NYU Center for Data Science

DS-UA 112
Introduction to Data Science

Week 1: Lecture 1
Overview – Solving Problems with Data

NYU Center for Data Science

What is data? What characterizes data?

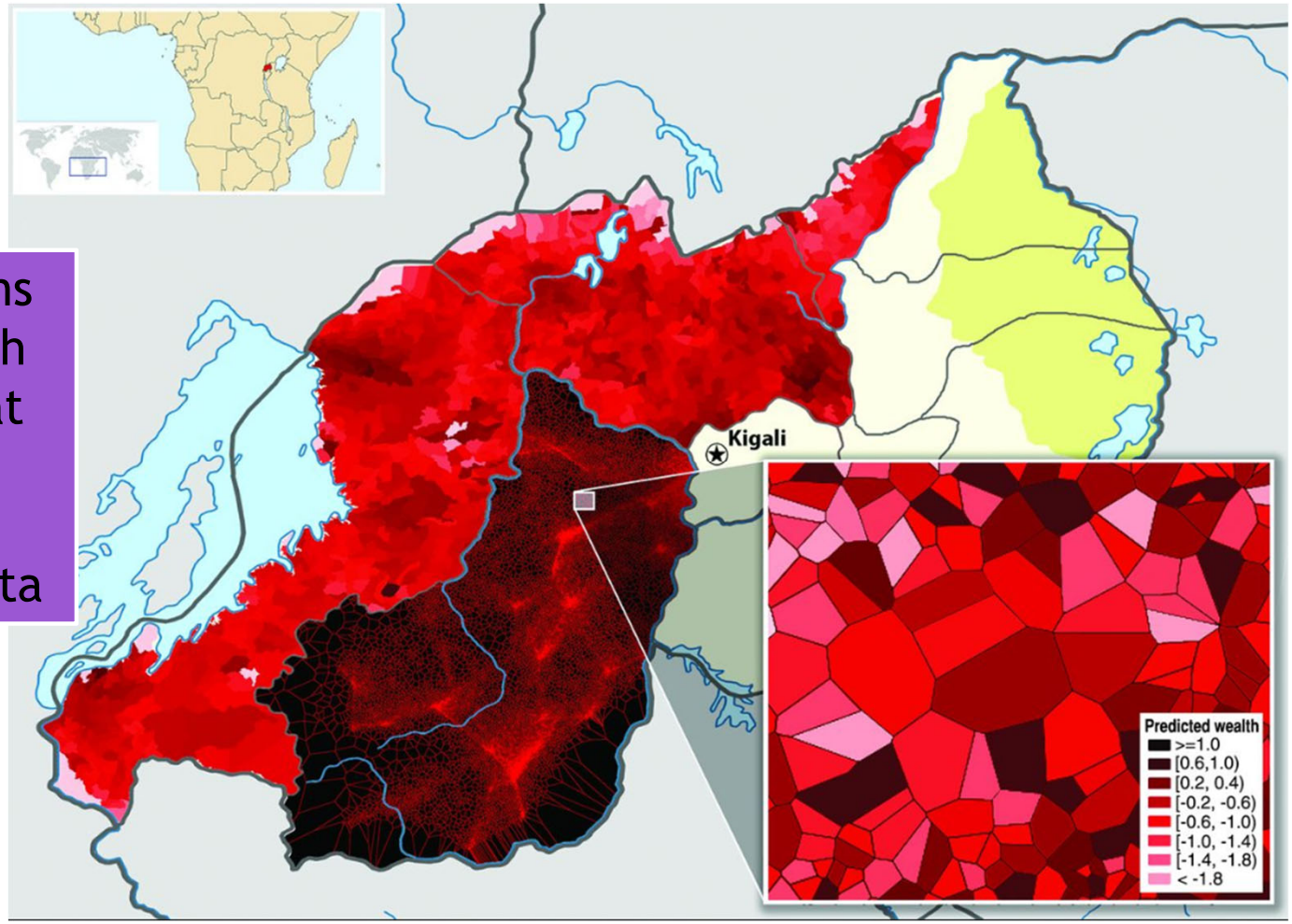
DS-UA 112
Introduction to Data Science

Week 1: Lecture 1
Overview – Solving Problems with Data

Adapted from Nolan, Denero, and Salganik

What is data?

Connecting questions and answers through research design that incorporates information determined from data



What is data?

