data scientist, or the most dangerous job of the 21st century

hugo bowne-anderson
datacamp
@hugobowne

11/12/2019

We need to talk about

- Where we are
- How we got here
- Paths forward

Charlie Chaplin, Modern Times

We need to talk about

- ➔ Where we are
- ➔ How we got here
- ➔ Paths forward

Charlie Chaplin, Modern Times

Artificial Intelligence—The Revolution Hasn't Happened Yet

by Michael I. Jordan

While the building blocks are in place, the principles for putting these blocks together are not, and so the blocks are currently being put together in ad-hoc ways. Thus, just as humans built buildings and bridges before there was civil engineering, humans are proceeding with the building of societal-scale, inference-and-decision-making systems that involve machines, humans, and the environment. Just as early buildings and bridges sometimes fell to the ground—in unforeseen ways and with tragic consequences—many of our early societal-scale inference-and-decision-making systems are already exposing serious conceptual flaws.

Artificial Intelligence—The Revolution Hasn't Happened Yet

by Michael I. Jordan

Unfortunately, we are not very good at anticipating what the next emerging serious flaw will be. What we're missing is an engineering discipline with principles of analysis and design.

What we have: recycled intelligence

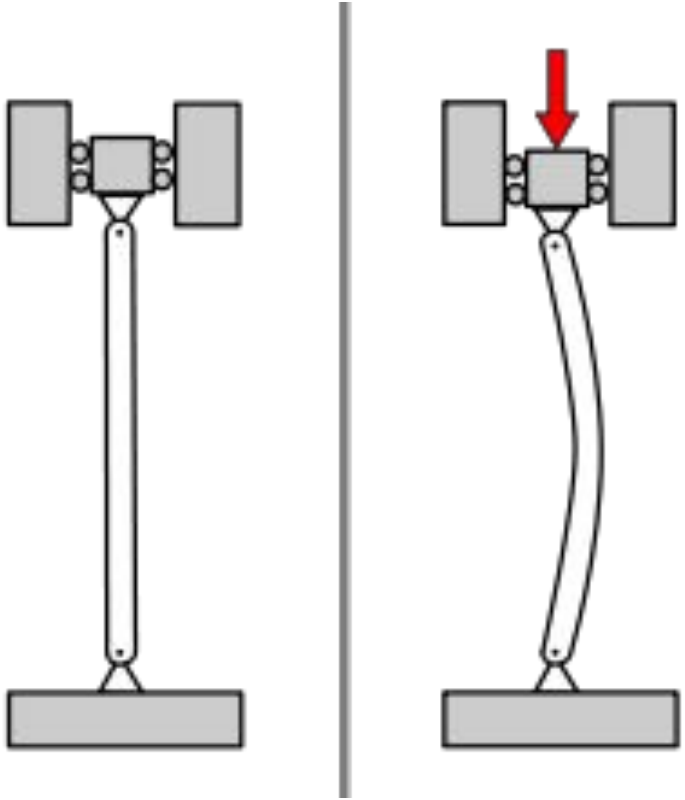
➔ “The success stories in language & vision processing came from scrupulously mimicking human intelligence. No new intelligence has been created; **existing human intelligence is merely recycled.**” -- David Donoho

A new discipline of engineering

Structural failure in civil engineering

1. Structure is not strong enough to support the load
2. Fatigue or corrosion
3. Manufacturing error or defective materials
4. Lack of consideration of unexpected problems

Structural failure: buckling



Structural failure in data science

1. Poor design (e.g. does not generalize as expected, not all users considered)
2. Lack of maintenance (e.g. model drift)
3. Failure due to bad parts (e.g. training data, assumptions, objective function)
4. Lack of consideration of unexpected problems (e.g. bad actors such as Cambridge Analytica)

Engineering medicine at scale

- White spots around heart possible markers for Down Syndrome (risk 1 in 20)
- Amniocentisis could tell more (fatal 1 out of 300)
- White spots were white noise due to increased resolution of modern ultrasound

Engineering medicine at a planetary scale

- Measure variable/outcome
- (Statistical) analysis
- (Attempt to) generalize
- Decision making

Engineering finance at a planetary scale

DHH ✓
@dhh

The @AppleCard is such a fucking sexist program. My wife and I filed joint tax returns, live in a community-property state, and have been married for a long time. Yet Apple's black box algorithm thinks I deserve 20x the credit limit she does. No appeals work.

3:34 PM · Nov 7, 2019 · Twitter for iPhone

8.8K Retweets **26.2K** Likes

Building a fairer and more inclusive financial services industry for everyone

NY Department of Financial Services Follow
Nov 10 · 3 min read

By Linda A. Lacewell, Superintendent of New York State Department of Financial Services

Bloomberg Subscribe

Future Finance

Apple Co-Founder Says Goldman's Apple Card Algorithm Discriminates

By Shahien Nasiripour and Sridhar Natarajan

- ▶ Steve Wozniak urges tougher regulation on credit algorithms
- ▶ Regulator opens probe after sexism was alleged in viral tweets

"These sorts of unfairnesses bother me and go against the principle of truth. We don't have transparency on how these companies set these things up and operate," Wozniak said in an interview on Sunday. "Our government isn't strong enough on the issues of regulation. Consumers can only be represented by the government because the big corporations only represent themselves."

Wozniak said he can borrow 10 times as much as his wife on their Apple Cards even though they share bank and other credit card accounts, and that other lenders treat them equally.

"Algos obviously have flaws," Wozniak said. "A huge number of people would say, 'We love our technology but we are no longer in control.' I think that's the case."

Engineering finance at a planetary scale

DHH
@dhh

The @AppleCard is such a fucking sexist program. My wife and I filed joint tax returns, live in a community-property state, and have been married for a long time. Yet Apple's black box algo
the credit limit she does. I

3:34 PM · Nov 7, 2019 · Twitter for iPl

8.8K Retweets **26.2K** Likes

DHH Retweeted

Linda Lacewell
@LindaLacewell

If you have been subjected to discrimination, step forward and email us at consumers@dfs.ny.gov. We also invite experts and members of the tech community to reach out to us at innovation@dfs.ny.gov.

3:15 PM · Nov 10, 2019 · Twitter for iPhone

Bloomberg Subscribe

Future Finance

Apple Co-Founder Says Goldman's Apple Card Algorithm Discriminates

…on credit algorithms
…alleged in viral tweets

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…panies set these things up and operate,"
…Our government isn't strong enough on
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"Algos obviously have flaws," Wozniak said. "A huge number of people would say, 'We love our technology but we are no longer in control.' I think that's the case."

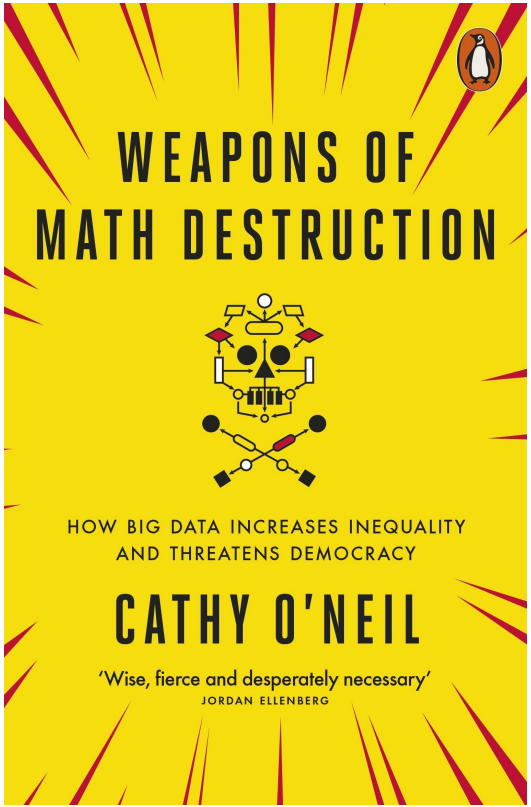
Building a fairer a financial services

NY Department of Financial Services
Nov 10 · 3 min read

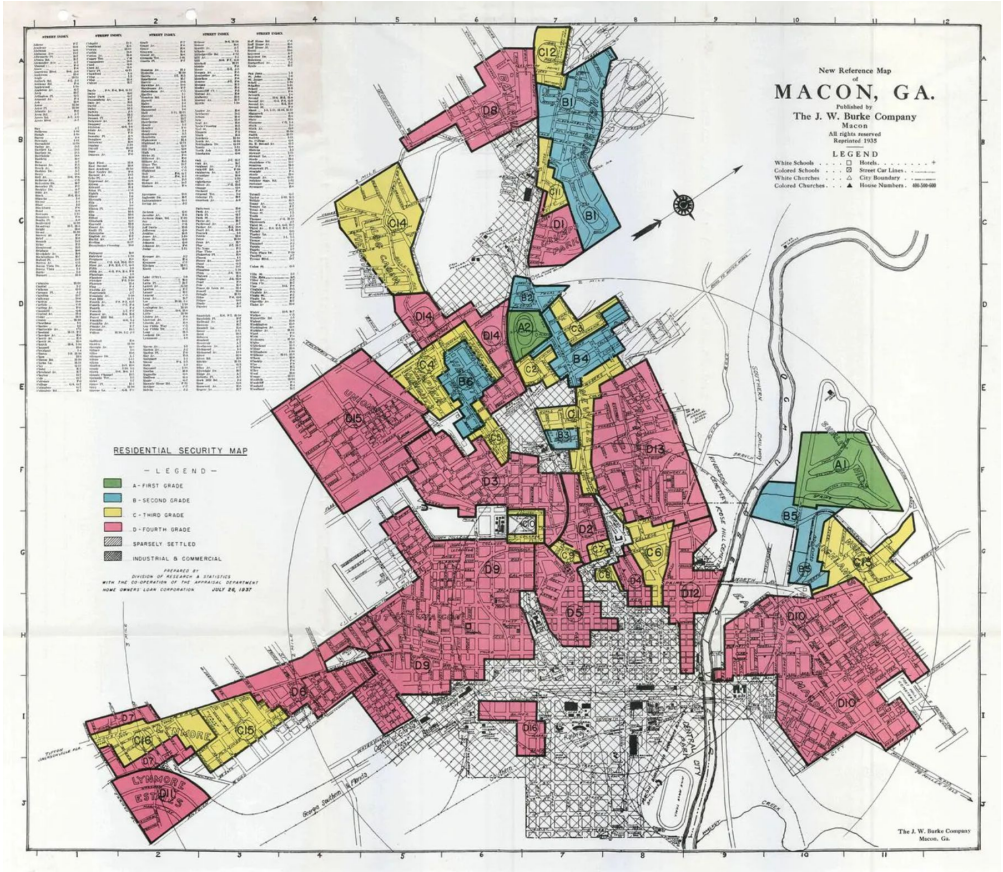
By Linda A. Lacewell, Superintendent of New York State Department of Financial Services

