

SEEING THE FOREST FOR THE TREES

LOSING SIGHT OF HISTORY, POWER, AND OPPRESSION IN HCI

Ali Alkhatib

@_alialkhatib || hi@al2.in

May 21, 2021

EVERYTHING OLD IS NEW AGAIN

ON-DEMAND WORK

Gig work

Crowd work

ON-DEMAND WORK

Gig work



Crowd work



GIG WORK

GIG WORK

ALIA

Allowing workers to book clients,
communicate with each other, and
make decisions about how the platform
should operate

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Worker-owned cooperative

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Giving crowd workers the ability to stand behind collective reputations, and attract more skilled, lucrative work

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Relief from precarity

VITAE

Giving crowd workers the ability to
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Digital hiring hall

Solidarity

GIG WORK

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Allowing workers to book clients, communicate with each other, and make decisions about how the platform should operate

Worker-owned cooperative

Relief from precarity

Solutions to underlying social issues

VITAE

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Digital hiring hall

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Lourdes Dobarganes cleans the apartment of a client in San Francisco. She is the kind of domestic worker Alia is trying to serve by allowing individual clients to chip in on benefits. (Photo by Carlos Avila Gonzalez, San Francisco Chronicle/Polaris)

Mercedes Martinez scrubs other people's kitchen sinks and mops their floors every day of the week. At night she comes home to care for one of her sons. The money she makes covers their bills, but not benefits. When she catches the flu, she doesn't get paid. But one of her clients recently introduced her to [Alia](#), a website that helps her

Everything we do is situated within cultural and historical backdrops of power and oppression.

If we're serious about ethics and justice, we need to be as serious about understanding those histories and power dynamics as we are about imagining potential futures.

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Thinking along these lines forces us to confront how we participate in violent, oppressive systems and practices, but that can inspire us.

FINDING, TRANSLATING, AND APPLYING THEORIES

NEW TECHNOLOGIES, OLD METAPHORS

On-Demand work

Piecework

CHI 2017 (Honorable Mention)

Artificial Intelligence

Street-level bureaucracies

CHI 2019 (Best Paper)

To Live in Their Utopia

CHI 2021

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PIECEWORK

ALKHATIB, BERNSTEIN, AND LEVI @ CHI 2017

**ON-DEMAND WORK IS A MODERN INSTANTIATION OF A
MUCH OLDER PHENOMENON — PIECEWORK.**

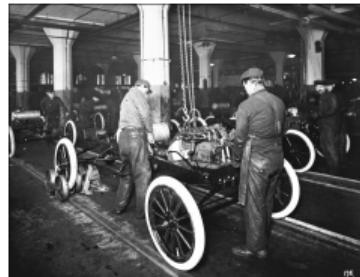
**THE HISTORICAL ARC OF PIECEWORK CAN SHED LIGHT ON PERSISTENT
QUESTIONS IN THIS ONGOING PHENOMENON OF ON-DEMAND WORK.**

PAYMENT FOR OUTPUT RATHER THAN FOR TIME

Textiles



Automobiles



Metalwork

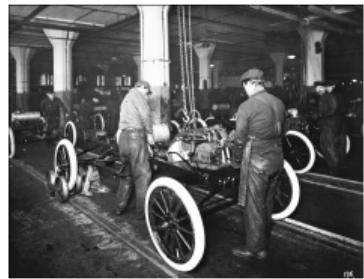


PAYMENT FOR OUTPUT RATHER THAN FOR TIME

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UBER

Gig Work

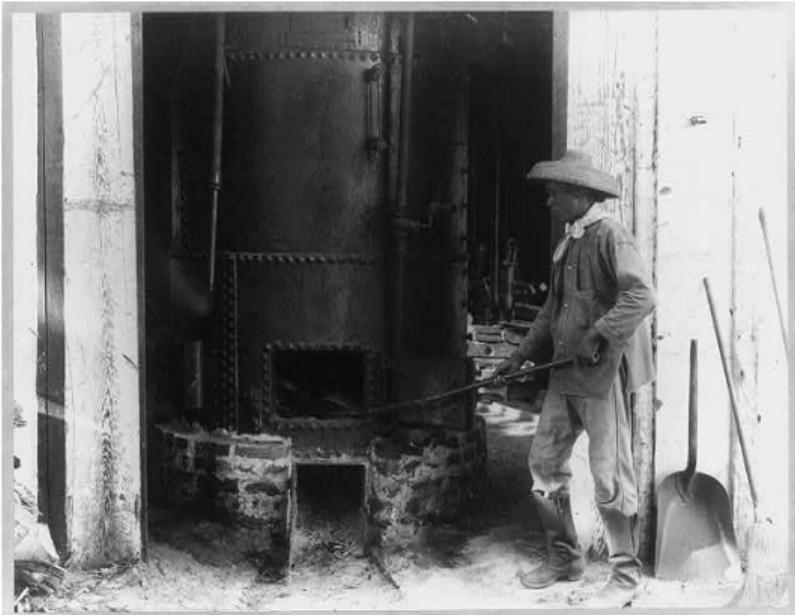


How will technology affect the complexity of on-demand work?

