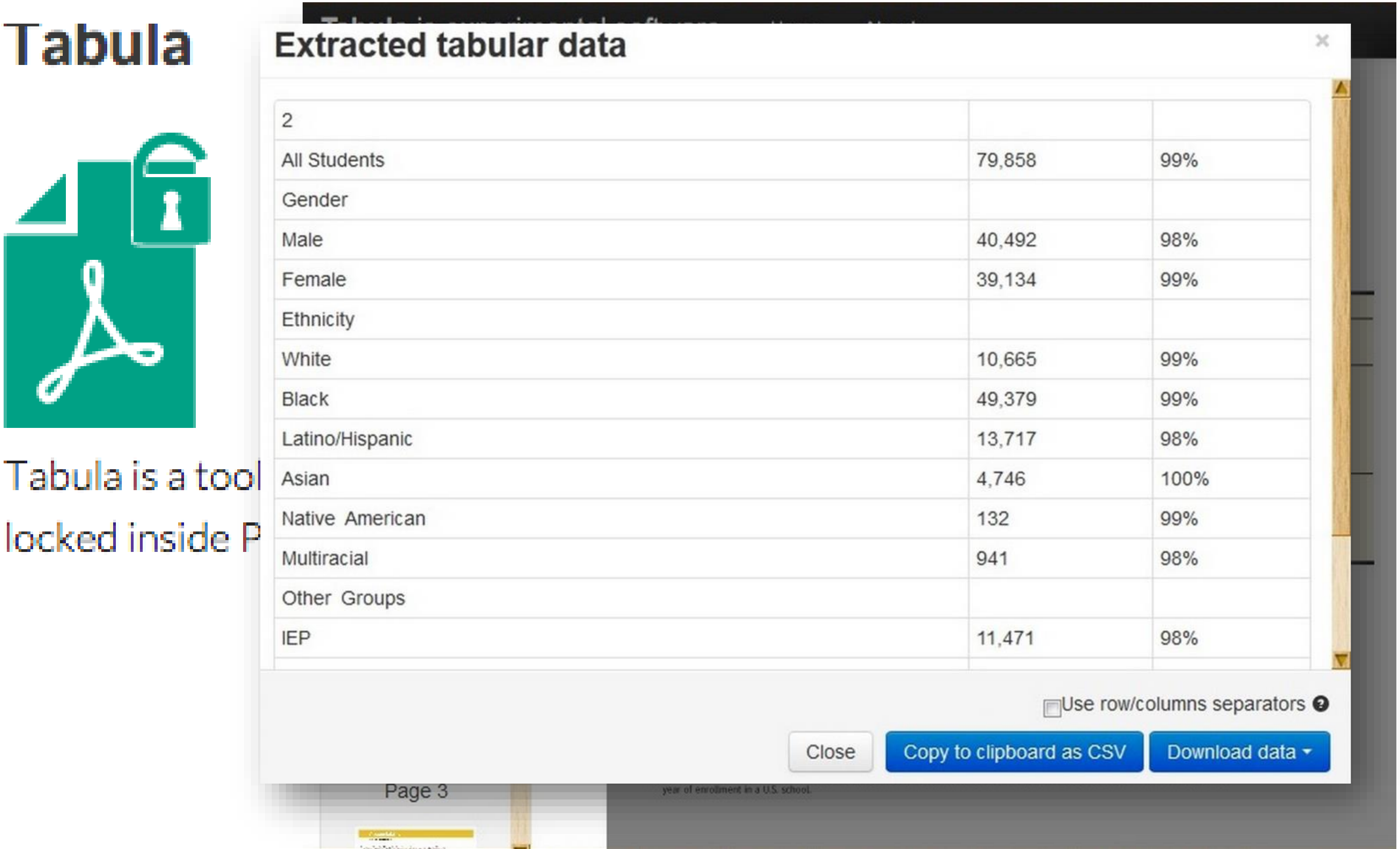
Rank	State / Union Territory	Type	Population	% [18]	Area [19] (km²)	Density (/km²)	Males	Females	Sex Ratio [20]	Literacy	Rural [21] Population	Urban [21] Population
1	Uttar Pradesh	State	199,812,341	16.50	240,928	828	104,480,510	95,331,831	912	67.68	131,658,339	34,539,582
2	Maharashtra	State	121,455,333	9.28	307,713	365	58,243,056	54,131,277	929	82.34	55,777,647	41,100,980
3	Bihar	State	103,804,637	8.60	94,163	1,102	54,278,157	49,821,295	918	61.80	74,316,709	8,681,800
4	West Bengal	State	91,276,115	7.54	88,752	1,030	46,809,027	44,467,088	950	76.26	57,748,946	22,427,251
5	Madhya Pradesh	State	72,626,809	6.00	308,245	236	37,612,306	35,014,503	931	69.32	44,380,878	15,967,145
6	Tamil Nadu	State	72,147,030	5.96	130,058	555	36,137,975	36,009,055	996	80.09	34,921,681	27,483,998
7	Rajasthan	State	68,548,437	5.66	342,239	201	35,550,997	32,997,440	928	66.11	43,292,813	13,214,375
8	Karnataka	State	61,095,297	5.05	191,791	319	30,966,657	30,128,640	973	75.36	34,889,033	17,961,529
9	Gujarat	State	60,439,692	4.99	196,024	308	31,491,260	28,948,432	919	78.03	31,740,767	18,930,250



```
=ImportHtml("http://en.wikipedia.org/wiki/Demographics_of_India", "table",4)
```

	A	B	C	D	E	F
1	Rank	State / Union Territory	Type	Population	% [18]	Area [19] (km²)
2	1	Uttar Pradesh	State	199,812,341	16.5	240,928
3	2	Maharashtra	State	121,455,333	9.28	307,713
4	3	Bihar	State	103,804,637	8.6	94,163
5	4	West Bengal	State	91,276,115	7.54	88,752
6	5	Madhya Pradesh	State	72,626,809	6	308,245
7	6	Tamil Nadu	State	72,147,030	5.96	130,058

PARSING PDFS



Tabula

Tabula is a tool

locked inside P

Extracted tabular data

2		
All Students	79,858	99%
Gender		
Male	40,492	98%
Female	39,134	99%
Ethnicity		
White	10,665	99%
Black	49,379	99%
Latino/Hispanic	13,717	98%
Asian	4,746	100%
Native American	132	99%
Multiracial	941	98%
Other Groups		
IEP	11,471	98%

□ Use row/columns separators

BUILDING A WEB SCRAPER

FETCHING DATA + PARSING DATA

YOU SHOULD **SEPARATE** THESE PROCESSES **WHENEVER POSSIBLE!**

FETCHING DATA

DON’T DO EVERYTHING AT ONCE

Download complete pages and save them locally **before** you process them.