Engineering finance at a planetary scale

➔ Targeted ads based on e-credit score



Engineering finance at a planetary scale



Engineering finance at a planetary scale

BUSINESS

Modern-day redlining: How banks block people of color from homeownership

By AARON GLANTZ AND EMMANUEL MARTINEZ
REVEAL | FEB 17, 2018 | 2:30 PM

For people of color, banks are shutting the door to homeownership

By Aaron Glantz and Emmanuel Martinez / February 15, 2018

Google to Ban All Payday Loan Ads

Google's ban on payday loan ads will take effect July 13. Jeff Chiu/Associated Press

By Christine Hauser

May 11, 2016

Technological redlining

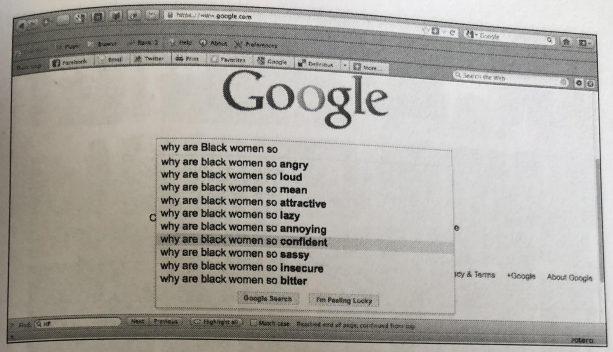


Figure 1.5. Google autosuggest results when searching the phrase "why are black women so," January 25, 2013.

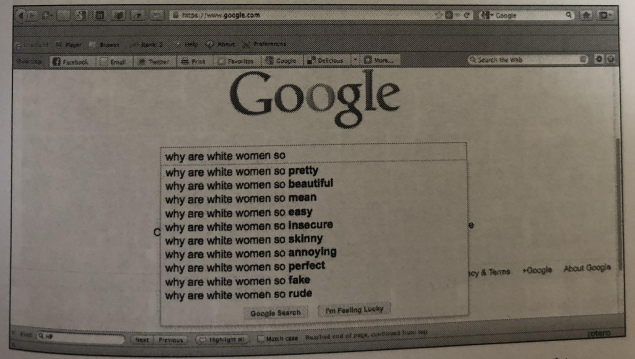
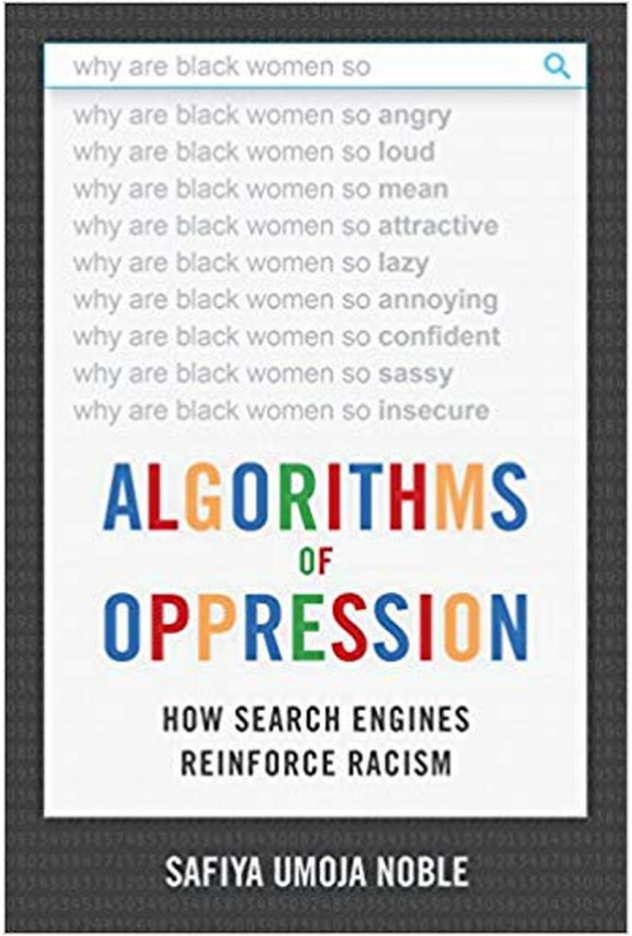


Figure 1.6. Google autosuggest results when searching the phrase "why are white women so," January 25, 2013.



Technological redlining: facial recognition

The New York Times

Opinion

The Racist History Behind Facial Recognition

When will we finally learn we cannot predict people's character from their appearance?

Lens

LENS

The Racial Bias Built Into Photography

Sarah Lewis explores the relationship between racism and the camera.

Shirley Card, 1978. Courtesy of Hermann Zschiegner

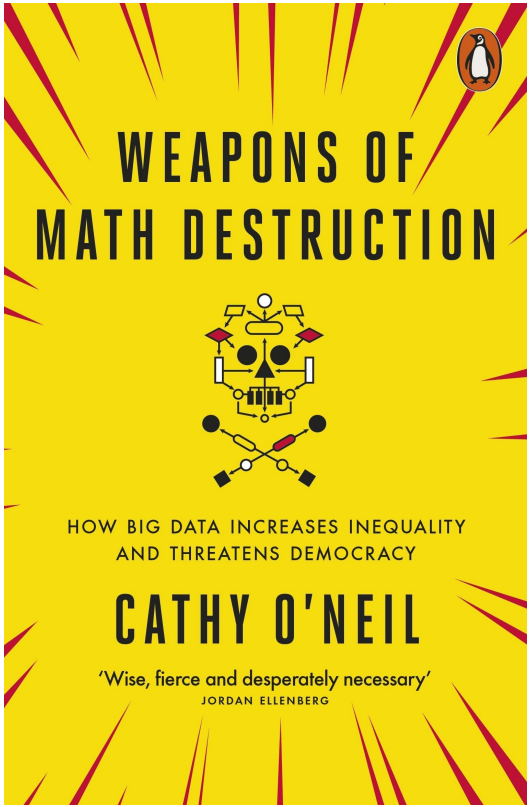
By Sarah Lewis

April 25, 2019

Engineering society at scale: WMDs

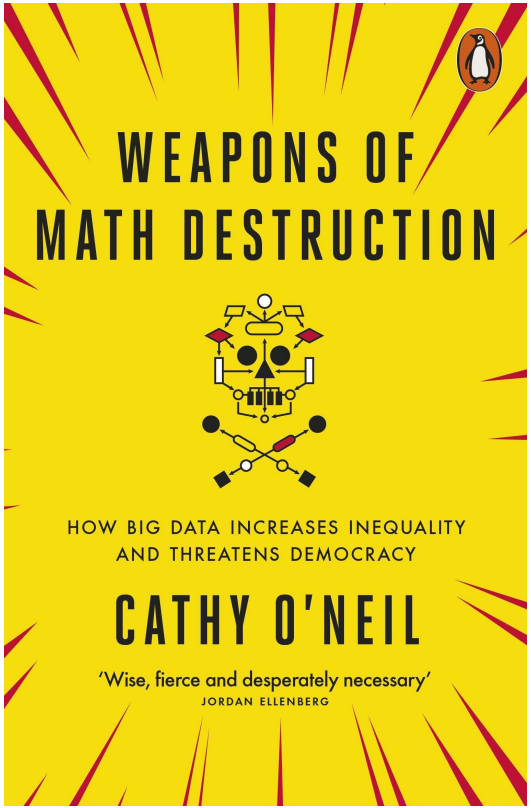
Important, secretive, and harmful algorithms that impact

- ➔ Financial decisions
- ➔ Livelihood decisions
- ➔ Decisions around liberty
- ➔ Decisions around information



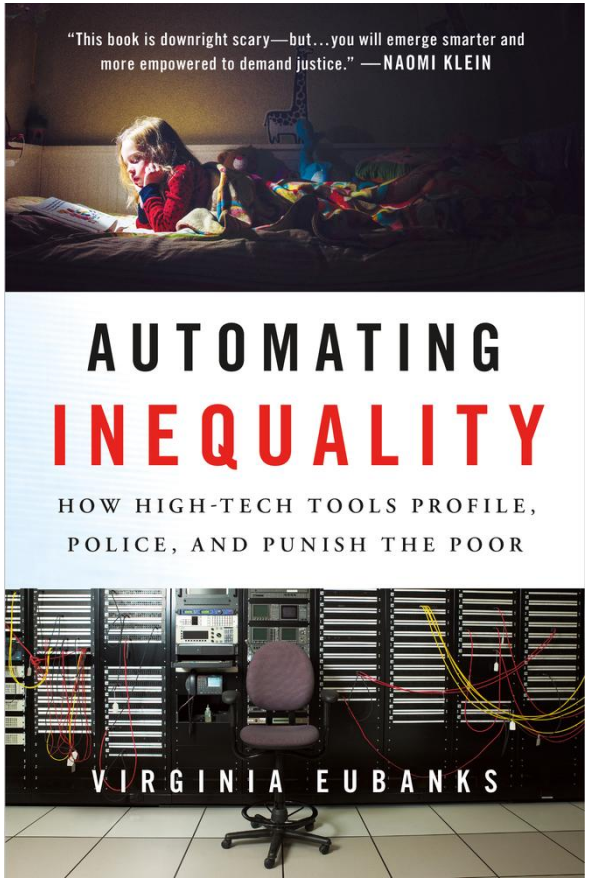
Engineering society at scale: WMDs

- The Value Added Model for teachers
- A widespread hiring model for minimum wage positions that had, embedded in it, a personality test that essentially performed a mental health assessment, which is illegal under the Americans with Disability Act
- Recidivism risk algorithms in the criminal justice system



Engineering society at scale: the digital poorhouse

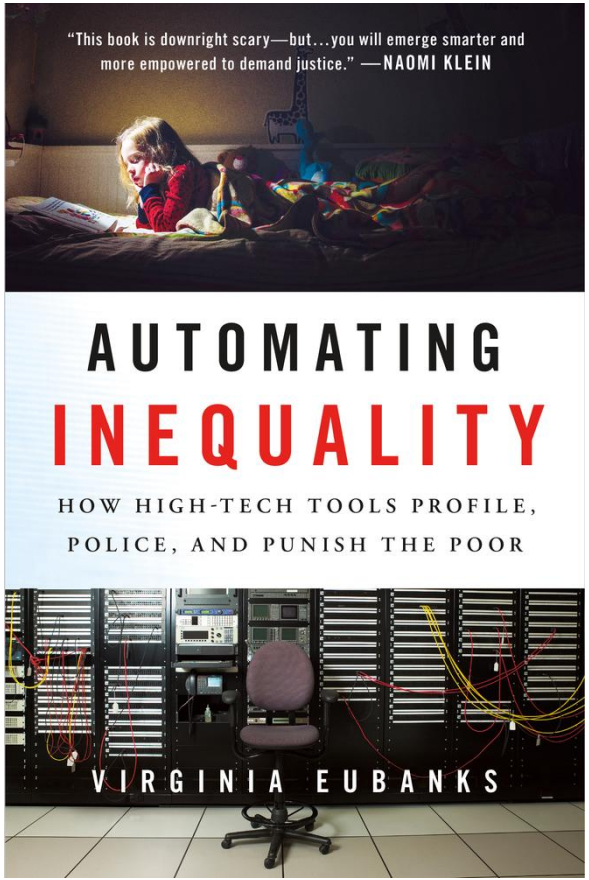
- An attempt at automating the welfare eligibility system in Indiana;
- A predictive model that uses data in social services databases to determine whether or not children are at risk of abuse and/or neglect in Pennsylvania;
- An algorithm used in Los Angeles to determine who will get housing, out of the city's tens of thousands of homeless people



Engineering society at scale: the digital poorhouse

Those at highest risk

- ➔ had all types of personal data collected with little regard for security or privacy with minimal upside;
- ➔ were classified as “risky investments” and “problematic parents” by the relevant predictive models;
- ➔ Were targets of vast networks of surveillance.