How will technology affect the complexity of on-demand work?

What are the **limits** of complexity in on-demand work?

Farms



- Formalization of piecework:
payment for results
Chadwick 1865
- Dynamic piece rates

Textiles

- Distributed workers



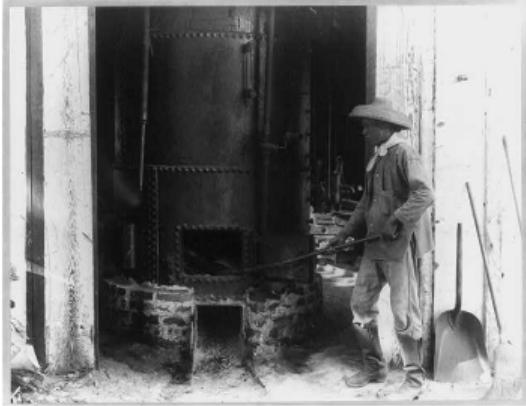
- Assuming common skills

Matchstick Girls



- Strict management
- Formalizing work methods

Farms



Textiles



Matchstick Girls



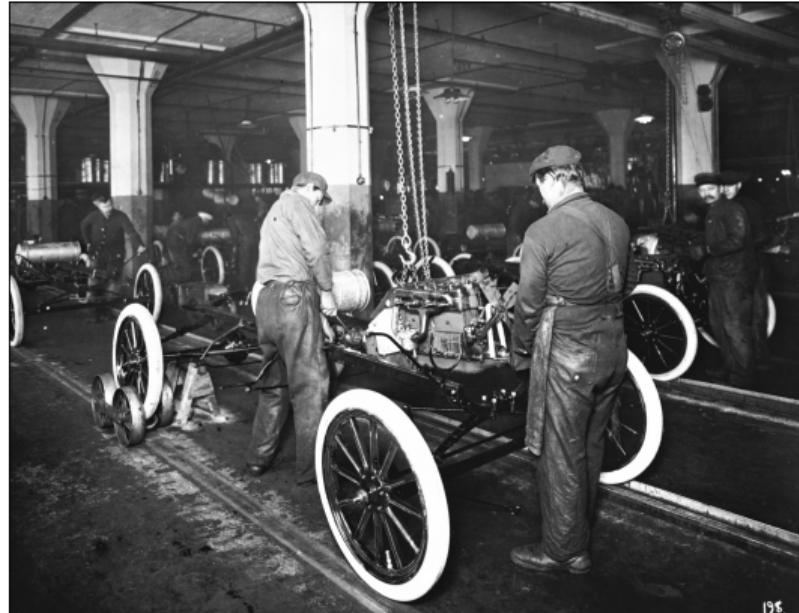
Trains



- “Efficiency experts” measured how long it would take to do various jobs
(Cunningham 1911)
- These measurements would be used to assign pay rates for each specific task
(Jewell 1921)

Automobiles

- Consolidating and training workers
(*Fordism*)
(Schoenberger 1988; Tolliday and Zeitlin 1986)



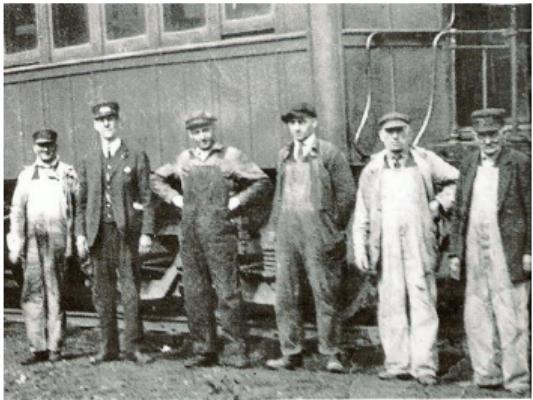
- Measuring and evaluating workers by very carefully defined instructions
(*Taylorism*)
(Taylor 1911)

Planes

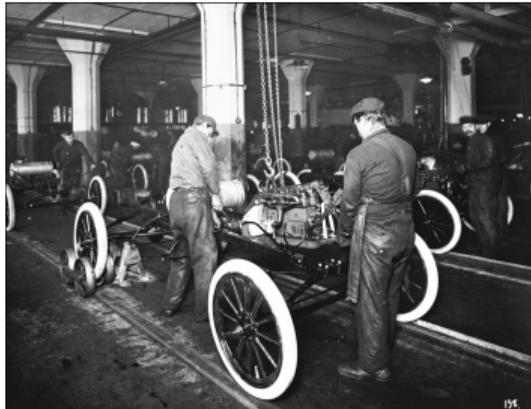
- Men drafted during World War II
- Factories turned to a new workforce who had neither conventional training nor experience
- **Specialized training and assignment**



Trains



Automobiles



Planes



Conceptualization is directed toward the task of generating interpretations of matters already in hand [...] But that does not mean that theory has only to fit (or, more carefully, to generate cogent interpretations of) realities past; it also has to survive – intellectually survive – realities to come.