DEALING WITH PAGINATION

If results or records are spread across multiple pages, you may need to parse the page to find the link to the next page.

PARSING DATA

SERIOUSLY, DON'T DO EVERYTHING AT ONCE!

Processing data from local files means you **don't have to get it right the first time.**

USE YOUR BROWSER'S DEVELOPER TOOLS

All modern web browsers have built-in tools that let you inspect web pages.

BE CAREFUL - YOU CAN GET YOURSELF BLOCKED

Many sites will try to slow or block heavy access (both to prevent scraping and DoS attacks)

To get around this…You can introduce delays in your scraper or scrape from multiple locations.

A FEW MORE NOTES ABOUT DATA MANAGEMENT

FORMATS AND BEST-PRACTICES

DATA FORMATS

STRUCTURED vs. UNSTRUCTURED

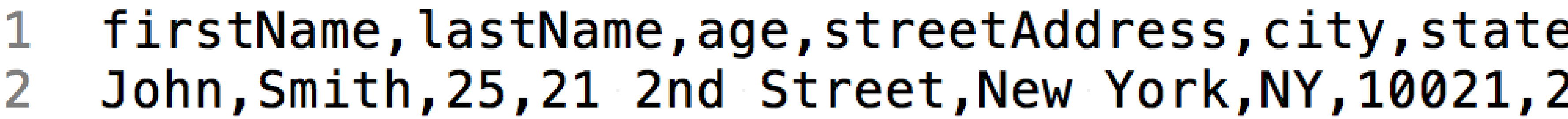
STRUCTURED DATA is more like what you'd find in a traditional **spreadsheet** or **database**.

UNSTRUCTURED DATA can include **raw text**, **streaming data**, even **images** or **video**.

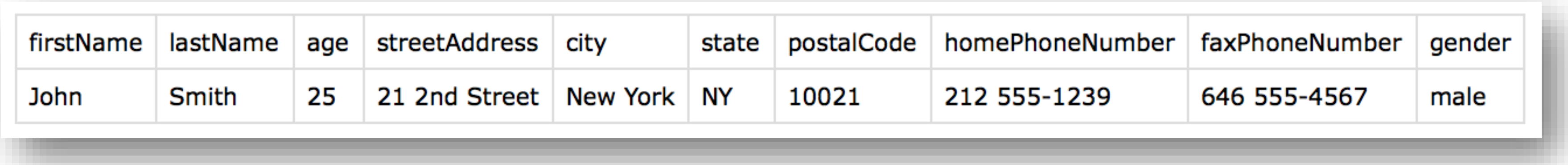
SEMI-STRUCTURED DATA is more organized, but doesn't follow a fixed schema (e.g. DBPEDIA data)

CSV

(Comma-Separated Value)



```
firstName,lastName,age,streetAddress,city,state
John,Smith,25,21 2nd Street,New York,NY,10021,2
```



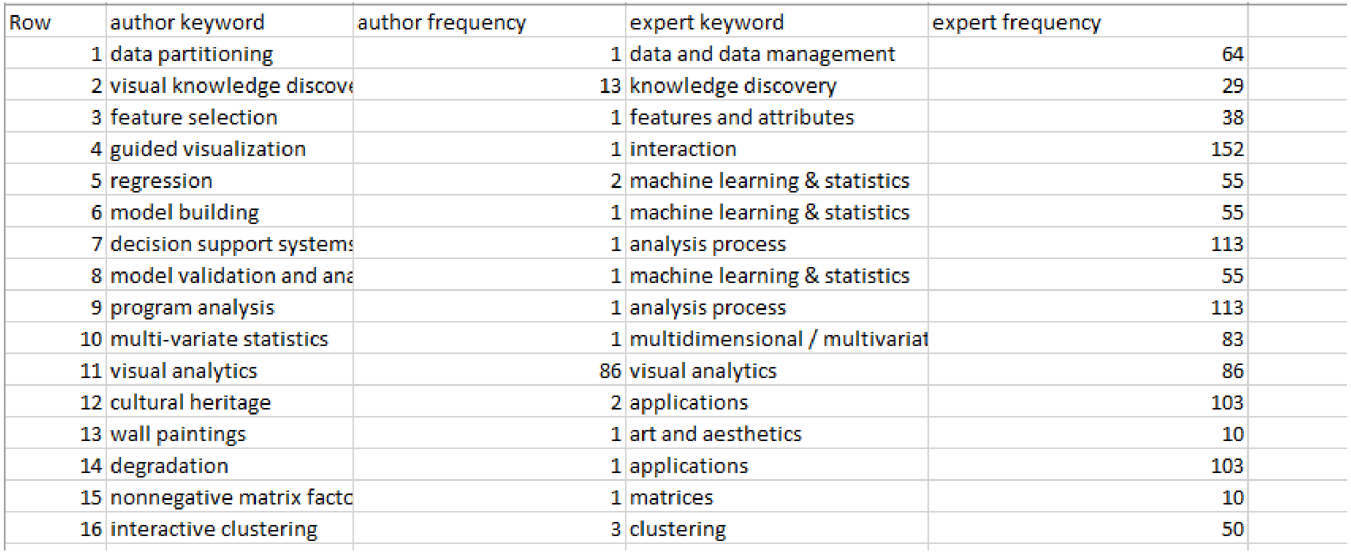
firstName	lastName	age	streetAddress	city	state	postalCode	homePhoneNumber	faxPhoneNumber	gender
John	Smith	25	21 2nd Street	New York	NY	10021	212 555-1239	646 555-4567	male

