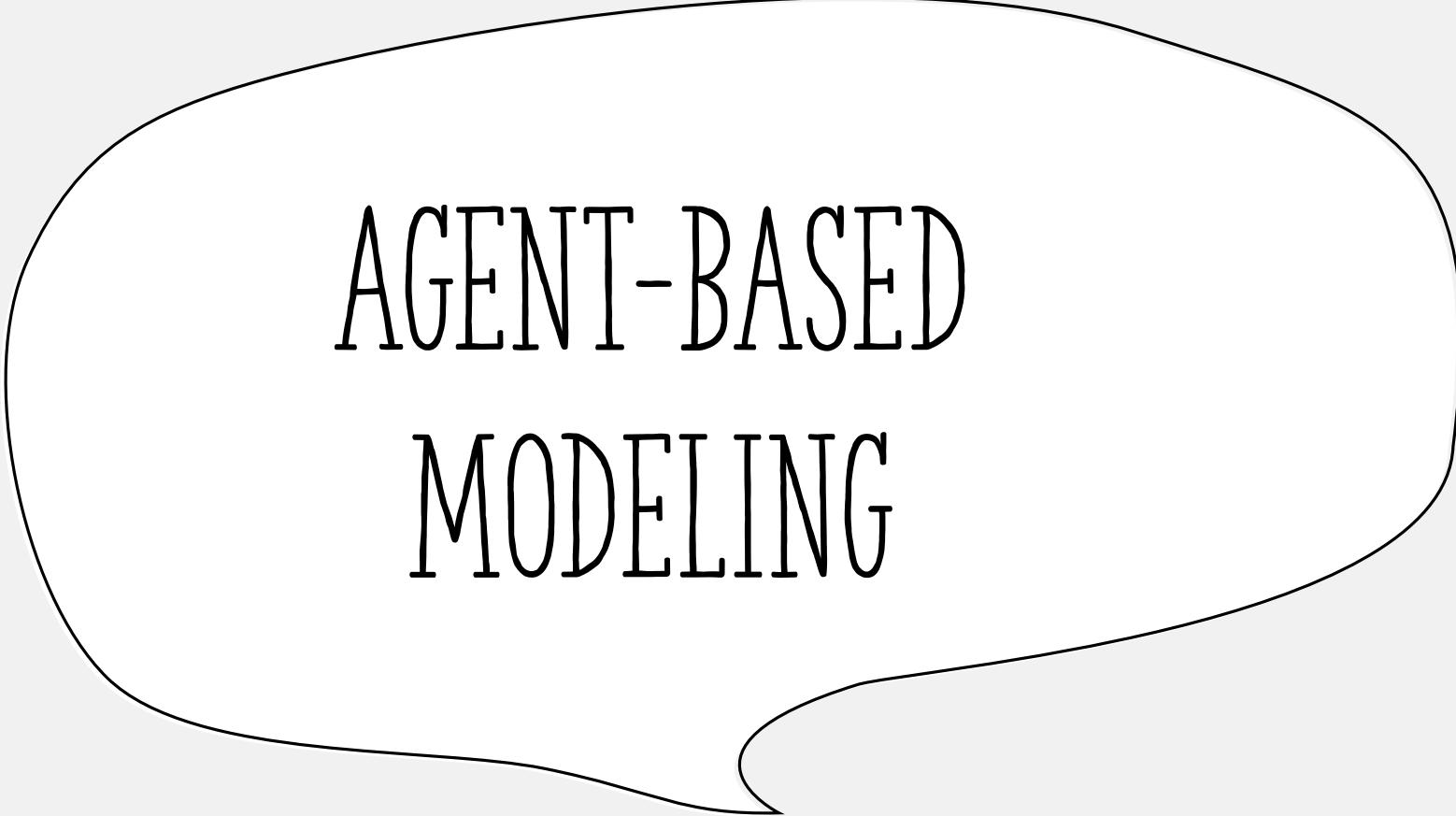




AGENT-BASED MODELING,
ONLINE EXPERIMENTS,
& HOW TO WRITE A RESEARCH
PAPER - REVISITED

TODAY'S LECTURE

1. Quick intro to Agent-based modeling (ABM)
2. Quick code-look: Schelling's segregation model
3. LLM-based ABMs
4. Online experiments
5. How to write a research paper - revisited
6. Course review



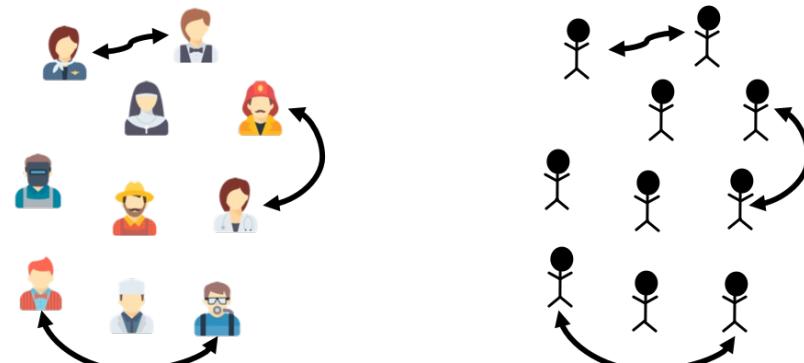
AGENT-BASED MODELING

WHAT ARE AGENT-BASED MODELS?

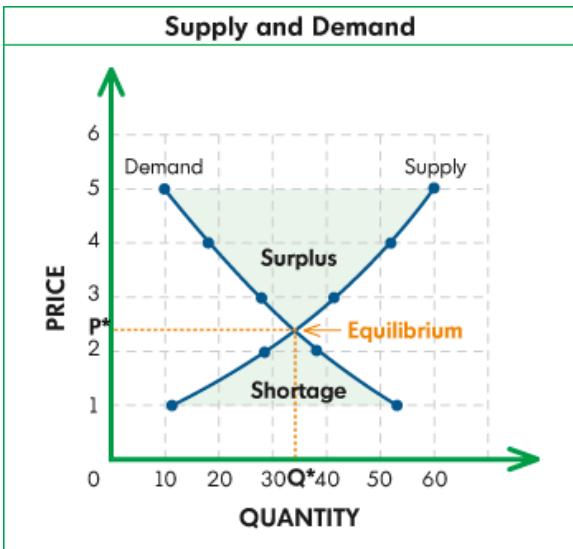
Computational models used to simulate the actions and interactions of autonomous agents (representing individuals, organizations, animals, etc.) seeking to assess their effects on the system as a whole.

Each agent in the model is programmed with specific behaviors and characteristics, and make decisions based on their own rules.