REPORT

Predicting poverty and wealth from mobile phone metadata

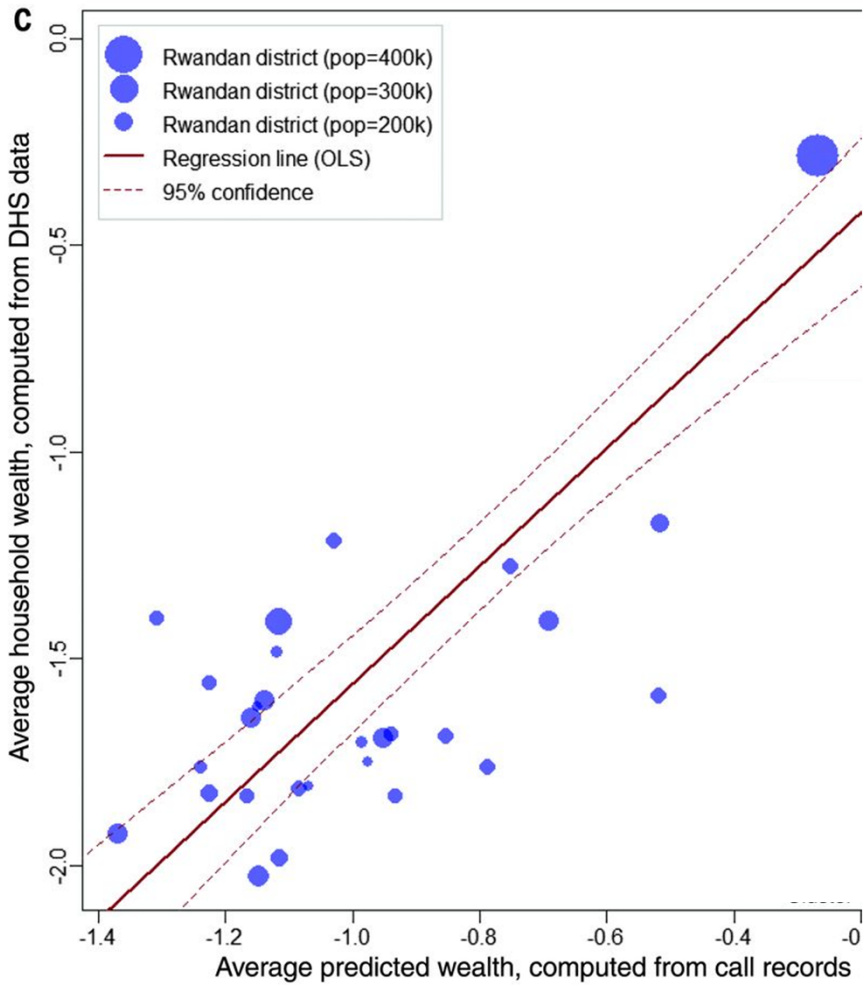
Joshua Blumenstock[1,*], Gabriel Cadamuro[2], Robert On[3]
+ See all authors and affiliations

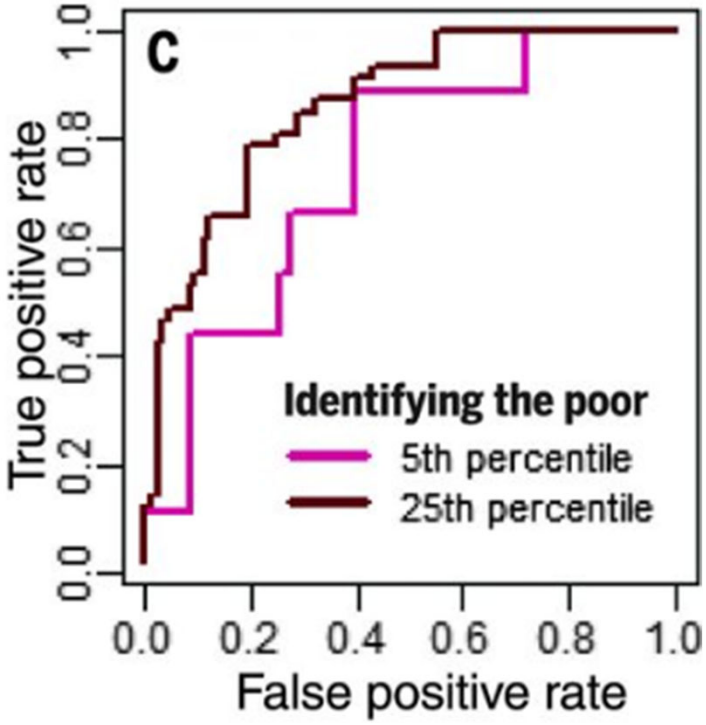
Science 27 Nov 2015:
Vol. 350, Issue 6264, pp. 1073-1076

Abstract

Accurate and timely estimates of population characteristics are a critical input to social and economic research and policy. In industrialized economies, novel sources of data are enabling new approaches to demographic profiling, but in developing countries, fewer sources of big data exist. We show that an individual's past history of mobile phone use can be used to infer his or her socioeconomic status. Furthermore, we demonstrate that the predicted attributes of millions of individuals can, in turn, accurately reconstruct the distribution of wealth of an entire nation or to infer the asset distribution of microregions composed of just a few households. In resource-constrained environments where censuses and household surveys are rare, this approach creates an option for gathering localized and timely information at a fraction of the cost of traditional methods.

