Computational Sociology

Introduction

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Plan

- Introductions
- A brief introduction to computational sociology
- Course outline
- R, Github, Slack
- Other resources

Introductions

- University, program and year
- What are your main research interests?
- Any aspects of this course you are particularly excited about?
- Did you pick up any new hobbies during the pandemic?

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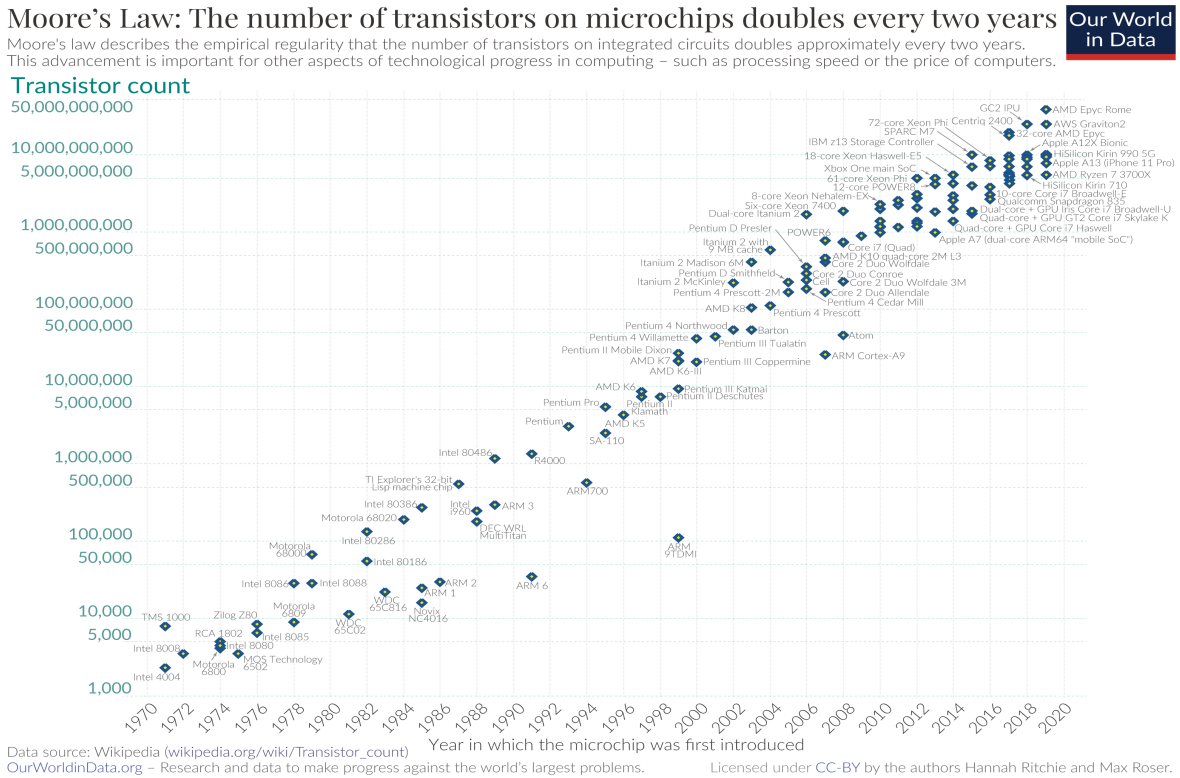

https://en.wikipedia.org/wiki/Moore%27s_law#/media/File:Moore's_Law_Transistor_Count_1970-2020.png