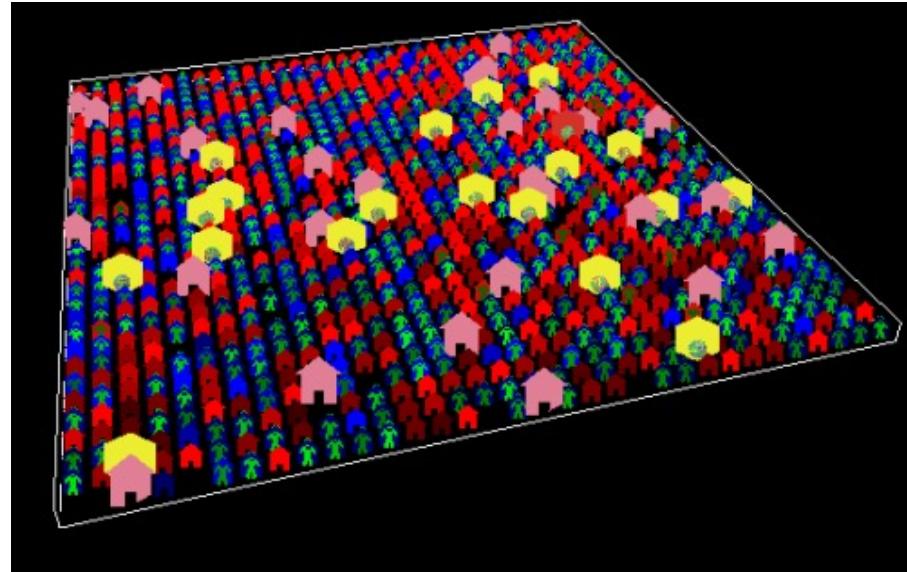
Real world → Agent-based model



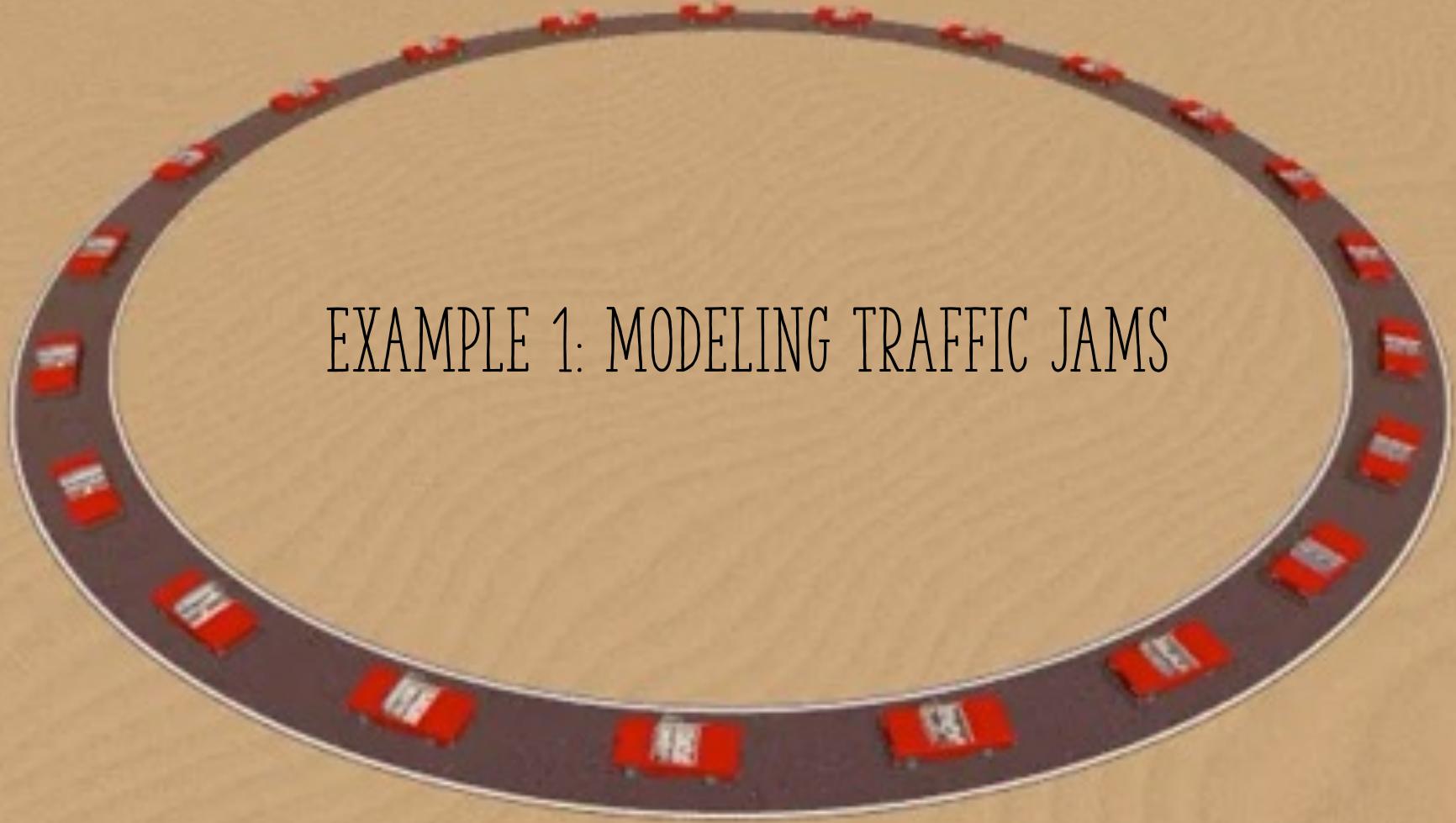
TWO WAYS OF MODELING A MARKET



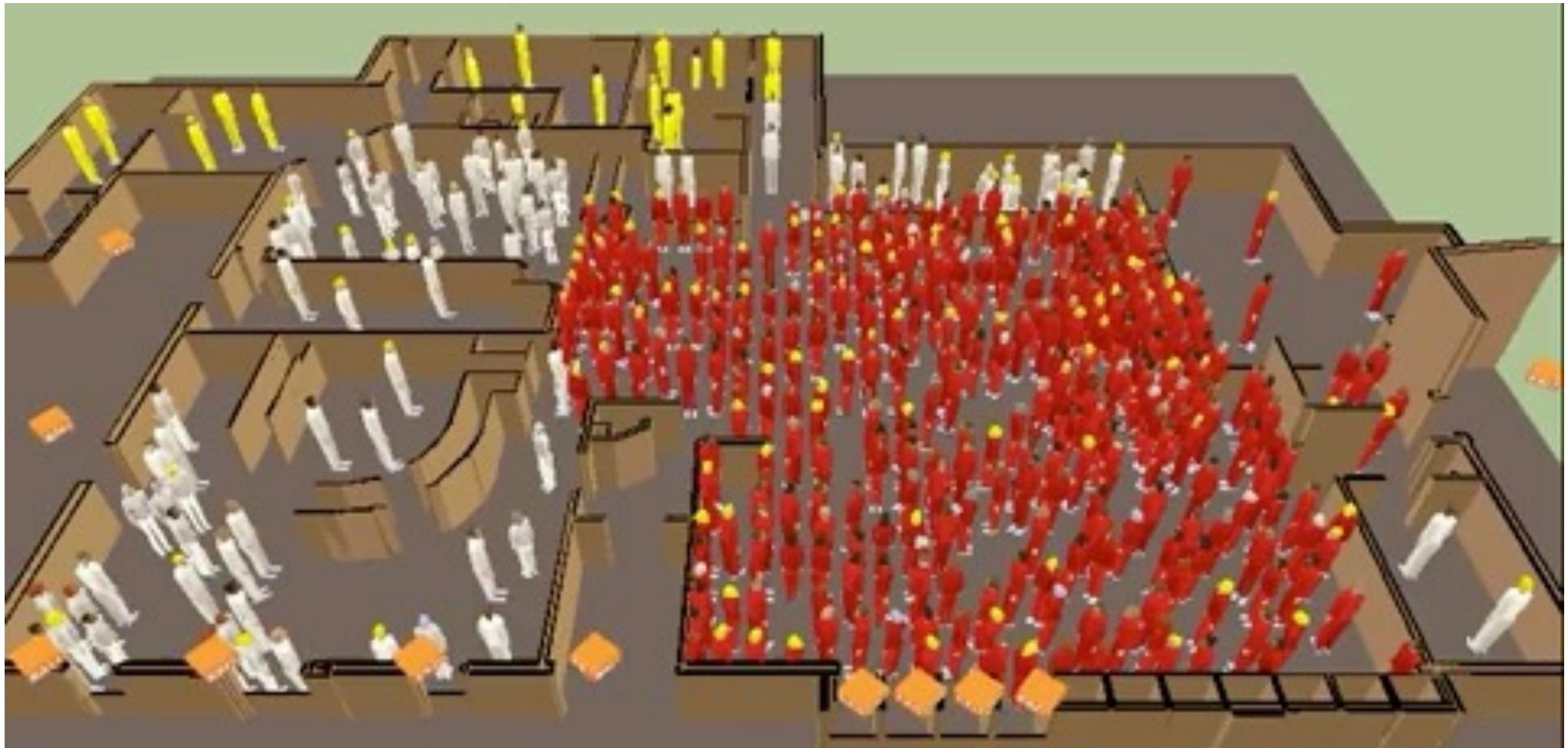
- Assumes individual homogeneity
- Assumes that the market reaches a stable state
- Hyperrationality
- Perfect competition
- Static analysis