What is data?


c
Rwandan district (pop=400k)
Rwandan district (pop=300k)
Rwandan district (pop=200k)
Regression line (OLS)
95% confidence
Average household wealth, computed from DHS data
0.0
-0.5
-1.0
-1.5
-2.0
-1.4
-1.2
-1.0
-0.8
-0.6
-0.4
-0
Average predicted wealth, computed from call records


c
True positive rate
0.0
0.2
0.4
0.6
0.8
1.0
Identifying the poor
5th percentile
25th percentile
0.0
0.2
0.4
0.6
0.8
1.0
False positive rate

What is data?

Private traits and attributes are predictable from digital records of human behavior

Michal Kosinski, David Stillwell, and Thore Graepel

PNAS April 9, 2013 110 (15) 5802-5805;

Abstract

We show that easily accessible digital records of behavior, Facebook Likes, can be used to automatically and accurately predict a range of highly sensitive personal attributes including: sexual orientation, ethnicity, religious and political views, personality traits, intelligence, happiness, use of addictive substances, parental separation, age, and gender. The analysis

What is data?

- What would these groups gather from the study?
  - Social Scientists
  - Computer Scientists
  - Business Managers
  - Activists
  - Policy Makers

Logistics

For more information please refer to the syllabus along with https://wp.nyu.edu/idss20/

Logistics

- Instructor: Chris
  - Office Hours: Thursdays 11-12PM at 60 Fifth Avenue, Room 650
- Section Leaders: Shreyas and Ashwin
- Graders: Ruoyu, Sarthak, Peeyush and Serkan

Logistics

- NYU Classes
  - Weekly Agenda, Zoom Conference, Syllabus
- JupyterHub
  - Class Materials, Submission Labs/Homework/Projects
- Piazza
  - Announcements, Discussion
- Gradescope
  - Submission Homework/Projects, Retrieve Exams

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Please complete Survey 0 linked to the Weekly Agenda on NYU Classes

Announcements

- Homework 40%
- Labs 15%
- Projects 20%
- Exams
  - Midterm 10%
  - Final 15%
- Participation
  - Office Hours, Piazza

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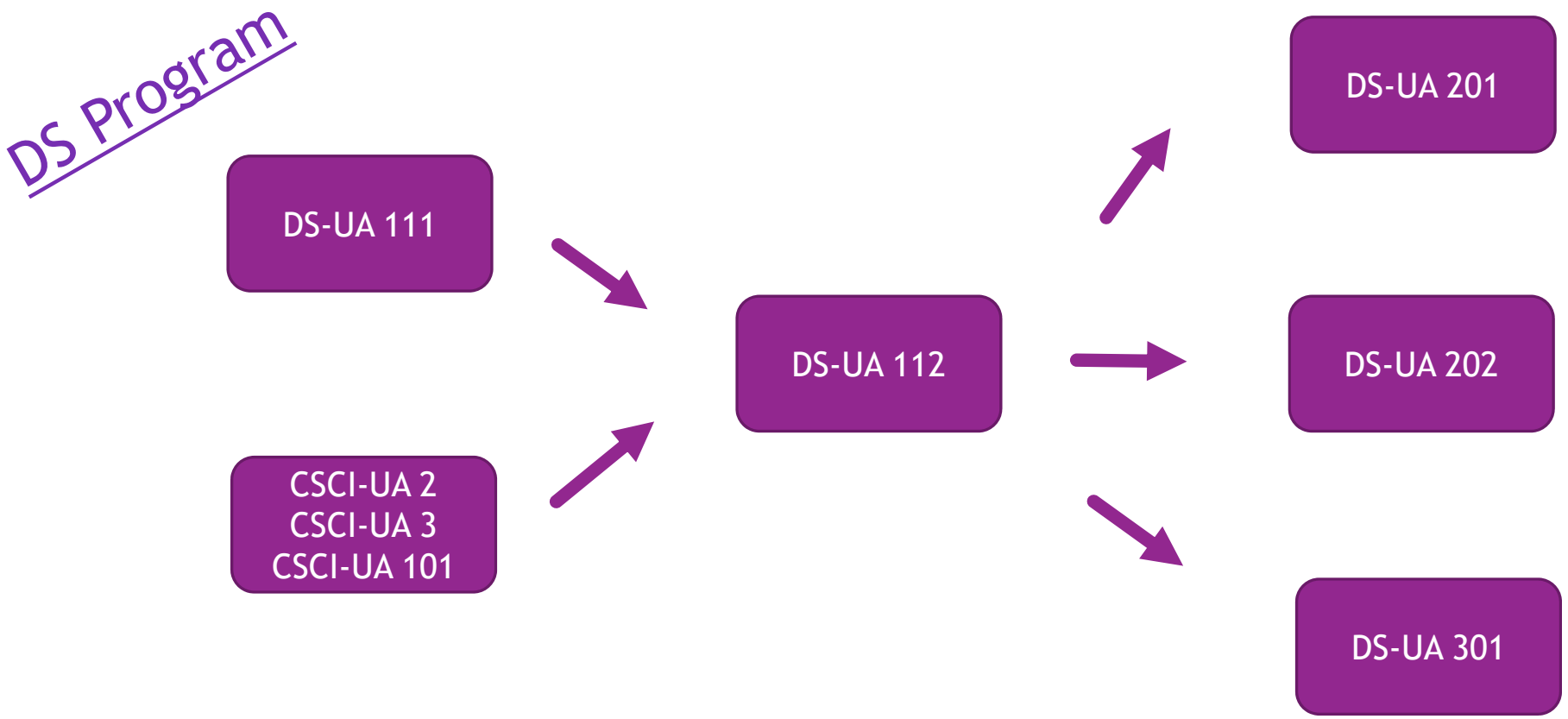
Logistics

