ODI Workshop

November 22, 2022

The Opportunities of Big Data in Social Science Research

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Outline

1. Overview
    1. Big data
    2. Data science methods
2. Examples
    1. Contagion and epidemics
    2. Political misinformation and polarization
    3. Poverty and inequality
3. Demo: Measuring socioeconomic differences in consumption patterns using the Facebook Marketing API
4. Problems, debates, and next steps

Big Data

- Big data
  - High volume
  - High velocity
  - High variability/complexity
- New formats
  - Networks
  - Text
  - Images
  - Audio
  - Video

Big Data

- New sources
  - Digital trace data
  - Satellite imagery
  - Digitized historical archives
  - Census/register data
  - A/B testing
  - Crowdsourced data donation
  - Browser tracking data
  - Surveillance cameras

Data Science Methods

- Collecting data
  - Web scraping
  - APIs (Application Programming Interface)
- Storing and managing data
  - Relational databases – e.g., SQL
  - Non-relational databases – document/file collections
- Processing data
  - Cleaning – e.g., lemmatization
  - Labeling – e.g., crowdsourced image tagging and tweet classification
  - Matching – e.g., named entity recognition with regular expressions

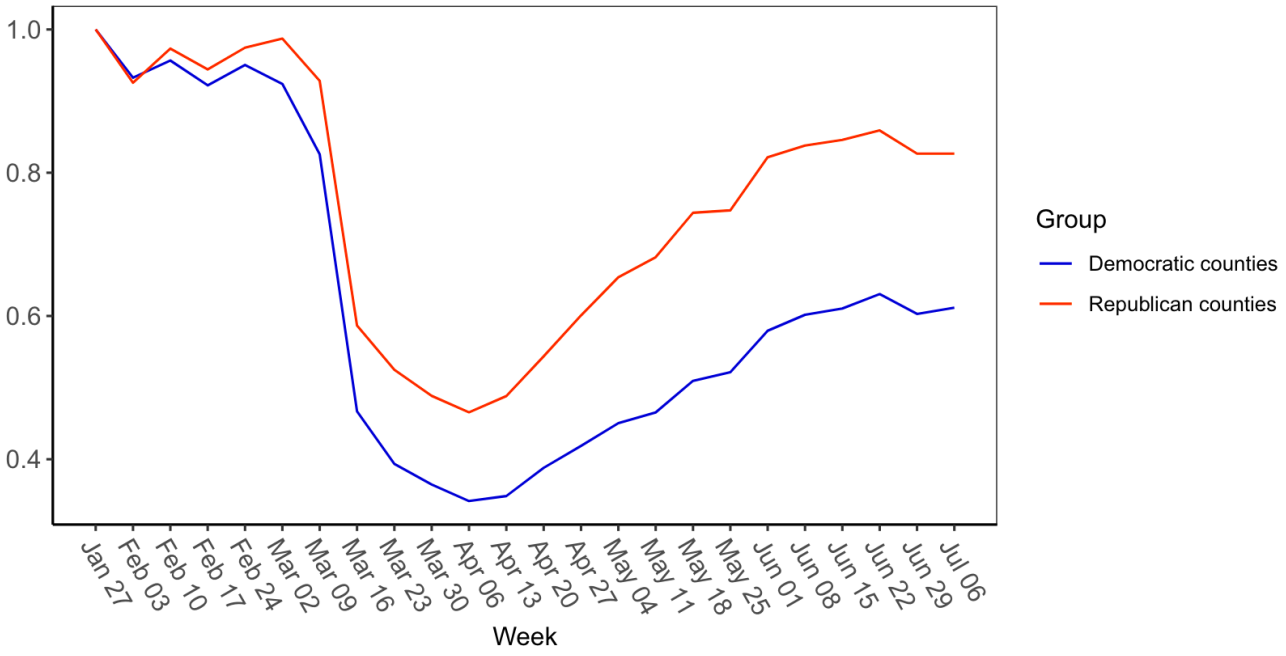
Data Science Methods

- Analyzing and visualizing data
  - **Data mining** – discovering patterns
  - **Machine learning** – making predictions
  - **Causal inference** – identifying causal relationships
  - **Natural language processing** – understanding text
  - **Network analysis** – understanding relational patterns