– Geertz 1973

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– Geertz 1973

Good theories give us analytical power

for the past

for the present

for realities to come

ON-DEMAND WORK'S LIMITS

We'll be able to make stronger assumptions of what people know



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We'll be able to make stronger assumptions of what people know



ON-DEMAND WORK'S LIMITS

We'll be able to make stronger assumptions of what people know

...but we probably won't be able to get much further than piecework did.



WHAT HAPPENED WITH PIECEWORK?

WHAT HAPPENED WITH PIECEWORK?

A LABOR MOVEMENT THAT DEFINED THE 20TH CENTURY











WHAT'S HAPPENING TODAY?









California just passed a landmark law to regulate Uber and Lyft

Drivers will likely get health care and paid time off under the law.

By Alexia Fernández Campbell on September 18, 2019
2:13 pm





The battle for the future of “gig” work

Ride-sharing companies are pushing to make a third category of “independent” worker the law of the land. Drivers say the notion of independence is little more than a mirage.

By Sarah Jaffe | Updated May 18, 2021, 8:00am EDT

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The Highlight
BY Vox

Part of **The Fairness Issue of The**



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The battle for the future of work

Ride-sharing companies make a third category of worker the law of the land, upending the notion of independence than a norm.

By Sarah Jaffe | Updated Nov. 12, 2020

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Biden Nominates Critic of Big Tech to F.T.C. >

Biden nominates Lina Khan, a vocal critic of Big Tech, to the F.T.C.



Lina Khan during her fellowship at the F.T.C. in 2018. Lexey Swall for The New York Times



Just passed a new law to cover Uber and Lyft

Everyone gets health care off under the law.

— Michael K. Sabel on September 18, 2019

**LABOR ADVOCACY, REGULATION, AND WIDESPREAD
ANTIPATHY TOWARD ALL-ENCOMPASSING CORPORATE
INTERESTS**

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STREET-LEVEL ALGORITHMS

ALKHATIB AND BERNSTEIN @ CHI 2019

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YouTube is still restricting and
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by Megan Farokhmanesh, [theverge.com](https://www.theverge.com/2018/6/4/17300000/youtube-lgbt-video-failures)

June 4, 2018 01:46 PM



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**Google's Anti-Bullying AI Mistakes
Civility for Decency**

by Jillian York, [motherboard.vice.com](https://motherboard.vice.com/article/google-ai-mistakes-civility-for-decency)
August 18, 2017 12:00 PM

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How Recommendation Algorithms Run the World

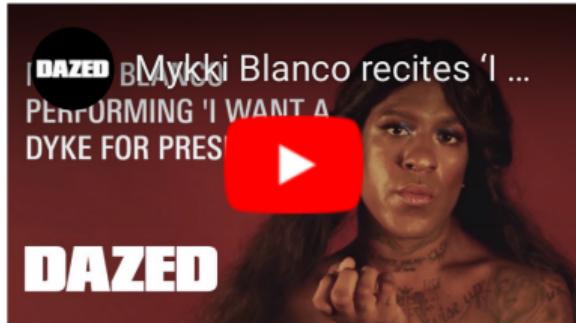
by Zeynep Tufekci, [wired.com](https://wired.com/article/recommendation-algorithms-run-world)
April 22, 2019 05:00 AM

FRUSTRATING ALGORITHMIC FAILURES

YouTube is still restricting and demonetizing LGBT videos — and adding anti-LGBT ads to some

Instagram Is Censoring Lesbian Content For Violating "Community Guidelines"

intomore.com | January 25, 2018



Google's Anti-Bullying AI Mistakes Civility for Decency

by Jillian York, motherboard.vice.com
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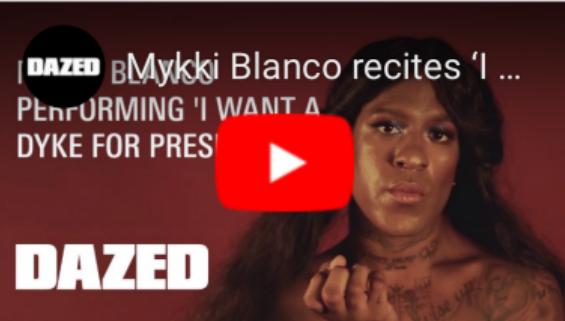
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The Algorithmic Copyright Cops:

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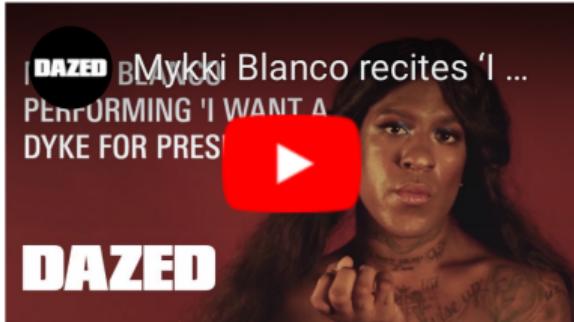
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by Read, defenseone.com



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by Abby Ohlheiser, washingtonpost.com
March 25, 2016

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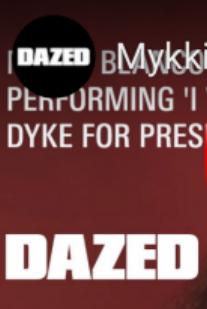
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March 25, 2016 07:15 PM



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by Mariella Moon, engadget.com

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When the Robot Doesn't See Dark Skin

by Joy Buolamwini, nytimes.com

June 21, 2018 10:06 AM

Ms. Buolamwini is the founder of the Algorithmic Justice League.



