

JUST INFRASTRUCTURES SPEAKER SERIES

March 10, 2021

Dr. J. Nathan Matias

Governing Human & Machine Behavior



School of Information Sciences

HHS Community
Research Center

NCSA



ANDY GREENBERG

SECURITY 09.18.2014 05:38 AM

Hacked Celeb Pics Made Reddit Enough Cash to Run Its Servers for a Month

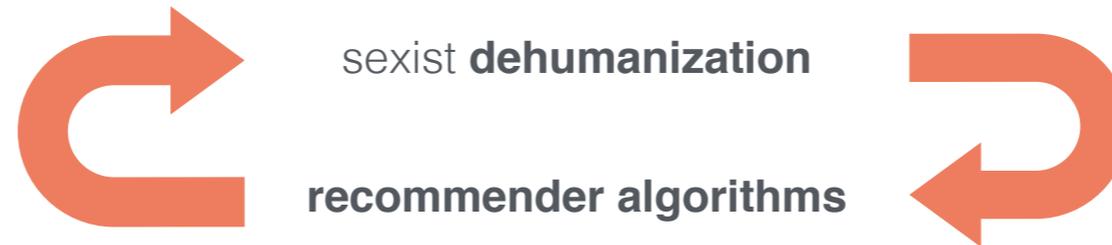
If you saw Kate Upton or Jennifer Lawrence naked last week, there's a good chance you saw them on the social news site Reddit. The self-proclaimed "front page of the Internet" was one of the main outlets linking to the celebrity nude photographs hacked from Apple's iCloud accounts and leaked across the web. Over the [...]

In 2014, after someone illegally broke into multiple celebrity photo accounts, people posted non-consensual intimate imagery to forums on the platform Reddit. As people downloaded and reacted to the photos, Reddit's popularity algorithms promoted them to **even more people**, who kept the cycle going and even donated money to Reddit in appreciation, earning Reddit more than a hundred thousand dollars before the company banned the content a week later.



This incident, like so many problems with the internet, was a complicated mess. Reddit, a company, built a system that profited off what people found popular, using algorithms that observed and amplified those interests. Communities organized around misogyny and disregard for women had violated people's privacy for lurid pleasure, and with the help of the algorithm, distributed this harm widely.

“ non-human technological agents
(algorithms, scripts, policies) **can shape
and are shaped by human activity**



Massanari, A. (2017). # Gamergate and The Fapping: How Reddit's algorithm, governance, and culture support toxic technocultures. *New media & society*, 19(3), 329-346.

Governing Human and Machine Behavior

In an article on toxic technocultures, Adrienne Massanari describes how “non-human technological agents... can shape and are shaped by human activity.” During this dreadful episode, a set of powerful, non-human technological agents, including reddit’s **business model**, its **corporate policies**, and its **popularity algorithms**, were **driving** and **being influenced by** large groups of people in cultures with dehumanizing views of women, encouraged by the many thousands of people who viewed and spread intimate imagery without consent— people who donated to reddit to signal their appreciation for the systems that made it possible.

10/14

CNBC

YouTube radicalized the Christchurch shooter, New Zealand report concludes

By Jon Heald
10/14/2020

SHARE f t in

KEY POINTS

- The Australia terrorist who killed 51 people at two mosques in Christchurch was radicalized by YouTube, according to a report from The New Zealand Royal Commission.
- New Zealand Prime Minister Jacinda Ardern said she plans to talk to YouTube's leaders about the platform's role in the 2019 murder.
- YouTube has been linked to radicalization and while it removed extremist content, the Alphabet-owned company has been accused of using algorithms that push viewers toward more polarized content as they use the platform.

NEWS

Instagram: New tools to ban self-harm and suicide posts

11 November 2020



Instagram has launched new technology to recognize self-harm and suicide content on its app in the UK and Europe.

Researchers are concerned that Instagram's new "suggested posts" feature is contributing to the spread of misinformation.

Instagram Suggested Posts To Users. It Served Up COVID-19 Falsehoods, Study Finds

10/14/2020



Researchers are concerned that Instagram's new "suggested posts" feature is contributing to the spread of misinformation.

Governing Human and Machine Behavior

The problem of inter-related human and machine behavior is a deep and pervasive one. These feedback loops have been blamed for mass murder, self harm, suicide, and health misinformation, just to name a few.

NEWS

4:43 PM EST

New treatment may help slow progression of ALS, research shows

The research was supported in part by donations from the Ice Bucket Challenge.



Major advances in finding treatments thanks to Ice Bucket Challenge

Feb. 3, 2014, 4:43 PM EST

By **Laura Clavin**

An experimental medication may slow the progression of amyotrophic lateral sclerosis, or ALS, researchers reported Wednesday. The research was supported in part by donations from the Ice Bucket Challenge, the social media sensation that raised more than \$200 million worldwide.

CRITICAL MASS

WIKIPEDIA

Wikipedia's Sprawling, Awe-Inspiring Coverage of the Pandemic

The online encyclopedia reveals that there are at least 31,000 ways to talk about Covid-19.

Shari Gashler
February 25, 2021

📖 | 📄 | 📑 | 📌

The Wikipedia article for the Covid-19 pandemic didn't exist until January 2020. By June, it was one of the site's most visited articles of all time. It became, according to Wikipedia's public page of article rankings, "the biggest phenomenon Wikipedia has ever known."

Today, with [59 million page views](#), the Covid-19 pandemic entry is in a two-way tie for the thirty-fourth most viewed Wikipedia

NEWS

BEHAVIOR & SOCIETY

Killings by Police Declined after Black Lives Matter Protests

A study also found body-camera use and community policing increased in places with the most active movements.

By Joe Orey on March 1, 2021



Black Lives Matter protest in Oakland, Calif., 2020. Photo: David Healy/Getty

Since Black Lives Matter protests gained national prominence following the 2014 police killing of Michael Brown in Ferguson, Mo., the movement has spread to hundreds of cities and towns across the U.S. Now a new study shows police homicides have significantly decreased in most cities where such protests occurred.

Governing Human and Machine Behavior

Even as we worry about the risks, society has also seen beautiful examples of humans and machines that cooperate to spread generosity, grow human understanding, and develop transformative citizen power. There are people who are alive and healthy today, and who live in hope of a more just society, thanks to the benefits of feedback loops between humans and machines that are also capable of tremendous harm.

How can we govern Human + Machine Behavior?

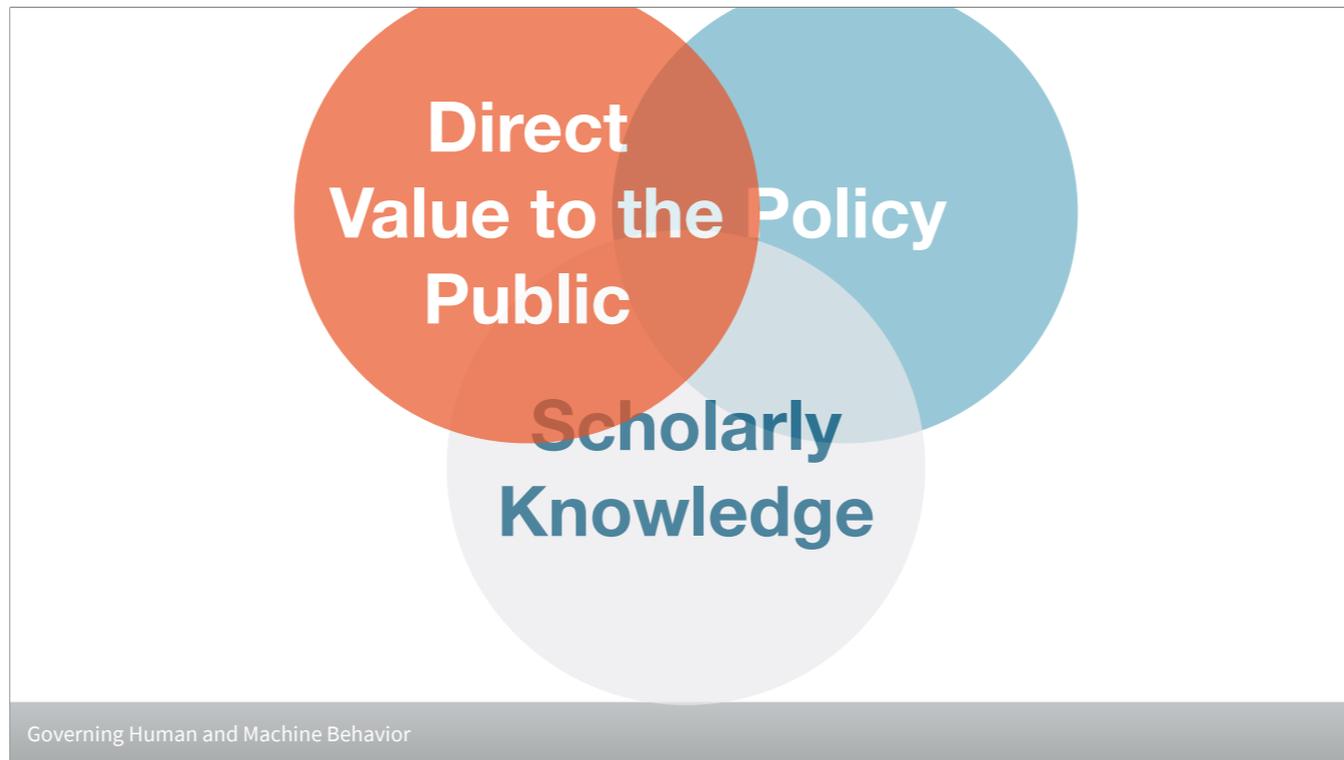
Governing Human and Machine Behavior

Today, I want to ask how we can govern human and machine behavior—and as a social scientist and computer scientist, how to do that in a democracy.

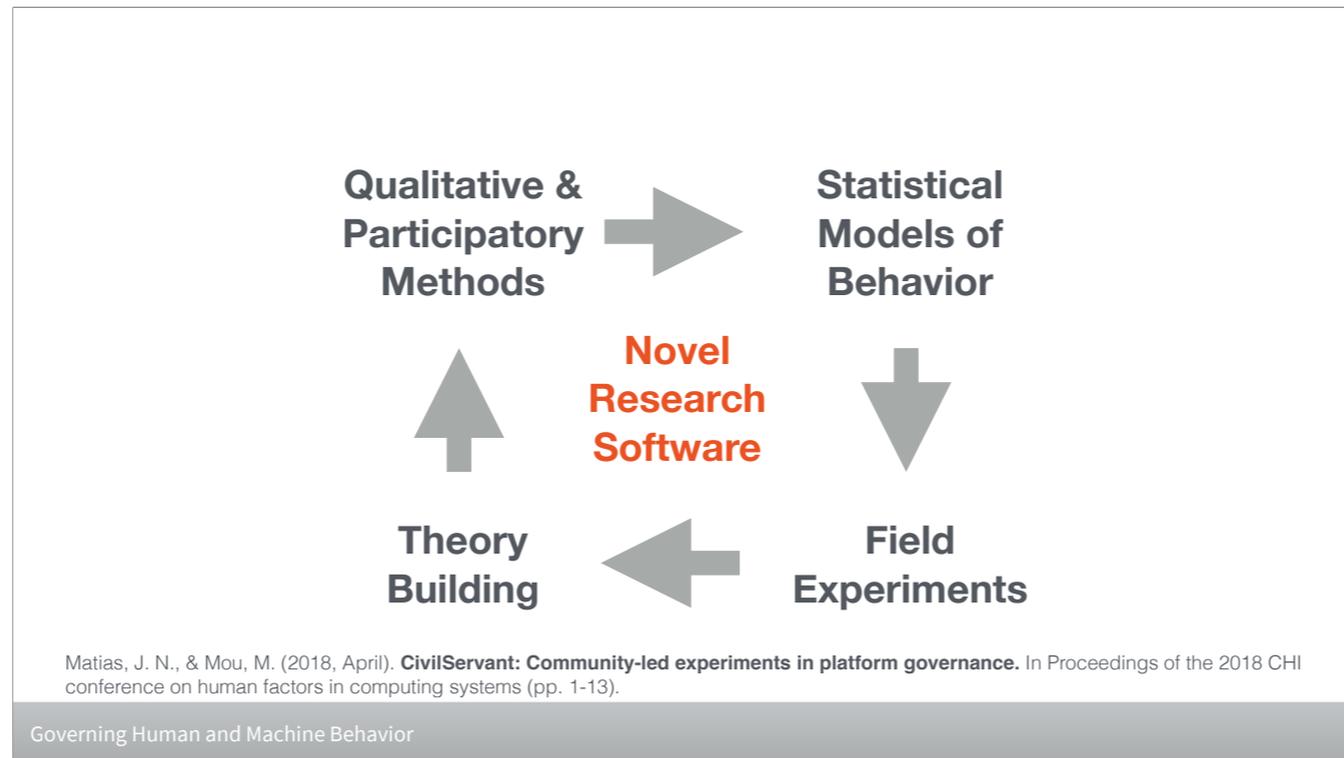
We organize **citizen science** to
test the social impacts of digital power
and **discover effective ideas for change**



At Cornell University, I lead the Citizens and Technology Lab, who work alongside the public in citizen science to inform how we govern. We work alongside the public to test the social impacts of digital power and discover effective ideas for change



The best projects at CAT Lab achieve a trifecta of direct value to the public, scholarly knowledge, and policy impacts



Our approach to developing knowledge is inspired by what social psychologists Betsy Paluck and Robert Chialdini call **Full Cycle Research**. My version, which I call citizen behavioral science, looks like this.

- We often start by having conversations with communities about issues that matter to them
- We then carry out observational analysis of online behavior with their permission
- We follow-up with further participatory research design
- That leads to field experiments
- That then engages with theory, often but not exclusively in communication and social psychology

Vision: Imagine a world where **digital power** is **guided by evidence** and **publicly accountable**



Community scientists record bird migration patterns at the Salton Sea National Wildlife Refuge. CC-BY 2.0 Kyle Elmstensen

We work toward a larger vision where digital power is guided by evidence and accountable to the public.