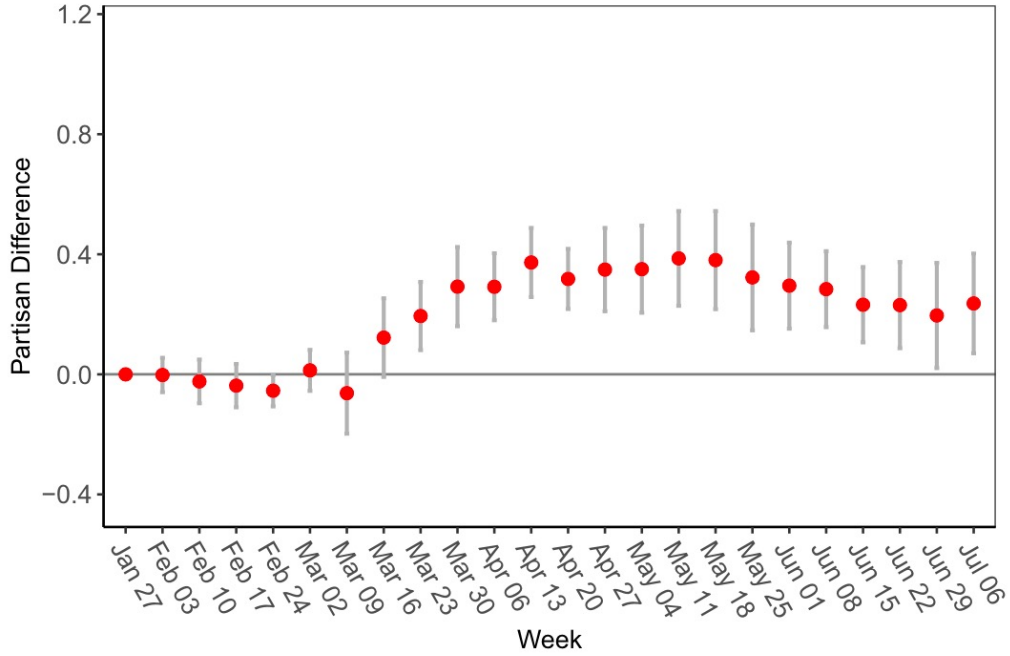
Example: Contagion and Epidemics

- Were there partisan differences in social distancing during COVID?
- Mobile location data from SAFEGRAPH

POI visits



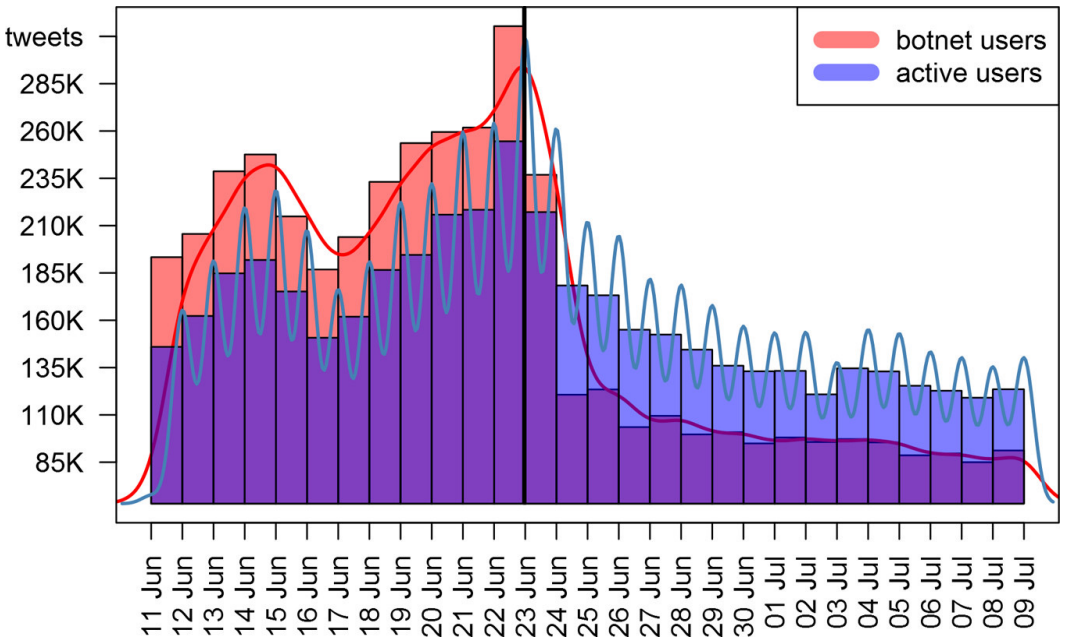
Estimated coefficient for effect of Republican vote share in county for log(POI visits)