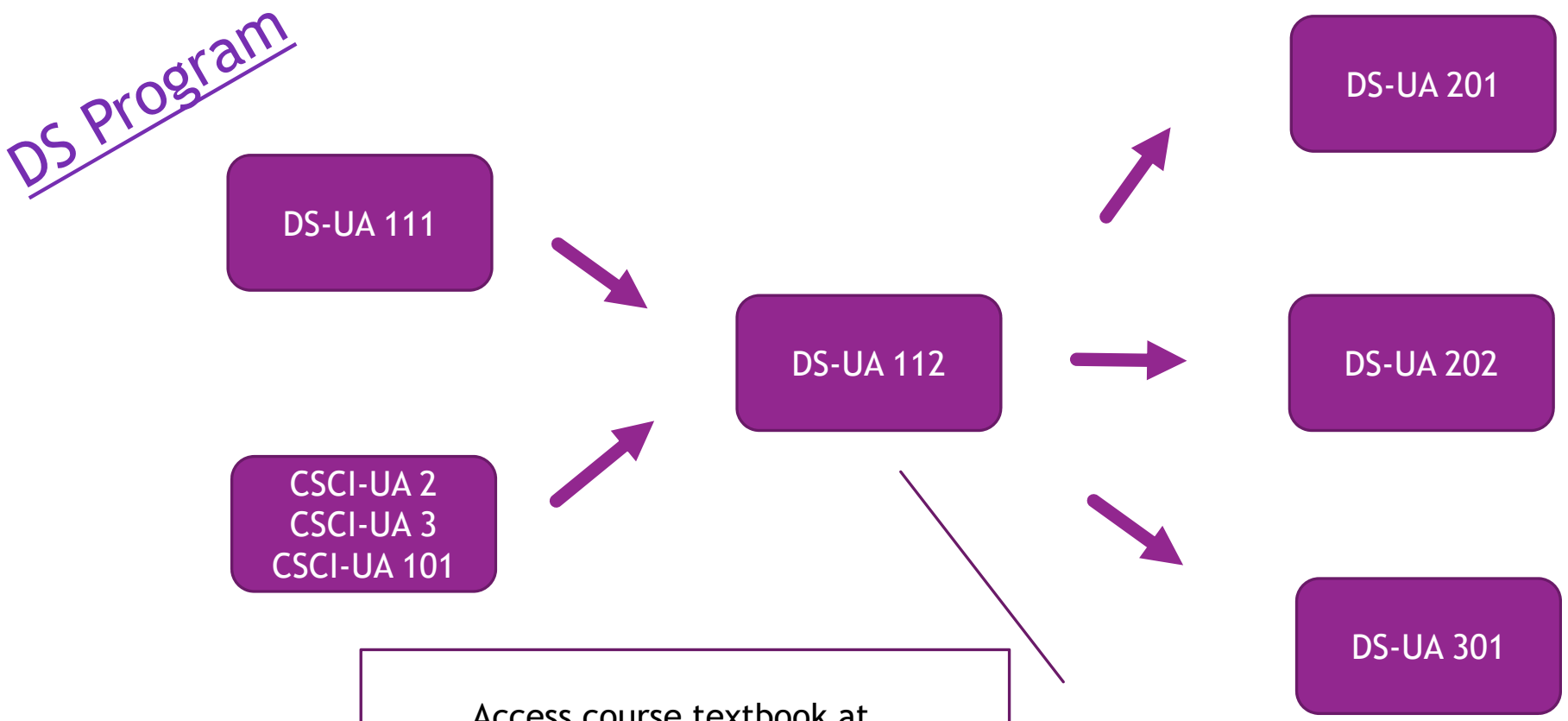
- Part of the Major and Minor in Data Science
- Interdisciplinary course for students in the sciences and humanities
- Goals
  - Empower
  - Enable
  - Prepare