Today, I want to invite you into that vision- where we can reduce harm and move toward more flourishing societies through a combination of evidence-making, collective action, and the ongoing struggle of governance.

I also want to inspire you to make your own discoveries that could help humans live better in a world of algorithms.

What does it mean to govern?

What knowledge do we need to govern?

How do we create that knowledge?

How can knowledge inform governance?

You might be a member of the public worried about the role of technology in your life. You might be an activist, a tech company employee, or a policymaker, you're still asking the same questions I will introduce today, questions that I work on at CAT Lab.

- What does it mean to govern?
- What knowledge do we need to govern?
- How do we create that knowledge?
- How can knowledge inform governance?

Answering these questions is one of the grand challenges of our time- and I hope you come away from today's talk with an appetite to join what Elinor Ostrom called the Struggle to Govern.

What does it mean to govern?

What knowledge do we need to govern?

How do we create that knowledge?

How can knowledge inform governance?

What does it mean to govern?



A dumpster fire at Altus AFB

According to social scientists who study these things, **policy** is often described in terms of putting out fires, especially if more those fires keep on happening and it seems like a repeatable approach to fighting them would be useful.

What is Policy?

- Someone identifies a **problem**
- People debate the problem
- People propose and debate **solutions**
- People debate policy **evaluation**
- Institutions may or may not:
 - **Implement** solutions
 - **Evaluate** solutions

Cairney, P. (2019, December 20). **Policy Analysis in 750 Words: Defining policy problems and choosing solutions.** Paul Cairney: Politics & Public Policy. <https://paulcairney.wordpress.com/2019/12/20/policy-analysis-in-750-words-defining-policy-problems-and-choosing-solutions/>

What does it mean to govern?

According to policy scholars, governance begins when someone identifies a problem, people debate the problem, people propose **solutions**, and people debate ways to evaluate those policy solutions. At the end of that exhausting process, institutions may or may not do anything, but hey, that's the world of policy.

Instagram Suggested Posts To Users. It Served Up COVID-19 Falsehoods, Study Finds

March 9, 2020 · 12:01 AM ET



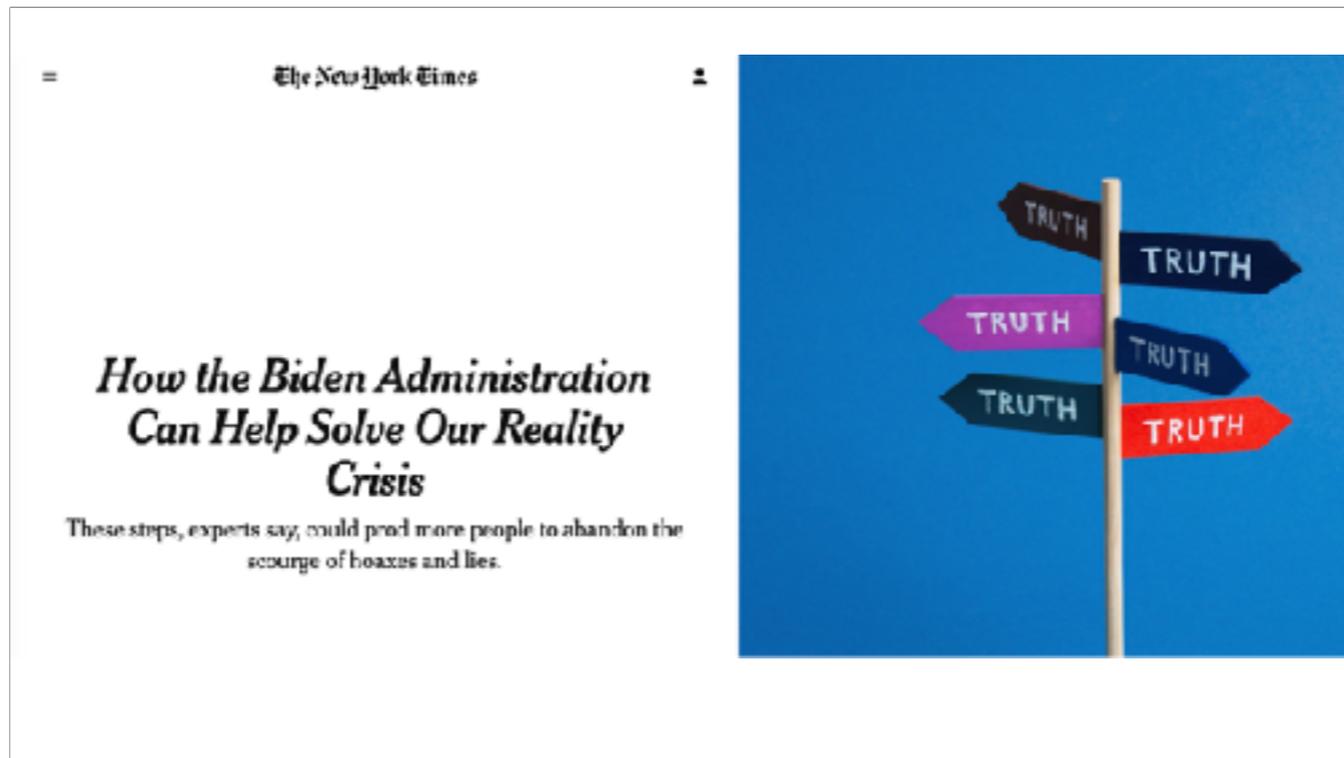
What does it mean to govern?

Who is **responsible**, and who can **create change**?

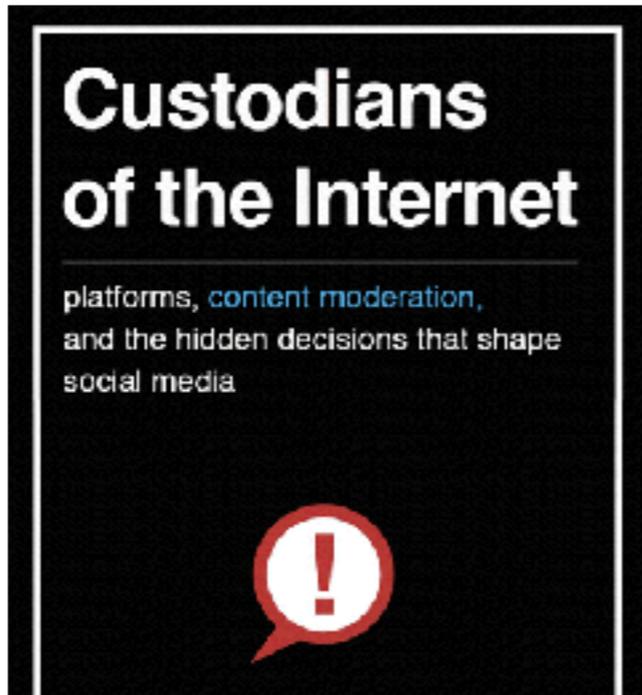
- Governments?
- Tech Firms?
 - Policy teams?
 - Designers / Engineers?
- Public institutions?
- The public?
- Capitalism?

Our first challenge when governing human and machine behavior is to identify *who* is in a position to govern. For example, when an algorithm interacts with humans to promote misinformation, who is responsible, and who can create change?

Is it governments? Tech companies? Public institutions like news publishers? Members of the public who share this content, or who work to debunk it? Or is the problem capitalism itself?



While the United States does not yet have a Algorithm Governance Agency, we do have government agencies dedicated to governing other complex systems, including aviation, cars, food safety, workplace safety, air quality, poverty, medicine, education, housing, elections, national security, and many more. And many of these already govern what we do online.



**Custodians
of the Internet**

platforms, content moderation,
and the hidden decisions that shape
social media

What does it mean to govern?

“ Moderation is,
in many ways,
the commodity
that platforms
offer

Gillespie, T. (2018). **Custodians of the Internet: Platforms, content moderation, and the hidden decisions that shape social media.** Yale University Press.

In *Custodians of the Internet*, Tarleton Gillespie points out that governance is one of the core offerings of any tech platform— they are by definition, the institution that:

- defines what behaviors are possible
- creates policies to encourage or discourage certain behaviors
- generates revenue on the basis of how well their policies work

And in the years since the scandal over non-consensual image-sharing on Reddit, we have seen companies reluctantly embrace this reality, creating vast teams of content moderators, and whole offices of policymakers who routinely speak with legislatures and activists around the world in the desperate attempt to **manage policy problems** and **protect companies' revenue** by **preventing government regulation**.



CR Consumer Reports

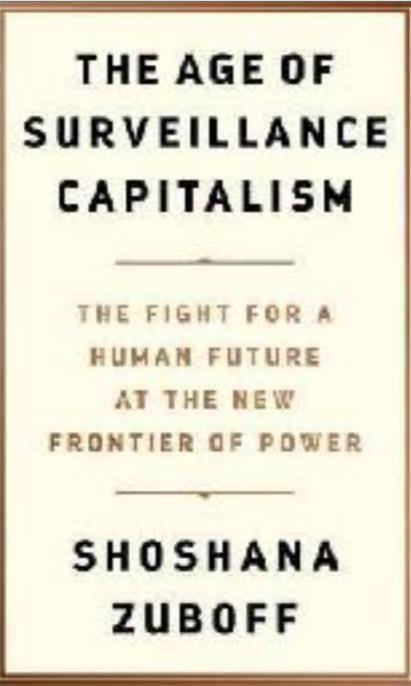
The Markup

What does it mean to govern?

“ scandalous design: changes in how social media operate in response to scandal

Bossetta, M. (2020). *Scandalous Design: How Social Media Platforms' Responses to Scandal Impacts Campaigns and Elections*. *Social Media+ Society*, 6(2), 2056305120924777.

Public institutions, such as consumer protection and journalistic organizations can also carry out governance by proxy. When a journalist at The Markup or Consumer Reports discovers a problem with a technology, the publicity they generate can put pressure on the company and force the company to **acknowledge the problem** and **promise change**. And the scientific literature, if weak, does suggest that more often than not, scandals can influence corporate behavior if they can influence stock prices, harm a CEO's reputation in their friendship circles, or invoke the risk of regulation.

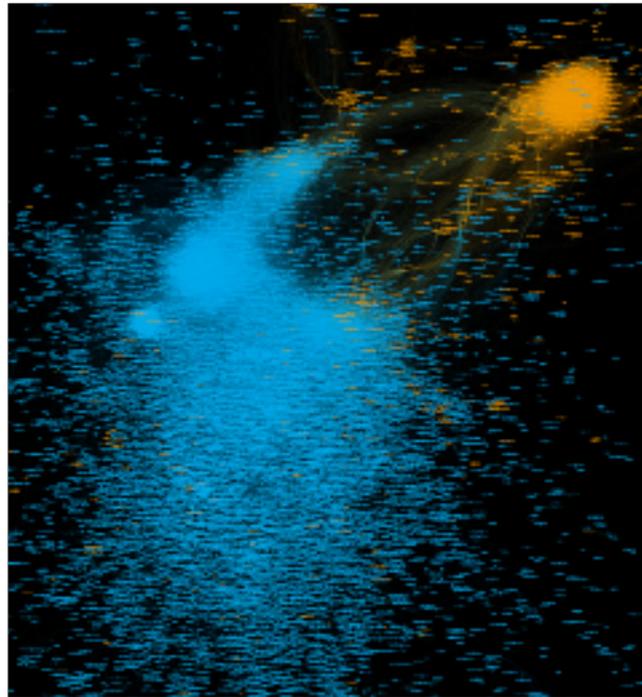


Instead of armaments and armies [capitalism] works its will through the automated medium of an increasingly ubiquitous computational architecture

Zuboff, S. (2019). **The age of surveillance capitalism**: The fight for a human future at the new frontier of power: Barack Obama's books of 2019. Profile books.

What does it mean to govern?

Another view, promoted by Zuboff, is that capitalism is itself a kind of force in the world— and that the very idea that you could or should govern human and machine behavior online is an alarming and parasitic threat to human freedom and democracy.



“ Volunteer governance remains a common approach to managing social relations, conflict, and civil liberties

Matias, J. N. (2019). *The civic labor of volunteer moderators online*. *Social Media+ Society*, 5(2), 2056305119836778.

What does it mean to govern?

Even as people with fancy titles debate how to govern human and machine behavior, hundreds of thousands — maybe millions of people around the world are already doing governance work, every time we support a friend online, create rules for an online group, resolve disputes, and try to trick algorithms into working less badly for our communities. We **see a problem**, discuss solutions, and put them into practice.

Ever since the very earliest online social spaces, platforms have been designed to support volunteer leadership and intervention. Given that people volunteer for hours a day to create, manage, and enforce policies for millions of people online, we need to acknowledge this work as governance too.

Actions

- Responding
- Rewarding
- Removing
- Banning
- Stating rules
- Collecting Data

Design

- Defaults
- Visual style
- Voting
- Algorithm parameters
- Visibility
- Timing

Means

- Settings
- Coordinated responses
- Automated systems
- Appeals to reddit

What does it mean to govern?

Moderators on reddit, Facebook, WhatsApp, and other platforms have tremendous power within their communities. Moderators on reddit have access to unique actions within the platform. They also have substantial powers to **configure the design** of their community, from the **visual style** to the **parameters behind some algorithms**. Finally, these volunteers carry out their work through **default settings, coordination, automated systems, and appeals to reddit**.

Matias, J. N., Johnson, A., Boesel, W. E., Keegan, B., Friedman, J., & DeTar, C. (2015). **Reporting, reviewing, and responding to harassment on Twitter.** arxiv.org/abs/1505.03359

Matias, J.N. (2019) **The Civic Labor Volunteer Moderators Online.** Social Media and Society

Matias, J. N. (2016). **Going Dark: Social Factors in Collective Action Against Platform Operators in the Reddit Blackout.** CHI 2016. ACM. bit.ly/redditblackout2015

What does it mean to govern?

Since 2015, I've been doing ethnographic fieldwork with **reddit moderators** and **Twitter harassment reporters** to understand the **nature of the governance work they do, how they organize online** and how they relate to **companies** and the **governments**.

I don't have time today to share the results of these papers, but you can follow these links to learn more.