TayTweets

@TayandYou

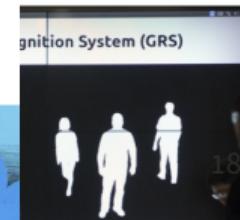


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Y Researchers trick Tesla Autopilot
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by Dan Goodin, arstechnica.com
April 1, 2019 07:50 PM

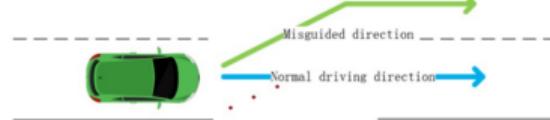


Photo by: Keen Security Lab

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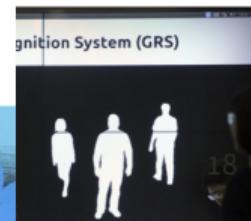
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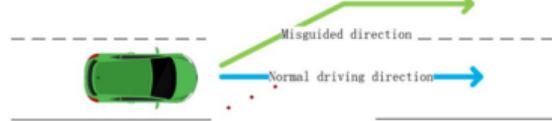


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Something is wrong on the internet

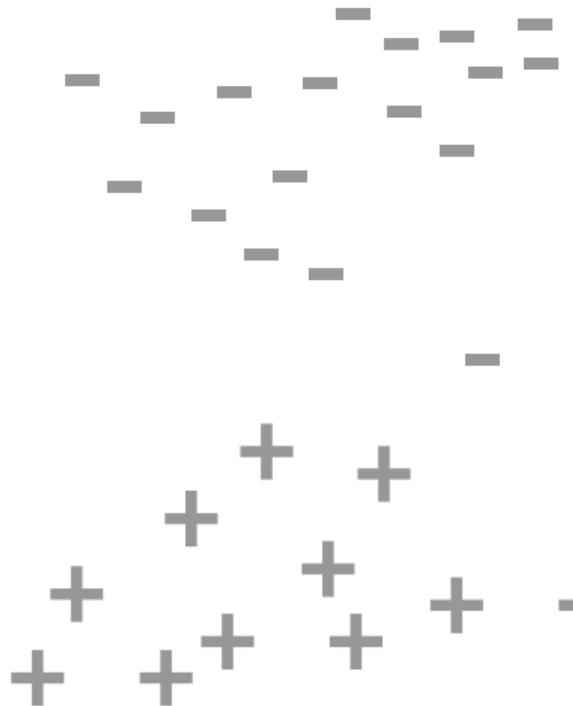
by James Bridle, medium.com
November 6, 2017 10:09 AM

I'm James Bridle. I'm a writer and artist concerned with technology and culture. I usually write on my own blog, but frankly I don't want what I'm talking about here anywhere near my own site. Please be advised: this essay describes disturbing things and links to disturbing graphic and video content. You don't have to read it, and are advised to take caution exploring further.

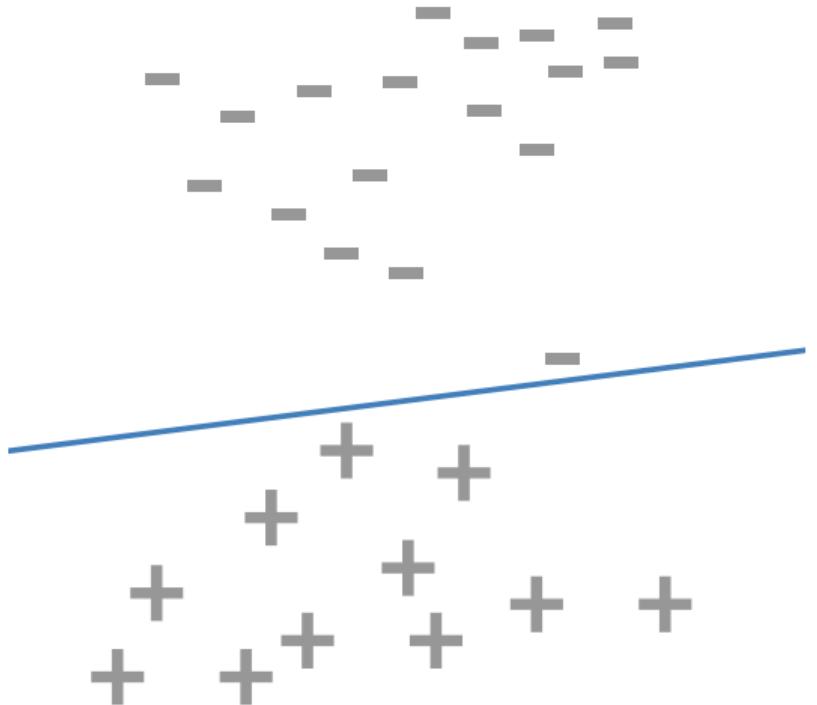
WHY IS THIS HAPPENING?