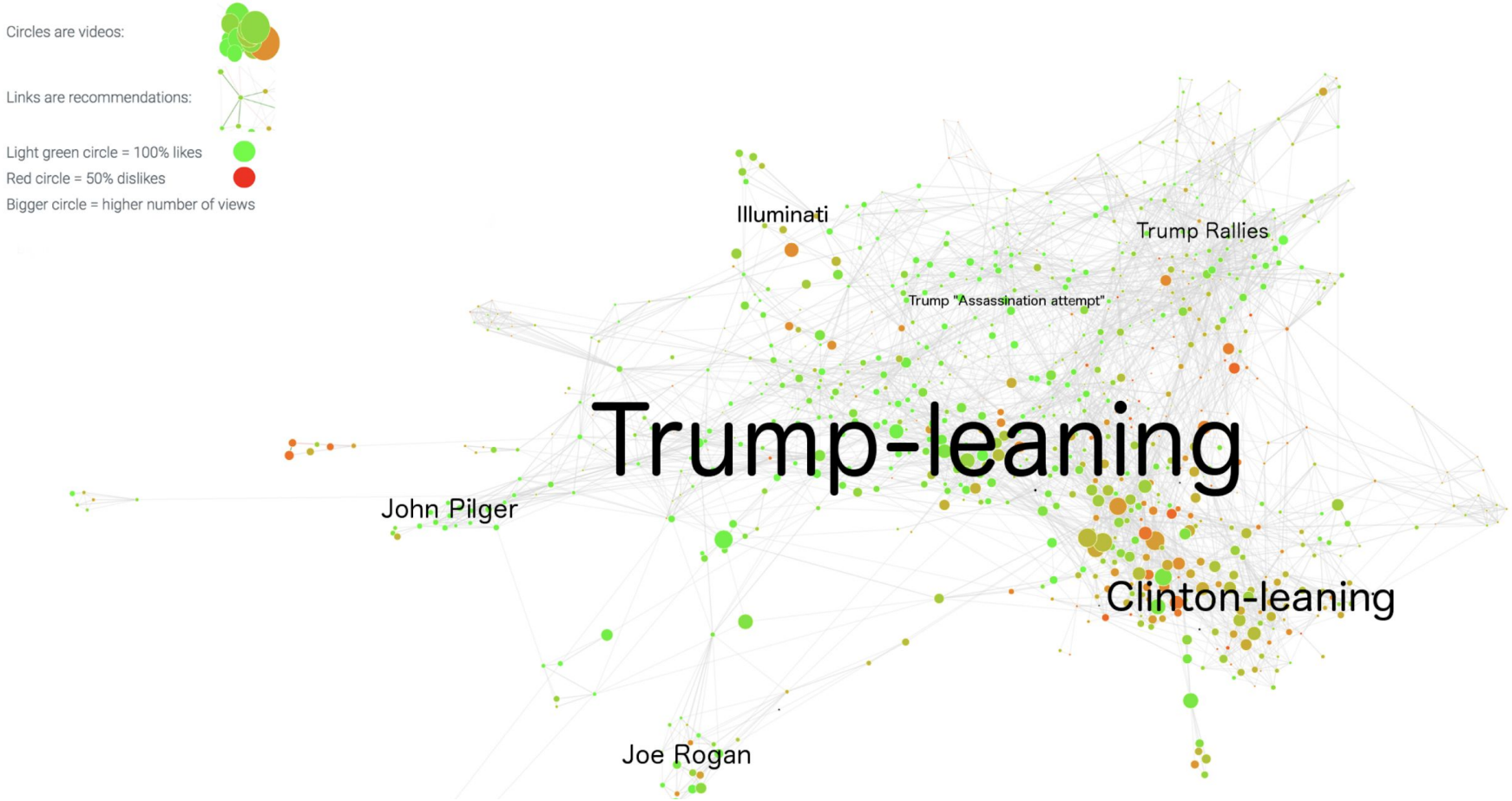


YouTube's A.I. was divisive in the US presidential election

Guillaume Chaslot Follow
Nov 27, 2016 · 5 min read

> *YouTube's Artificial Intelligence (A.I.) recommends tens of billions of videos every single day, yielding billions of views. On the eve of the US Presidential Election, we gathered recommendation data on the two main candidates, and found that more than 80% of recommended videos were favorable to Trump, whether the initial query was "Trump" or "Clinton". A large proportion of these recommendations were divisive and fake news.*
> *We propose two transparency metrics to elucidate the impact of A.I. on the propagation of political opinions and fake news.*

Engineering information at a planetary scale



Searching from “is the earth flat or round?” and following recommendations five times, we find that **more than 90% of recommended videos state that the earth is flat.**

Alignment towards divisiveness

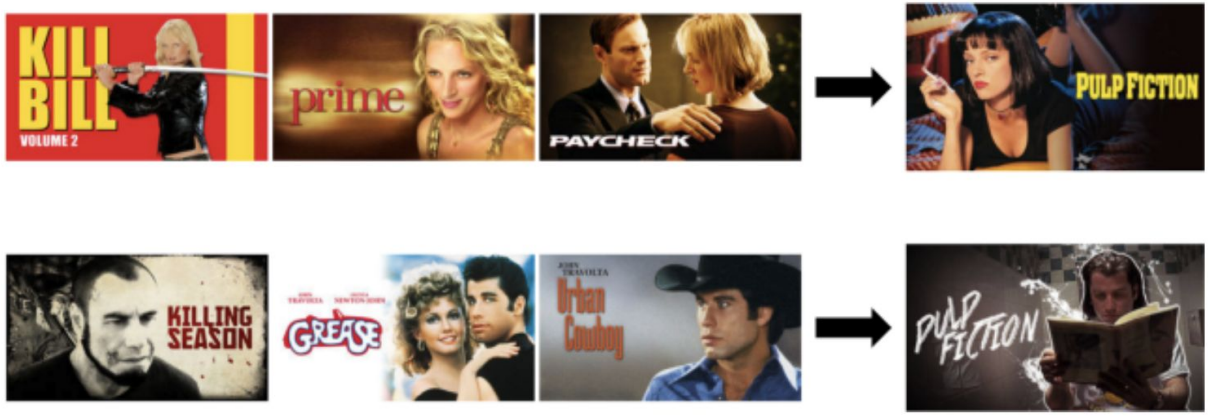
Maximizing engagement can create alignment towards values and behaviors that are particularly engaging for a small group of people at the cost of others, such as **racism, homophobia, sexism, xenophobia, bullying, religious hatred, violence, or conspiracies**. Tay.ai, the Twitter chatbot from Microsoft, showed support for all of these, within 24 hours.

Engineering information at a planetary scale

NITASHA TIKU CULTURE 10.24.2018 08:20 PM

Why Netflix Features Black Actors in Promos to Black Users

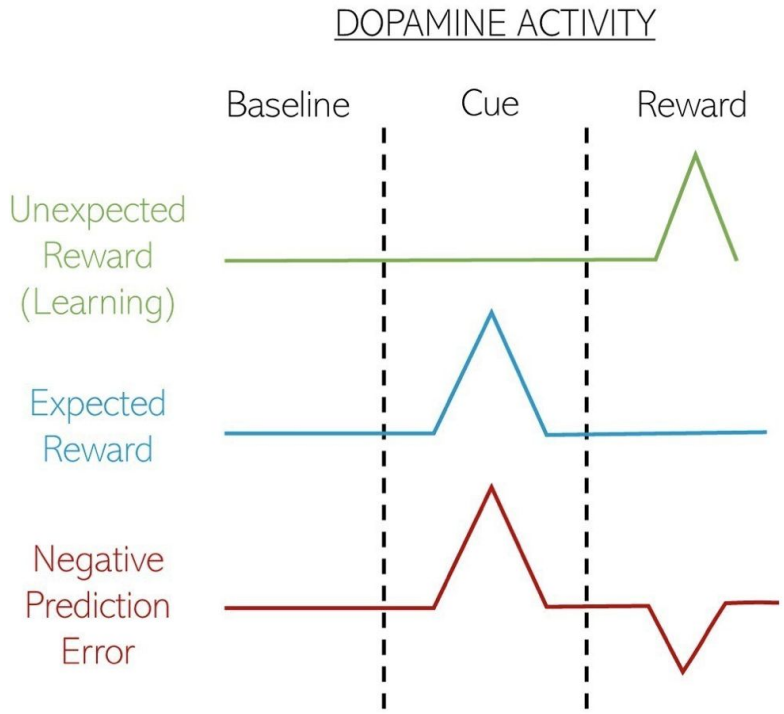
The streaming firm says it does not track users' race or ethnicity. But in customizing promotions based on users' past viewing history, it can achieve a similar effect.