- Skills
  - Formulate
  - Process
  - Access
  - Visualize
  - Fit
  - Evaluate

Logistics



Logistics



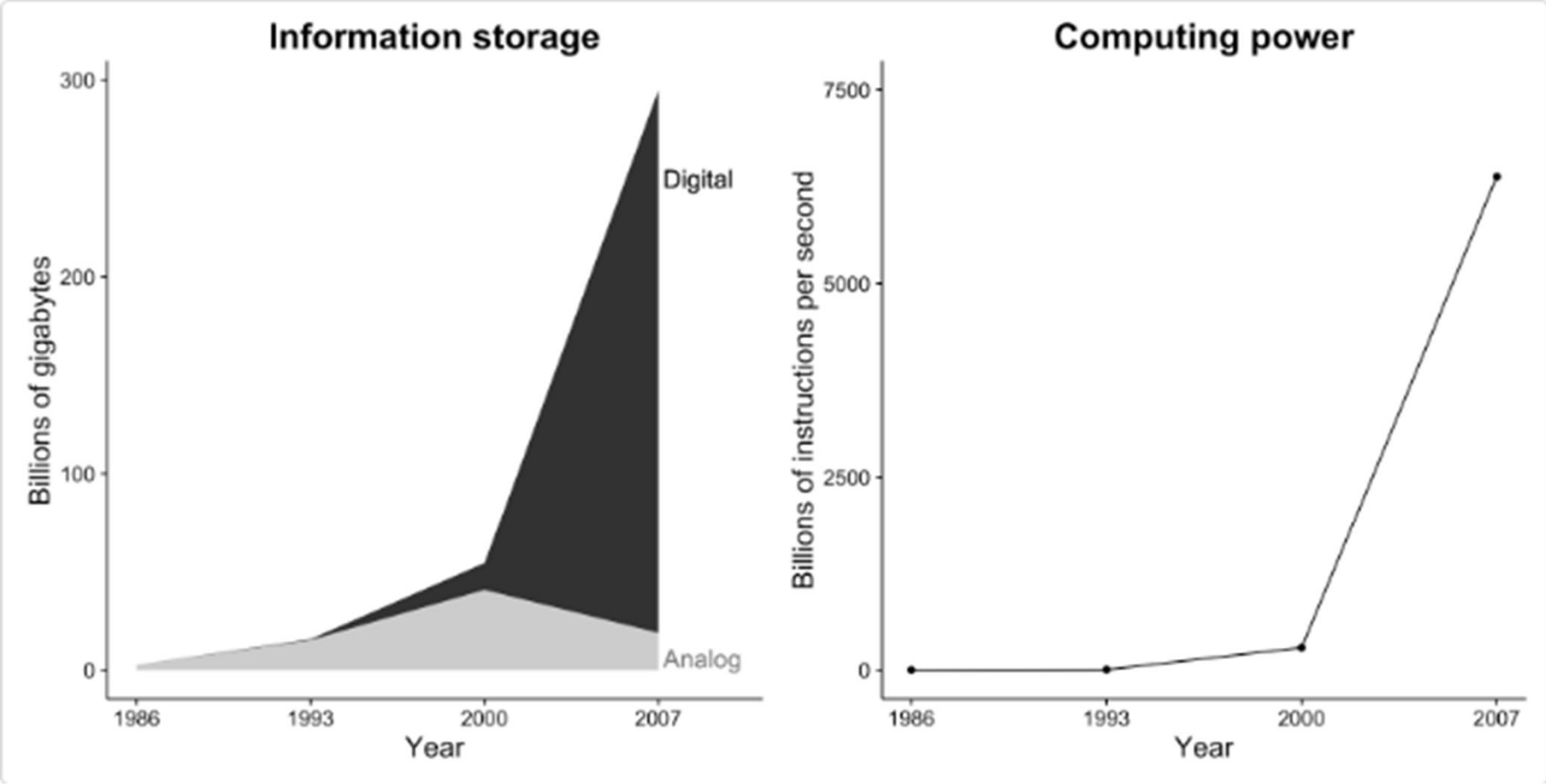
Access course textbook at
https://cp71.github.io/textbook/intro