We will mostly use CSV in this course

CSV BEST PRACTICES

Remove unnecessary rows or cells

- empty cells, comments, write NA for missing values

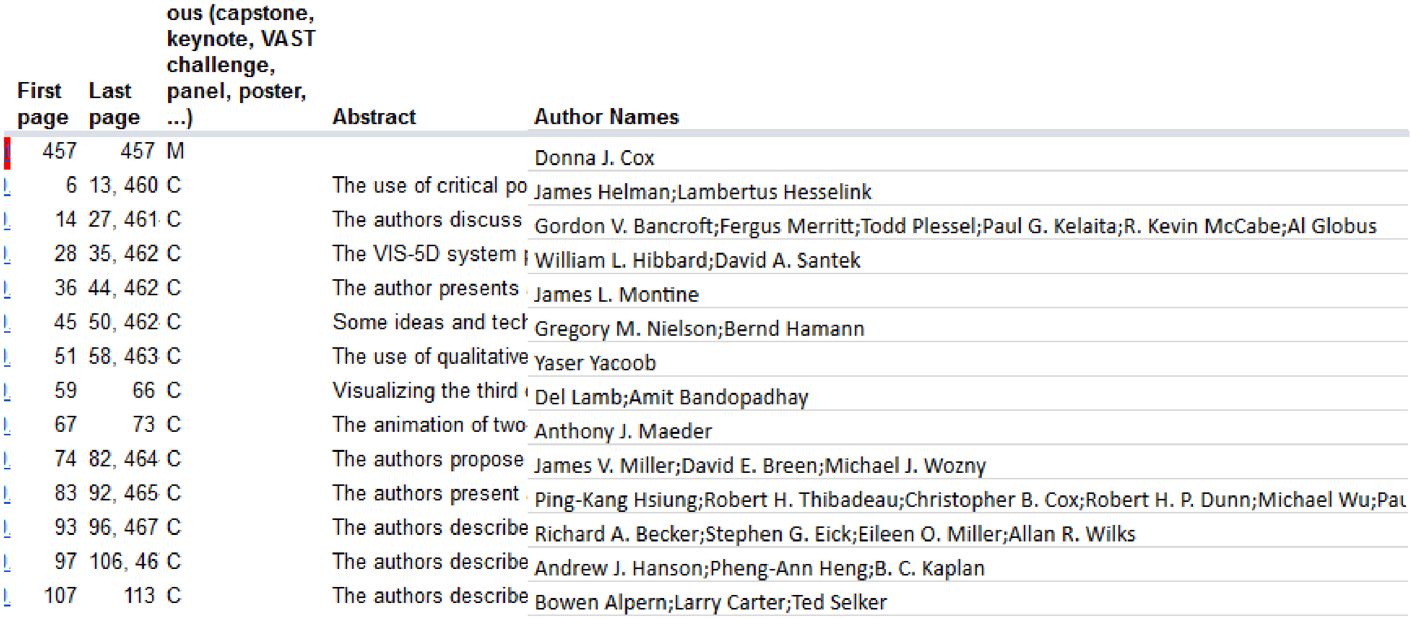


Row	author keyword	author frequency	expert keyword	expert frequency
1	data partitioning	1	data and data management	64
2	visual knowledge discove	13	knowledge discovery	29
3	feature selection	1	features and attributes	38
4	guided visualization	1	interaction	152
5	regression	2	machine learning & statistics	55
6	model building	1	machine learning & statistics	55
7	decision support systems	1	analysis process	113
8	model validation and ana	1	machine learning & statistics	55
9	program analysis	1	analysis process	113
10	multi-variate statistics	1	multidimensional / multivariat	83
11	visual analytics	86	visual analytics	86
12	cultural heritage	2	applications	103
13	wall paintings	1	art and aesthetics	10
14	degradation	1	applications	103
15	nonnegative matrix facto	1	matrices	10
16	interactive clustering	3	clustering	50

CSV BEST PRACTICES

Splits cells if you can

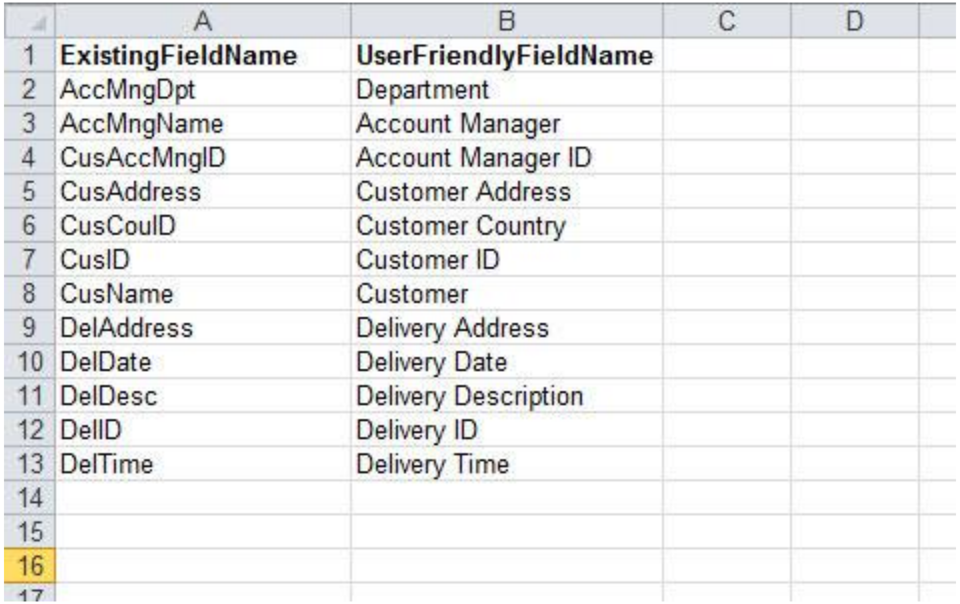
If needed create a second file



First page	Last page	ous (capstone, keynote, VAST challenge, panel, poster, ...)	Abstract	Author Names
457	457	M		Donna J. Cox
6	13, 460	C	The use of critical po	James Helman;Lambertus Hesselink
14	27, 461	C	The authors discuss	Gordon V. Bancroft;Fergus Merritt;Todd Plessel;Paul G. Kelaita;R. Kevin McCabe;Al Globus
28	35, 462	C	The VIS-5D system	William L. Hibbard;David A. Santek
36	44, 462	C	The author presents	James L. Montine
45	50, 462	C	Some ideas and tecl	Gregory M. Nielson;Bernd Hamann
51	58, 463	C	The use of qualitative	Yaser Yacoob
59	66	C	Visualizing the third	Del Lamb;Amit Bandopadhay
67	73	C	The animation of two	Anthony J. Maeder
74	82, 464	C	The authors propose	James V. Miller;David E. Breen;Michael J. Wozny
83	92, 465	C	The authors present	Ping-Kang Hsiung;Robert H. Thibadeau;Christopher B. Cox;Robert H. P. Dunn;Michael Wu;Pau
93	96, 467	C	The authors describe	Richard A. Becker;Stephen G. Eick;Eileen O. Miller;Allan R. Wilks
97	106, 46	C	The authors describe	Andrew J. Hanson;Pheng-Ann Heng;B. C. Kaplan
107	113	C	The authors describe	Bowen Alpern;Larry Carter;Ted Selker