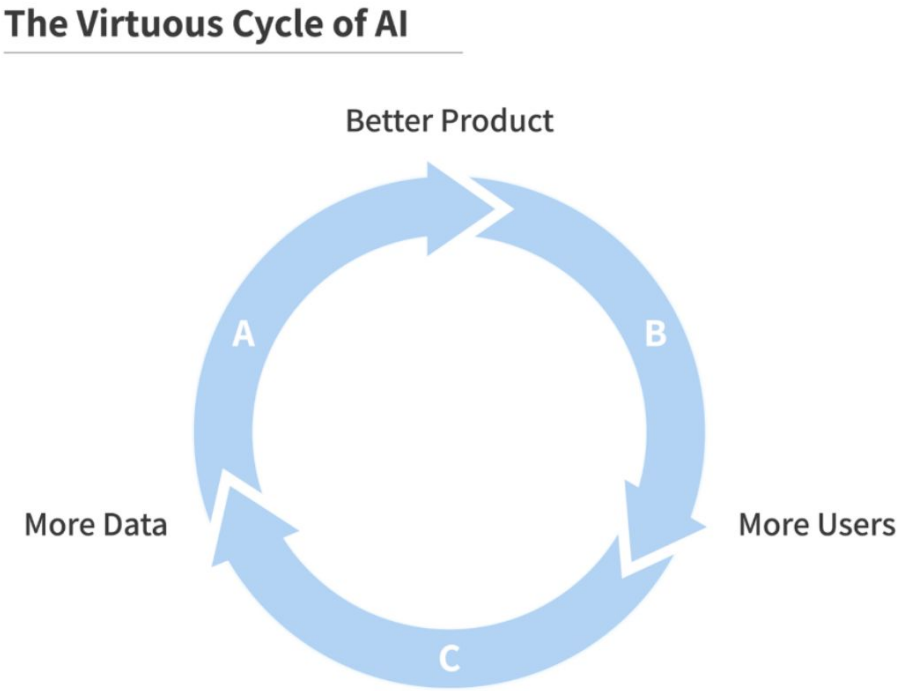
stacia l. brown @slb79 · Oct 18, 2018

Other Black @netflix users: does your queue do this? Generate posters with the Black cast members on them to try to compel you to watch? This film stars Kristen Bell/Kelsey Grammer and these actors had maaaaybe a 10 cumulative minutes of screen time. 20 lines between them, tops.

Engineering information at a planetary scale

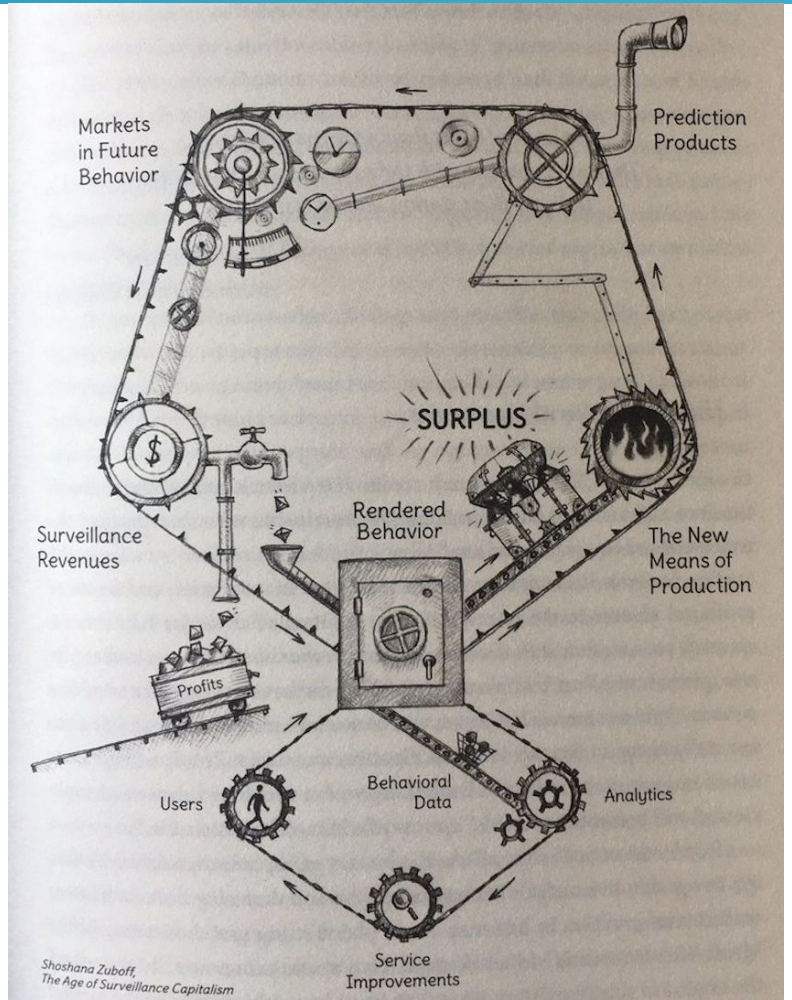


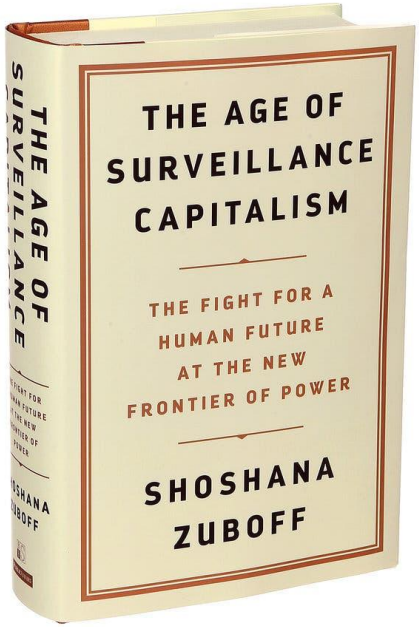
The Virtuous Cycle of AI



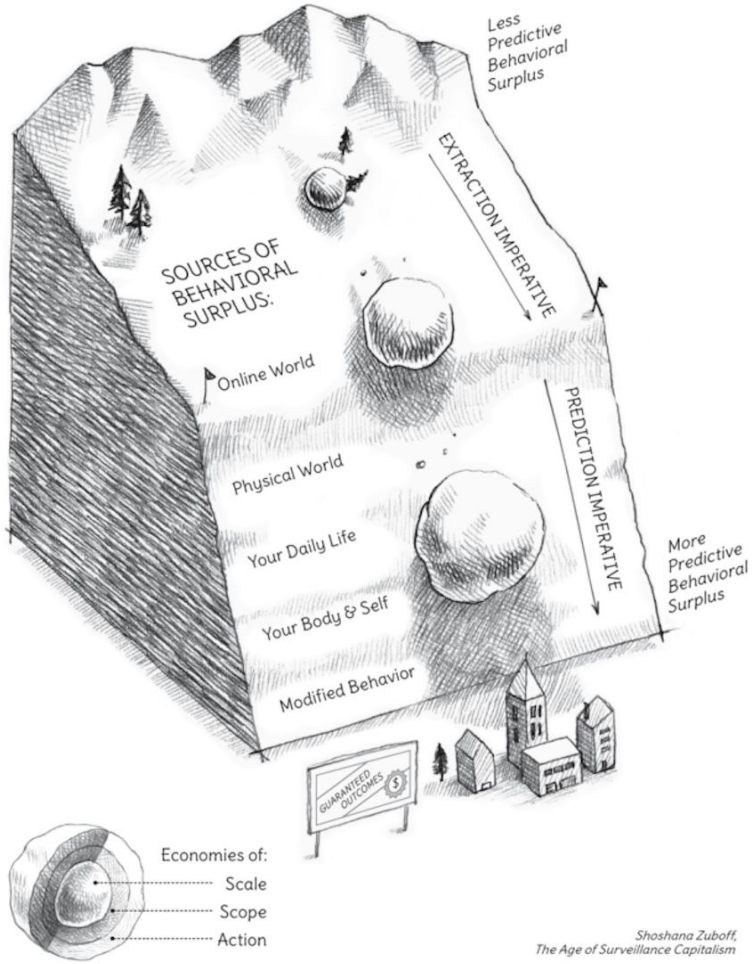
Andrew Ng, [The AI Transformation Playbook]

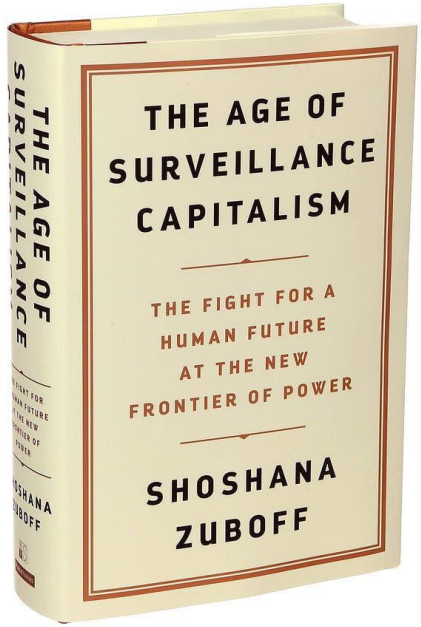
The Not-So Virtuous Cycle of AI





The Not-So Virtuous Cycle of AI



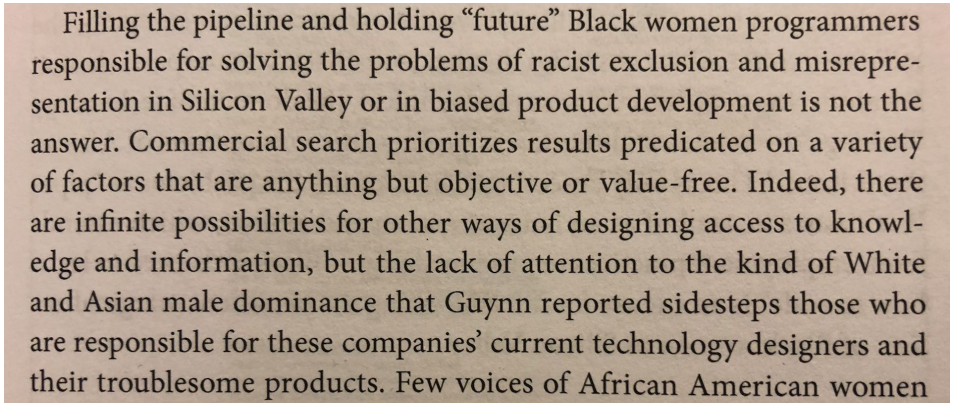


We need to talk about

- Where we are
- How we got here
- Paths forward

Charlie Chaplin, Modern Times

Builders don't represent users



Filling the pipeline and holding "future" Black women programmers responsible for solving the problems of racist exclusion and misrepresentation in Silicon Valley or in biased product development is not the answer. Commercial search prioritizes results predicated on a variety of factors that are anything but objective or value-free. Indeed, there are infinite possibilities for other ways of designing access to knowledge and information, but the lack of attention to the kind of White and Asian male dominance that Guynn reported sidesteps those who are responsible for these companies' current technology designers and their troublesome products. Few voices of African American women