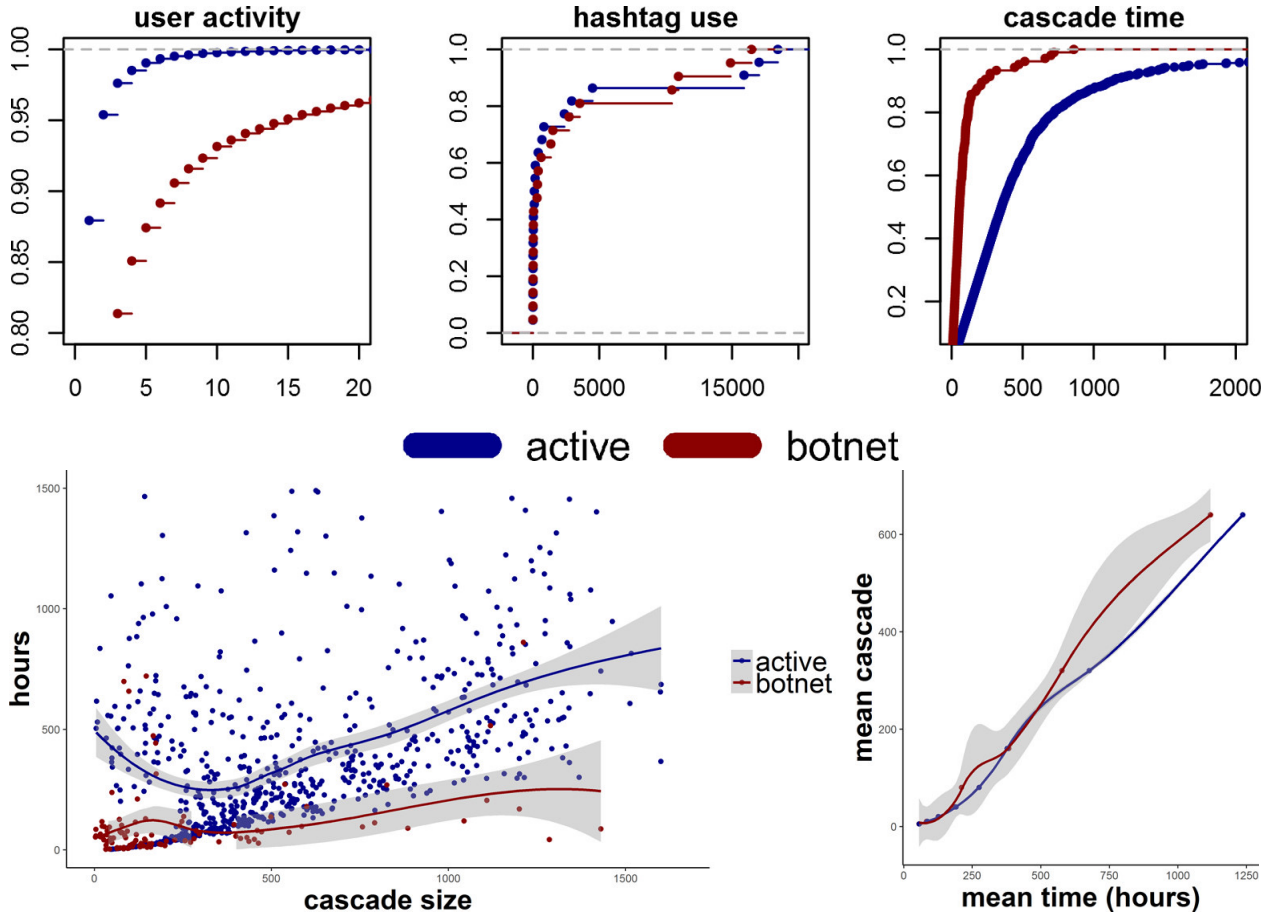


Allcott, H., Boxell, L., Conway, J., Gentzkow, M., Thaler, M., & Yang, D. (2020). Polarization and public health: Partisan differences in social distancing during the coronavirus pandemic. *Journal of Public Economics*, 191, 104254.

Example: Political Misinformation

- Can bots on Twitter influence political opinion?