In 2016, I was approached by some of these volunteers—moderators of the r/worldnews subreddit community on reddit, a group of over 14 million subscribers who organize to share news about parts of the world outside of the US— four years later, the group has 26 million subscribers. The community uses the reddit platform but like all subreddits are independent from the company. Their international team of over 70 moderators has created their own policies and carried out their own enforcement for many years.

The image shows a screenshot of a news article on the MailOnline website. The article title is "Gunman screaming 'Allahu Akbar' opens fire in Spanish supermarket while wearing 'suicide vest' filled with gasoline and gunpowder". Below the title are several bullet points: "A man walked into the Mercadona shop and began firing shots into the air", "The gunman was also reportedly carrying gasoline and gunpowder", "Police sources say he has psychological issues and lives next door", and "According to local media, officers engaged with a seized vest". The article is attributed to "By PAUL DANAHY FOR MAIL ONLINE" and is dated "PUBLISHED 18:22, 7 JANUARY 2017 / UPDATED 22:42, 11 JANUARY 2017". There are social media sharing icons for Facebook, Twitter, Pinterest, and Email, along with a "19k" share count and a "335" comment count. To the right of the article are two other headlines: "SUPERMARKET TERROR Gunman 'screaming Allahu Akbar' opens fire in Spanish supermarket while 'carrying bag filled with petrol and gunpowder'" from THE Sun, and "TERROR IN SPAIN: Gunman screaming 'Allahu Akbar' opens fire in supermarket" from THE EXPRESS.

MailOnline

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Latest Headlines | News | World News | Arts | Real Estate | Finance | Politics | More »

Gunman screaming 'Allahu Akbar' opens fire in Spanish supermarket while wearing 'suicide vest' filled with gasoline and gunpowder

- A man walked into the Mercadona shop and began firing shots into the air
- The gunman was also reportedly carrying gasoline and gunpowder
- Police sources say he has psychological issues and lives next door
- According to local media, officers engaged with a seized vest

By PAUL DANAHY FOR MAIL ONLINE
PUBLISHED 18:22, 7 JANUARY 2017 / UPDATED 22:42, 11 JANUARY 2017

19k shares

335 comments

SUPERMARKET TERROR Gunman 'screaming Allahu Akbar' opens fire in Spanish supermarket while 'carrying bag filled with petrol and gunpowder'

TERROR IN SPAIN: Gunman screaming 'Allahu Akbar' opens fire in supermarket

What does it mean to govern?

The community came to me with the policy problem — the problem of misinformation amplified by algorithms,

Here's a story that someone posted to worldnews in January 2017. Almost everything about these headlines was wrong. **The man was a Spanish national with a mental illness who was speaking in Catalan, not Arabic.** The worldnews community received dozens of articles like this every day, and some of them were so popular that reddit's algorithms were promoting them to even more people. Managing that problem was taking a lot of work.

Can we **encourage**
people to **question news**
from inaccurate sources
without making the
articles trend on
platform algorithms?

What does it mean to govern?

The community also had a **policy solution**- something they thought might help. “Can we encourage people to question news from inaccurate sources?” they asked. They also had some uncertainty— what if their policy solution had an unintended side effect of causing Reddit’s algorithms to promote that news even further?

What does it mean to govern?

What knowledge do we need to govern?

How do we create that knowledge?

How can knowledge inform governance?

Although the community **understood the problem**, could imagine policies, and could debate the **values behind** those policies, they needed to know the **outcome** of their idea to decide if they should do it. Like any institution trying to govern wisely and effectively, the World News community needed **knowledge**.

So what do we know about the effects of encouraging people to question inaccurate sources of information?

Understanding Misinformation by Attempting to Correct It

- Individual perception and beliefs
- Social context, culture, structure
- Algorithms that make autonomous decisions that react to human behavior

Lewandowsky, S., Ecker, U. K. H., Seifert, C. M., Schwarz, N., & Cook, J. (2012). **Misinformation and Its Correction: Continued Influence and Successful Debiasing.** *Psychological Science in the Public Interest*, 13(3), 106–131. [1]
Margolin, D. B., Hannak, A., & Weber, I. (2017). **Political Fact-Checking on Twitter: When Do Corrections Have an Effect?.** *Political Communication*, 1-24.

What knowledge do we need to govern?

Scholars have studied misinformation by trying to correct it at several levels:

- looking at how people **develop** and **change beliefs**
- and by studying the **social structures** that shape the **spread** of information and **people's perceptions**
- **online**, these **perceptions, beliefs, and social structures** are all interrelated with the **actions of algorithms**

The image shows a screenshot of a news aggregator interface. It is divided into three main columns. The left column is titled 'Trending' and lists several news items with their respective sources and brief descriptions. The middle column is titled 'United States trends' and lists trending topics like '#TakeTheKnee', 'Ravens', 'Ray Lewis', 'Jags', 'Mike Tomlin', 'Blake Bortles', 'Jaguars', 'Rex Ryan', 'Flacco', and 'J Cole'. The right column shows a list of news items with their titles, sources, and brief descriptions. At the bottom of the interface, there are logos for Facebook, the text 'News Aggregators', and the Reddit logo.

Trending

- Kurdistan Regional Government**
U.S cautions citizens of possible unrest during 40th anniversary... - reuters.com
- Bruce Maxwell**
A's catcher Maxwell kneels for national anthem - msn.com
- DPRK Today**
North Korea 'attacks' U.S aircraft carrier and bomber' in... - uk.news.yahoo.com
- Pope Francis**
Conservative Roman Catholic theologians accuse pope of... - chicagotribune.com
- Scarlett Pika**
'Drugged' walkers spark mountain rescue - bbc.com
- Charles Bradley**
Charles Bradley, soul singer who battled cancer, dies at 58 - msnnews.com
- Tom Price**
Price hits use of private jets during investigations - thehill.com
- St. Louis**
22 arrested Sunday in Galleria protest, protests move to Clayton... - stltoday.com
- DHS**
These Are The 21 States Russian Hackers Targeted In The 2016... - huffingtonpost.com

United States trends Change

- #TakeTheKnee**
@BJJYONCE, @Glasgowry and 4 more are Tweeting about this
- Ravens**
184K Tweets
- Ray Lewis**
28.5K Tweets
- Jags**
38.9K Tweets
- Mike Tomlin**
28.8K Tweets
- Blake Bortles**
6,257 Tweets
- Jaguars**
179K Tweets
- Rex Ryan**
Former Buffalo Bills coach Rex Ryan 'passed off' as Trump's NFL... comments
- Flacco**
13.8K Tweets
- J Cole**
14.1K Tweets

News Items:

- CNN Poll: Opinion of the Republican Party falls to all-time low** (cnn.com)
submitted 4 hours ago by [LynHesse](#) (1) to [r/politics](#)
2371 comments share save hide report crosspost (1x1)
- TIL cats decided to live with humans on their own and domesticated themselves** (www.nationalgeographic.com)
submitted 4 hours ago by [maidenmadness](#) (1) to [r/TodayILearned](#)
814 comments share save hide report crosspost (1x1)
- 25 years ago today, Nirvana released the album "Nevermind"** (reddit.com) [self-post]
submitted 4 hours ago (last edited 2 hours ago) by [LuckyProfessional](#) (1) to [r/Reddit](#)
808 comments share save hide report crosspost
- Saudi Arabia accidentally prints textbook showing Yasa sitting next to the king** (telegram.com)
submitted 5 hours ago by [remprem1234](#) (1) to [r/islamism](#)
842 comments share save hide report crosspost (1x1)
- A jump through the ring** (imgur.com)
submitted 6 hours ago by [strangeComedian](#) (1) to [r/ryth](#)
647 comments share save hide report crosspost (1x1)
- Birth control vending machines installed in college campuses - UC Davis is offering students the morning after pill, condoms, and pregnancy tests inside the convenience of a vending machine on campus.** (reddit.com)
submitted 6 hours ago by [vtdr](#) (1) to [r/TextChromosomes](#)
440 comments share save hide report crosspost (1x1)
- Nestlé, Unilever, P&G Among Worst Offenders for Plastic Pollution in Philippines Beach Audit** (www.redd.it)
submitted 8 hours ago by [Mawwll](#) (1) to [r/Environment](#)

News Aggregators

If you looked at your phone today, you probably encountered a **news recommender**. These **algorithms observe** the behavior of hundreds of millions of people and **make suggestions** of what to read. These lists are delivered to our **email inbox**, in the **background** of sites like Facebook and Twitter, or in the case of reddit, they are the **core product**: roughly 6% of Americans read reddit to get “**the front page of the internet**,” collated from online behavior of hundreds of millions of people. Managing misinformation requires **more than influencing people**- it now involves **influencing algorithms**.

Influencing Algorithm Behavior:

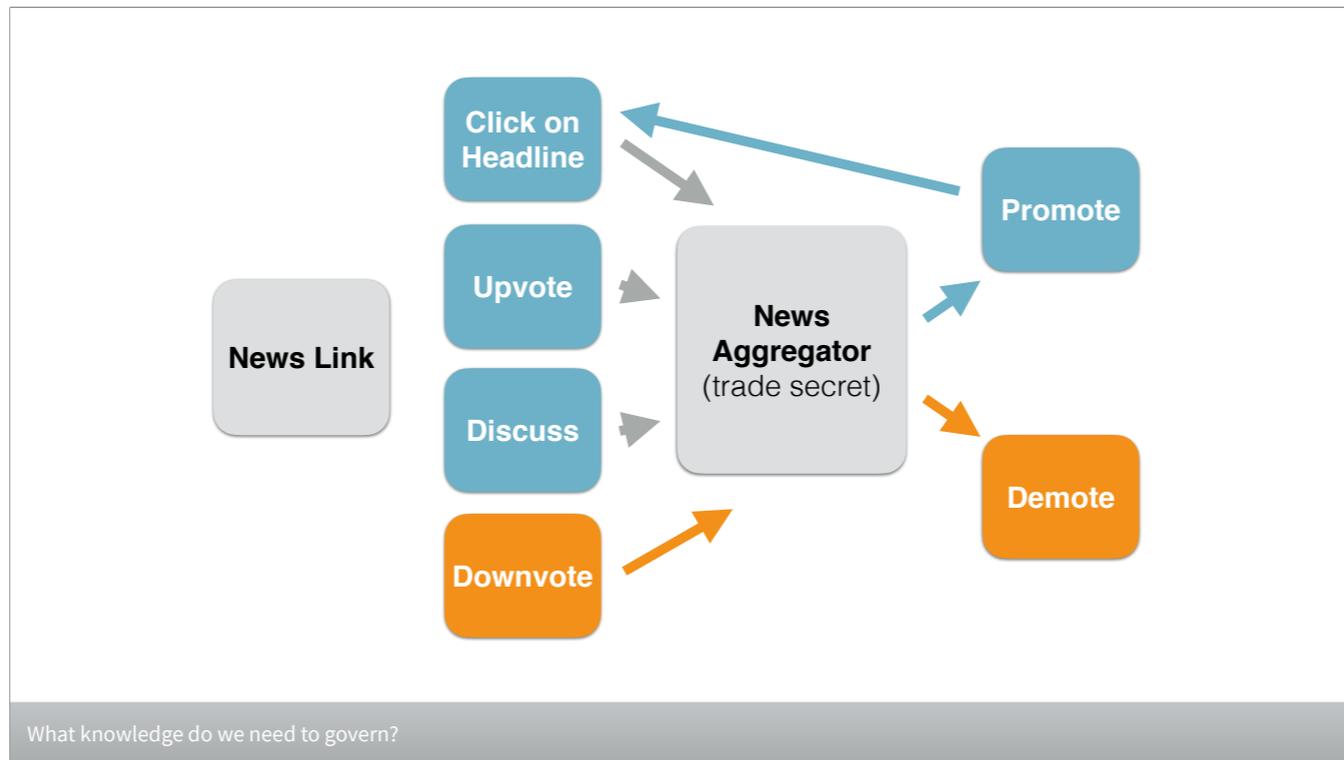
- **Directly:**
 - **Software** engineers
 - **Data standard** creators
 - Training **datasets**
- **Indirectly:**
 - **Human behavior** observed by algorithms

Kitchin, R. (2017) **Thinking critically about and researching algorithms**. Information, Communication & Society
Resnick, P., Varian, J. (1997) **Recommender systems**. Communications of the ACM 40, 3

What knowledge do we need to govern?

So How can we influence an algorithm?

- Computer scientists focus on **direct influence**: the **software engineers** who create the algorithm, the **data standard creators** who define **what it is able to know**, and the **training datasets** that sometimes **steer its early actions**.
- Many algorithms are also designed to be **indirectly influenced**- since their function is to **observe human behavior** and **react accordingly**.



Here's how a news aggregator works, in theory. First, someone posts a news link. Then, people react to that link in ways that are recorded by a platform like reddit. They might click, vote, or discuss the link. That information is observed by a news aggregator, whose design we can't know for sure, because the company keeps the algorithm mostly secret. On the basis of what it observes, the algorithm decides whether to promote or demote the article. Of course, if it promotes the article, then more people will see and respond to it.

“ “ To what extent can the perception of success become a “self-fulfilling prophecy”? We have explored this question experimentally by **artificially inverting the true popularity of songs in an online “music market,”**

... **most songs experienced self-fulfilling prophecies**, in which **perceived—but initially false—popularity became real over time.**

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.

What knowledge do we need to govern?

Aggregators can create runaway behavioral patterns such as “self-fulfilling prophecies” - in a controlled experiment, Salganik and Watts found that if you invert the initial order of the list to show lower-quality songs, those low quality songs can become popular over time.