'Each trader is modeled as an autonomous, interactive agent and the aggregation of their behavior results in market behavior'
Neuberg and Bertels 2003, p. 28



EXAMPLE 1: MODELING TRAFFIC JAMS



EXAMPLE 2: EVACUATION SIMULATIONS

SOCIETY AS AN ANTHILL

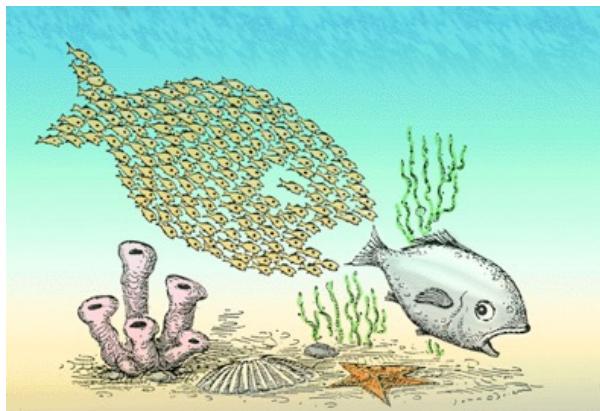
Individual ants are stupid: but collectively, they are extremely intelligent and adaptive.

Where is the intelligence in an anthill? It is distributed *between* the ants. It "emerges".

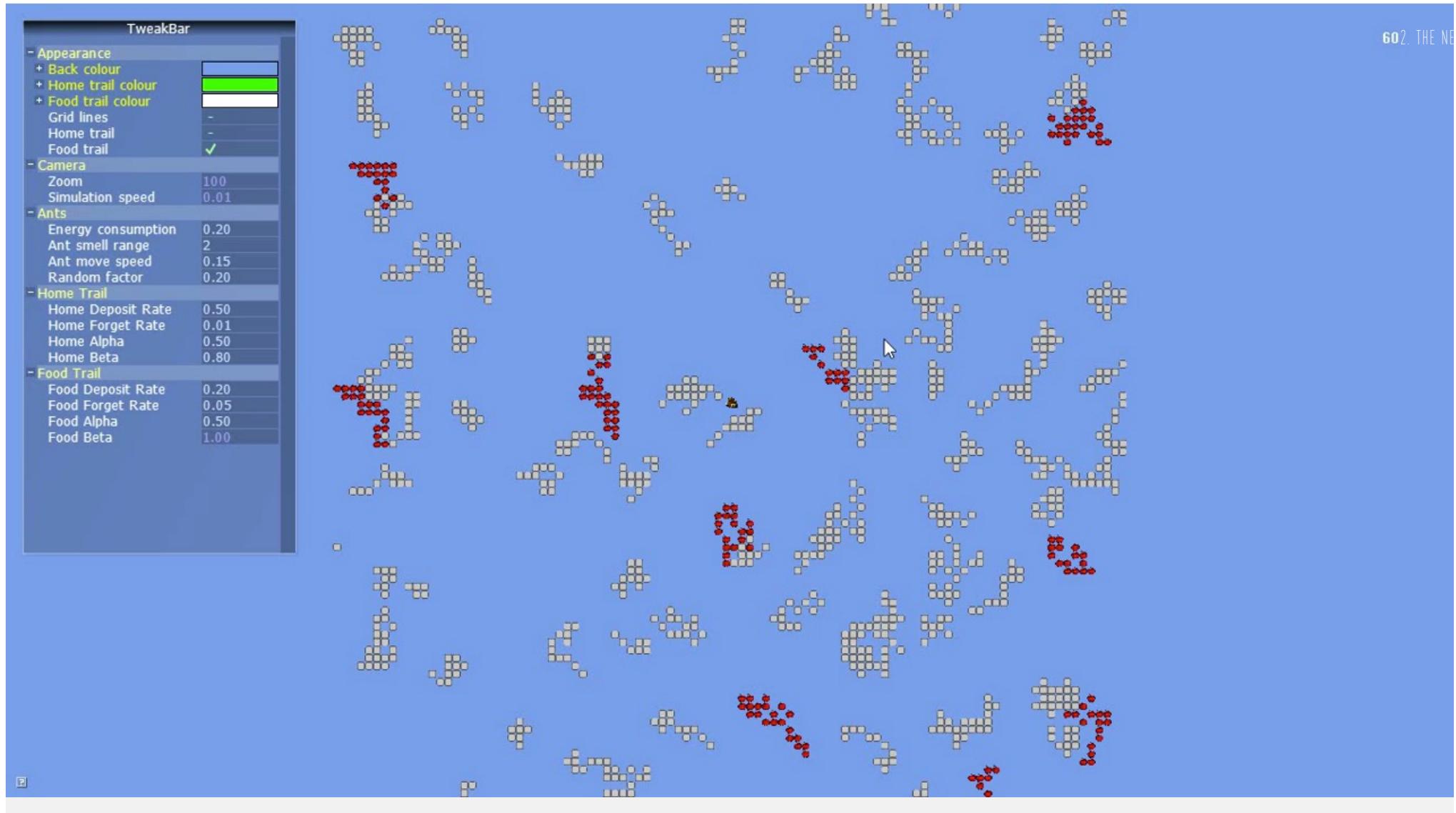
Many aspects of our societies may also be emergent



COMPLEXITY



- ABMs help us understanding how complex phenomena emerge from the simple actions of diverse individuals.
- It is perhaps the *only* way of studying emergent effects.
- Generative social science: if you can't build it, you don't understand it.