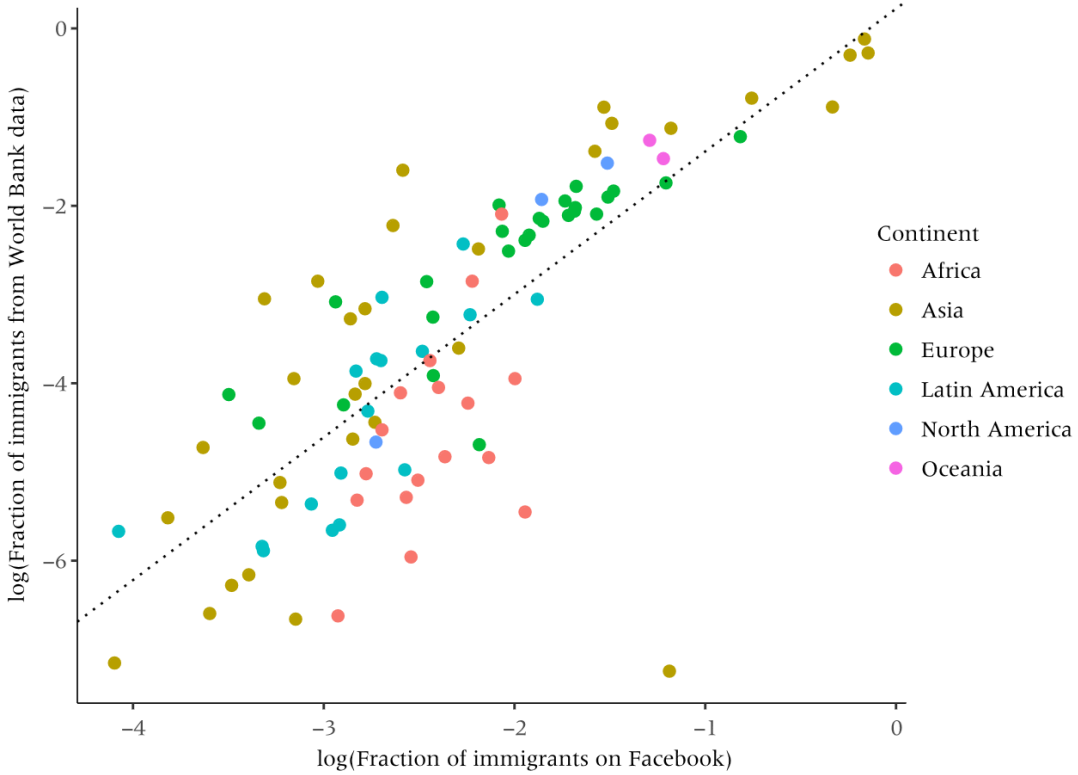


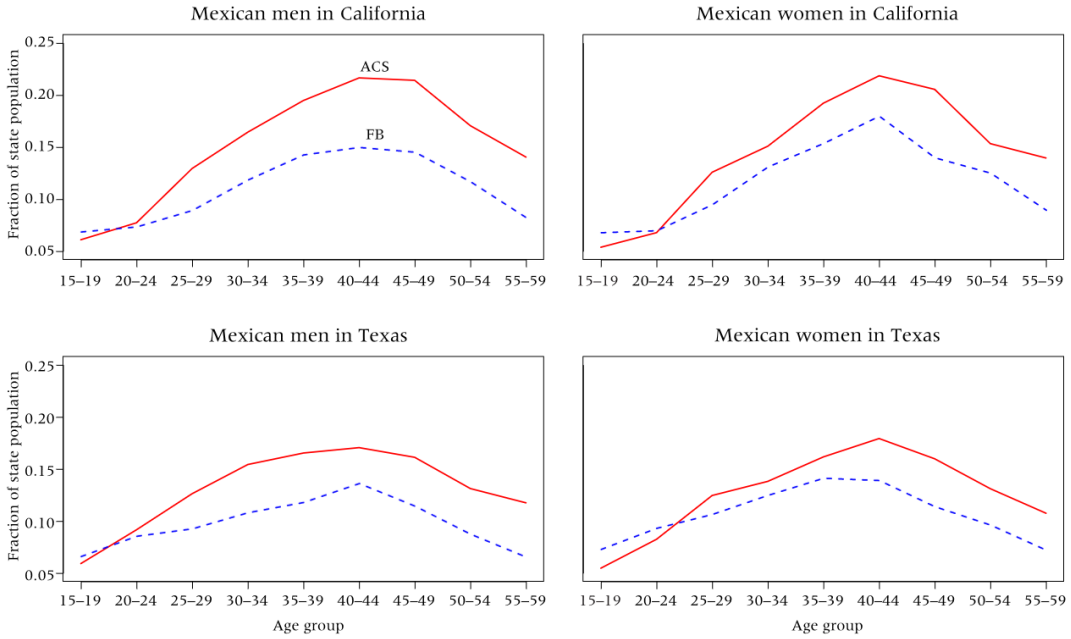


Bastos, M. T., & Mercea, D. (2019). The Brexit botnet and user-generated hyperpartisan news. *Social Science Computer Review*, 37(1), 38–54.