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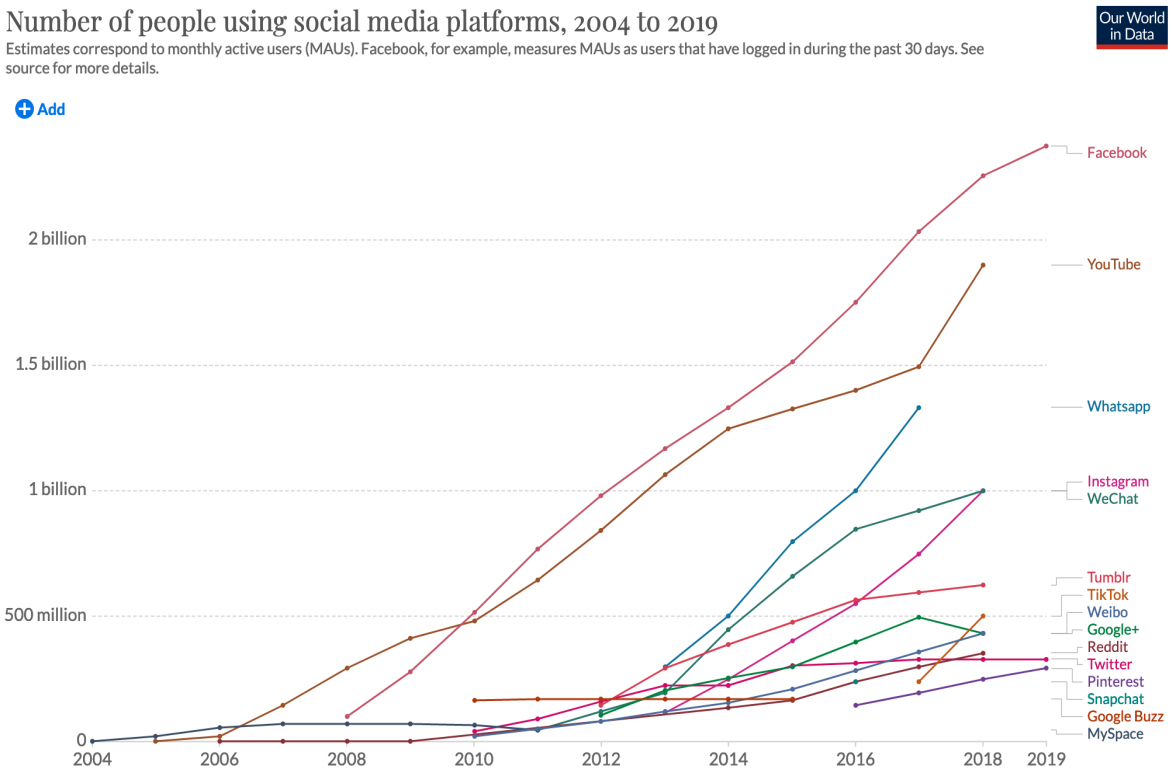

https://ourworldindata.org/grapher/users-by-social-media-platform

Introduction to Computational Sociology

Computational Social Science

The capacity to collect and analyze massive amounts of data has unambiguously transformed such fields as biology and physics. The emergence of such a data-driven "computational social science" has been much slower, largely spearheaded by a few intrepid computer scientists, physicists, and social scientists. If one were to look at the leading disciplinary journals in economics, sociology, and political science, there would be minimal evidence of an emerging computational social science engaged in quantitative modeling of these new kinds of digital traces. However, computational social science is occurring, and on a large scale, in places like Google, Yahoo, and the National Security Agency. Computational social science could easily become the almost exclusive domain of private companies and government agencies. Alternatively, there might emerge a "Dead Sea Scrolls" model, with a privileged set of academic researchers sitting on private data from which they produce papers that cannot be critiqued or replicated. Neither scenario will serve the long-term public interest in the accumulation, verification, and dissemination of knowledge.

Lazer et al. 2009 make the case for computational social science (CSS)

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Digital traces and big data

> *[J]ust as the invention of the telescope revolutionized the study of the heavens, so too by rendering the unmeasurable measurable, the technological revolution in mobile, Web, and Internet communications has the potential to revolutionize our understanding of ourselves and how we interact . . . . [T]hree hundred years after Alexander Pope argued that the proper study of mankind should lie not in the heavens but in ourselves, we have finally found our telescope. Let the revolution begin.*
>
> —Duncan Watts (2011, p. 266)

Quoted in Golder and Macy 2014.