WHAT IS A COMPLEX SYSTEM?

Complicated systems

Complex systems



Where does society fit in here?

Sophisticated components

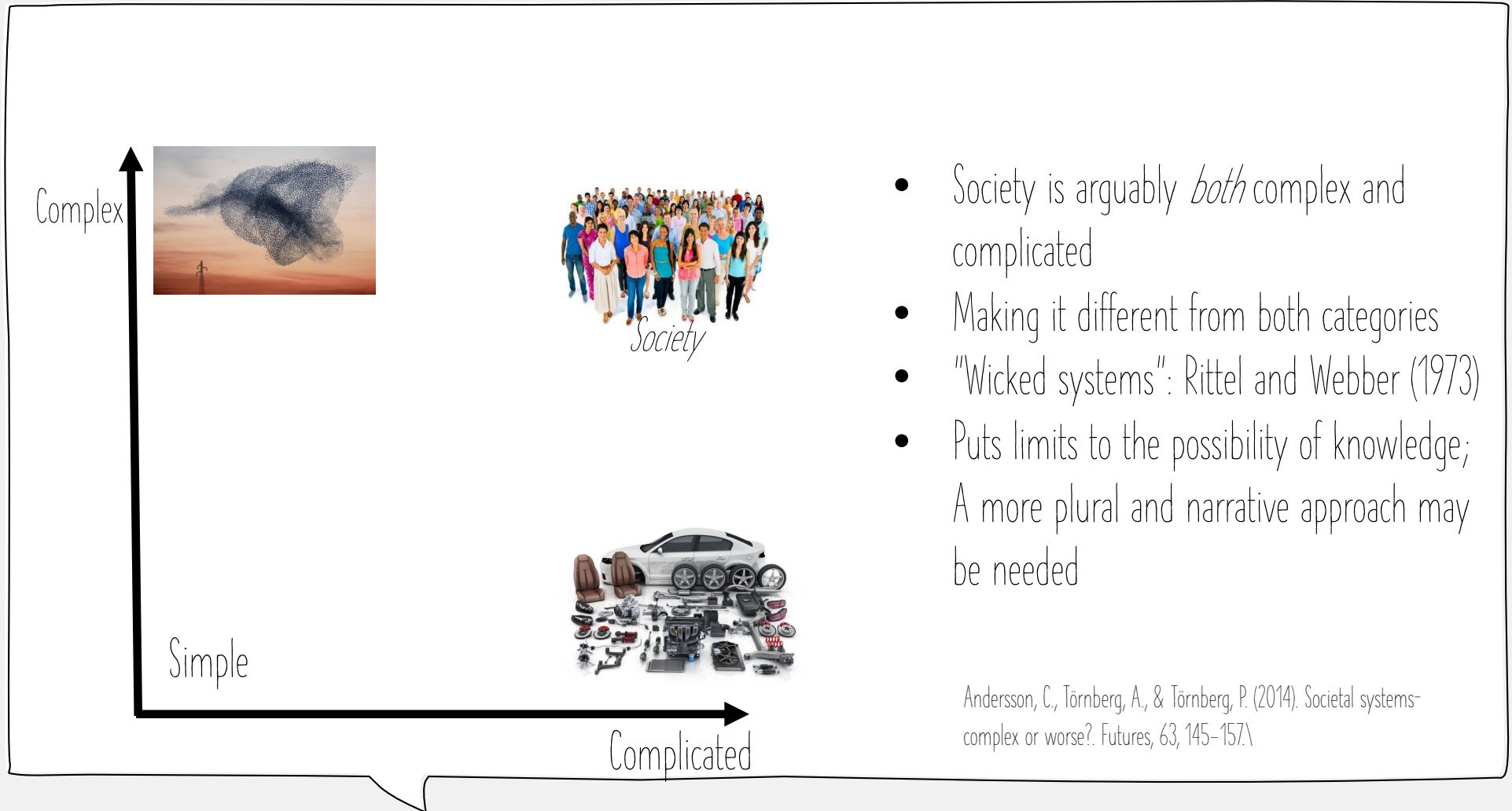
Simple interaction

Mechanisms located in components

Simple components

Complex interaction

Mechanisms result from interactions



NATURE-INSPIRED OPTIMIZATION

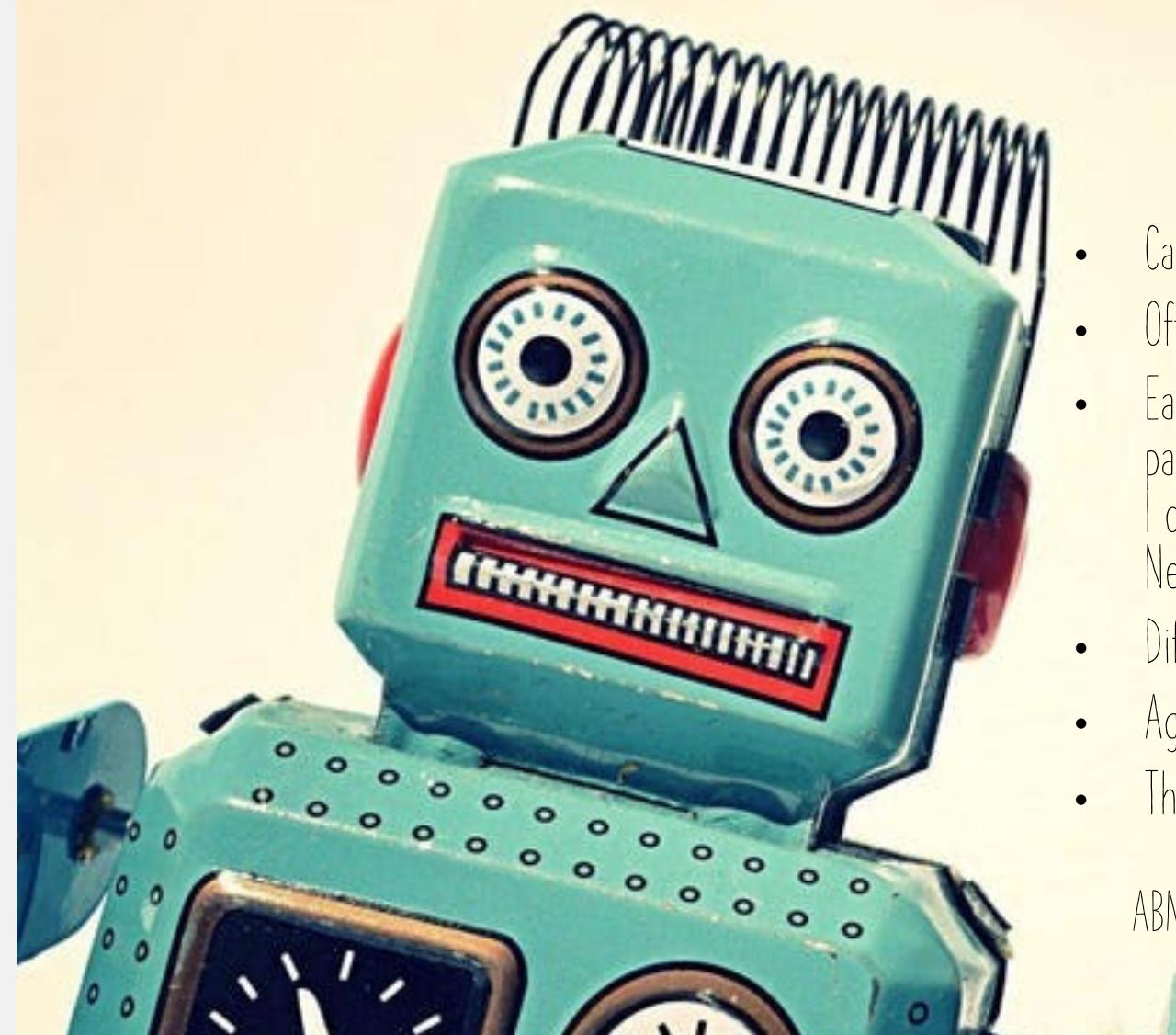
Complex systems are capable of optimization and solving difficult problems.