Example: Poverty and Inequality

- Can we use Facebook ad data to estimate stocks of migrants within and across countries?



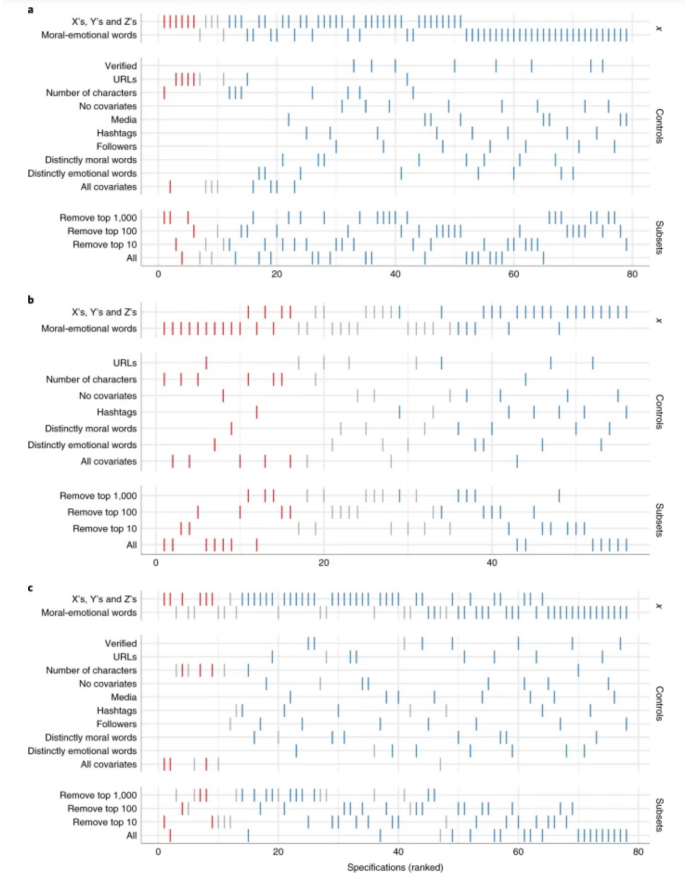


Zagheni, E., Weber, I., & Gummadi, K. (2017). Leveraging Facebook's advertising platform to monitor stocks of migrants. *Population and Development Review*, 721-734.