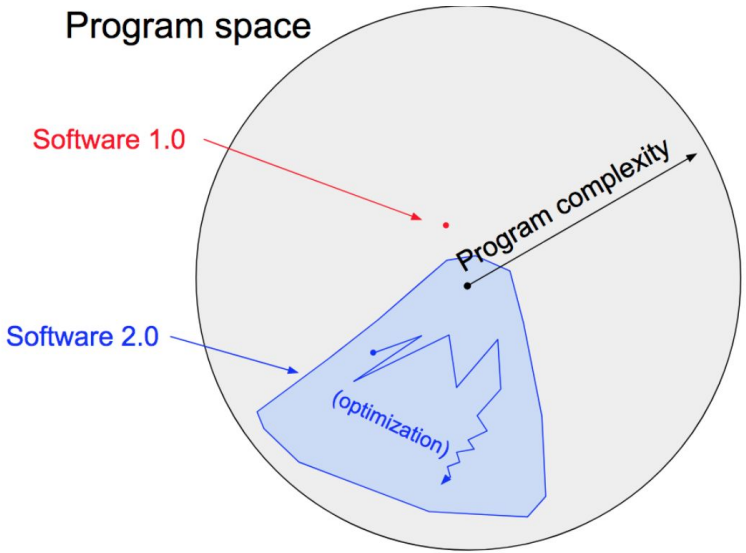
Safiya Noble, Algorithms of Oppression

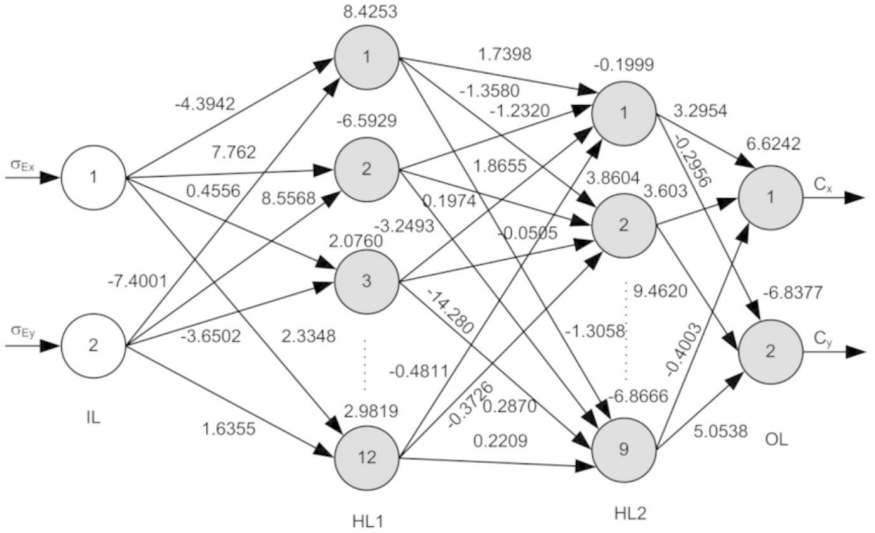
If you think women in tech is just a pipeline problem, you haven't been paying attention

Rachel Thomas Follow
Jul 27, 2015 · 11 min read

According to the Harvard Business Review, 41% of women working in tech eventually end up leaving the field (compared to just 17% of men), and I can understand why…

Paradigm shift: traditional software to software 2.0





Andrej Karpathy, [Software 2.0]

Paradigm shift: traditional software to software 2.0

Forget the robots! Here's how AI will get you

The real reason AI is more dangerous than traditional software

Cassie Kozyrkov Follow

Sep 13 · 10 min read

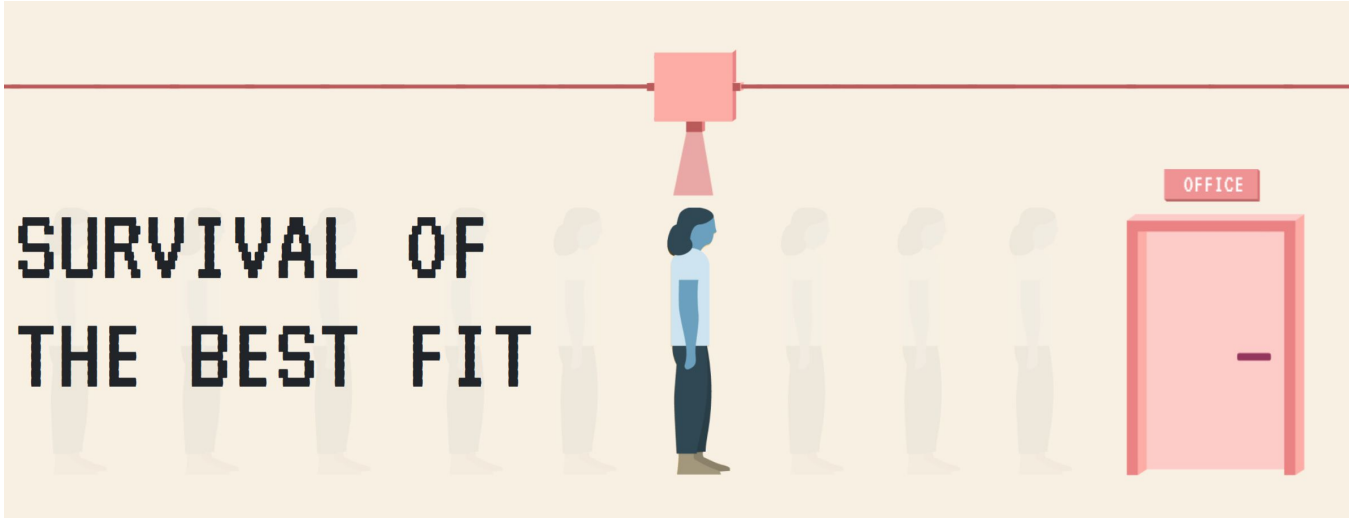
There's a lot of huffing and puffing in ML/AI engineering, but most of it is about spinning up and wrangling unfriendly tools. You might write 10K lines of code in your project, but most of it is in service of coaxing those unwieldy tools into accepting your instructions. As the tools get better and better, you'll eventually see that there are only *two* real instructions in ML/AI:

1. Optimize this goal…
2. …on this dataset.

Biased data & broken systems scaled

BUSINESS NEWS OCTOBER 9, 2018 / 11:12 PM / A YEAR AGO

Amazon scraps secret AI recruiting tool that showed bias against women



Survival of the Best Fit, an educational game about hiring bias in AI.

Biased data & broken systems scaled

Bias doesn't come from AI algorithms, it comes from people.

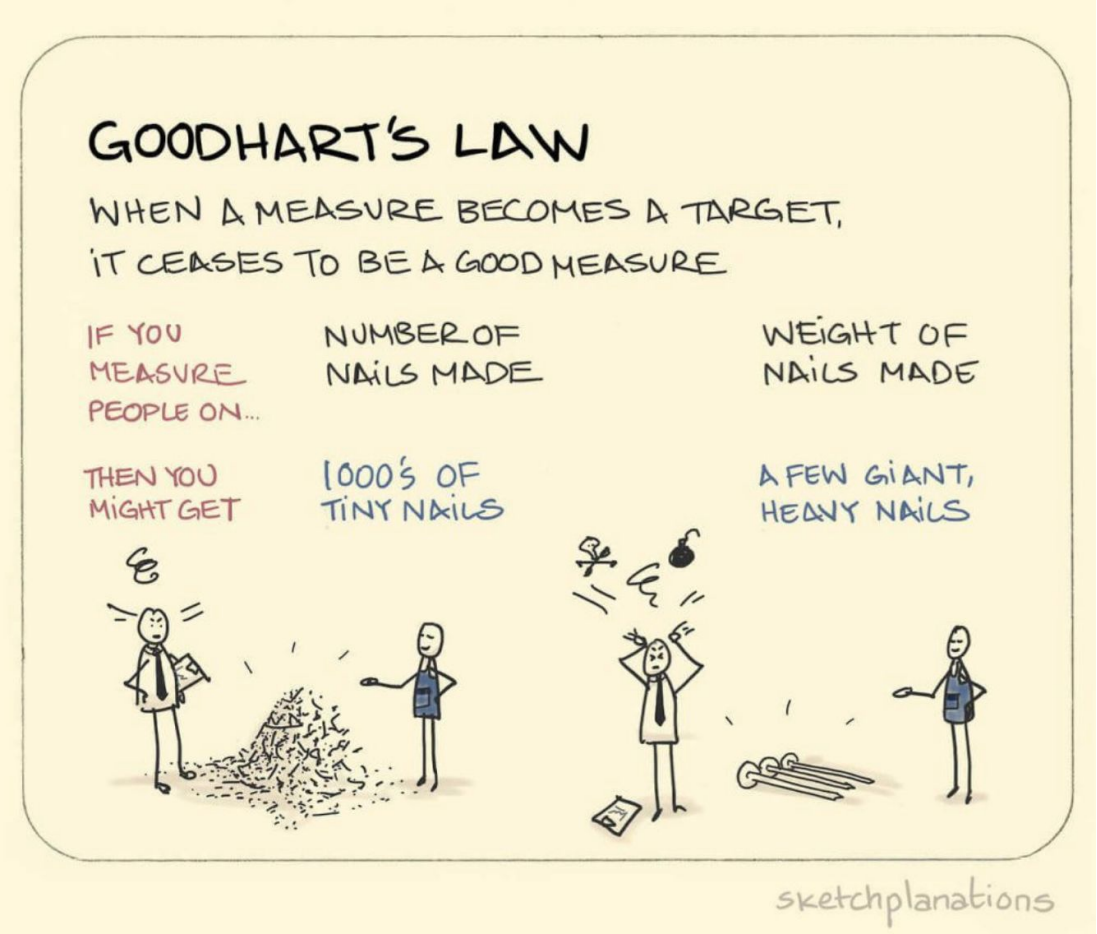
What is AI bias?

Cassie Kozyrkov Follow

Jan 24 · 4 min read

"If a group of people has a consistently lower usage of technology and as such I have less data points of the person, I would be much less likely to target the person either with advertising, or with a job offer." Claudia Perlich on 2nd order bias.

Optimization, objective functions & proxies



MOTHERBOARD
TECH BY VICE

‘Significant Racial Bias’ Found in National Healthcare Algorithm Affecting Millions of People

A series of studies argue that by focusing on costs as a proxy for health, risk algorithms are ignoring the racial inequalities in healthcare access.