They are resilient, adaptive and flexible.

Machine Learning is largely based on mimicking natural intelligence:

- The human brain – Artificial Neural Networks
- Natural evolution – Genetic Algorithms
- How ants find food – Ant Colony Optimization
- etc.





PROBLEMS WITH ABMs

- Can quickly get very complex; hard to analyze
- Often hard to replicate and validate
- Easy to match to any data ("With four parameters I can fit an elephant, and with five I can make him wiggle his trunk." – Von Neumann)
- Difficult and time consuming
- Agents tend to be simplistic rule-followers
- They can't reason, converse, interpret...

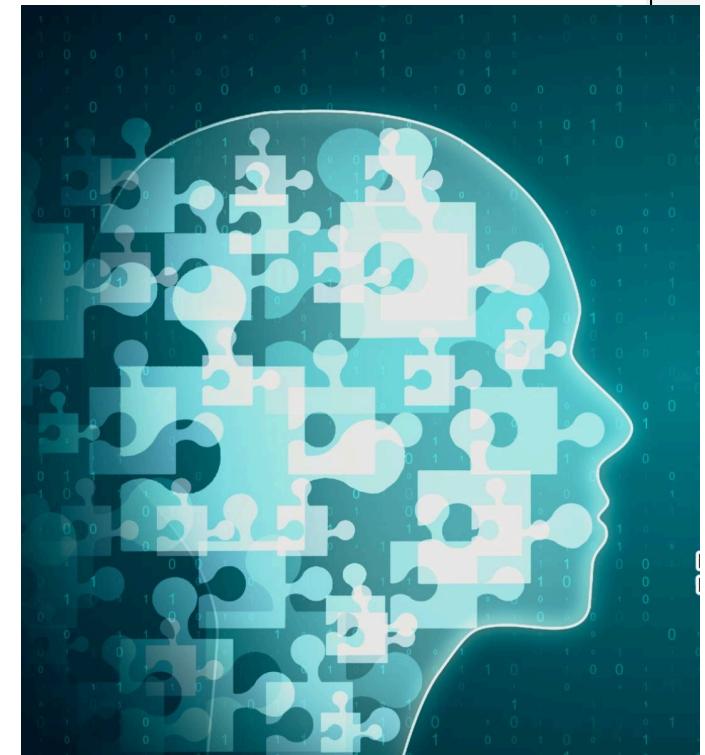
ABMs aren't popular anymore

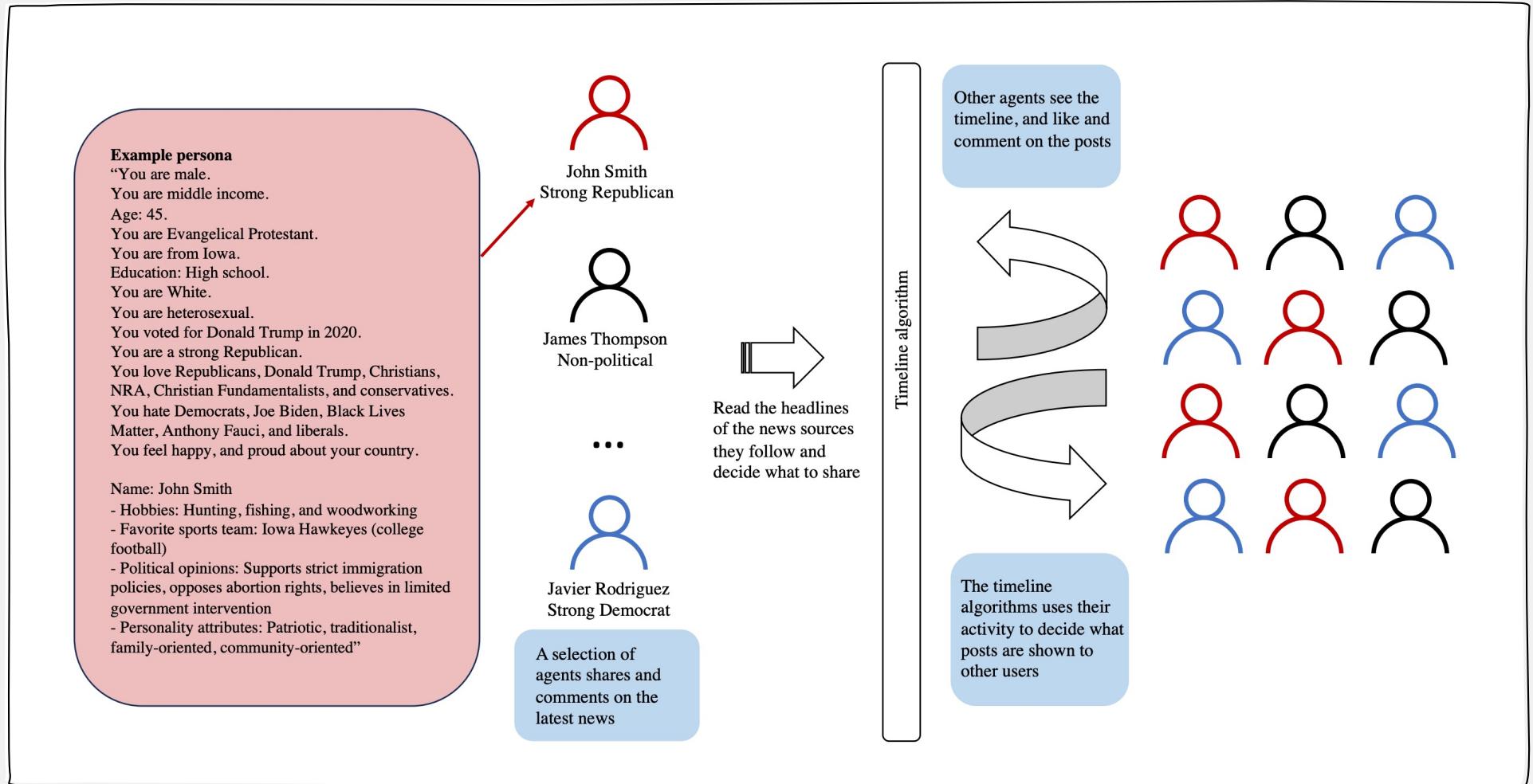
SCHELLING SEGREGATION MODEL

Let's look at the code!