Logistics

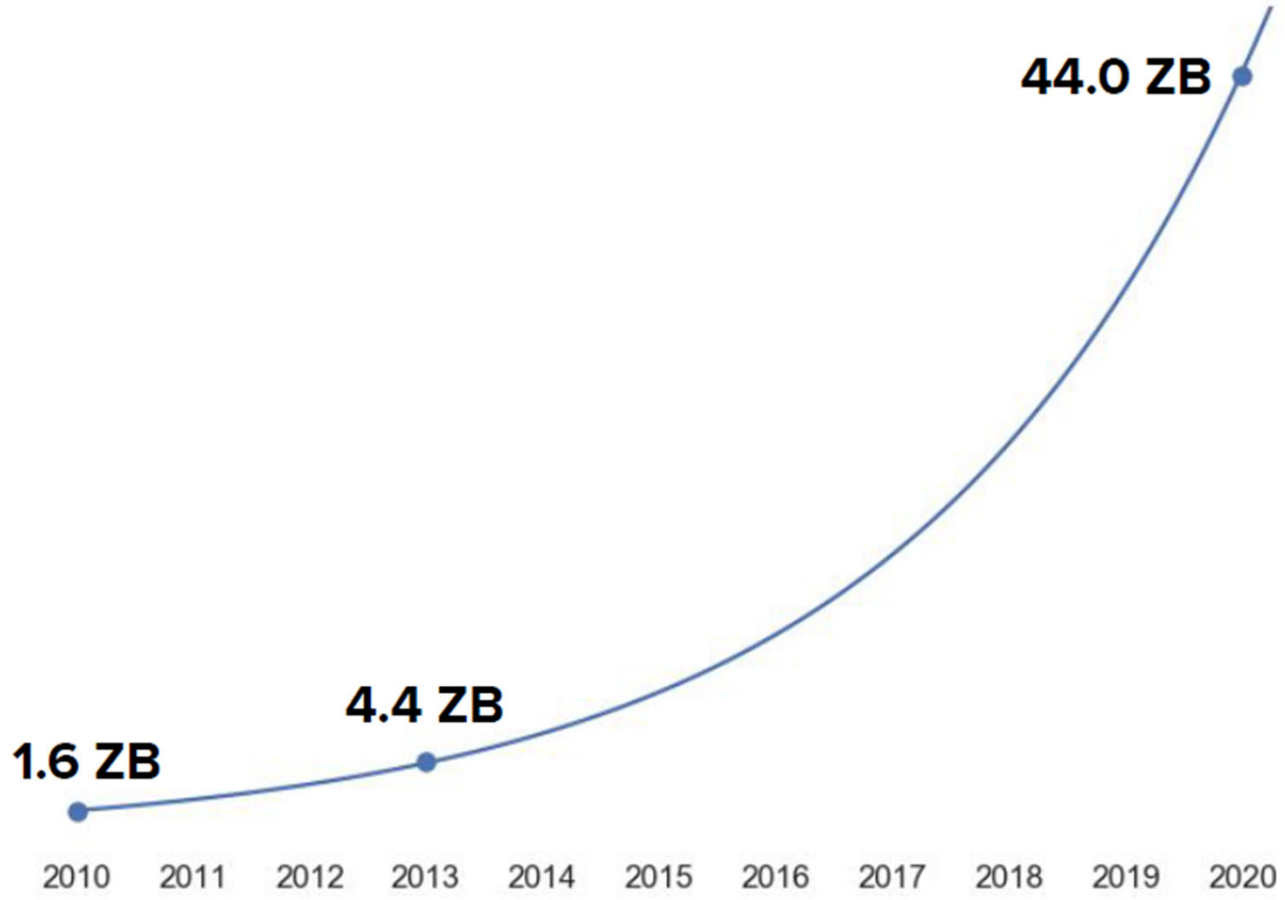
- DS-UA 111
  - Data has many properties including
    - Volume
    - Velocity
    - Variety
    - Veracity?