By **Edward Ongweso Jr**

Oct 25 2019, 8:00am Share Tweet Snap

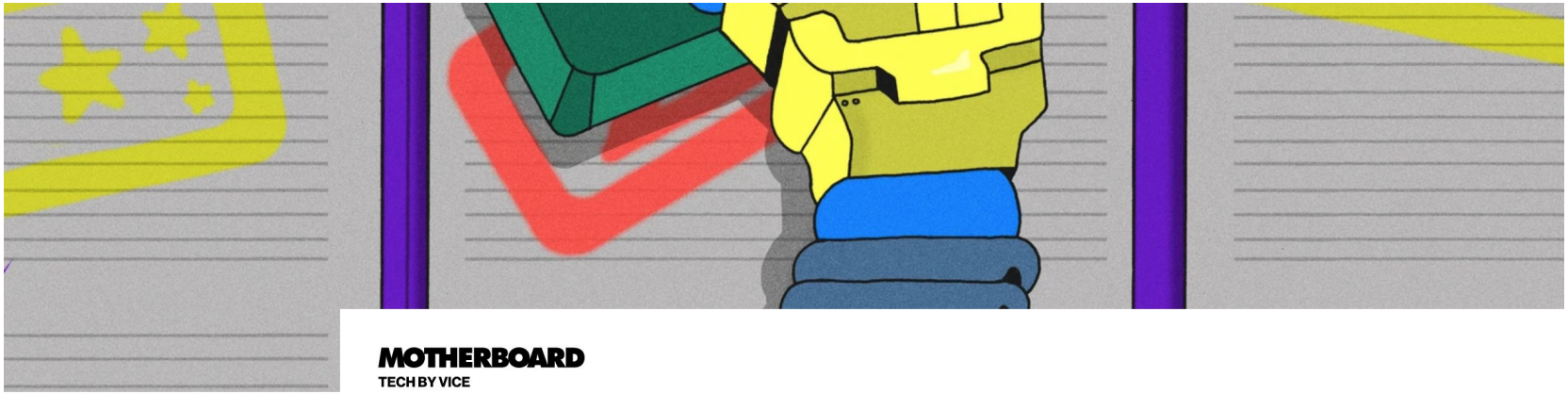
Optimization, objective functions & proxies

Rachel Thomas
@math_rachel

The problem with metrics is a big problem for AI
- Most AI approaches optimize metrics
- Any metric is just a proxy
- Metrics can, and will, be gamed
- Metrics overemphasize short-term concerns
- Online metrics are gathered in highly addictive environments

fast.ai/2019/09/24/met...

Optimization, objective functions & proxies



MOTHERBOARD
TECH BY VICE

Flawed Algorithms Are Grading Millions of Students' Essays

Fooled by gibberish and highly susceptible to human bias, automated essay-scoring systems are being increasingly adopted, a Motherboard investigation has found

By **Todd Feathers**

Aug 20 2019, 9:00am Share Tweet Snap

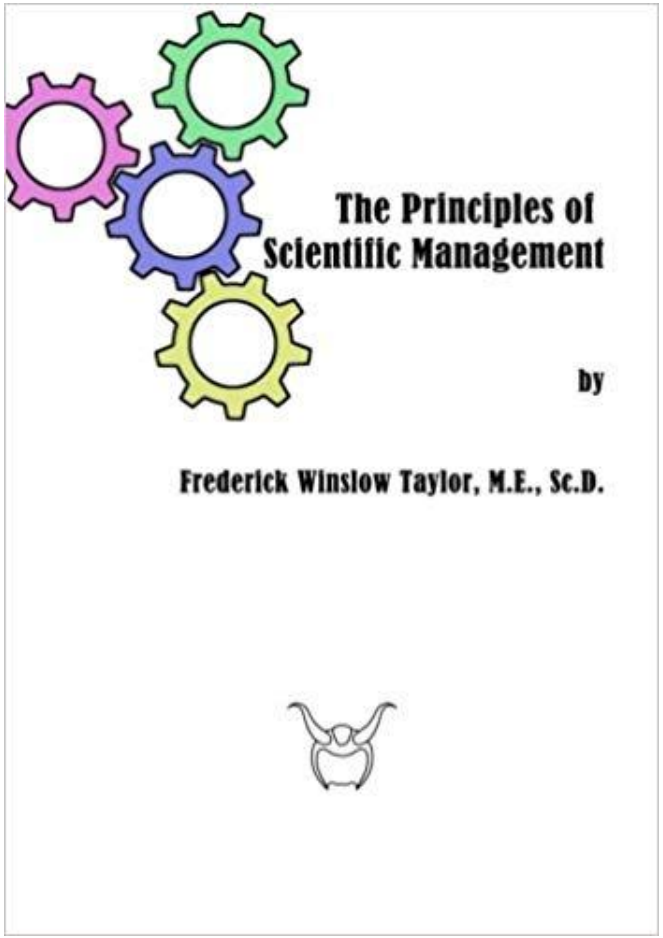
Optimization, objective functions & proxies

Goodhart's Law states that *"When a measure becomes a target, it ceases to be a good measure."* At their heart, what most current AI approaches do is to optimize metrics. The practice of optimizing metrics is not new nor unique to AI, yet AI can be particularly efficient (even *too* efficient!) at doing so.

This is important to understand, because any risks of optimizing metrics are heightened by AI. While metrics can be useful in their proper place, there are harms when they are unthinkingly applied. Some of the scariest instances of algorithms run amok (such as Google's algorithm contributing to radicalizing people into white supremacy, teachers being fired by an algorithm, or essay grading software that rewards sophisticated garbage) all result from over-emphasizing metrics. We have to understand this dynamic in order to understand the urgent risks we are facing due to misuse of AI.

Rachel Thomas, The problem with metrics is a big problem for AI

The Efficiency Movement



Charlie Chaplin, Modern Times

The Efficiency Movement

The Efficiency Movement

Shareholder value maximization & neoliberalism

ELSEVIER

Journal of Financial Economics

Volume 3, Issue 4, October 1976, Pages 305-360

Theory of the firm: Managerial behavior, agency costs and ownership structure

Michael C. Jensen, William H. Meckling *

> The directors of such [joint-stock] companies, however, being the managers rather of other people's money than of their own, it cannot well be expected, that they should watch over it with the same anxious vigilance with which the partners in a private copartnery frequently watch over their own. Like the stewards of a rich man, they are apt to consider attention to small matters as not for their master's honour, and very easily give themselves a dispensation from having it. Negligence and profusion, therefore, must always prevail, more or less, in the management of the affairs of such a company.
>
> Adam Smith, *The Wealth of Nations*, 1776, Cannan Edition

The Anatomy of a Large-Scale Hypertextual Web Search Engine

Sergey Brin and Lawrence Page
{sergey, page}@cs.stanford.edu
Computer Science Department, Stanford University, Stanford, CA 94305

8 Appendix A: Advertising and Mixed Motives

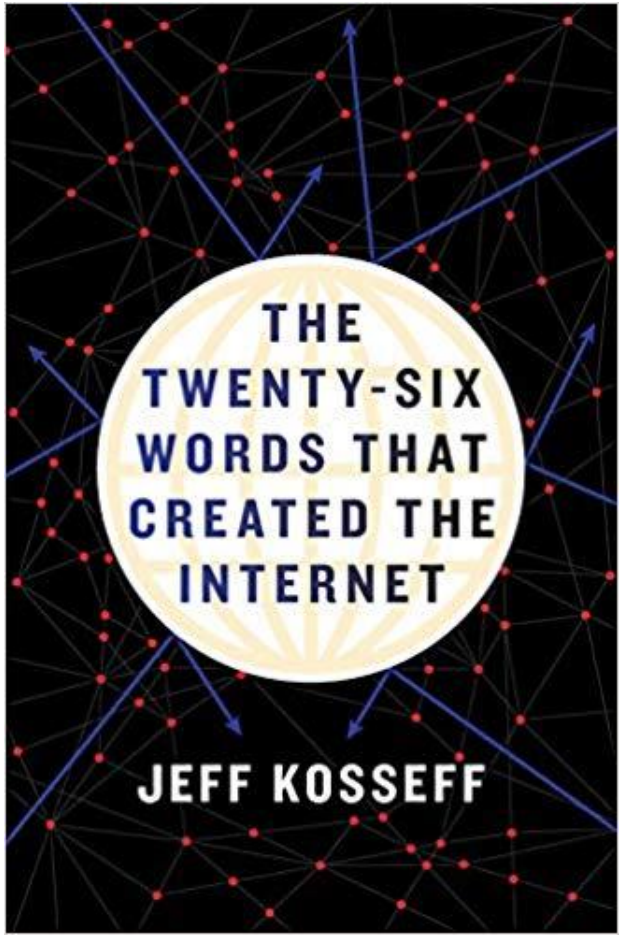
Currently, the predominant business model for commercial search engines is advertising. The goals of the advertising business model do not always correspond to providing quality search to users. For example, in our

The Anatomy of a Large-Scale Hypertextual Web Search Engine

Sergey Brin and Lawrence Page
{sergey, page}@cs.stanford.edu
Computer Science Department, Stanford University, Stanford, CA 94305

products, or have something that is genuinely new. But we believe the issue of advertising causes enough mixed incentives that it is crucial to have a competitive search engine that is transparent and in the academic realm.

CDA Section 230



Section 230 of the Communications Decency Act

From Wikipedia, the free encyclopedia

Section 230 of the Communications Decency Act (CDA) of 1996 (a common name for Title V of the Telecommunications Act of 1996) is a landmark piece of Internet legislation in the United States, codified at 47 U.S.C. § 230. Section 230(c)(1) provides immunity from liability for providers and users of an "interactive computer service" who publish information provided by third-party users:

> No provider or user of an interactive computer service shall be treated as the publisher or speaker of any information provided by another information content provider.

CDA Section 230

Hugo Bowne-Anderson @hugobowne · Aug 12

What does the solution space look like to you, Peter?

2

Peter Wang
@pwang

Replying to @hugobowne and @gchaslot

Longer term: overlay a new comms & information network on top of TCP/IP, HTTP.
Short term: Revoke CDA 230 protection for any content that a user did not explicitly ask for, search for, navigate to. Anything "promoted", "recommended", etc. - the platform is responsible for.

6:35 PM · Aug 12, 2019 · Twitter Web App

Peter Wang @pwang · Aug 12

Replying to @pwang @hugobowne and @gchaslot

Basically, tie accountability to financial incentives.
If you make money promoting eyeball-minutes of attention capture on your platform, you're accountable for the content that you're monetizing. Fin.

CC @tristanharris

1 1

Peter Wang @pwang · Aug 12

This gives the social content platforms like Youtube a way to still surface a broad amount of content from *validated* users; and takes away the free pass their Algorithm has enjoyed for the last decade, at the cost of social health of most industrialized nations.