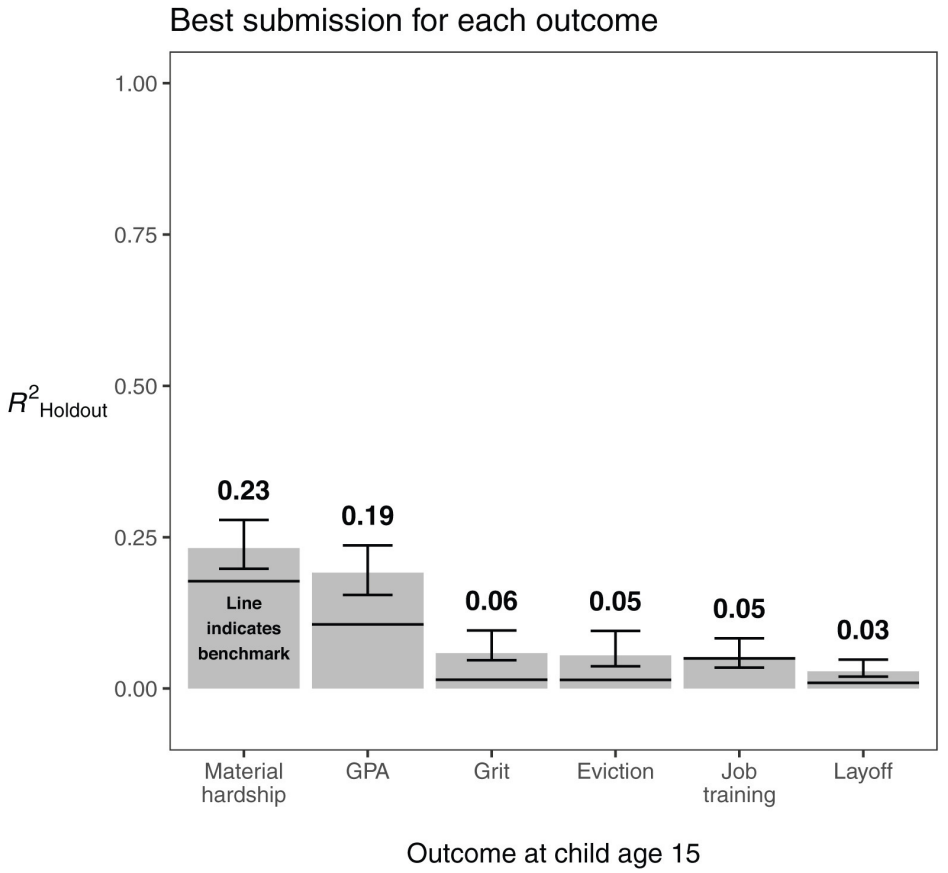
Demonstration

- View/work locally
  - Install python and VS Code on your machine
  - Go to https://github.com/social-research/big-data-workshop and download the repository
  - Open the (unzipped) folder in VS Code
- Alternatively, view/work remotely
  - Go to https://colab.research.google.com/github/social-research/big-data-workshop

Problems and Debates: Reproducibility



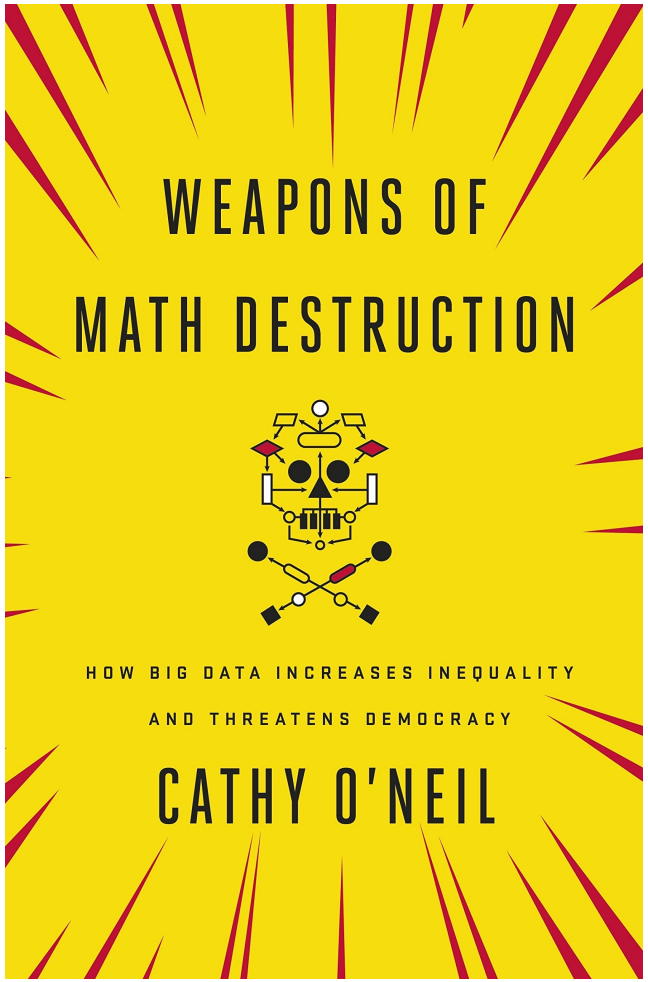
a, COVID-19 corpus. **b**, #MeToo corpus. **c**, #MuellerReport corpus. Each possible model specification (*x* axis) is represented by three vertically aligned points corresponding to the outliers removed and covariates and independent variable included in the negative binomial regression equation (*y* axis). Red indicates a significant ($P < 0.05$) negative regression coefficient, grey indicates a non-significant coefficient and blue indicates a significant positive coefficient.



Burton, J. W., Cruz, N., & Hahn, U. (2021). Reconsidering evidence of moral contagion in online social networks. *Nature Human Behaviour*, 5(12), 1629-1635.

Salganik, M. J., et al. (2020). Measuring the predictability of life outcomes with a scientific mass collaboration. *Proceedings of the National Academy of Sciences*, 117(15), 8398-8403.