- CSCI-UA 2/3/101
  - Programming will be a tool to obtain information from data
  - Python is one of many tools for data science.
  - We will work backwards from problems to learn about the relevant tools

Exercise


Information storage
Billions of gigabytes
300
200
100
0
Digital
Analog
1986
1993
2000
2007
Year
Computing power
Billions of instructions per second
7500
5000
2500
0
1986
1993
2000
2007
Year

Exercise


44.0 ZB
4.4 ZB
1.6 ZB
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020

What characterizes data?

Inside the Fight to Save Alaska's 20 Native Languages from Dying Out

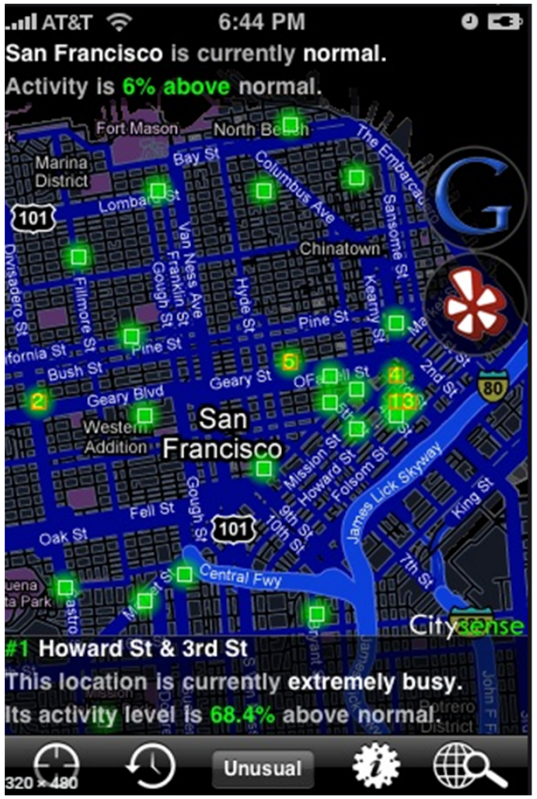
Alaskans are racing to collect their elders' knowledge of 20 native languages and design a pedagogy that breaches the generational divide.

By Agnes Walton

Volume

"[Our] corpus contains over 500 billion words, in English (361 billion), French (45 billion), Spanish (45 billion), German (37 billion), Chinese (13 billion), Russian (35 billion), and Hebrew (2 billion). The oldest works were published in the 1500s. The early decades are represented by only a few books per year, comprising several hundred thousand words. By 1800, the corpus grows to 98 million words per year; by 1900, 1.8 billion; and by 2000, 11 billion. The corpus cannot be read by a human. If you tried to read only English-language entries from the year 2000 alone, at the reasonable pace of 200 words/min, without interruptions for food or sleep, it would take 80 years. The sequence of letters is 1000 times longer than the human genome: If you wrote it out in a straight line, it would reach to the Moon and back 10 times over."

What characterizes data?



Volume

WIRED

NYC Now Knows More Than Ever About Your Uber and Lyft Trips

In 2007, New York City's Taxi and Limousine Commission, in a belated ... because along with those readers came GPS trackers that became a ... The ride-hail companies, though, remain wary of such data operations.

Jan 31, 2019

What characterizes data?

Velocity

NYU

Memorandum

Date: January 24, 2020

To: THE NYU COMMUNITY

From: Carlo Ciotoli, MD, Associate Vice President for Student Health and Executive Director of the Student Health Center

Re: The Emergence of the Novel Coronavirus

An AI Epidemiologist Sent the First Warnings of the Wuhan Virus

WIRED · 2 days ago

What characterizes data?