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Readymade data (Salganik 2017)

Readymade

Custommade

https://www.bitbybitbook.com/figures/chapter1/bitbybit1-2_readymade-custommade.png

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Multi-modal data and cultural sociology

- Bail (2014) writes that "[S]ocial scientists—and cultural sociologists in particular—have largely ignored the promise of so-called "big data." Instead, cultural sociologists have left this wellspring of information about the arguments, worldviews, or values of hundreds of millions of people from Internet sites and other digitized texts to computer scientists who possess the technological expertise to extract and manage such data but lack the theoretical direction to interpret their meaning."

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The emergence of a field

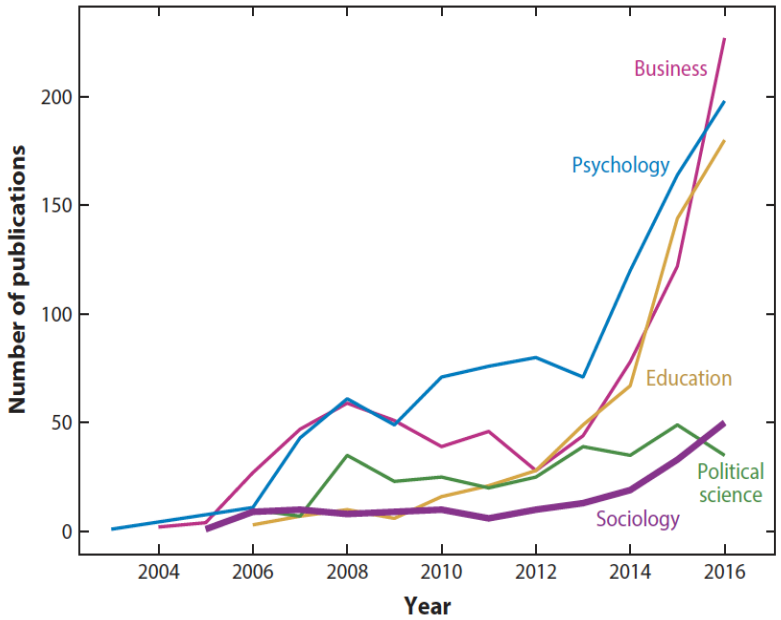

Figure 1

Number of computational social science publications by year—2003–2016—across four scholarly disciplines.

Edelmann et al. 2020

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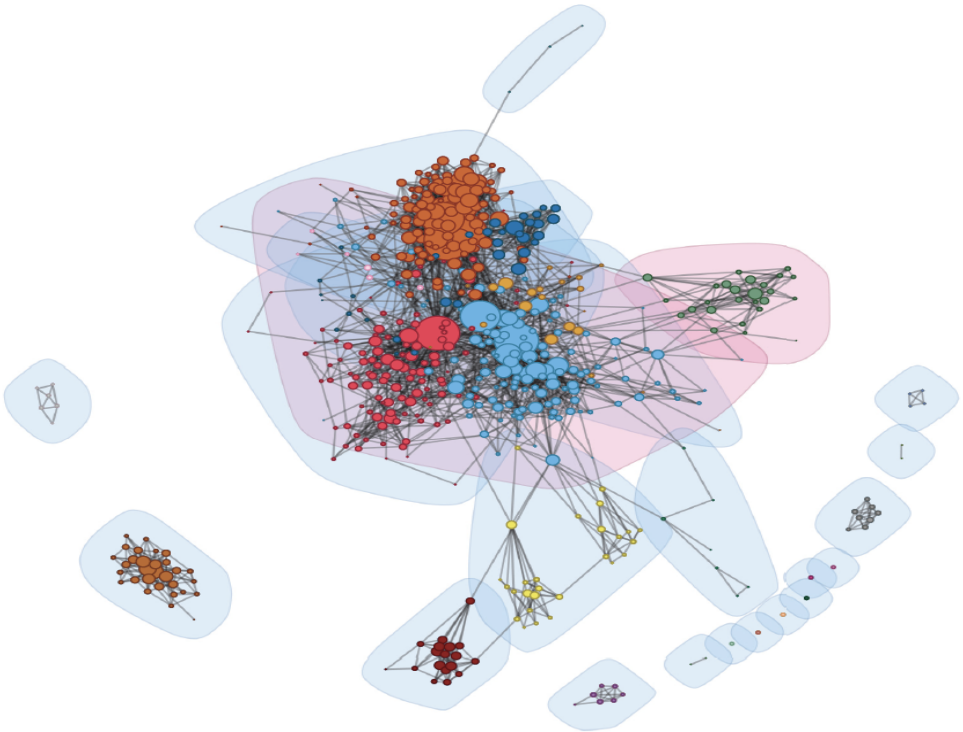
The emergence of a field