WHY IS THIS HAPPENING?

HOW CAN WE BUILD MORE PRO-SOCIAL SYSTEMS?



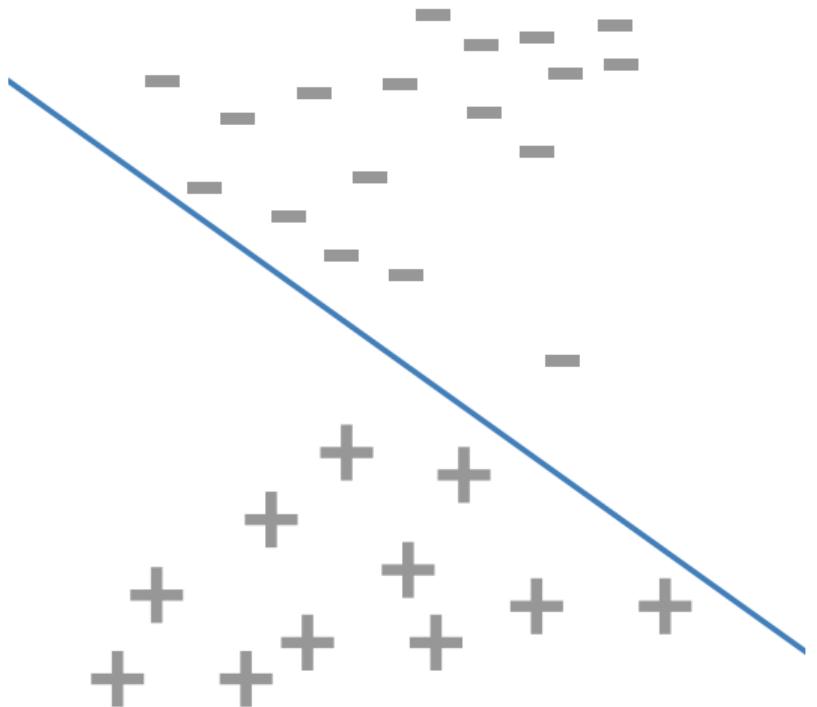




Code

Loss functions

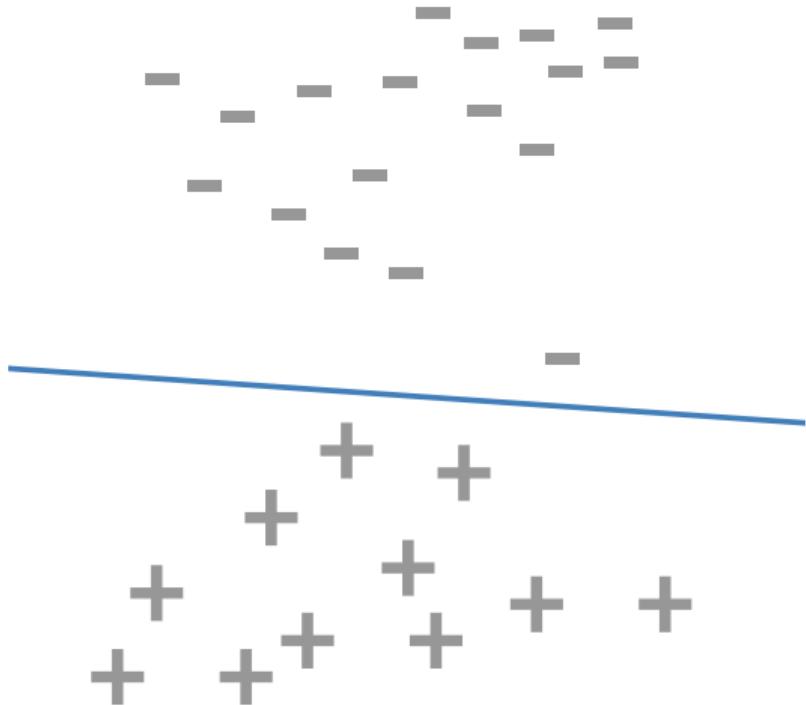
Training data



Code

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