Problems and Debates: Accountability



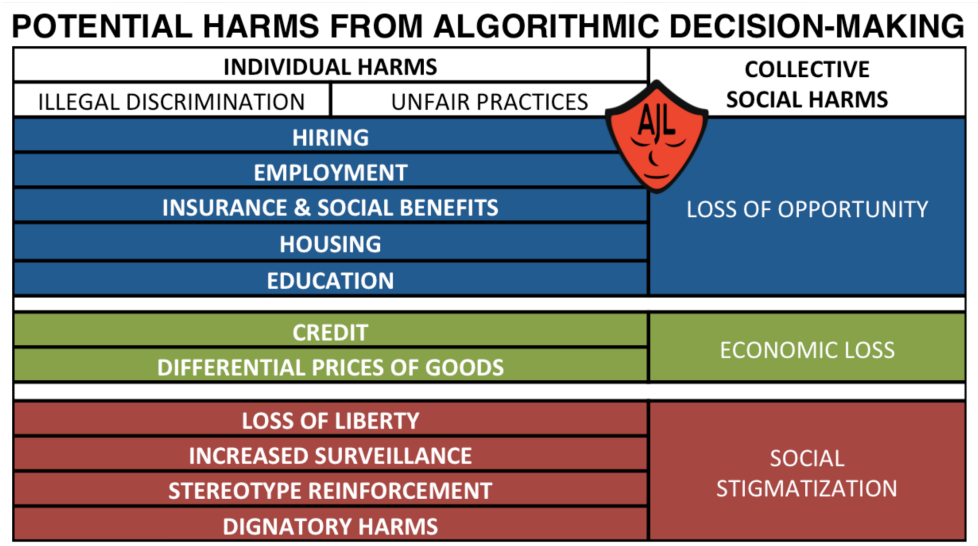
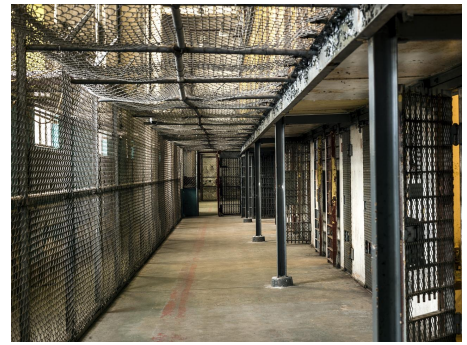
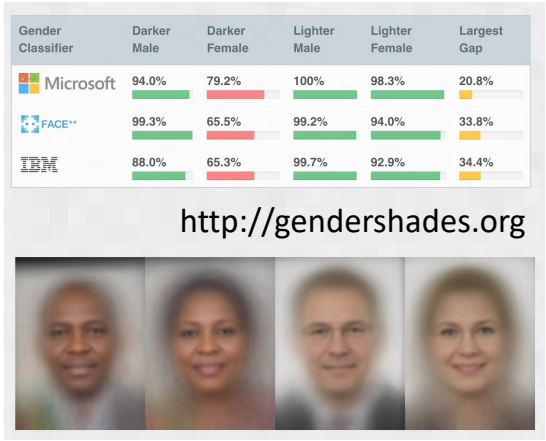