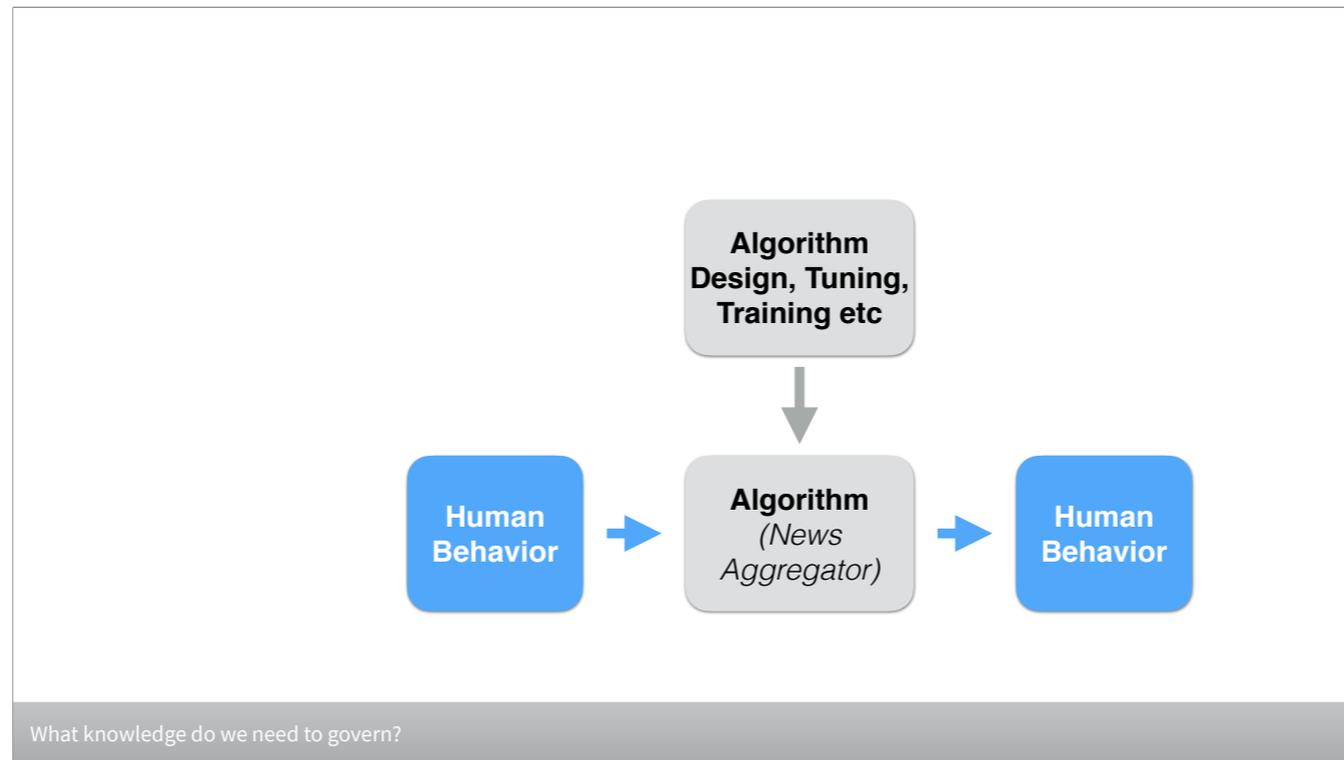
“ Prior ratings created **significant bias in individual rating behavior...**

positive social influence increased the likelihood of positive ratings by 32% and created **accumulating positive herding that increased final ratings by 25%** on average.

Muchnik, L., Aral, S., & Taylor, S. J. (2013). **Social influence bias: A randomized experiment.** *Science*, 341(6146), 647-651.

What knowledge do we need to govern?

And a field experiment on reddit found that simply applying one up-vote to an article on reddit could cause this positive herding effect. In the case of **popular** but **inaccurate** information, these online feedback loops are a **serious problem**.



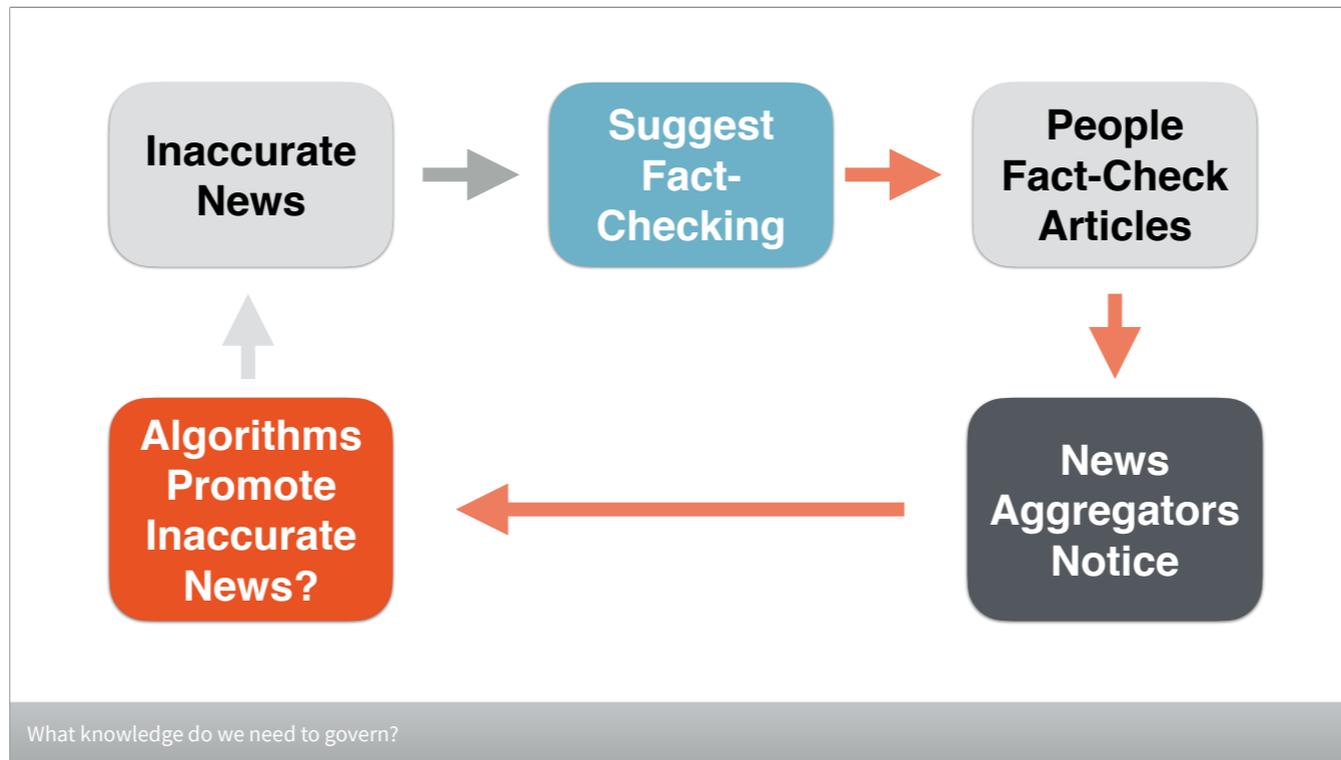
How do we create empirical knowledge about algorithms?

- **lab and field experiments** like these and others in human computer interaction look at the effect of algorithms decisions on human behaviour
- computer scientists often examine things that engineers can do, something researchers of algorithmic accountability also study
- ethnographers like Massanari can observe how people and algorithms interact and come up with new ways to see what's happening in social contexts
- In my conversation with the moderators of the Worldnews community, I realized we needed a very different kind of knowledge

Can we **encourage**
people to **question news**
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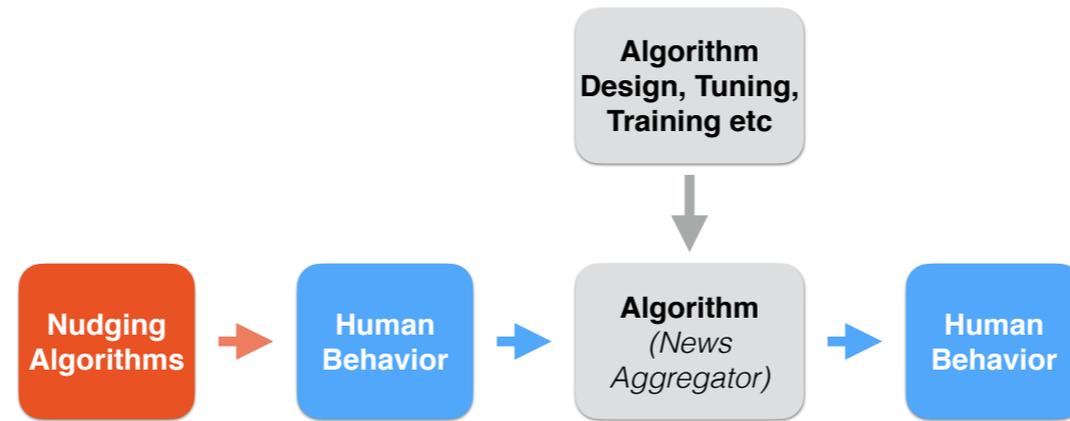
What knowledge do we need to govern?

When the Worldnews community asked me whether we could encourage people to question news from inaccurate sources **without making the articles trend** on platform algorithms, here's what they were worried about....



They were worried that nudging people to fact-check could backfire. If someone posted inaccurate news and the community suggested volunteer fact-checking, what would happen if people actually went ahead and fact-checked them? Might the news aggregator notice, interpret skepticism as popularity and then promote inaccurate news?

Nudging Algorithms: Influencing algorithm behavior by nudging human behavior



What knowledge do we need to govern?

The community was wondering about something that engineers and behavioral scientists hadn't considered: that since human behavior influences algorithm behavior, attempts to influence human behavior might also influence algorithms.

**Intervention:
Messages In
News Discussions**

Control

**Suggest
Fact-
Checking**

**Fact-
Checking +
Voting**

What knowledge do we need to govern?

To test this idea, I designed experiment software to respond whenever someone posted a new tabloid article to the community. In the control group, the software made no suggestions. In a treatment group, the software suggested fact-checking. And in a third group, the software encouraged people to fact-check and also vote.

Suggest Fact-Checking

Fact-Checking + Voting

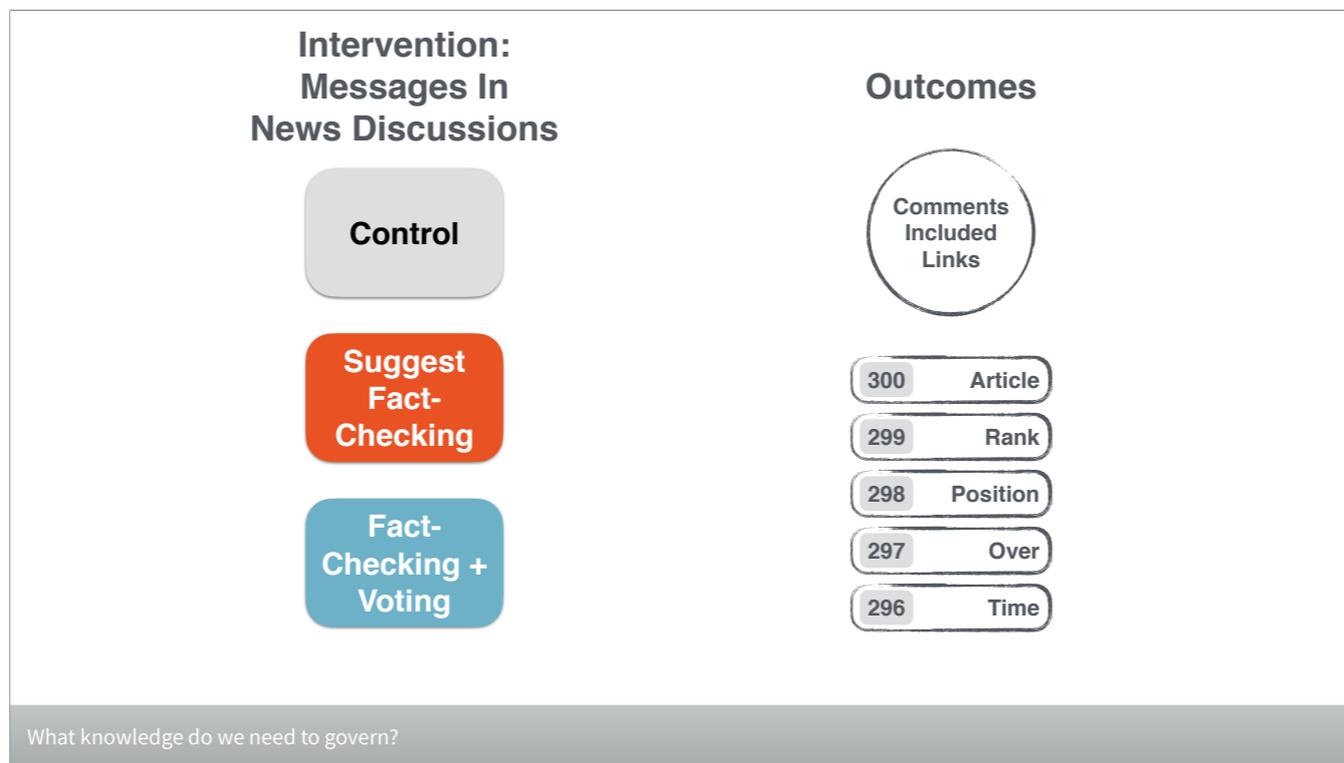
[-] CivilServantBot [N] [score hidden] 31 minutes ago - stickied comment
Users often report submissions from this site and ask us to ban it for sensationalized articles. At /r/worldnews, we oppose blanket banning any news source. Readers have a responsibility to be skeptical, check sources, and comment on any flaws.
Help improve this thread by linking to media that verifies or questions this article's claims. With over 14 million subscribers, your link could help readers better understand this issue. If you do find evidence that this article or its title are false or misleading, contact the moderators who will review it for removal (submission guidelines).

[-] CivilServantBot [M] [score hidden] 29 minutes ago - stickied comment
Users often report submissions from this site and ask us to ban it for sensationalized articles. At /r/worldnews, we oppose blanket banning any news source. Readers have a responsibility to be skeptical, check sources, and comment on any flaws.
Help improve this thread by linking to media that verify or question this article's claims. With over 14 million subscribers, your link could help readers better understand this issue. **If you can't independently verify these claims, please consider downvoting.** If you do find evidence that this article or its title are false or misleading, contact the moderators who will review it for removal (submission guidelines).