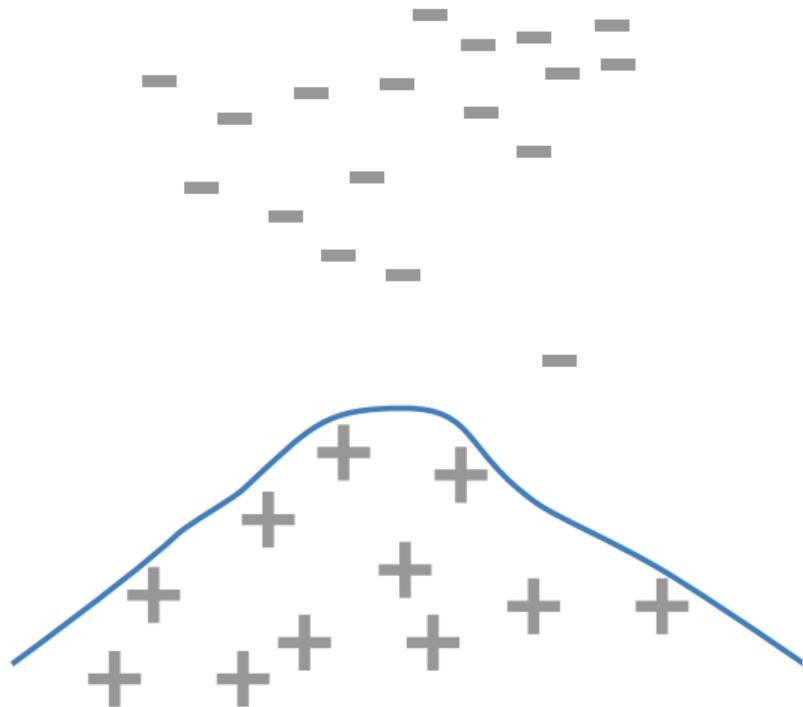
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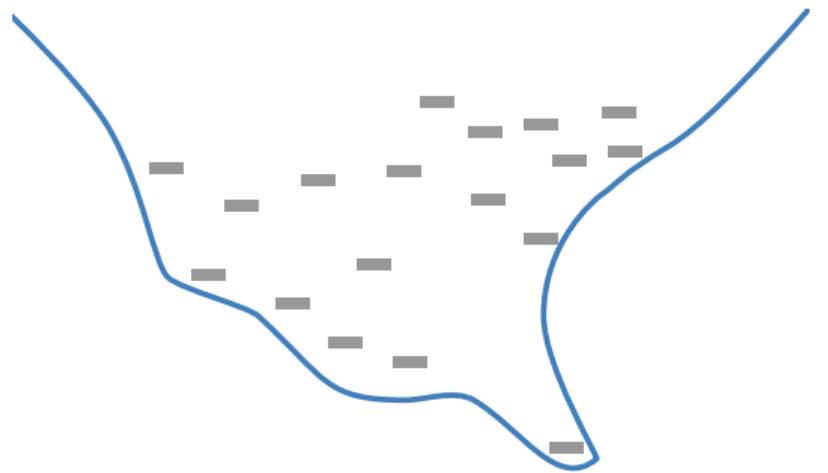
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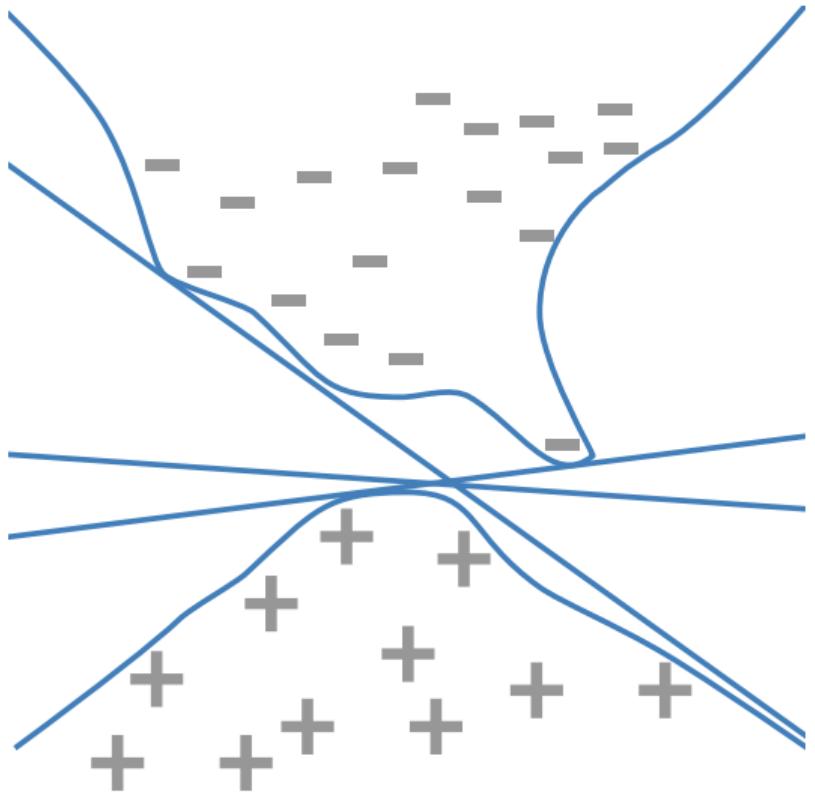