Edelmann et al. 2020

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Some attempts at a definition

1. Use of non-numeric and multimodal data (image, text, video)
2. New digital modes of data collection (web-scraping, APIs, online experiments)
3. Application of computational methods developed by computer scientists (topic modeling, word embeddings, deep learning)

Course outline

Goals

- By the end of this course you should be able to
  - Understand the field of computational sociology and computational social science more broadly
  - Code using R at an intermediate level
  - Understand and implement various computational methodologies for data collection and analysis
  - Apply computational methods in your own research
  - Think critically about the use of new data sources and methods

Course outline

Structure

1. Programming in R (Weeks 1-3)
2. Data collection (4-6)
3. Natural language processing (7-9, 11)
4. Machine learning (10-13)
5. Agent-based modeling (14)

Course outline

Topics NOT covered

- Social network analysis
- Bayesian statistics
- Remote-sensing and spatial methods

Course outline

Assessment

- Homework assignments (50%)
  - Programming fundamentals
  - Data collection and storage
  - Natural language processing
  - Machine learning
  - Agent-based modeling

Course outline

Assessment

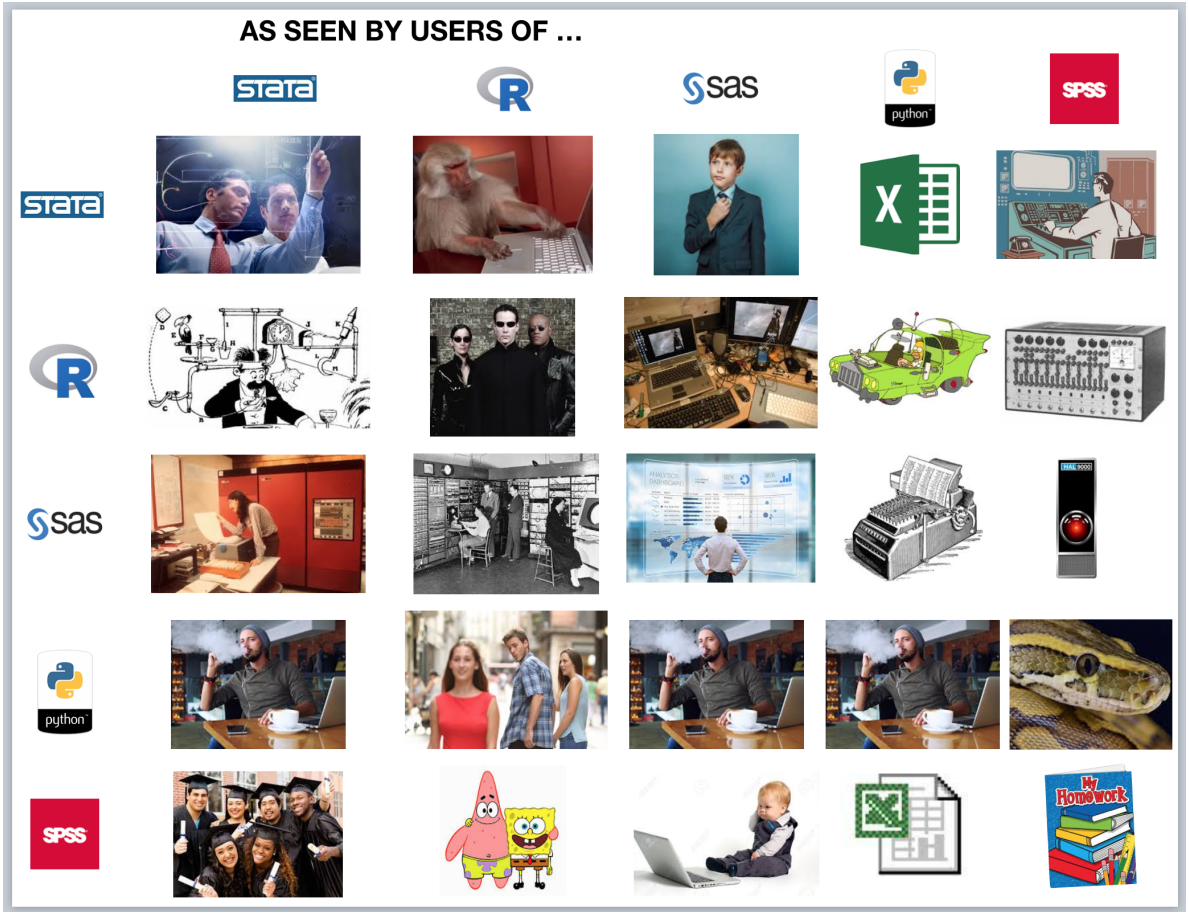
- Final paper (50%)
  - Phase 0: Develop project ideas
  - Phase 1: Submit paper proposal (W6)
  - Phase 2: Data collection due (W10)
  - Phase 3: Paper due (Exam period, date TBA)