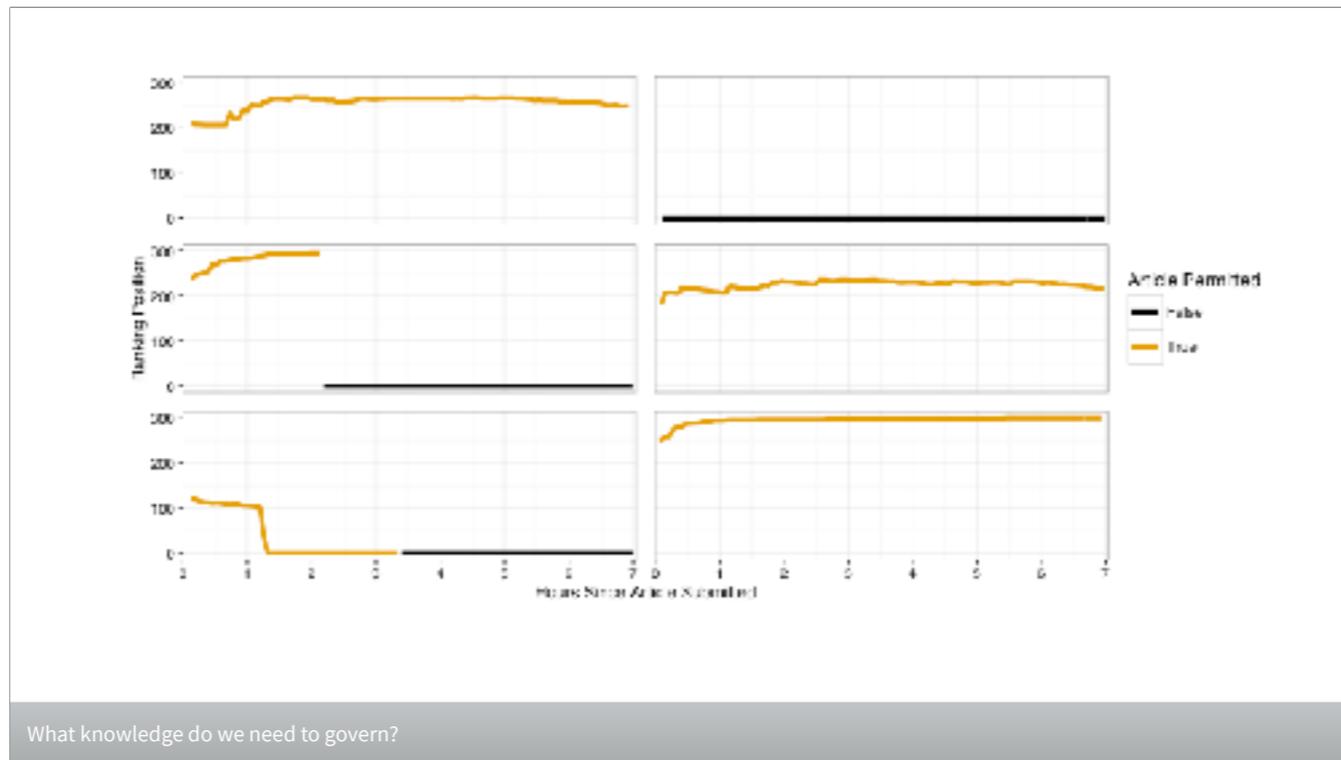
What knowledge do we need to govern?

The fact-checking condition urged people to “improve this thread by linking to media that verifies or questions this article’s claims”

The fact-checking and voting condition urged “If you can’t independently verify these claims, please consider downvoting.”



I then observed two outcomes: the first was whether comments included links to further evidence, excluding internal links to reddit and image hosting sites. I also observed the rank position of an article in the recommender system



What knowledge do we need to govern?

sampling every four minutes for the first seven hours. 300 is the highest position, and 0 indicates that the article is no longer in the top 300. The software also observed whether the article was removed by moderators for violating community policies or being a duplicate— when that happens, the article is immediately pulled from the rankings.

H1 Encouraging fact-checking will
increase the chance that **comments**
will include links to further evidence

<https://osf.io/hmq5m/>

H2 Encouraging fact-checking will increase the rank position of news articles from regularly-inaccurate sources in the community's news aggregator

<https://osf.io/hmq5m/>

H3 Encouraging fact-checking & voting will **decrease the rank position** of news articles from regularly-inaccurate sources in the community's news aggregator

<https://osf.io/hmq5m/>

[-] **CivilServantSet** [12] [F,H] [size hidden] 4 months ago · **stickied comment**

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permalink source embed save view RSS report give gold reply hide child comments

“I found these other sources:”

- link

- link

“I trust the second one somewhat”

What knowledge do we need to govern?

From December 7 2016 to February 15 in 2017, participants made over 35,000 comments in 1104 discussions of articles from labeled sources— only a small percentage of the news they discussed. In a typical thread people would respond with links to other sources and then discuss which ones they trusted the most.

Encouraging fact-checking **increases the % of comments that include links**, on average in r/worldnews

[1] OwlSawdust [D] Score hidden | 34 minutes ago · stickied comment

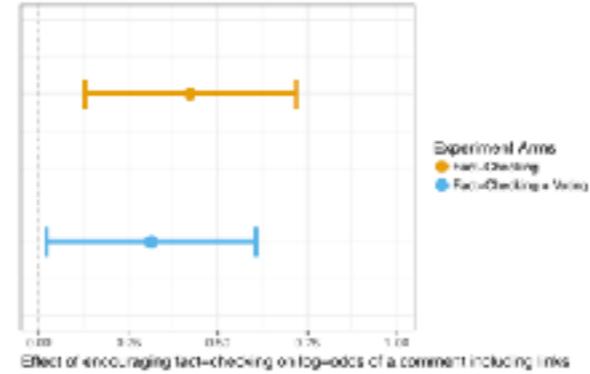
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[2] OwlSawdust [H] Score hidden | 23 minutes ago · stickied comment

Users often report submissions from this site and ask us to ban it for sensationalized articles. At r/worldnews, we oppose blanket banning any news source. Readers have a responsibility to be skeptical, check sources, and comment on any flaws.

Help improve this thread by linking to media that verify or question this article's claims. With over 1.4 million subscribers, your link could help readers better understand this issue. **If you can't independently verify these claims, please consider downvoting.** If you do find evidence that this article or its title are false or misleading, contact the moderators who will review it for removal [submission guidelines].



What knowledge do we need to govern?

With regression adjustment for discussion removals, clustered standard errors, and multiple comparisons, I found that as expected, encouraging fact-checking increases the % of comments that include links, on average in r/worldnews



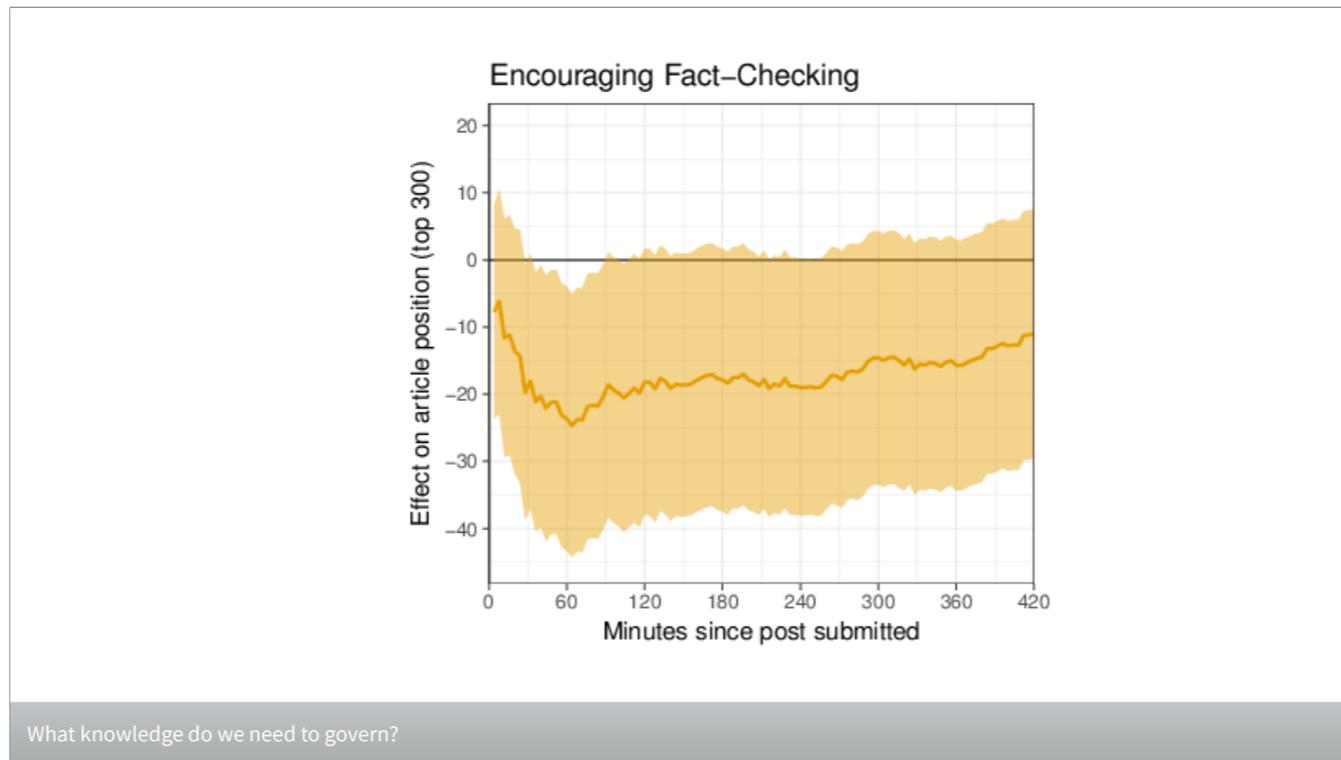
I also created a model for the average treatment effect of the intervention on the ranking of an article at a moment in time. Each regression model tested the effect at each four-minute moment in time.

<i>Position_t</i>	Article rank position at time <i>t</i>
<i>TA</i>	Treatment A (Fact-Checking)
<i>TB</i>	Treatment B (Fact-Checking + Voting)
<i>SA_t</i>	Other treated articles (A) in top N at time <i>t</i>
<i>SB_t</i>	Other treated articles (B) in top N at time <i>t</i>

$$Position_t = \alpha + \beta_1 TA + \beta_2 TB + \beta_3 SA_t + \beta_4 SB_t + \epsilon$$

What knowledge do we need to govern?

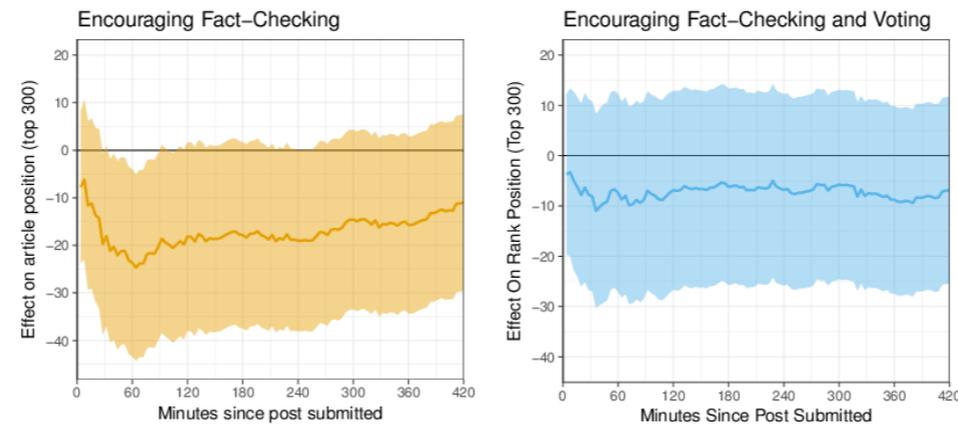
The model was a straightforward linear regression predicting the article rank position at time *t*



In this chart, I plotted the result of each regression model and their confidence intervals, adjusted for multiple comparisons.

An article that received an encouragement toward fact-checking was demoted in the rankings by up to 24 rank positions on average, compared to the control group— enough to move it off the community’s front page.

Encouraging fact-checking reduces the spread of inaccurate news by reddit's algorithms, but I fail to find an effect from encouraging people to influence the algorithm

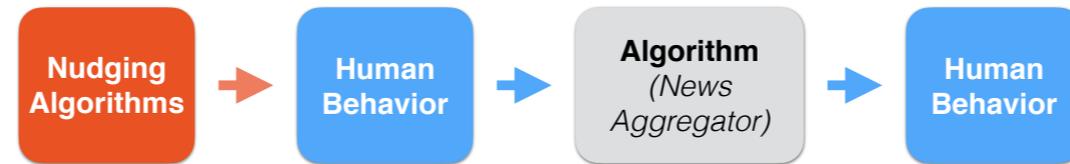


What knowledge do we need to govern?

What was the effect from encouraging fact-checking and voting? - **no discernible effect, though it might just be smaller and not observable with our sample size.**

This is good news for the community. **Encouraging people to fact-check articles influences them to do fact-checking and could also reduce the spread of articles from unreliable sources by algorithms too.** Based on this knowledge, the community could make a clear policy decision.

Nudging Algorithms: Influencing algorithm behavior by nudging human behavior



1. Understanding Human & Machine Behavior

How does this study potentially add to science?

As Robert Chialdini has written, **field experiments help identify consequential phenomena** in the world that **further research can investigate** in the **field** and **in the lab**. By confirming the potential to nudge algorithms, this study identifies such a phenomenon.

We might also see algorithm nudges elsewhere: **if a nudge influences retirement savings**, it might also influence **credit score** algorithms. Or if a nudge **influences prejudice**, it might also **influence discrimination** by an algorithm that learns from prejudiced people.

“ As well as being **heterogeneous** and **embedded**, algorithms are **rarely fixed in form** and their work in practice **unfolds in multifarious ways**.

they are **never fixed in nature**, but are **emergent** and **constantly unfolding**

Kitchin, R. (2017) **Thinking critically about and researching algorithms**. Information, Communication & Society

What knowledge do we need to govern?