CSV BEST PRACTICES

Give meaningful unique column names



	A	B	C	D
1	**ExistingFieldName**	**UserFriendlyFieldName**		
2	AccMngDpt	Department		
3	AccMngName	Account Manager		
4	CusAccMngID	Account Manager ID		
5	CusAddress	Customer Address		
6	CusCouID	Customer Country		
7	CusID	Customer ID		
8	CusName	Customer		
9	DelAddress	Delivery Address		
10	DelDate	Delivery Date		
11	DelDesc	Delivery Description		
12	DelID	Delivery ID		
13	DelTime	Delivery Time		
14				
15				
16				
17				

http://www.qlikviewaddict.com/2013/05/user-friendly-field-names-in-qlikview.html

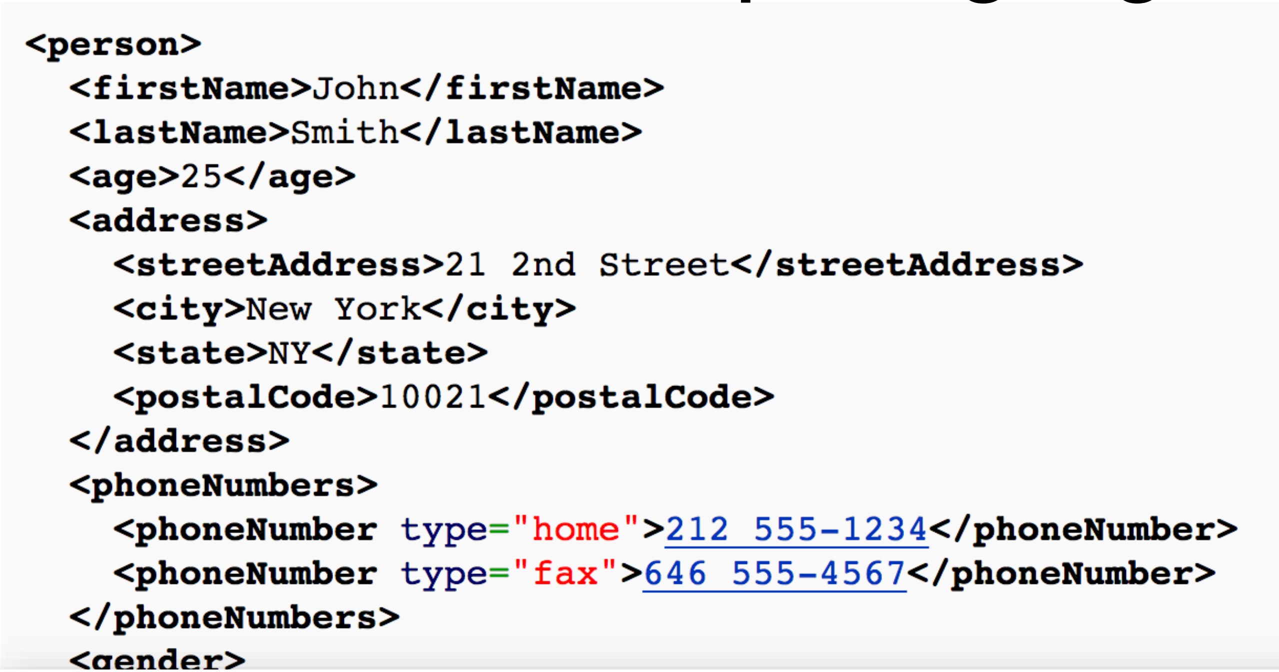
Make column name casing consistent

For pandas, snake_case is recommended
→ with it you can do:

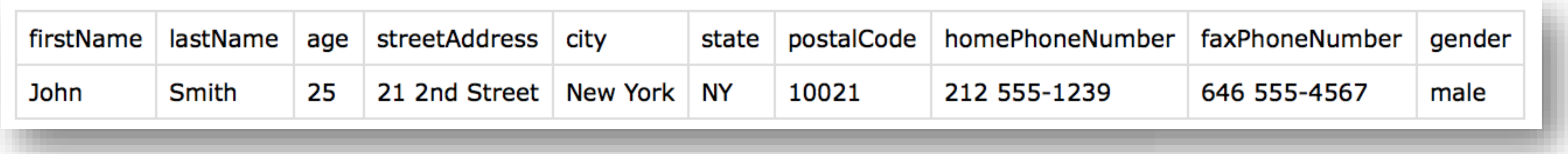
df.column_name or
df[‘column_name’]

XML

(eXtensible Markup Language)



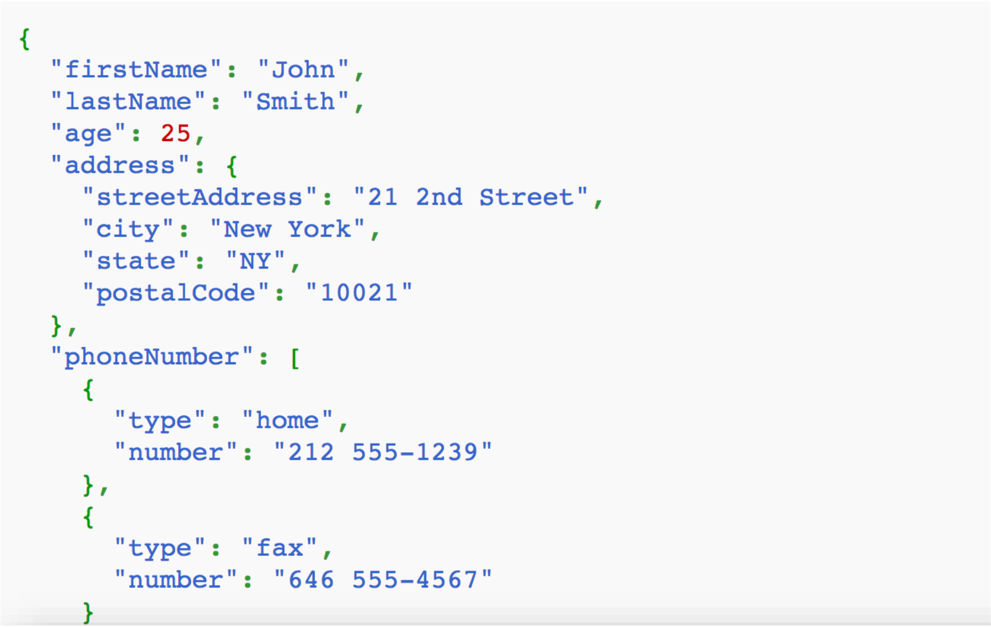
```
<person>
  <firstName>John</firstName>
  <lastName>Smith</lastName>
  <age>25</age>
  <address>
    <streetAddress>21 2nd Street</streetAddress>
    <city>New York</city>
    <state>NY</state>
    <postalCode>10021</postalCode>
  </address>
  <phoneNumbers>
    <phoneNumber type="home">212 555-1234</phoneNumber>
    <phoneNumber type="fax">646 555-4567</phoneNumber>
  </phoneNumbers>
  <gender>
```