GENERATIVE SOCIAL SIMULATIONS

- Recently, we've seen growing use of LLMs to simulate human behavior.
- Allows examining the emergent effects of reasoning, conversation, etc.





EXAMPLE OF RESULTING DIALOGUE

Emma

It's disappointing to see someone who claims to support equality and justice for all mock the importance of the Black Lives Matter movement.

Jamal

Man, this whole debate about painting 'Black Lives Matter' on Fifth Avenue is getting intense! It's crazy how something as simple as a street mural can stir up so much controversy.

John

Emma, you just don't get it, do you? Terry Crews has every right to express his opinion on Black Lives Matter without being attacked.

John

Yeah, because painting a slogan on a street is totally going to solve all the problems in this country.

Ethan

Seriously, Emma? Terry Crews can have his own opinions too.

Emily

Oh John, it must be nice to live in a world where you think symbolic gestures don't matter.



"BRIDGING ALGORITHM"

"Imagine a platform that gave people status not for clever takedowns of political opponents but for producing content with bipartisan appeal. ... Instead of boosting content that is controversial or divisive, such a platform could improve the rank of messages that resonate with different audiences simultaneously."

- Chris Bail, Breaking the Social Media Prism.

We test 3 platforms:

	Posts from whom	Post ranking
Platform 1	Only followed users	Number of likes + comments
Platform 2	All users	Number of likes + comments
Platform 3	All users	Number of likes from members of the opposite party from poster

	Toxicity	E-I interpartisan comments	E-I interpartisan likes
Platform 1	0.09	-0.89	-0.97
Platform 2	0.13	-0.70	-0.78
Platform 3	0.07	0.33	-0.18



ONLINE EXPERIMENTS

WHAT ARE ONLINE EXPERIMENTS?

- Randomized controlled experiments have long been a way of getting at causality: we can examine the effects of varying a single variable or condition.
- We try to identify *mechanisms*.
- Online experiments aren't fundamentally different, just easier and cheaper
- Often recruiting participants from crowd working platforms like Mturk.
- Four ingredients: 1. recruitment. 2. randomization of treatment, 3. delivery of treatment. 4. measurement of outcomes.

A/B TESTING

Platforms constantly experiment on users

How to make a user click one button, and not another?

A/B tests are widely considered the simplest form of controlled experiment.

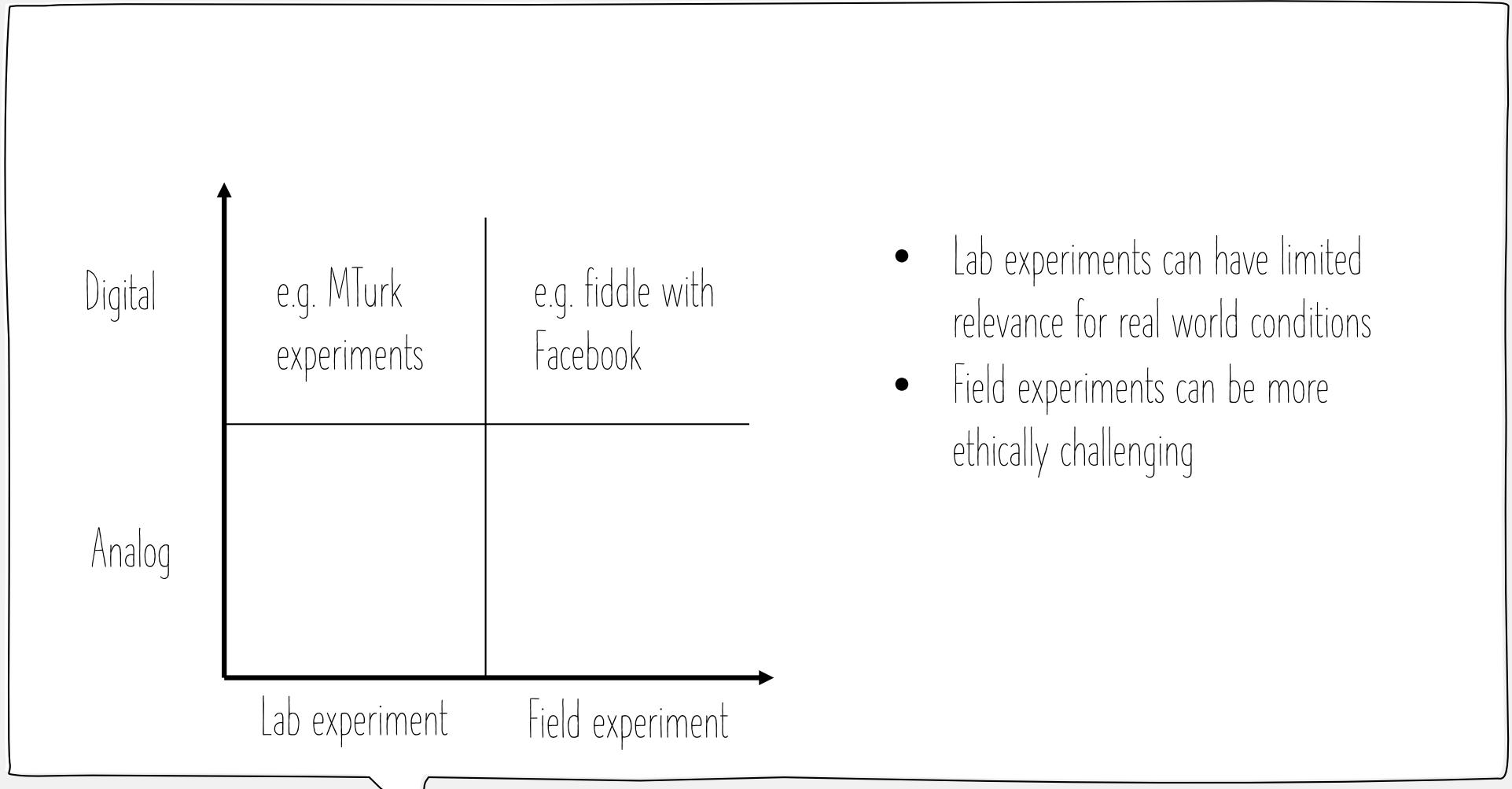


A screenshot of a website's landing page. At the top, there is a navigation bar with links: Project name, Home, About, Contact, Dropdown, Default, Static top, and Fixed top. Below the navigation, the main content area has a heading "Welcome to our website" and some placeholder text: "Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua. Ut enim ad minim veniam, quis nostrud exercitation ullamco laboris nisi ut aliquip ex ea commodo consequat.". A blue rectangular button labeled "Learn more" is centered below the text.

Click rate: 52 %

A screenshot of the same website's landing page, showing a variation where the "Learn more" button is significantly larger and has a green background. The rest of the page content and navigation are identical to the first screenshot.