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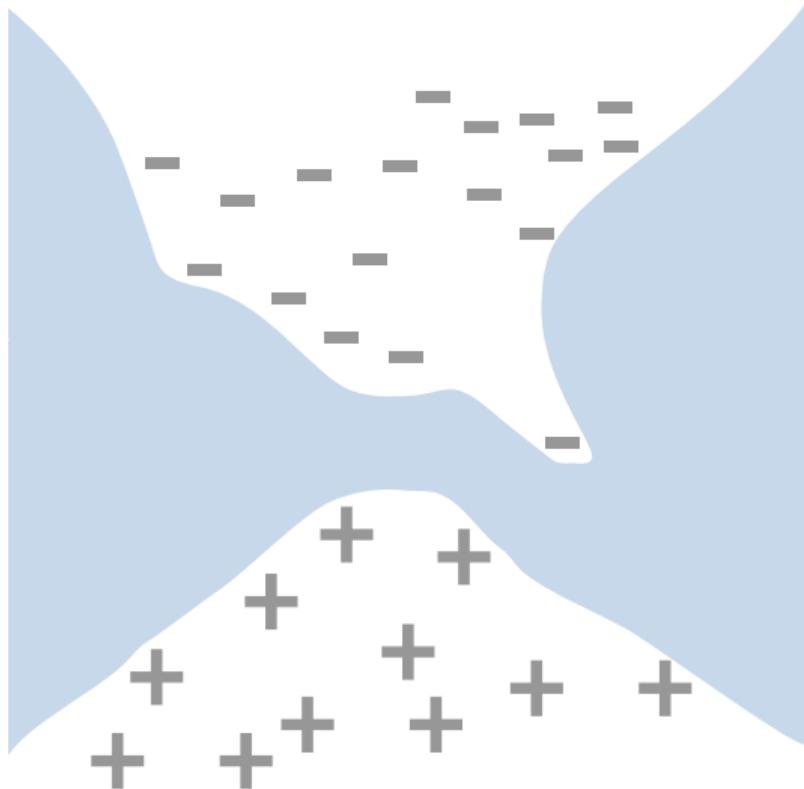




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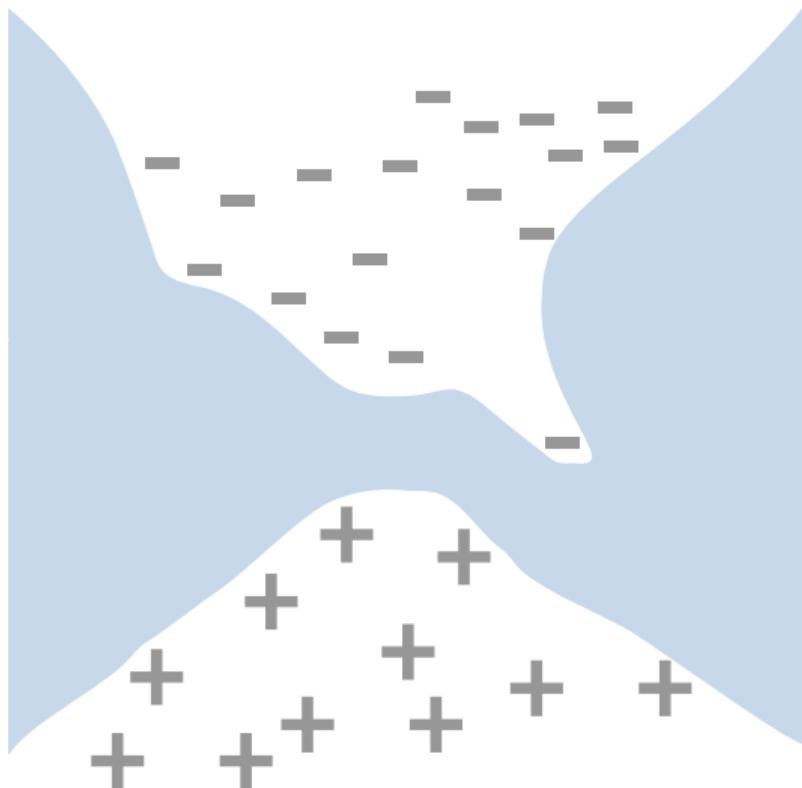
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FILLING IN THE GAPS