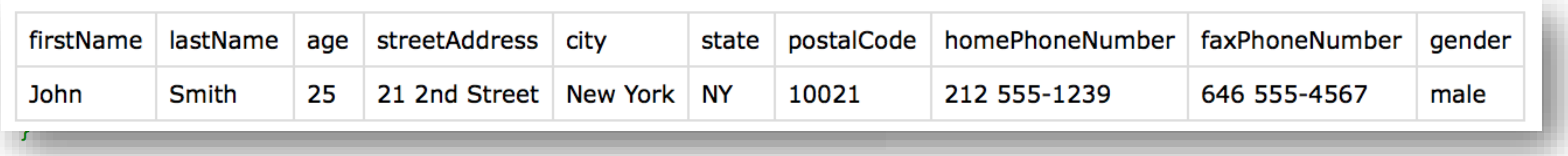
firstName	lastName	age	streetAddress	city	state	postalCode	homePhoneNumber	faxPhoneNumber	gender
John	Smith	25	21 2nd Street	New York	NY	10021	212 555-1239	646 555-4567	male

JSON

(JavaScript Object Notation)



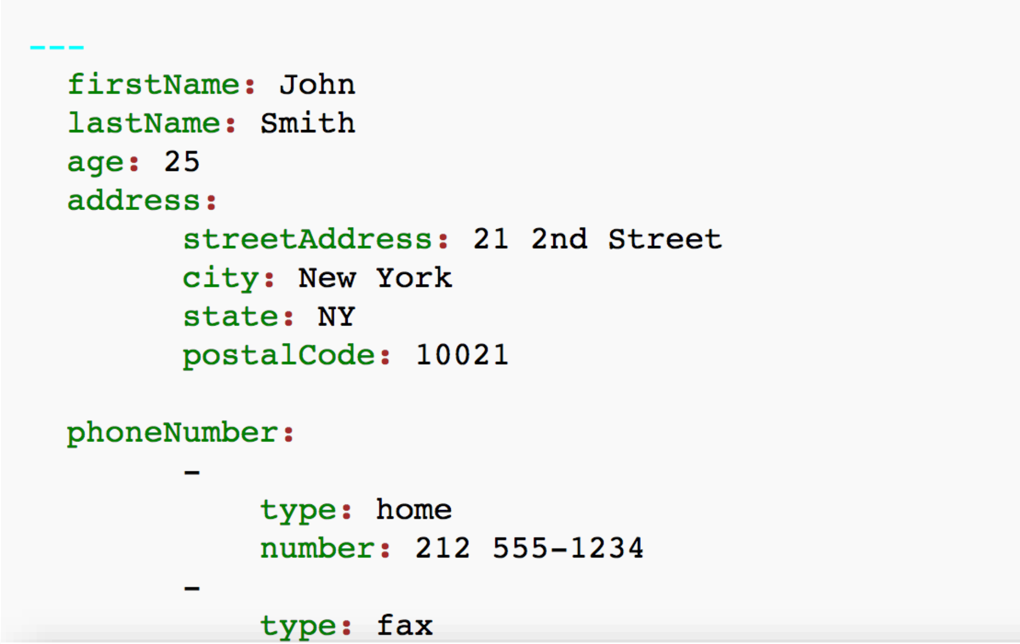
```
{
  "firstName": "John",
  "lastName": "Smith",
  "age": 25,
  "address": {
    "streetAddress": "21 2nd Street",
    "city": "New York",
    "state": "NY",
    "postalCode": "10021"
  },
  "phoneNumber": [
    {
      "type": "home",
      "number": "212 555-1239"
    },
    {
      "type": "fax",
      "number": "646 555-4567"
    }
```



firstName	lastName	age	streetAddress	city	state	postalCode	homePhoneNumber	faxPhoneNumber	gender
John	Smith	25	21 2nd Street	New York	NY	10021	212 555-1239	646 555-4567	male

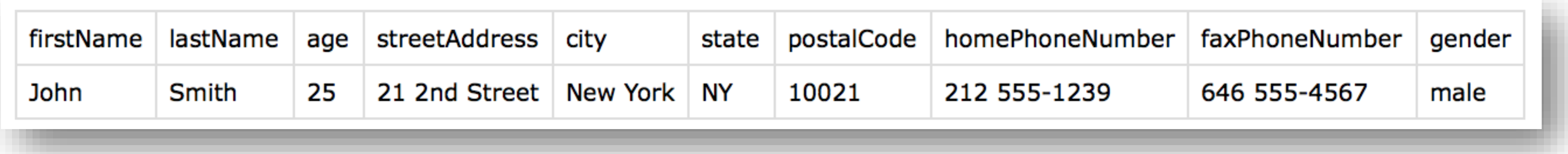
YAML

(YAML Ain't Markup Language)



```yaml
---
  firstName: John
  lastName: Smith
  age: 25
  address:
        streetAddress: 21 2nd Street
        city: New York
        state: NY
        postalCode: 10021

  phoneNumber:
        -
            type: home
            number: 212 555-1234
        -
            type: fax
```



firstName	lastName	age	streetAddress	city	state	postalCode	homePhoneNumber	faxPhoneNumber	gender
John	Smith	25	21 2nd Street	New York	NY	10021	212 555-1239	646 555-4567	male

HANDLING DATA

STORING DATA

- Always keep backups
- Password protect or encrypt any data with personal or sensitive information

PROVENANCE

- Keep track of where/when data was collected
- Record any data processing steps so you (or others) can repeat them if necessary