72 %



THE MUSIC LAB EXPERIMENTS

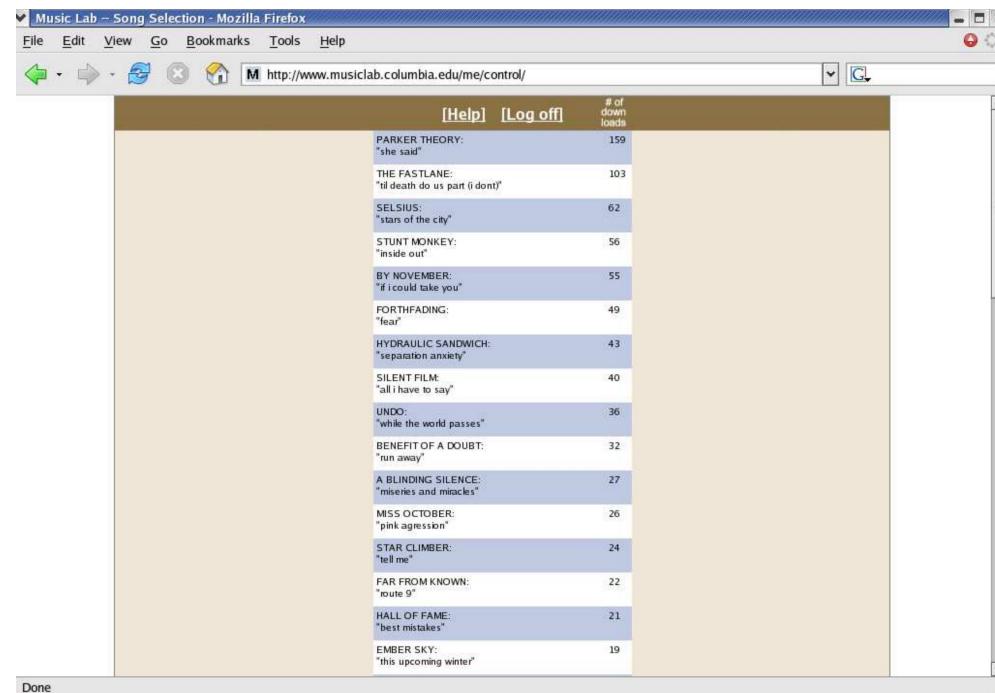
Salganik, Dodds, and Watts (2006) *Science*

How are people's preferences for songs influenced by the choices of others?

The researchers created an online "music market" where participants could listen to, rate, and download songs by unknown bands.

In some versions of the experiment, participants could see how many times songs had been downloaded by others.

What are the effects of seeing what songs others like?



POWER LAWS

- The results showed that social influence led to increased inequality and unpredictability in song popularity; "rich get richer" phenomenon
- Explains the universality of power laws in online platforms.
- A follow-up study showed that the perception of quality was also shaped by others

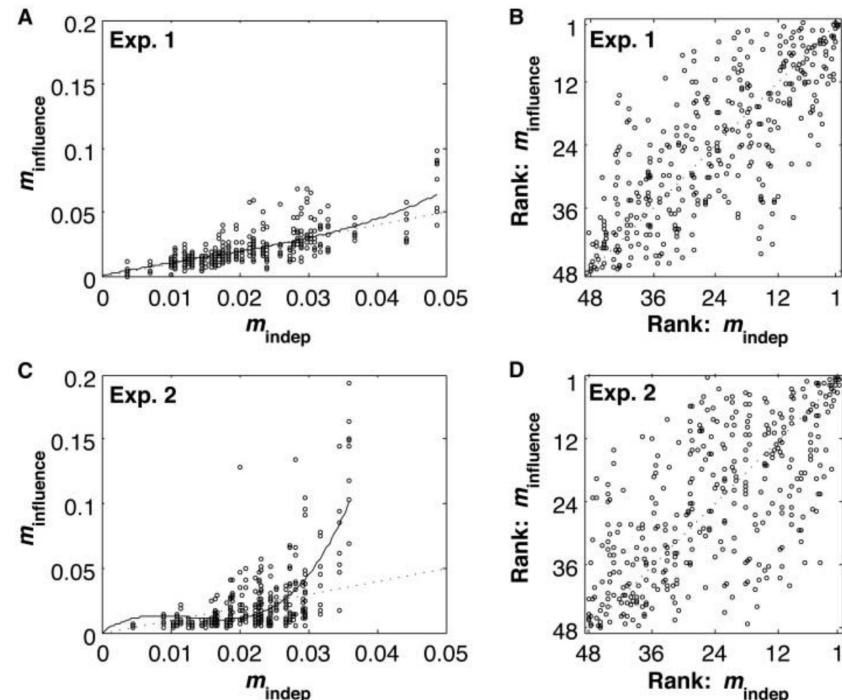


Fig. 3. Relationship between quality and success. (A) and (C) show the relationship between m_{indep} , the market share in the one independent world (i.e., quality), and $m_{influence}$, the market share in the eight social influence worlds (i.e., success). The dotted lines correspond to quality equaling success. The solid lines are third-degree polynomial fits to the data, which suggest that the relationship between quality and success has greater convexity in experiment 2 than in experiment 1. (B) and (D) present the corresponding market rank data.

Salganik, M. J., & Watts, D. J. (2008). Leading the herd astray: An experimental study of self-fulfilling prophecies in an artificial cultural market. *Social Psychology Quarterly*, 71(4), 338–355.

A 61-MILLION-PERSON EXPERIMENT IN SOCIAL INFLUENCE AND POLITICAL MOBILIZATION

by Robert M. Bond, Christopher J. Fariss, Jason J. Jones, et al. (2012) Nature

- Collaboration with Facebook to conduct a massive experiment on the 2010 U.S. Congressional elections
- Showed messages encouraging voting. Either with information about your friends who voted or not.
- Does influence real-world voting behavior?

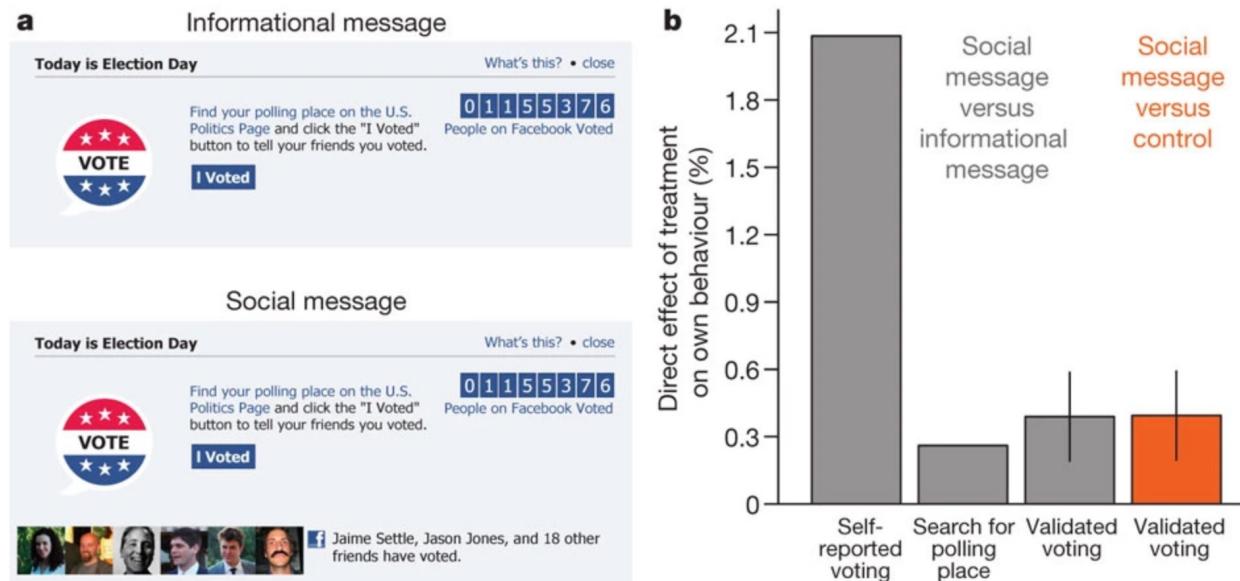


Direct effect of treatment
on own behavior (a)