Course outline

Policies

- Read the syllabus!
  - Diversity and inclusion
  - Academic integrity
  - Accommodations
  - COVID-19
- A note on incompletes:
  - **Please avoid taking an incomplete for this class. It is a bad outcome for everyone involved.**

Why R?



https://kieranhealy.org/blog/archives/2019/02/07/statswars/

Why R?

- Free and open-source
- A statistical programming language
  - Many cutting-edge approaches now implemented in R before Stata
  - Rutgers Sociology will transition to R for the grad stats sequence
- Alongside Python, it is one of the main programming languages used by data scientists
- A very active developer community
- RStudio

RStudio

Overview

- RStudio is an Integrated Development Environment for programming in R
  - Run code in the console or in scripts
  - Easy to view data, objects in memory, plots
  - Easy to create output such as papers or slides
  - Terminal interface
  - Integrations including Github and Python

RMarkdown

Overview

- RMarkdown is an interactive coding environment
  - RMarkdown documents can combine text, LaTeX code, R code, and any output.
  - Write in Markdown or Visual Editor
  - These slides are rendered using RMarkdown
  - You will be using RMarkdown for your homework assignments and hopefully your papers

Slack

Why Slack?

- Quick and easy communicate
  - Reduces need to email
  - Shared problem solving
- Code formatting
  - Use “““ to start a code snippet (Slack should auto-complete)
- Emojis!

Other resources

- StackOverflow
  - An online community for coding questions
    - Search for error messages or snippets. In most cases you should be able to find answers to your issues.
    - Sometimes it can take a while to figure out the appropriate query to use to find an answer.
    - If you can't find an answer, you can make your own question - but the formatting requirements are quite strict and users can be unforgiving.
  - A useful thread for posting an R question and example: https://stackoverflow.com/questions/5963269/how-to-make-a-great-r-reproducible-example

Other resources

- R4DS Community
  - An online community associated with the R4DS book, including a Slack channel https://www.rfordatasci.com/
- R Reddit
  - https://www.reddit.com/r/rstats/
- R Twitter
  - Follow #rstats
- An Introduction to R
  - Free online R textbook https://intro2r.com/index.html

Questions?