IP, COPYRIGHT, **AND** (RE)SHARING DATA

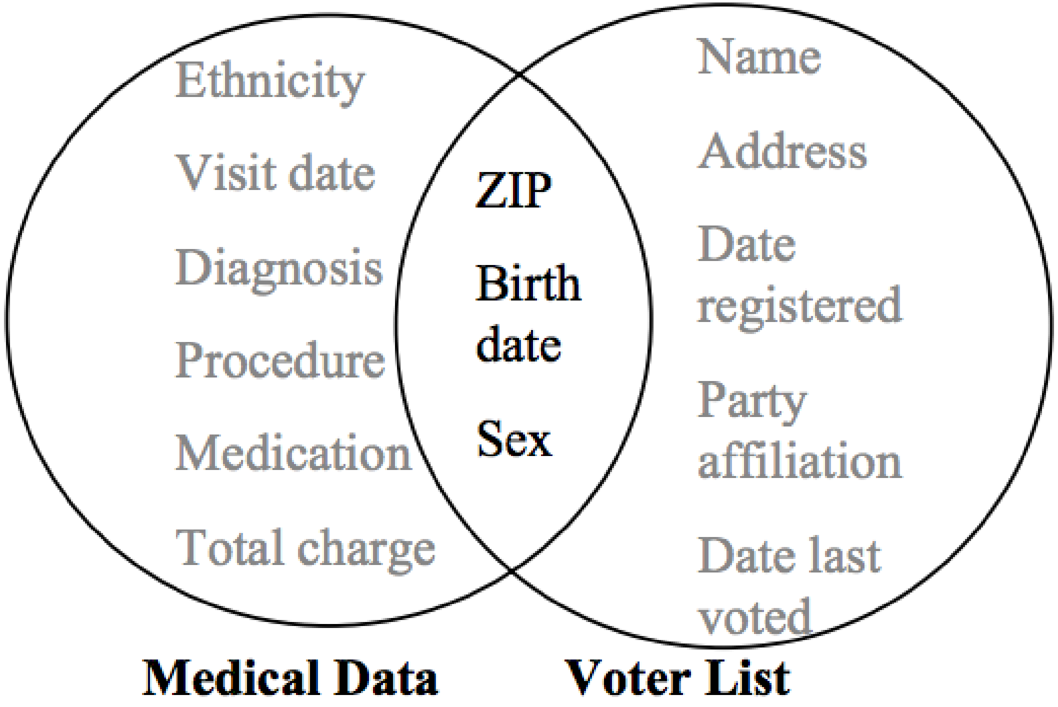
- Be sure you know who **owns** the data.
- Think early on about whether or not you'll need to **publish** or **(re)share** data.
- Be careful you **aren't violating copyright**, especially when scraping.

PRIVACY AND ANONYMIZING DATA

- Any information that could be used to identify individuals is sensitive!
- There may be legal repercussions for releasing it.
- In some cases you might need to anonymize data before sharing.

JUST REMOVING NAMES IS OFTEN NOT ENOUGH!

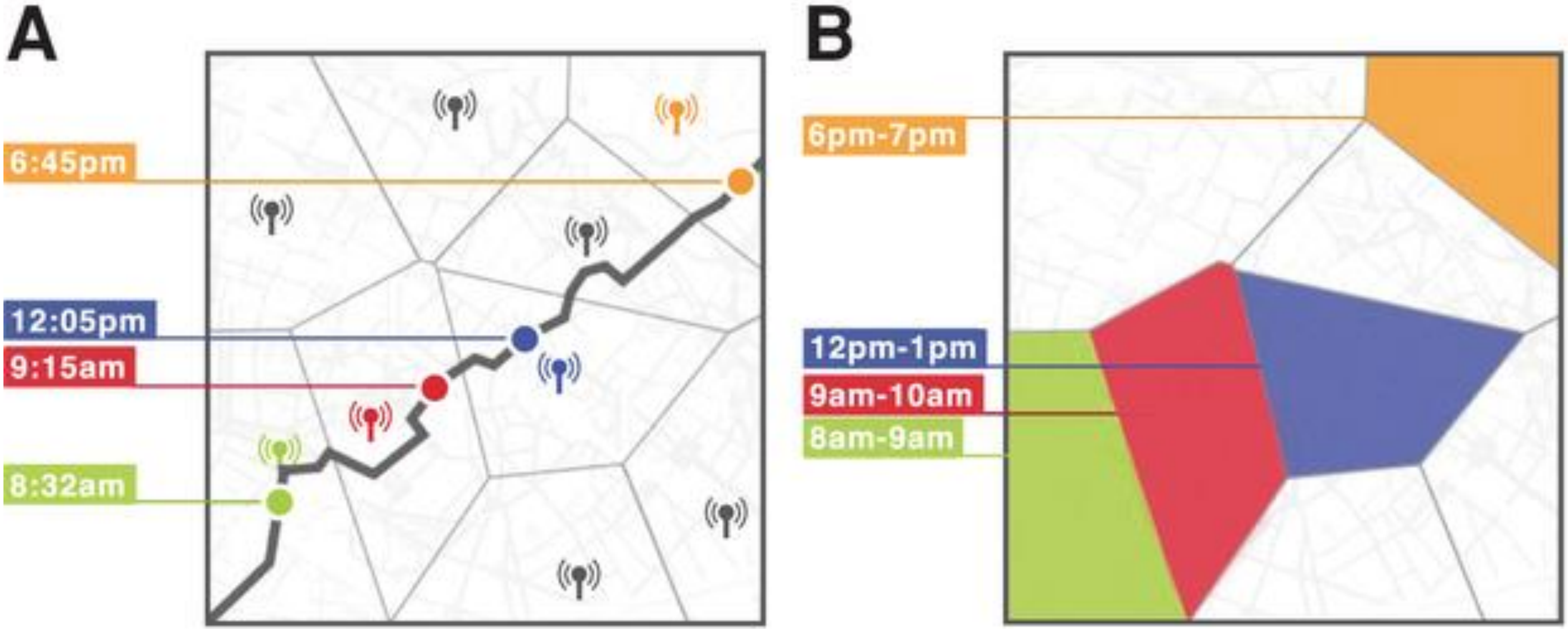
OTHER INFORMATION CAN STILL BE UNIQUE



[L. Sweeney. 2002]

[k-ANONYMITY: A MODEL FOR PROTECTING PRIVACY]

LOCATION DATA IS ESPECIALLY SENSITIVE



[de Montjoye et al. 2013]
Unique in the Crowd: The privacy bounds of human mobility

REGULATIONS (ACADEMIA AND RESEARCH)

Institutional Review and Ethics Boards may need to approve experiments or data collection **before it happens.**