But there's a problem: Robert Kitchin and others have written about the challenge of making scientific discoveries or any kind of re-usable knowledge about algorithm behavior.

- They're frequently re-written by their creators
- Their behavior is contingent on changing surroundings

Can we make any general discoveries about human and machine behavior? This is one of the central questions I'm interested in, and I think this study may represent a small step.

What does it mean to govern?

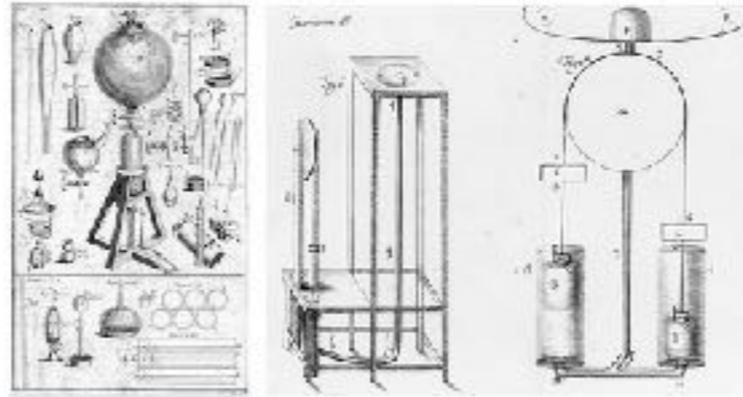
What knowledge do we need to govern?

How do we create that knowledge?

How can knowledge inform governance?

How do we create that kind of knowledge?

Is Knowledge About Human + Algorithm Behavior Repeatable?



Shapin, S., & Schaffer, S. (1985). *Leviathan and the air-pump: Hobbes, Boyle, and the experimental life*. Princeton University Press.

How do we create that knowledge?

This is a picture from Robert Boyle's *New Experiments* from 1666, which established the norm that scientists seek repeatable knowledge- developing testable hypotheses that are validated through reproduction and demonstration. And this kind of generalizable knowledge, if it could be obtained, would also be pragmatically valuable- if we could describe, predict, and reliably change the behavior of humans and algorithms, we might be able to govern our complex world more effectively.

“ As well as being **heterogeneous** and **embedded**, algorithms are **rarely fixed in form** and their work in practice **unfolds in multifarious ways**.

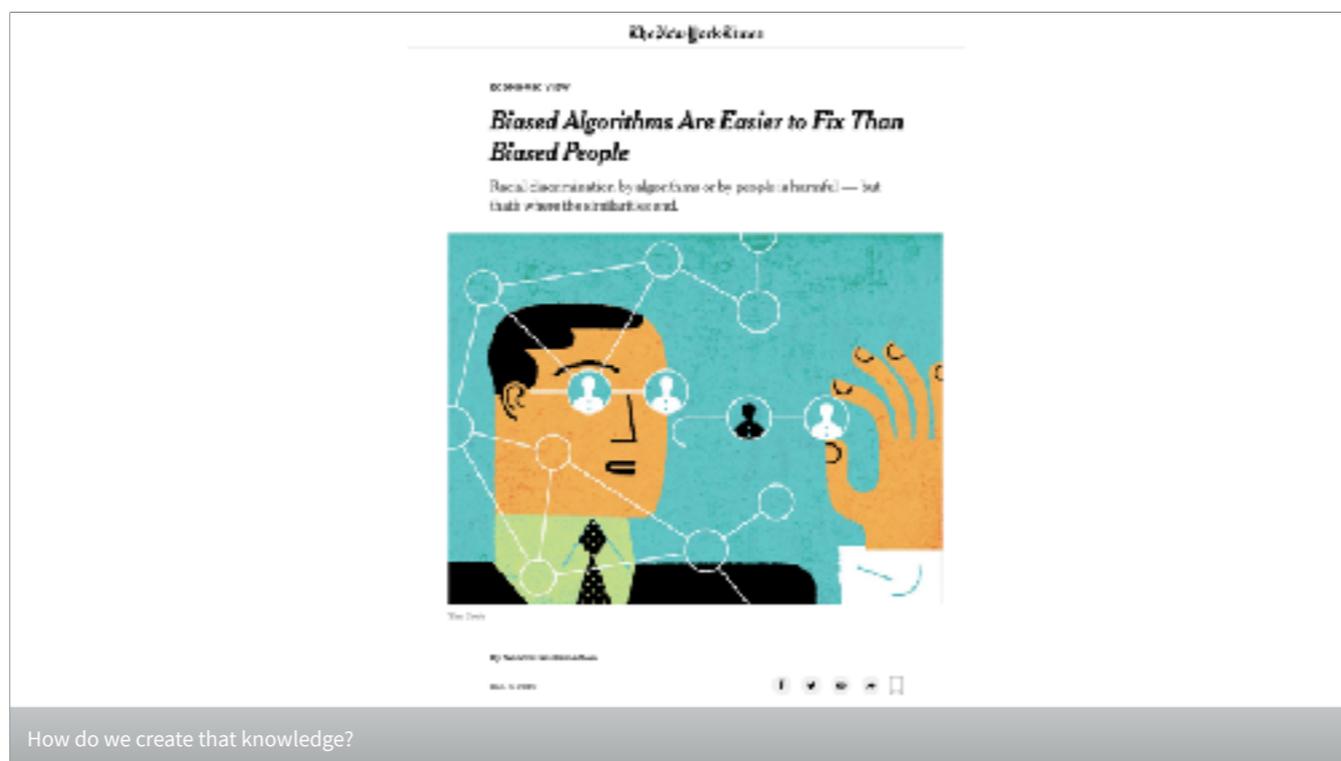
they are **never fixed in nature**, but are **emergent** and **constantly unfolding**

Kitchin, R. (2017) **Thinking critically about and researching algorithms**. Information, Communication & Society

How do we create that knowledge?

But maybe algorithm behavior isn't a science. Since they are contingent on changing surroundings and variations in human society and behavior, once you put them into what the Pragmatist Philosopher and Psychologist William James called "The Rich Thicket of Reality" all bets are off?

In this view, even though algorithms are very precisely defined by their creators, it's unlikely that we will be able to derive general knowledge about how they behave.



Maybe that's a good thing. Last year, Sendhil Mullainathan argued that if algorithm behavior is more easily changed than human behavior, “biased algorithms are easier to fix than biased people.” You might spend a decade trying to resolve a discrimination problem in a human institution, but you can re-program a computer to stop engaging in discrimination. The moment you change the algorithm, past knowledge about its performance becomes obsolete, and you have a fresh start on getting things right.

“ ‘computer science’ is **not a science**

“ practices on which the rest of **science** has reached consensus appear **little used or recognized in security**

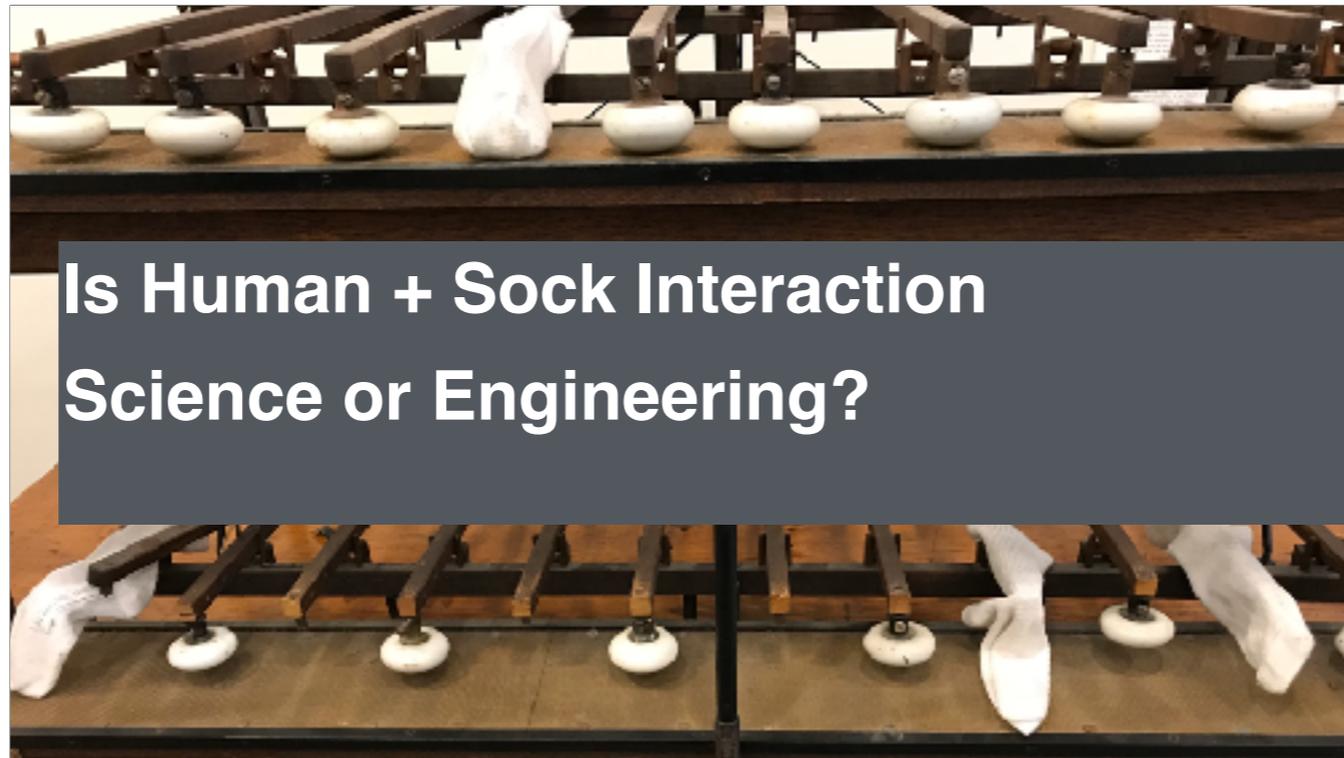
“ [replication is] **rarely done** in the field of Human Computer Interaction

Abelson, G. Sussman, and J. Sussman (1997) **Structure and Interpretation of Computer Programs**. New York, NY, USA: McGraw-Hill, Inc.
Herley, C., & Van Oorschot, P. C. (2017, May). **Sok: Science, security and the elusive goal of security as a scientific pursuit**. In 2017 IEEE symposium on security and privacy (SP) (pp. 99-120). IEEE.
Hornbæk, K., Sander, S. S., Bargas-Avila, J. A., & Grue Simonsen, J. (2014, April). **Is once enough? On the extent and content of replications in human-computer interaction**. In Proceedings of the SIGCHI Conference on Human Factors in Computing Systems (pp. 3523-3532).

How do we create that knowledge?

Mullainathan’s argument is in line with one tradition in computer science that strongly rejects the idea that CS is a scientific field. To quote Hornbaek and colleagues, computer scientists often think that **if you can get something to work once**, then you have succeeded—rather than valuing replicable knowledge, there is a culture that **values novelty**.

This disinterest for replication, while far from universal, is also **very compatible** with a culture that strongly values secrecy—many computer scientists want to publish research without having to release the underlying source code and other essential resources for **replication, transparency, or accountability**.



Is Human + Sock Interaction Science or Engineering?

To understand why this question matters, let's look at one of my favorite machines of all time. Can anyone guess what it does?

This is a **sock testing machine** used during by Consumer Reports, a members organization founded in 1936 that continues to do testing, journalism, and advocacy for consumer protection. The sock tester applied consistent amounts of friction to a large number of socks to find out which ones were the most durable. For those of you who do **algorithm accountability** and **transparency**– this was a **sock accountability** and **transparency** system.

Let's ask ourself: **is knowledge about Human + Sock Interaction Repeatable?** If I test a random sample of socks on this machine, will I be able to predict the reliability of future socks? Or will I have to **test every single sock** on the market to give you assurances about **sock reliability**? Consumer Reports was founded because no one had yet derived precise enough generalizable knowledge about socks. So when new models of socks came out, Consumer Reports had to test every single one.

Scientific Governance

- **broad, efficient** governance
- derive **general principles**
- build **policies** around those principles
- **update policies** occasionally

Accountability Governance

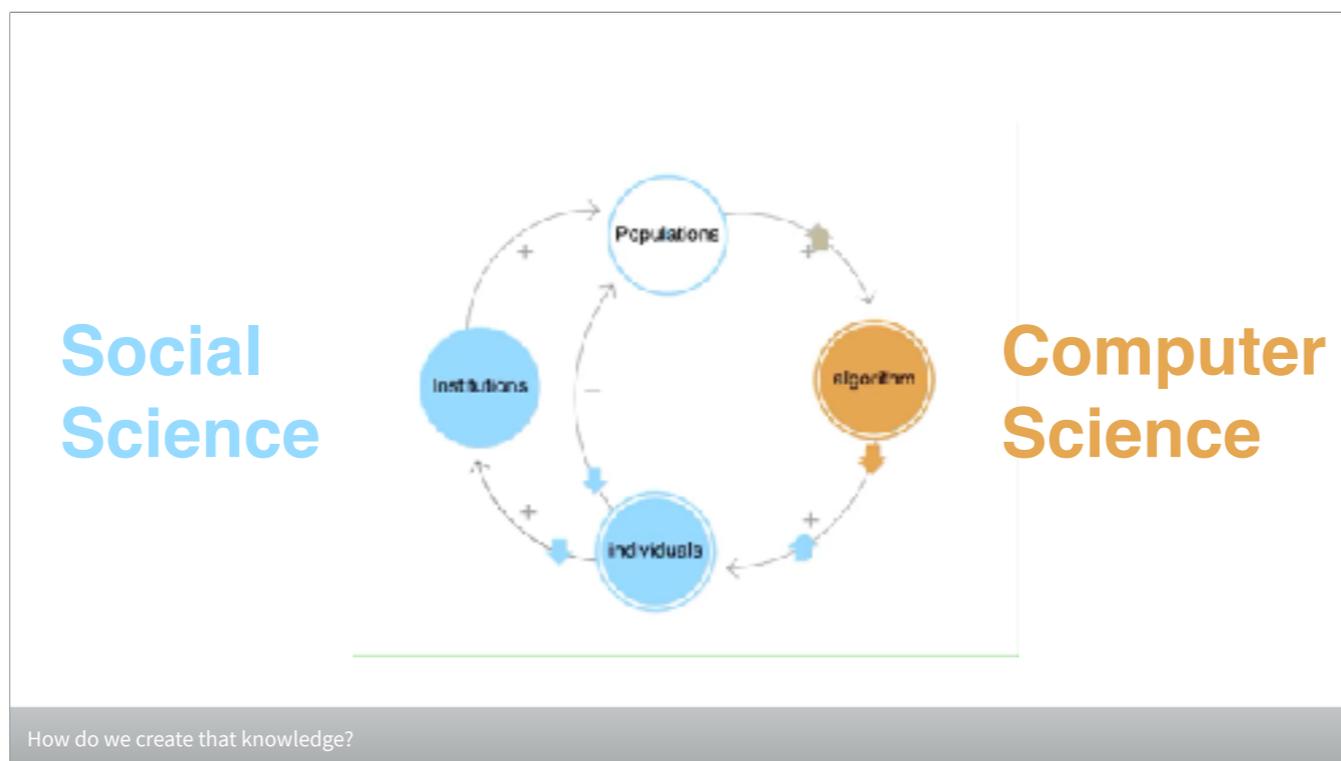
- **inefficient, costly, continuous** governance
- create **tests & standards**
- match **innovation rate** with **the pace of testing**
- **continuous evolution** in policy

How do we create that knowledge?