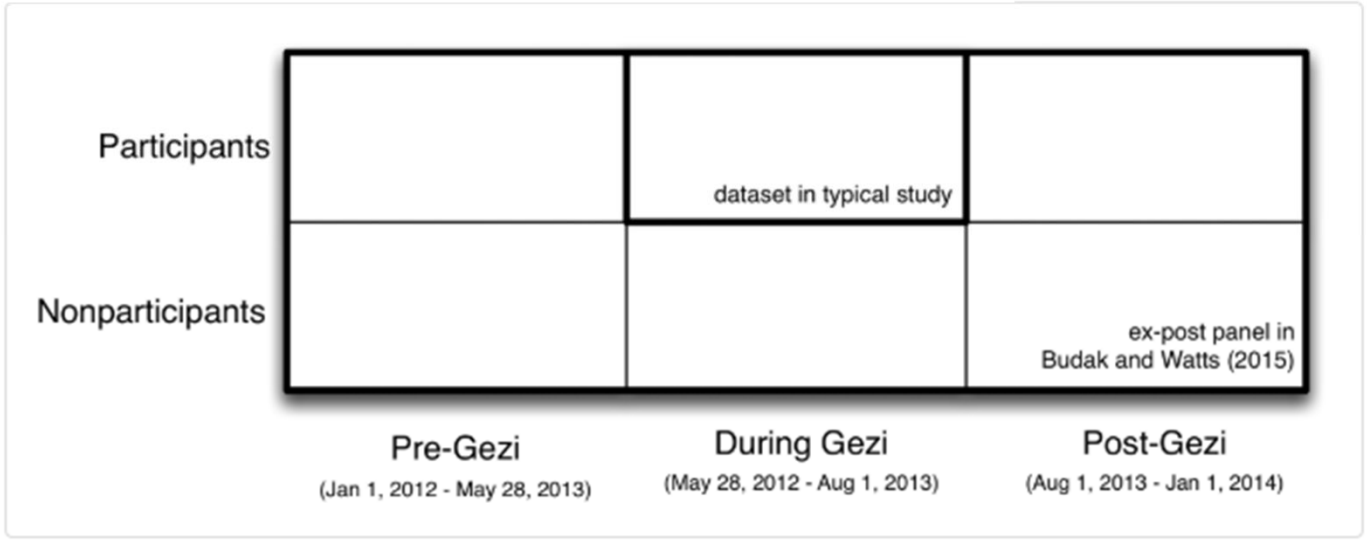
Reuters UK

Turkey escalates crackdown on dissent six years after Gezi protests

Turkey escalates crackdown on dissent six years after Gezi protests ... were inspired by the worldwide “Occupy” protests and Arab uprisings ...

Mar 18, 2019

Velocity



What characterizes data?

Not Reactive

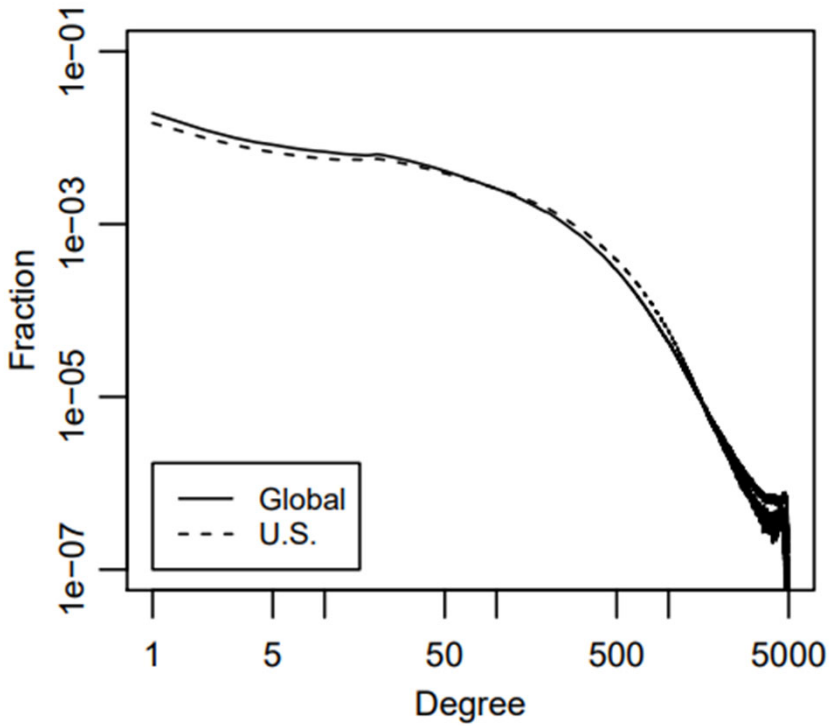
The cost of racial animus on a black candidate: Evidence using Google search data ☆

Seth Stephens-Davidowitz ✉

Highlights

- Google search data is used as a new measure of racial animus in the United States.
- In places where racial animus is highest, Obama did worse than comparable Democratic candidates.
- Racial animus cost Obama about 4 percentage points, giving his opponent the equivalent of a home state advantage.
- Analysis with Google searches suggest racism cost Obama substantially more votes than survey-based analysis.

What characterizes data?



Not Reactive

for a small anomaly near 20 friends. This kink is due to forces within the Facebook product to encourage low friend count individuals in particular to gain more friends until they reach 20 friends. The distribution shows a clear cutoff at 5000 friends, a limit imposed by Facebook on the number of friends at the time

Questions

- Questions on Piazza?
- Question for You!

  Should students have access to the class roster?