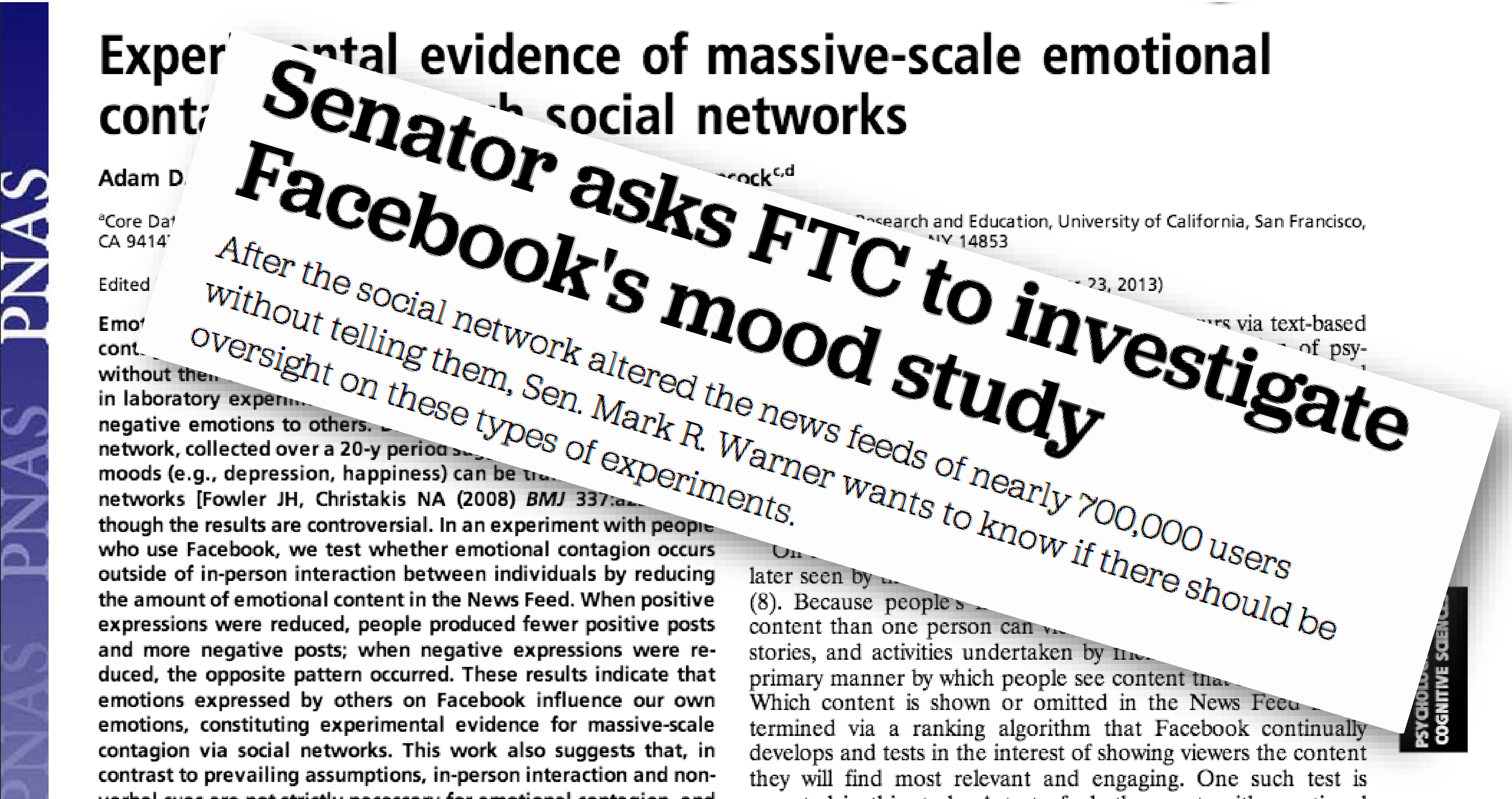
Studies involving people may need **informed consent.**

REGULATIONS (INDUSTRY)

Some governments have placed limits on how long user data can be kept.

Some kinds of tracking (e.g., cookies) may now require opt-in or notifications.
(However this varies by country).

SOCIAL EXPERIMENTS



Senator asks FTC to investigate Facebook's mood study

After the social network altered the news feeds of nearly 700,000 users without telling them, Sen. Mark R. Warner wants to know if there should be oversight on these types of experiments.

Exper ental evidence of massive-scale emotional conta social networks

Adam D cock c,d

aCore Dat esearch and Education, University of California, San Francisco, CA 9414 NY 14853

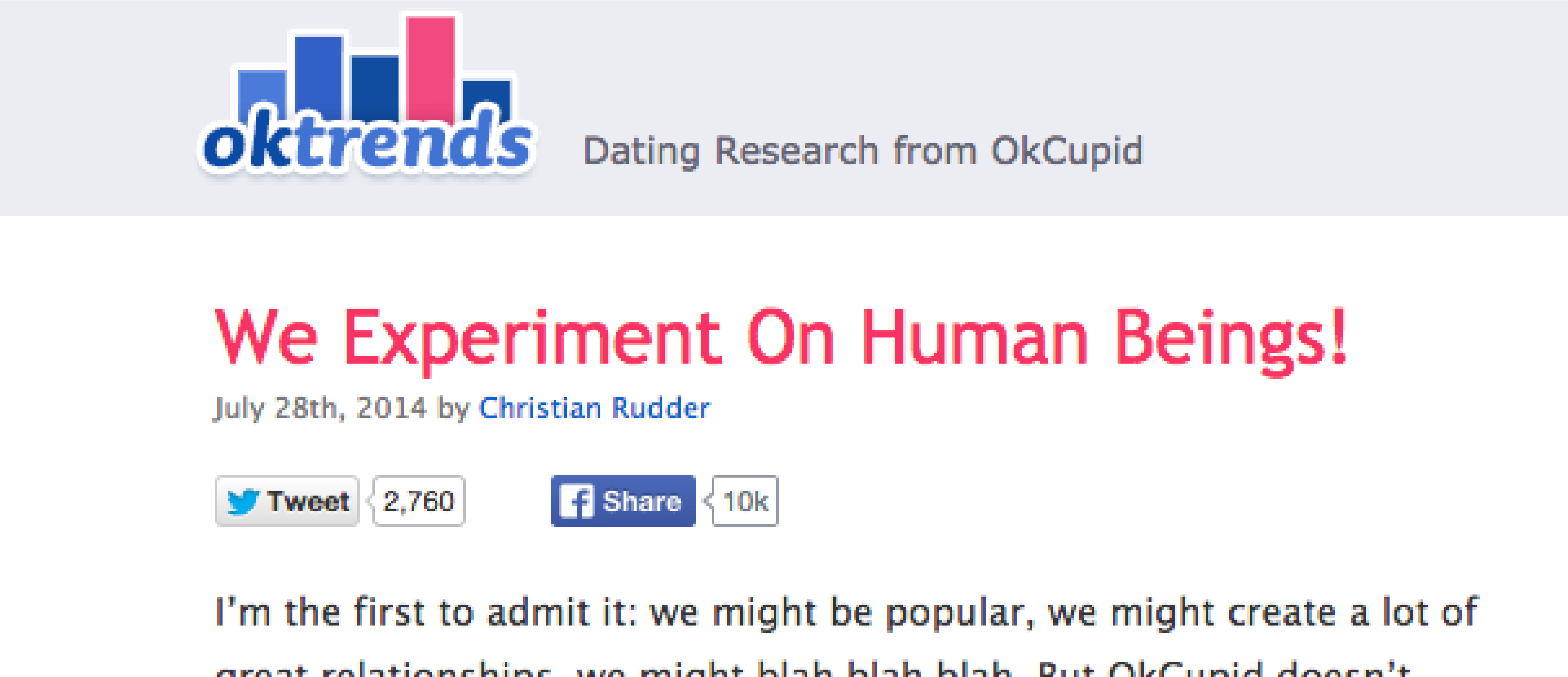
Edited 23, 2013)