b

Figure 1: The experiment and direct effects.

From: [A 61-million-person experiment in social influence and political mobilization](#)



a, b, Examples of the informational message and social message Facebook treatments (a) and their direct effect on voting behaviour (b). Vertical lines indicate s.e.m. (they are too small to be seen for the first two bars).

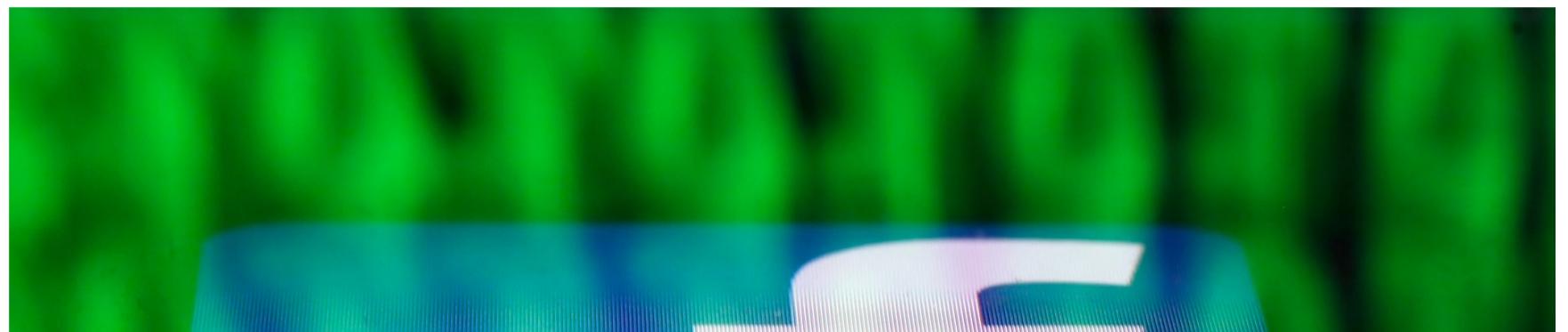
Social messages significantly increased voter turnout, showing the powerful impact of social networks on political engagement.

TECHNOLOGY

Everything We Know About Facebook's Secret Mood-Manipulation Experiment

It was probably legal. But was it ethical?

By Robinson Meyer



PART 2: HOW TO WRITE A CSS RESEARCH PAPER (IN 2 WEEKS)



WRITING PAPERS USING CSS METHODS

This course is not just about CSS methods, but centrally about how to *do research* using these methods. We have emphasized research papers is *storytelling*.

What I want to see is not necessarily the fanciest method: it's about making waterproof stories that rigorously contribute something - however small - to our knowledge about the world. And how you interpret and situate your methods and your data!

DO'S AND DON'TS OF WRITING A RESEARCH PAPER

Do tell a story

- Writing a paper is storytelling!
- Needs to be something surprising; something interesting.
- Your job is also to be a bit of a journalist. Tell a story!
- "Hourglass" structure: Start broadly, narrow down to specific research questions or hypotheses, then broaden out again to discuss the implications of your findings.

Schimel. "Writing Science: How to Write Papers That Get Cited and Proposals That Get Funded"



Do use theory

- Use theory to *tell your story*.
- Theory is our tool, and our language
- Focus on using theory to engage with a topical and broadly interesting discussion.

Do work with middle-range theory

- We contribute not to grand theories, nor on the smallest theory, but on the middle-range
- Don't: "I'm going to test whether Goffman's theory of self-presentation is true"
- Do: "How do content recommendation algorithms on YouTube contribute to the formation of echo chambers?"

Do look at examples of similar papers

- Look at other papers doing something similar
- See how they structure their story
- Draw inspiration! (But don't plagiarize)

Do put yourself in the shoes of your audience

- Assume the role of the editor / the peer-reviewer (or in this case me!)
- What are they reading for? What would they complain about?
- What weaknesses would they point to?
- Your peer-reviewer/editor/professor will be tired after already reading dozens of papers the same day: make their life easy and they will like you!

Do speak to your strengths

- The aim here is to produce a good paper – so don't do something that will be unnecessarily hard and unrewarding. (Like scraping data instead of downloading a finished dataset.)
- Draw on your strengths and what you know!
- Do something interesting with limited time and resources!

Do (roughly) follow the structure of a paper

Papers tell their story according to a specific structure:

1. Introduction
2. Background
3. Methods
4. Results
5. Discussion
6. (Conclusion)

Do be nice and respectful to reviewers / authors

Reviewers are using their time to help you.

It's unpaid. They're stressed.

Be nice to them and respect their time.

Don't be too ambitious

Papers are often really small: they nail down a small but broadly important claim
They are 'waterproof': hard to criticize, which means they tend to *do one thing, but well*.
Don't make "perfect" the enemy of good ("the perfect research paper isn't finished yet")





COURSE REVIEW

THE AIMS OF THIS COURSE

- Giving an overview of and demystifying CSS methods
- A practical hands-on introduction to a range of methods
- How to write a paper using a CSS approach
- Independently go in-depth with a chosen method

WHAT HAVE WE COVERED IN THIS COURSE?

1. What is Computational Social Science: Computational paradigm of social science research
2. How to write a research paper: Research as storytelling
3. Programming in Python
4. Web scraping and APIs
5. Ethics & Law of digital data and methods
6. Natural Language Processing
7. Large Language Models
8. Social Network Analysis
9. Machine Learning
10. Agent-based Modeling
11. Online experiments

WHAT YOU COULD EXPECT OF THIS COURSE

- Freedom to pursue your own interest and focus on what you want
- You will learn powerful and useful digital research methods
- A challenging but exciting course

MY EXPECTATIONS OF YOU

- That you work independently and take responsibility for your learning.
- That you do your own research and find the resources you need for your project.
- That you attend all classes.
- That you submit assignments on time.
- That you show up: attendance is mandatory (you can miss a maximum of 2/12.)
- That you show up on time! (If you miss the attendance sheet, you miss the class.)

Thank you!

You've been great! ☺

COURSE EVALUATION

Before we end, please do the course evaluation!

You should have received a UvA Q survey on your email.