1

Modern webapp tech stack & “creepware”

HTML

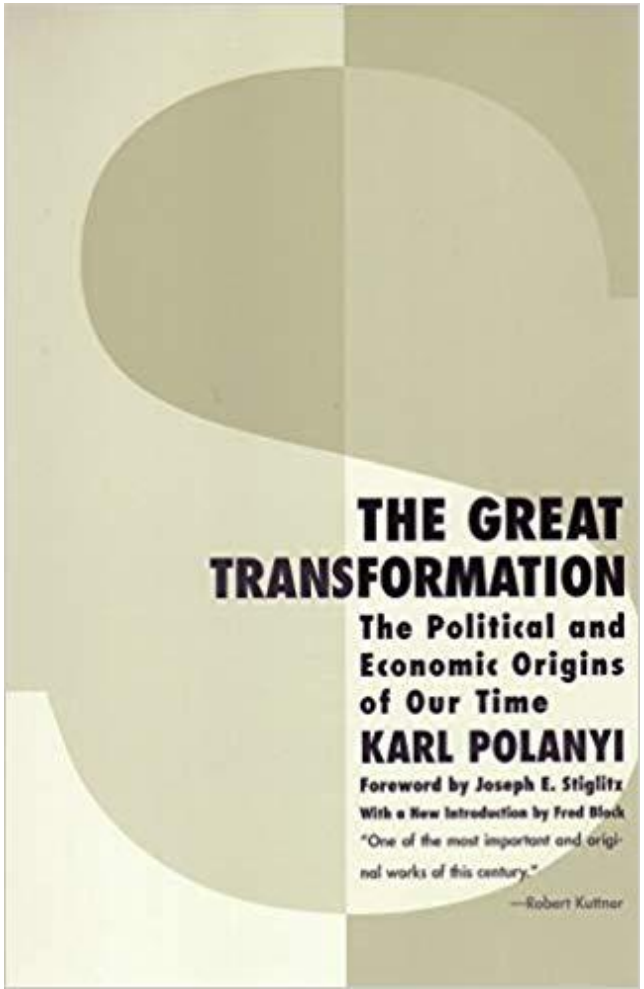
JavaScript

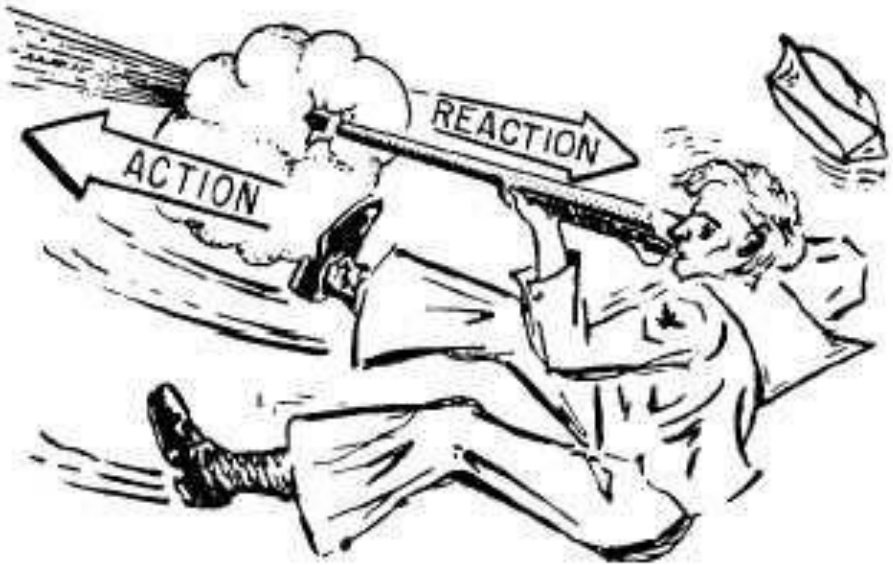
We need to talk about

- Where we are
- How we got here
- Paths forward

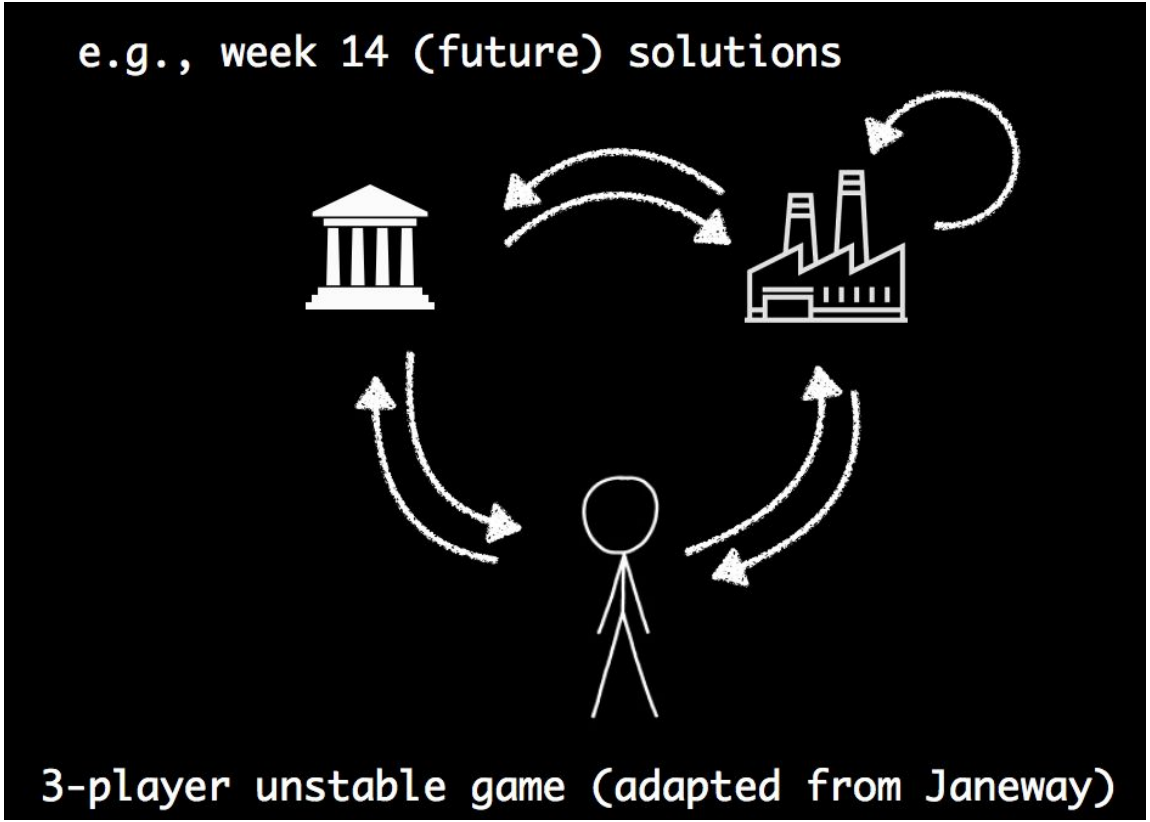
Charlie Chaplin, Modern Times

A Double Movement





Chase the power



chris wiggins, matt jones, [data: past, present and future]

AI Now Report 2018

7. **Technology companies must go beyond the “pipeline model” and commit to addressing the practices of exclusion and discrimination in their workplaces.** Technology companies and the AI field as a whole have focused on the “pipeline model,” looking to train and hire more diverse employees. While this is important, it overlooks what happens once people are hired into workplaces that exclude, harass, or systemically undervalue people on the basis of gender, race, sexuality, or disability. Companies need to examine the deeper issues in their workplaces, and the relationship between exclusionary cultures and the products they build, which can produce tools that perpetuate bias and discrimination. This change in focus needs to be accompanied by practical action, including a commitment to end pay and opportunity inequity, along with transparency measures about hiring and retention.

Employee walkouts

AMAZON WORKERS TO JEFF BEZOS: STOP WEAPONIZING OUR TECH

A growing tide of Silicon Valley workers are rebelling against their employers over practices they see as unethical.

GOOGLE HEDGES ON PROMISE TO END CONTROVERSIAL INVOLVEMENT IN MILITARY DRONE CONTRACT

Microsoft Employees Protest Work With ICE, as Tech Industry Mobilizes Over Immigration

Employee walkouts

MOTHERBOARD
TECH BY VICE

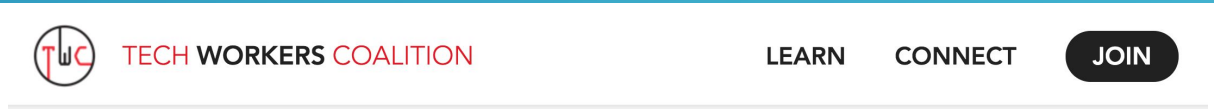
Tech Workers Walked Off the Job After Software They Made Was Sold to ICE

More than 200 employees at the Seattle-based data visualization company Tableau publicly called out their employer for the first time this week, demanding it cut ties with ICE and CBP.

By Lauren Kaori Gurley

Oct 31 2019, 4:11pm Share Tweet Snap

Employee walkouts

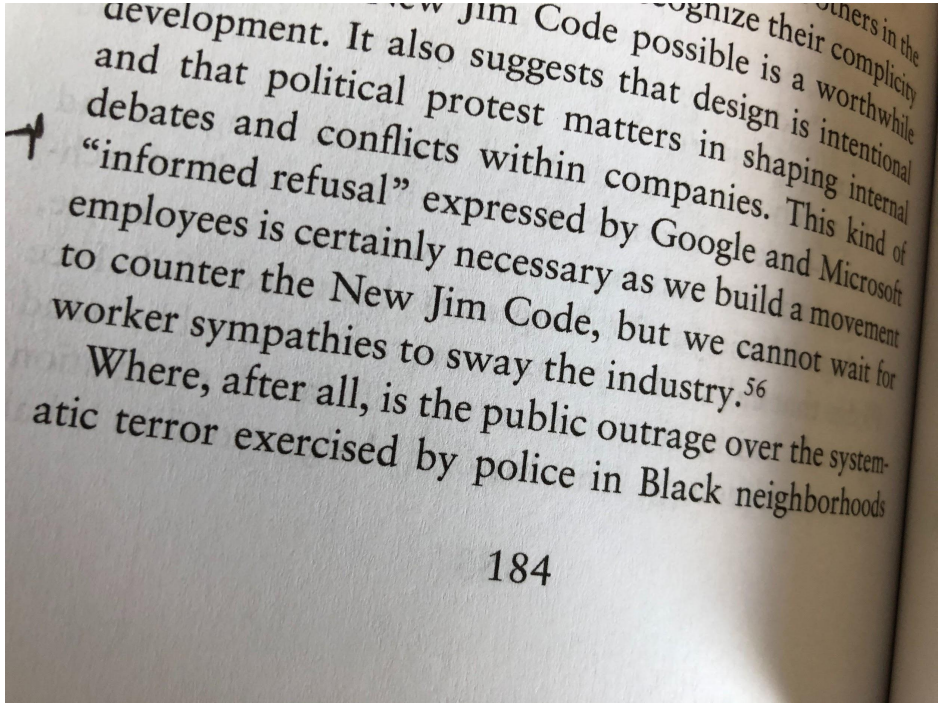


Tags labor technology

Lessons from the Long Sixties for Organizing in Tech

Radical Tech Workers of the 1960s and 1970s: Lessons from France, Italy, and the US for Organizing in Tech Today