Emot cont without them in laboratory experim negative emotions to others. network, collected over a 20-y period su moods (e.g., depression, happiness) can be tra networks [Fowler JH, Christakis NA (2008) *BMJ* 337:a2 though the results are controversial. In an experiment with people who use Facebook, we test whether emotional contagion occurs outside of in-person interaction between individuals by reducing the amount of emotional content in the News Feed. When positive expressions were reduced, people produced fewer positive posts and more negative posts; when negative expressions were reduced, the opposite pattern occurred. These results indicate that emotions expressed by others on Facebook influence our own emotions, constituting experimental evidence for massive-scale contagion via social networks. This work also suggests that, in contrast to prevailing assumptions, in-person interaction and non-

urs via text-based of psy-

On later seen by (8). Because people's content than one person can vi stories, and activities undertaken by the primary manner by which people see content tha Which content is shown or omitted in the News Feed termined via a ranking algorithm that Facebook continually develops and tests in the interest of showing viewers the content they will find most relevant and engaging. One such test is

“EXPERIMENTING ON HUMAN BEINGS”



oktrends Dating Research from OkCupid

We Experiment On Human Beings!

July 28th, 2014 by Christian Rudder

I’m the first to admit it: we might be popular, we might create a lot of great relationships, we might blah blah blah. But OkCupid doesn’t

GDPR

General Data Protection Regulation

→The world's strongest data protection rules

→ Define how organization can handle information about people (customers etc.)

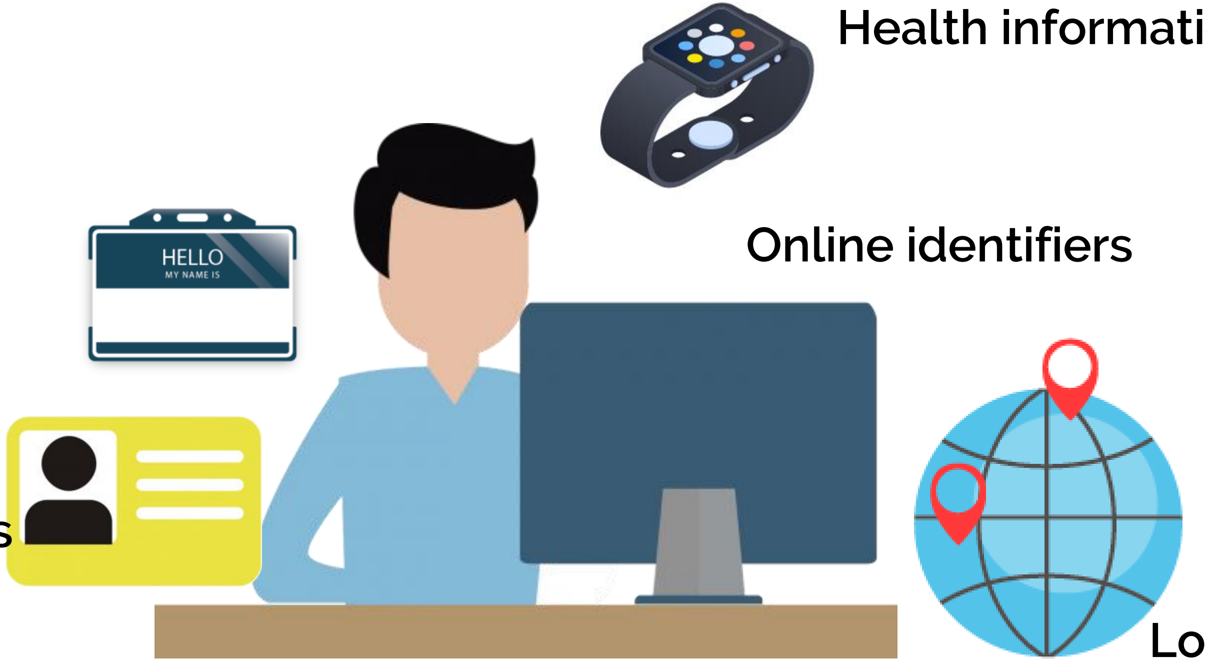
GDPR & RESEARCH

Collection of personal data

= data from which people can be identified

(data that is pseudonymous is still personal data)

PERSONAL DATA



Health information

Online identifiers

Names

Physical attributes

Location data

ID numbers

=Any information relating to an identified or identifiable natural person ('data subject'); an identifiable natural person is one who can be identified, directly or indirectly, in particular by reference to an identifier such as a name, an identification number, location data, an online identifier or to one or more factors specific to the physical, physiological, genetic, mental, economic, cultural or social identity of that natural person; (Art 4, 1)

Image credit: macrovector, freepix,

DATA PROCESSING

lawful, **fair** and **transparent**

get ethics approval

only process the minimal amount of necessary personal data; anonymize where possible

IN SUMMARY: **THERE ARE LOTS OF TOOLS AT YOUR DISPOSAL!**

COLLECT IT

- OBSERVATION
- SURVEYS
- LOGGING
- SENSORS
- CROWDSOURCING

FIND OR EXTRACT IT

- OPEN CORPUSES
- DATA RETAILERS
- APIS
- SCRAPING THE WEB

GENERATE IT

– SIMULATIONS

BEFORE NEXT CLASS

INSTALL :

OpenRefine (formerly Google Refine)
http://openrefine.org/