This is exactly the same question facing the r/worldnews community.

If it's possible to derive some general principles about human and algorithm decision-making, then algorithmic policy would look something like economists imagine economic policy would look like. We could derive general principles, build policies around them, and update those policies from time to time as old theories are overturned and new theories arise.

BUT if all prior knowledge is invalidated every time Facebook, Google, or Reddit make a change, we need to govern algorithms like we govern socks and other created artifacts. We need to design tests and standards, somehow get every algorithm tested, and do it at a scale that matches the pace of innovation, **or**, as we do with medicines, slow down the pace of innovation to the pace of testing.



So what's the answer? I'm not sure. There's a **good case to be made for the predictability of human-algorithm interaction**- and I hope the study I shared today becomes one of many others that help us govern more wisely.

Algorithms are produced and trained by human processes- people in tech firms in policy contexts with business models—we have multiple disciplines that produce knowledge about those processes. Algorithm design is constrained by mathematics, physics, and by how computer scientists think. The influence of algorithms on individual behavior is already studied systematically. Finally, algorithms shape and are shaped by institutional and societal patterns like discrimination that have proven very resistant to many people's best efforts to create change.

But maybe at the end of the day powerful **algorithms** are **more like socks than science**.

**Designing methods to evaluate
digital power is one of the great
science, engineering, and
governance challenges of our time**

Philosophers and historians of science have argued that progress in science is often achieved through innovations in research methods.

Just like Boyle, we need to invent **research systems** that enable us to ask questions in policy evaluation that previous researchers could not know to ask.

And just like Consumer Reports in the 1930s, we need to develop **research methods** that are **independent from a technology industry** that has a history of **resisting accountability** and **co-opting academics** to deflect criticism.

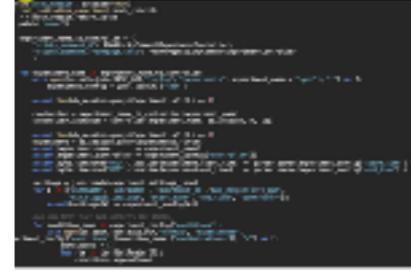
Process: **scaling industry-independent tests** with **innovative citizen science software**



Organizing & Education

Co-designing research together with affected communities

Growing public capacities for citizen science with workshops & summits



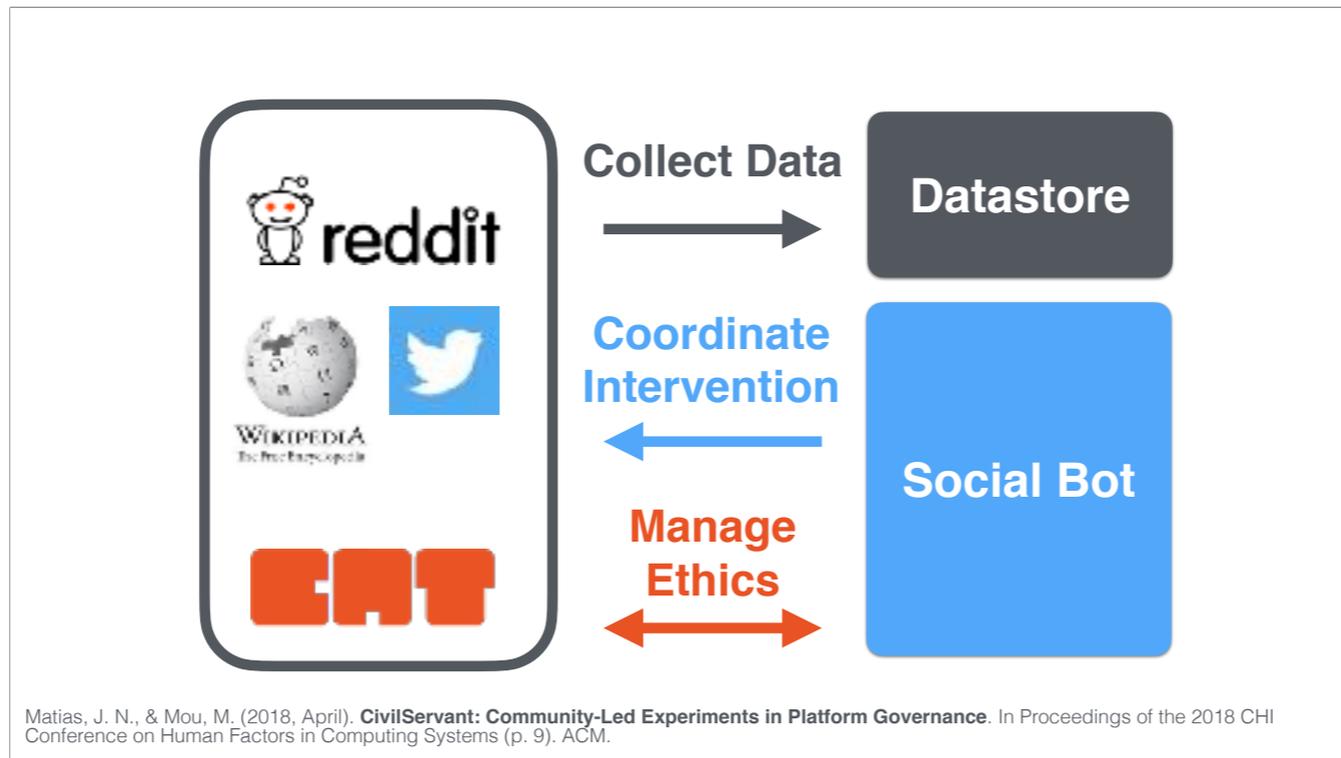
Methods & Software

Inventing easy to use methods to test vital questions about digital life

Maintaining secure, scalable systems to collect data and intervene with consent

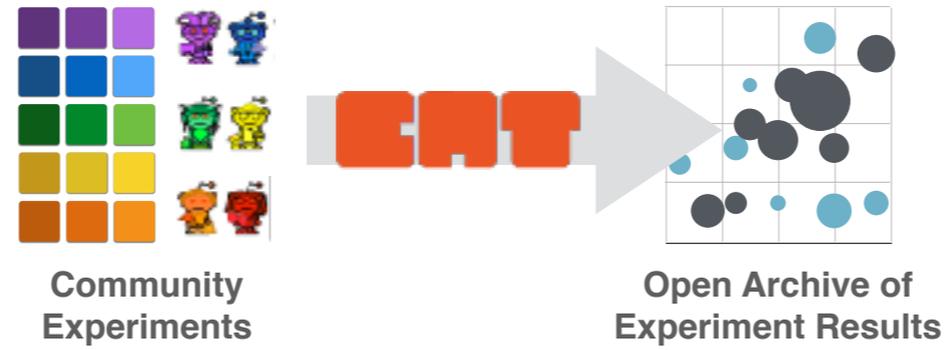
How do we create that knowledge?

At CAT Lab, we develop innovative community organizing processes and novel research software to enable industry-independent citizen science on questions like the fact-checking study I just shared.



One example is the CivilServant software that I used for the fact-checking study, which was published in CHI 2018. With permission from online communities the system collects data in real-time, conduct an A/B test of the policy, and manages community research ethics- without having to ask the company for permission.

Don't take our word for it



How do we create that knowledge?

Furthermore, we support communities to validate our collective findings by openly publishing all results, with data. As multiple communities are asking similar questions, policymakers can **discover where there are general effects** and which interventions just works under **some circumstances**.

12+ field experiments since August 2016
6 concurrent in Feb 2020



**Preventing
Harassment**

**Limiting Algo
Misinformation**

**Managing
Conflict**

**Moderating
Large Q&As**



WIKIPEDIA
L'encyclopédie libre



**Networks of
Appreciation**

**Supporting
Newcomers**

**Broadening
Knowledge**

How do we create that knowledge?

In its first three years the CivilServant software was used for over a dozen field studies across reddit and Wikipedia, with a pilot on Twitter underway.

Methods: **citizen behavioral science** and **volunteer tests of products and policies**

CivilServant: Industry-Independent Platform for Citizen Behavioral Science

Working with consent from individuals and communities, our software monitors and intervenes online to scale research on **causal questions about social impact**



Volunteer Tests and Audits

We have also prototyped systems and processes for crowdsourced tests of technologies and policies

- automatic management of n-of-one trials
- auto-generation of complex algorithmic audits
- recruiting volunteers with targeted ads
- large scale data privacy & ethics management

Awards



How do we create that knowledge?

Today, I talked about CAT Lab's work to test ideas about creating change in our social lives online. We have also created novel systems for volunteer-based tests and audits of technologies and corporate policies. In addition to the CivilServant software,

- The **Bartleby** system manages research ethics and data privacy
- We have piloted multi-armed bandit algorithms for citizen science
- Our **N-of-one trial system** enables people to ask questions about the effects of technology in their own lives
- Our pilot systems for **crowdsourced audit studies** can investigate complex decision-making systems
- And our **research support software** can calculate diagnose and simulate the viability of complex study designs

CAT Lab Receives \$1.3m in funding — and we're hiring!

February, 2021

Author
J. Nathan Matias



How do we create that knowledge?

And thanks to \$1.3m in grants from the Templeton World Charity Foundation and the MacArthur Foundation, we are spending the next three years further developing our research systems to be more widely usable by scientific collaborators.

If you are excited about this vision and want to be CAT Lab's deputy director or our new postdoc research manager, I encourage you to apply!

What does it mean to govern?

What knowledge do we need to govern?

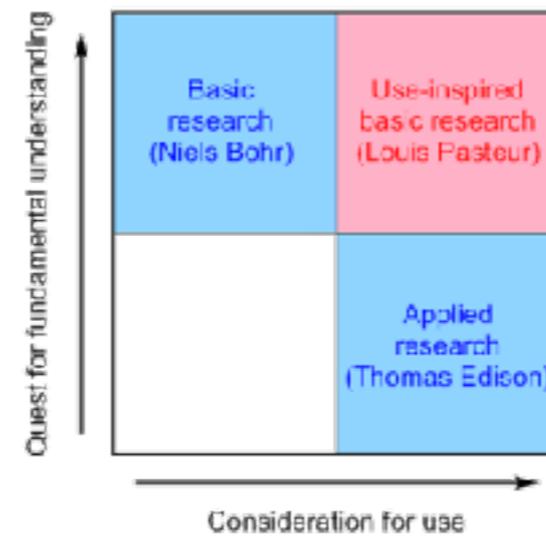
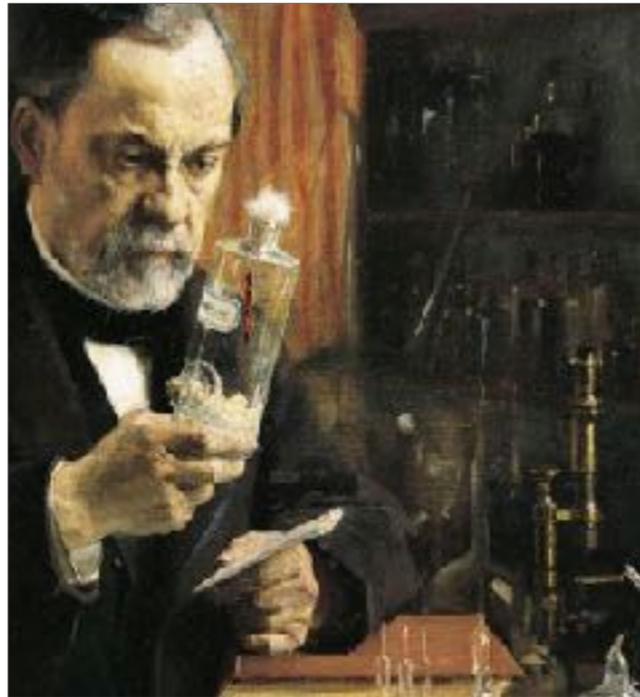
How do we create that knowledge?

How can knowledge inform governance?

While scientists often value knowledge for its own sake, how can this knowledge inform governance?

At CAT Lab, our findings have been used by communities as they make decisions affecting a few dozen or a few million people. They have influenced how tech companies design products and been cited in national policy debates. Our research has also been published in the world's leading scientific journals.

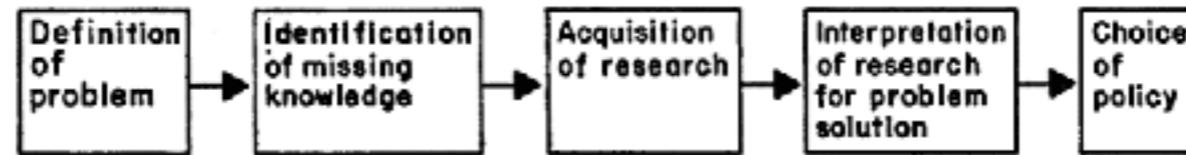
But I want to step back and ask a deeper question- what do we want the relationship between knowledge and governance to be?