Chart Contents Courtesy of Megan Smith, Former CTO of the United States

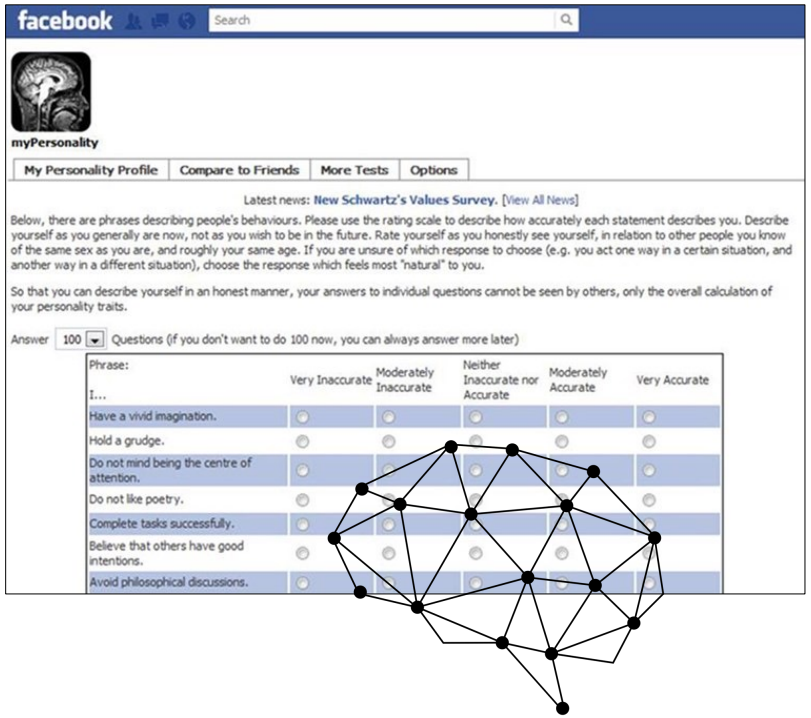




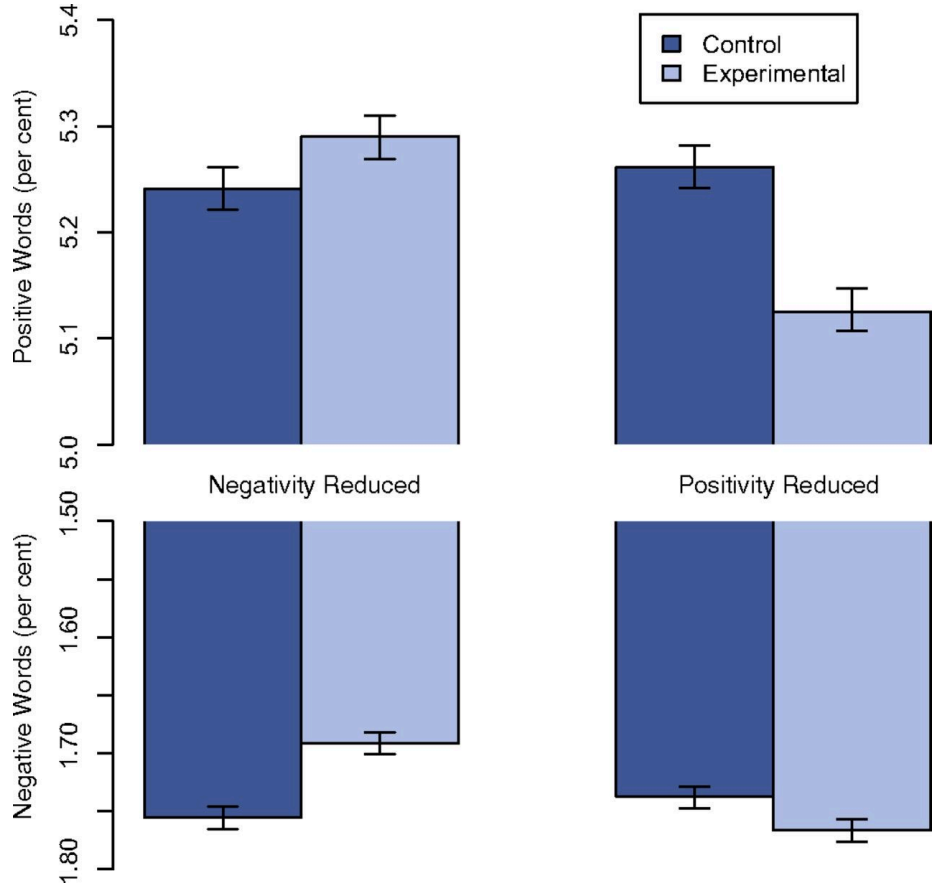
O'Neil, C. (2016). *Weapons of Math Destruction: How Big Data Increases Inequality and Threatens Democracy*. Broadway Books.

Buolamwini, J., & Gebru, T. (2018, January). Gender shades: Intersectional accuracy disparities in commercial gender classification. In *Conference on Fairness, Accountability and Transparency* (pp. 77-91). PMLR.

Problems and Debates: Research Ethics



Cambridge Analytica



Cadwalladr, C., & Graham-Harrison, E. (2018). Revealed: 50 million Facebook profiles harvested for Cambridge Analytica in major data breach. *The Guardian*, 17, 22.

Kramer, A. D., Guillory, J. E., & Hancock, J. T. (2014). Experimental evidence of massive-scale emotional contagion through social networks. *Proceedings of the National Academy of Sciences*, *111*(24), 8788-8790.

Next Steps

- **Summer course**: LSE ME314: Introduction to Data Science and Machine Learning (taught in R)
- **Online program**: LSE Data Analytics Career Accelerator
- **MSc program**: LSE MSc in Applied Social Data Science
- **Books**
  - Salganik, M. J. (2019). *Bit by Bit: Social Research in the Digital Age*. Princeton University Press.
  - Hogan, B. (2022). *From Social Science to Data Science: Key Data Collection and Analysis Skills in Python*. Sage.
- **Conference**: International Conference on Computational Social Science