Employee walkouts



development. It also suggests that design is intentional and that political protest matters in shaping internal debates and conflicts within companies. This kind of "informed refusal" expressed by Google and Microsoft employees is certainly necessary as we build a movement to counter the New Jim Code, but we cannot wait for worker sympathies to sway the industry.[56]

Where, after all, is the public outrage over the systematic terror exercised by police in Black neighborhoods

184

Community-based activism

THE LEGAL AID SOCIETY

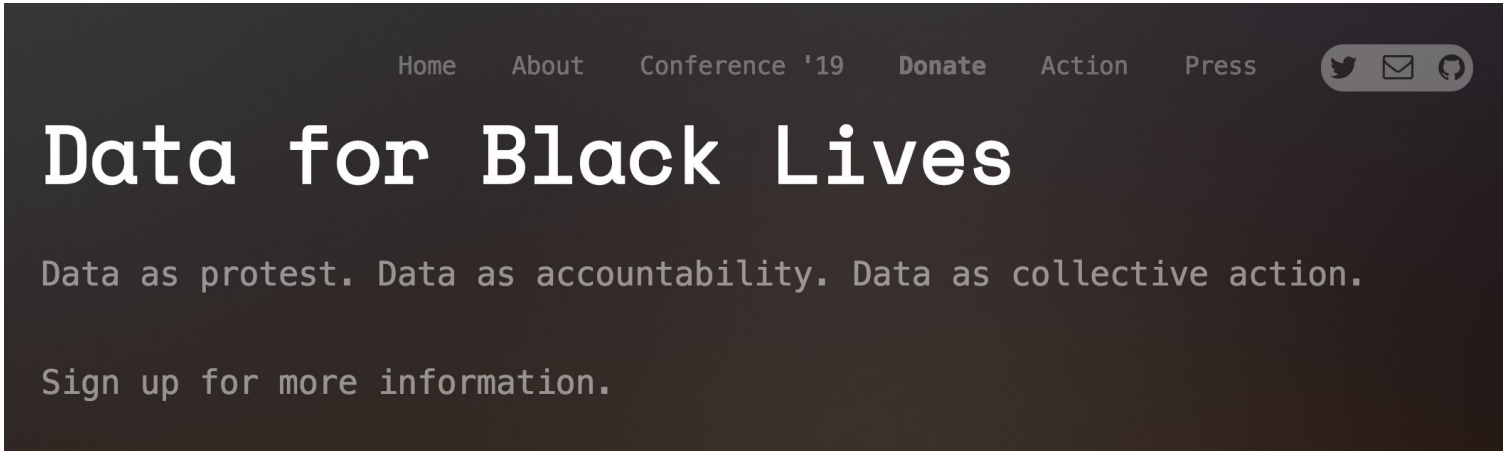
Need Help? Call 212-577-3300 DONATE FOR JUSTICE

Home Get Help Take Action What We Do Careers & Opportunities About Us Search

PROJECTS, UNITS & INITIATIVES

The Cop Accountability Project

Community-based activism



Legislative change

Vox recode

How facial recognition became the most feared technology in the US

Two lawmakers are drafting a new bipartisan bill that could seriously limit the use of the technology across the US.

By Shirin Ghaffary | Aug 9, 2019, 4:00pm EDT

Democrats Propose Federal Privacy Legislation That's Tougher Than CCPA

by **Allison Schiff** // *Wednesday, November 6th, 2019 – 12:35 am*

RENEE DIRESTA IDEAS 07.24.2019 09:00 AM

A New Law Makes Bots Identify Themselves—That's the Problem

Side note: ICP vs facial recog

It turns out that Juggalo makeup blocks facial recognition technology

Whoop whoop! Insane Clown Posse fans may have stumbled into a way to combat public surveillance

The Washington Post
Democracy Dies in Darkness

Morning Mix

Bad news for the Juggalos: The FBI's gang label could be here to stay

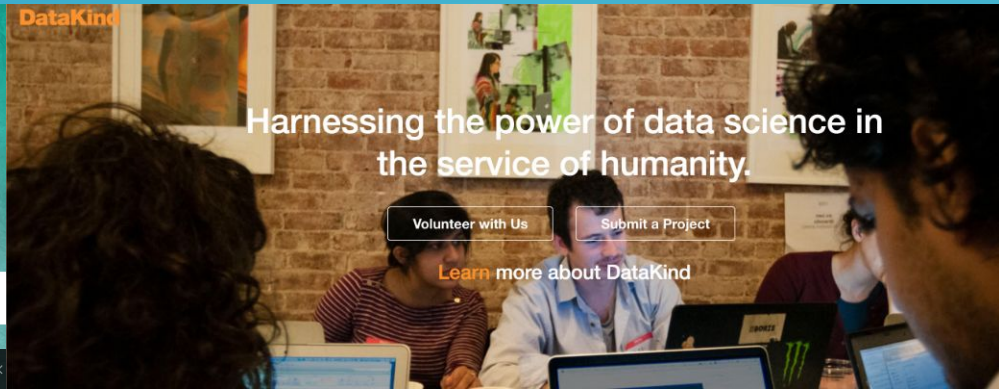
Future music: algorithmic audits & IRB analogues for tech

An FDA for Algorithms

69 Admin. L. Rev. 83 (2017)

41 Pages • Posted: 15 Mar 2016

More organizations to watch & work with



DATA& SOCIETY ABOUT PEOPLE RESEARCH OUR WORK ENGAGE

Data & Society advances public understanding of the social implications of data-centric technologies and automation.

Bringing together a growing community of researchers and practitioners concerned with fairness, accountability, and transparency in machine learning

More organizations to watch & work with

BLACK IN AI

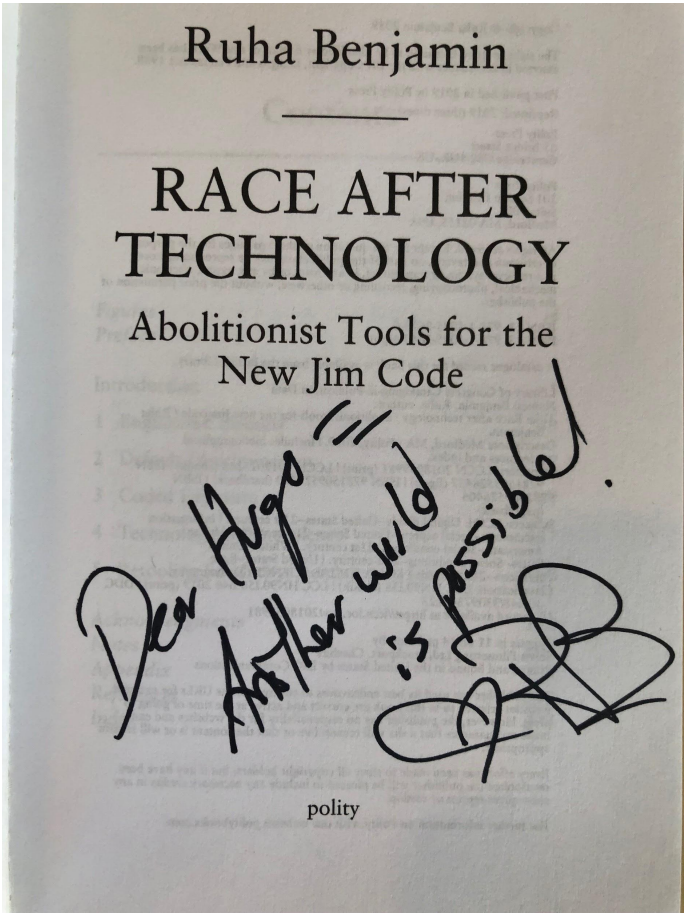
WiML
Women in Machine Learning

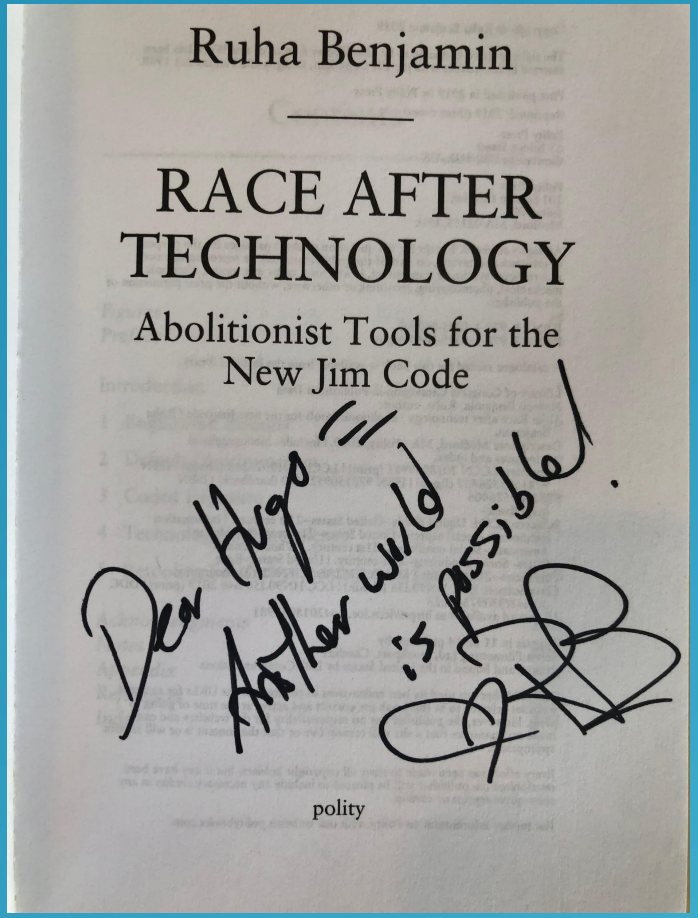
Queer in AI

LatinX in AI
Coalition

What you can do today

- Contribute to any of these projects
- Read, talk & educate widely
- Pressure your employers to consider the impact of your work on all stakeholders
- Pressure to move past the “pipeline model”
- Define principles and design for them in a principled, robust manner
- Continually ask “who am I building these bridges for? Who is using them?”





Thank you!

Hugo Bowne-Anderson
@hugobowne