Stokes, D. E. (2011). *Pasteur's quadrant: Basic science and technological innovation*. Brookings Institution Press.

How can knowledge inform governance?

In engineering and the social sciences, many researchers describe their work as “Use-inspired basic research” where researchers start by imagining pragmatic needs or collaborate with partners to make discoveries that advance theory and practice alike. Unlike Neils Bohr, who was concerned with atomic theory, or Thomas Edison, who wanted to create usable products, these researchers try to do both at the same time.

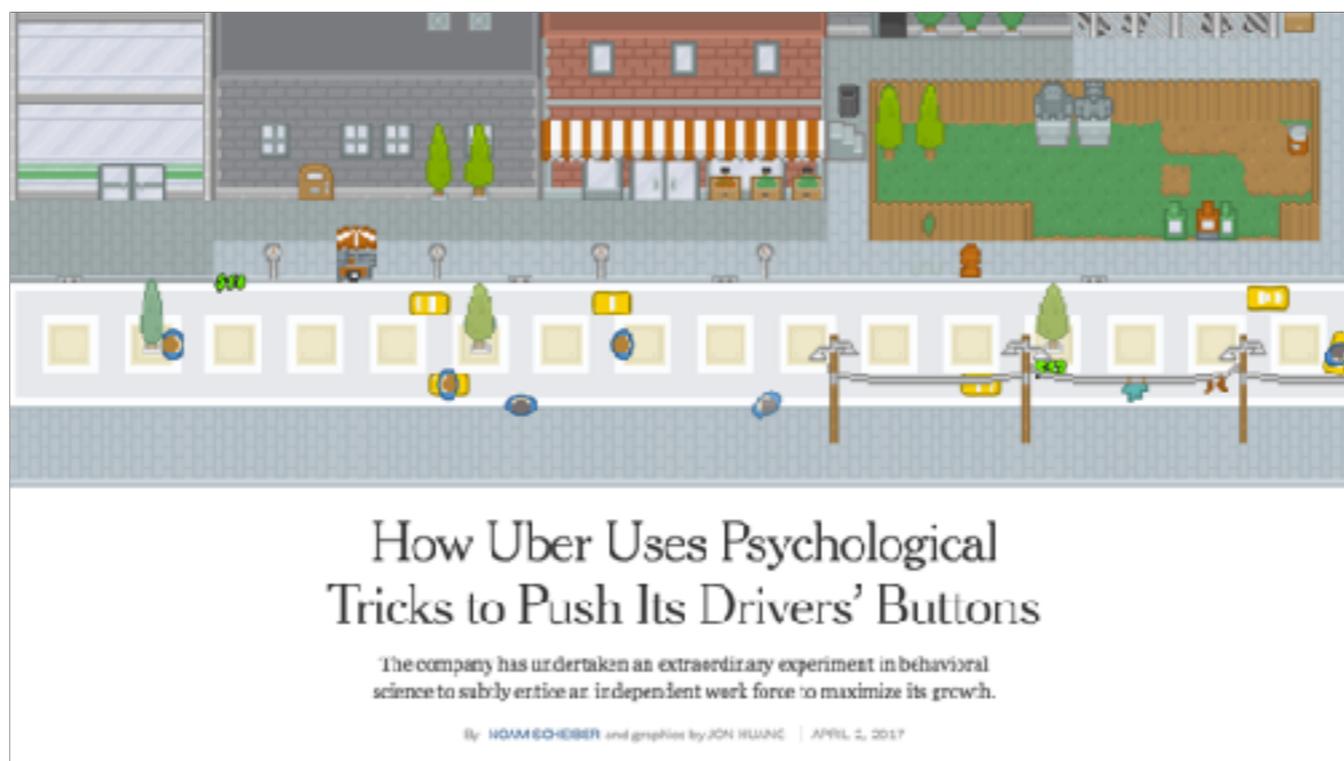


Weiss, C. H. (1979). **The many meanings of research utilization**. *Public administration review*, 39(5), 426-431.

How can knowledge inform governance?

And that's what policy researchers often aspire to, according to Carol Weiss- they define a problem, identify missing knowledge, acquire research, interpret the research, and guide policy decisions, with science as a byproduct.

Powerful organizations grow their **power**, **scientists** grow **knowledge**, and everyone wins, right?



Maybe not. We now live in a world where corporations have amassed the world's most powerful social science research endeavors in human history, endeavors that the public has learned to deeply mistrust. In 2017, a New York Times Magazine article accused the **ride-hailing company** Uber of **pulling its workers psychological levers**

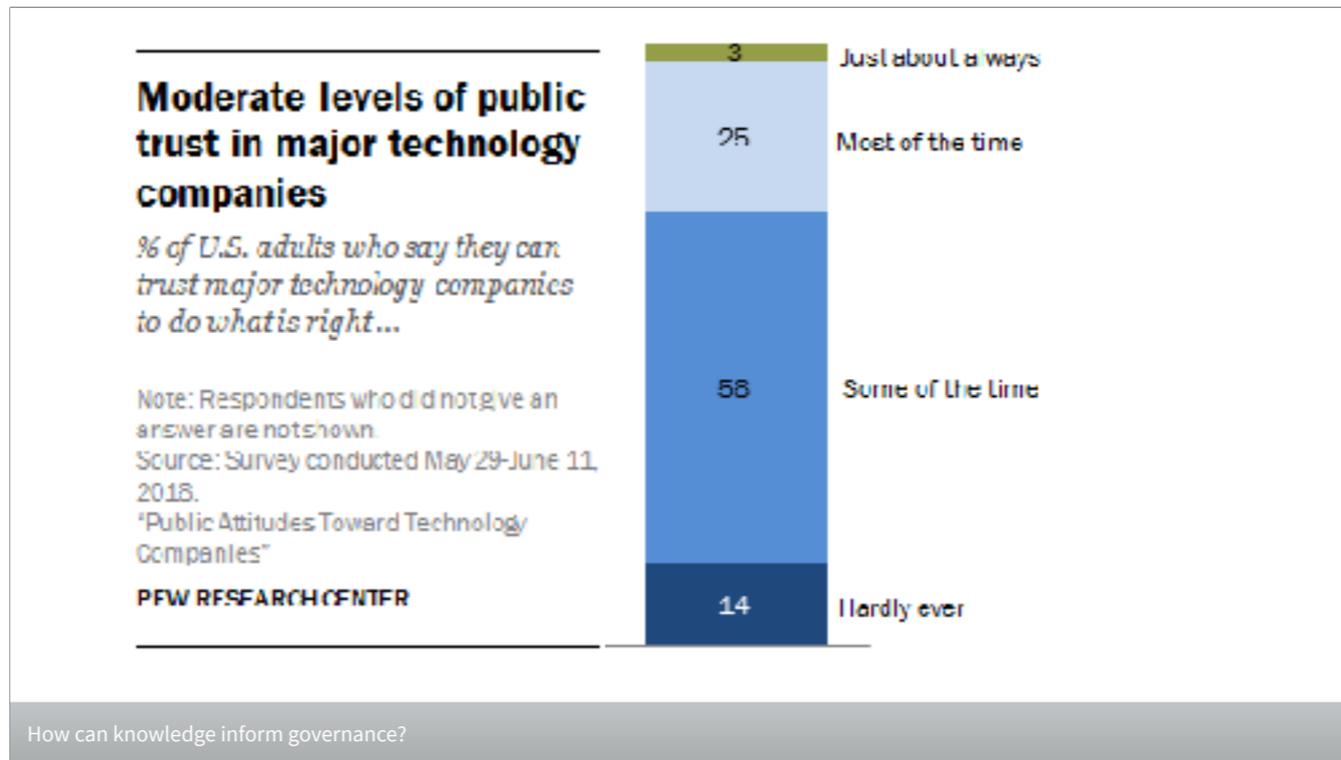
“ Employing **hundreds of social scientists and data scientists**,

Uber has **experimented** with video game techniques, graphics and noncash rewards of little value that can **prod drivers into working longer and harder** — and sometimes at **hours** and **locations** that are **less lucrative** for them.

Scheiber, N., Huang, J. (2017) **How Uber Uses Psychological Tricks to Push Its Drivers' Buttons**. New York Times Magazine. April 2, 2017.

How can knowledge inform governance?

The company **hired hundreds of social scientists** to generate **substantial evidence**, and according to the article, used that knowledge to **influence drivers** to act **against their own self interest to benefit the company**



According to a Pew survey, only **28% of Americans** say that they can **trust tech companies** to do **what is right most of the time**. What can we as researchers do to ensure that our work advances the public interest at a time when the public mistrusts tech companies, often for good reason?



Seyss-Inquart and Hitler with Himmler and Heydrich to the right in Vienna, March 1938. Source: Wikipedia

During the **second world war**, the **Austrian exile** and philosopher Karl Popper wrote about the politics of social experiments. While Popper is often imagined as an **advocate of unfettered positivism**, he had **deep doubts** about the role of science in policy, imagining **two kinds of governance: open and closed societies**.

Closed Societies

“the learned should rule”

Open Societies

the public evaluates & criticizes government

“so that **bad or incompetent rulers** can be **prevented from doing too much damage**”

Popper, K. (1947). *The open society and its enemies*. Routledge.

How can knowledge inform governance?

In **closed** societies, authoritarians **govern** and **manipulate** the **public** towards **utopian goals** on the **paternalistic principle** that “**the learned should rule**.” In **open societies**, the public is **encouraged to evaluate** and **criticize government decisions** “so that **bad or incompetent** rulers can be prevented from doing too much damage”

“ the **social engineer** conceives as the scientific basis of politics something like a **social technology**

the **Utopian engineer** will have to be deaf to many complaints ; in fact, it will be part of his business to suppress unreasonable objections. But with it, **he must invariably suppress reasonable criticism** also

Popper, K. (1947). *The open society and its enemies*. Routledge.

How can knowledge inform governance?

In *The Open Society and its Enemies*, Popper **yearns** for a way to **reconcile** the **social sciences** with **democracy** without **resorting to Nazi-style eugenics**. So he talks about two kinds of **social engineers** and **social technology**:

The **Utopian engineer** **ignores complaints** and **suppresses criticism**— for them, the **path** from **research to policy** is **direct** because they're **making the decisions**.

I have to be honest here—most corporate research advances this kind of closed society that deflects or criticism and works in secret.

“ The **piecemeal engineer** will, accordingly, adopt the method of **searching for, and fighting against, the greatest and most urgent evils of society...**

There will be a possibility of reaching a **reasonable compromise** and therefore of **achieving the improvement by democratic methods.**

Popper, K. (1947). **The open society and its enemies.** Routledge.

How can knowledge inform governance?

In contrast, Popper's **piecemeal engineer** tries to **alleviate social ills** through **social research** that informs **democratic processes** of **deliberation** and **compromise**.

They produce evidence that informs a deliberative process that involves the public and holds power accountable for failures.



Effective commons governance is easier to achieve when

- the resources and use of the resources by humans can be **monitored**, and
- the information can be **verified** and **understood** at relatively low cost



Dietz, T., Ostrom, E., & Stern, P. C. (2003). **The struggle to govern the commons**. *Science*, 302(5652), 1907–1912.

How can knowledge inform governance?

The thing to remember, as described by the Nobel prize winning political scientist Elinor Ostrom, is research is part of a **governance struggle** in complex ecosystems where the interests of multiple parties conflict.

Ostrom argued that effective governance is easier to achieve when multiple parties, including citizen groups, are able to **monitor** the environment and **verify** evidence, as part of a **co-evolutionary race**.

How can we govern Human + Machine Behavior?

How can knowledge inform governance?

So how can we govern human and machine behavior?

- This is an urgent question
- It's unclear whether human algorithm interaction is science or engineering, though I'm hopeful that some science is possible.
- We have an urgent need to monitor and intervene when these dynamics go wrong, to steer them in beneficial directions.
- Doing so will require us to use considerable creativity to remake the tools of research because we are still learning what questions to ask.
- And we need to do this work in ways that work for democracy

CNBC
11:07 AM
YouTube radicalized the Christchurch shooter, New Zealand report concludes
PUBLISHED FEB. 20, 2020 10:00 AM EST
Jen Hwang
@JenHwangCNBC

KEY POINTS

- The Australia terrorist who killed 51 people at two mosques in Christchurch was radicalized by YouTube, according to a report from The New Zealand Royal Commission.
- New Zealand Prime Minister Jacinda Ardern said she plans to talk to YouTube's leaders about the platform's role in the 2019 murder.
- YouTube has been linked to radicalization and while it removed extremist content before and the algorithm owned by Google has been accused of using algorithms that push viewers toward more polarized content as they use the platform.

NEWS
Tech
Instagram: New tools to ban self-harm and suicide posts
11 November 2020

Instagram has launched new technology to recognize self-harm and suicide content on its app in the UK and Europe.

WSKG
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Untangling Disinformation
Instagram Suggested Posts To Users. It Served Up COVID-19 Falsehoods, Study Finds
March 9, 2020 - 12:01 AM ET
SHANNON BOND

Researchers are concerned that Instagram's new "suggested posts" feature is contributing to the spread of misinformation.
New York Times | Daily Arrogance

Governing Human and Machine Behavior

It is my hope that policies governing human and machine behavior will become as boring and trusted as environmental monitoring, FDA protocols for clinical trials, or government standards on car safety.

Policy problems are rarely solved, but they can be managed, and in the struggle of governance, we can reduce harm and improve society one step at a time with the help of people who care and good evidence.

Vision: Imagine a world where **digital power** is **guided by evidence** and **publicly accountable**



Community scientists record bird migration patterns at the Salton Sea National Wildlife Refuge. CC-BY 2.0 Kyle Elmstensen

Whether you're an advocate, policymaker, scientist, or engineer, I invite you to work for a world where digital power is guided by evidence and accountable to the public — the open society that Popper and Ostrom wrote about. CAT Lab has been supporting communities to make that vision real, and so can you.