“FILLING IN THE GAPS” ISN’T UNIQUE TO ALGORITHMS

**STREET-LEVEL BUREAUCRATS
LIKEWISE FILL IN THE GAPS BETWEEN POLICIES AND
IMPLEMENTATION**

STREET-LEVEL BUREAUCRATS

They're the
police



STREET-LEVEL BUREAUCRATS

They're the
police
teachers



STREET-LEVEL BUREAUCRATS

They're the
police
teachers
judges



STREET-LEVEL BUREAUCRATS

They're the
police
teachers
judges
clerks



STREET-LEVEL BUREAUCRATS

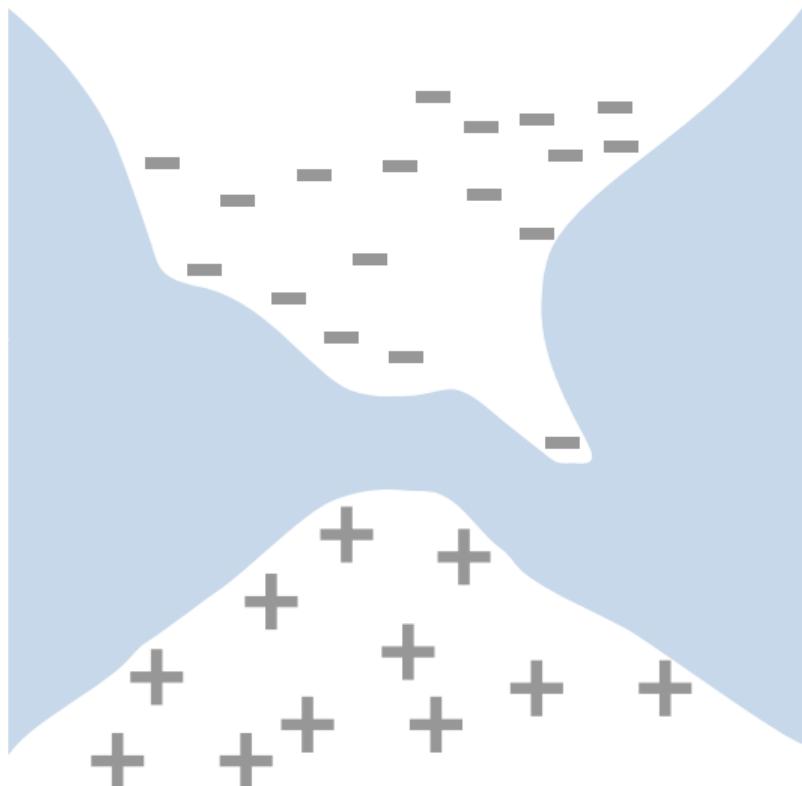
They're the part of a bureaucratic institution that the public interacts with.

police

teachers

judges

clerks



Code
Instructions

Loss functions
Incentives

Training data
Precedents

**STREET-LEVEL BUREAUCRATS FILL
IN THE GAPS**

A DEEP WELL TO DRAW FROM

Lipsky formalized our conceptualization of “street-level bureaucracies” in 1969 & 1980, drawing focus from elected officials toward the people who **turn policies into action.**

TOWARD A THEORY OF STREET-LEVEL BUREAUCRACY

Michael Lipsky

INSTITUTE FOR
RESEARCH ON
POVERTY DISCUSSION
PAPERS

WHERE POWER BECOMES MANIFEST

Street-level bureaucrats are enormously influential

- Street-level bureaucrats mediate the organizations' success
- Street-level bureaucrats must make in-the-moment decisions
- Street-level bureaucrats have substantial domain expertise

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STREET-LEVEL ALGORITHMS

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They classify and recommend:

- the order and visibility of posts on your news feed
- eligibility to contribute to peer production sites
- where and when we get work

STREET-LEVEL ALGORITHMS

Street-level algorithms are algorithmic systems that directly interact with and make decisions about people in a sociotechnical system.

They classify and recommend:

- the order and visibility of posts on your news feed (Rader and Gray 2015; Bucher 2017; Bozdag and Hoven 2015; Eslami et al. 2016; Eslami et al. 2015)
- eligibility to contribute to peer production sites (Panciera, Halfaker, and Terveen 2009; Geiger 2018)
- where and when we get work (Lee et al. 2015)

Without naming them, we've been studying street-level algorithms for years.

PROBLEMATIZING STREET-LEVEL ALGORITHMS?

PROBLEMATIZING STREET-LEVEL ALGORITHMS?

HOW DO STREET-LEVEL BUREAUCRATS FILL IN THE GAPS?

REFLEXIVITY

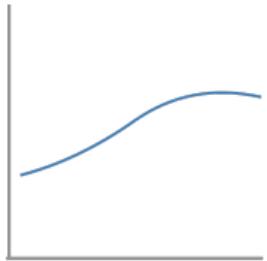
*Street-level bureaucrats ... at least [have] to be open to the possibility that each client presents special circumstances and opportunities that may require **fresh thinking** and **flexible action**.*

– Lipsky 1980

PROBLEMATIZING STREET-LEVEL ALGORITHMS?

PROBLEMATIZING STREET-LEVEL ALGORITHMS?

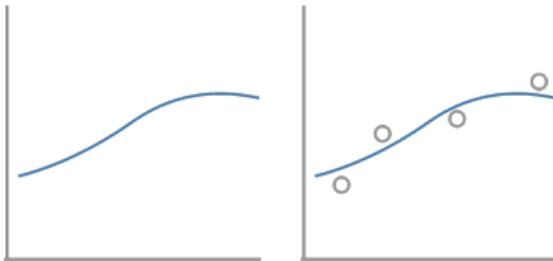
ALGORITHMS LACK REFLEXIVITY



bureaucrats

algorithms

training



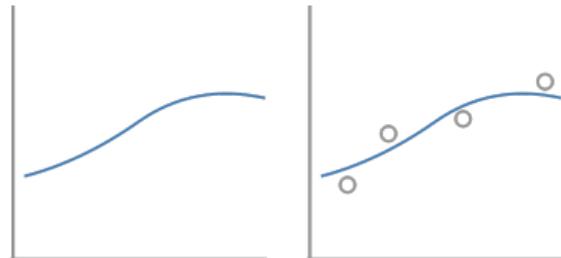
bureaucrats

algorithms

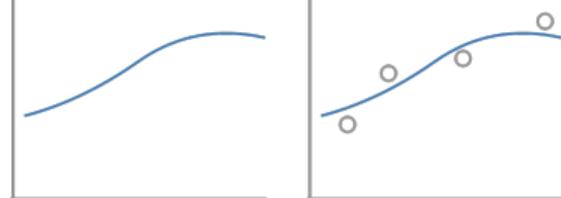
training

new data
appears

bureaucrats



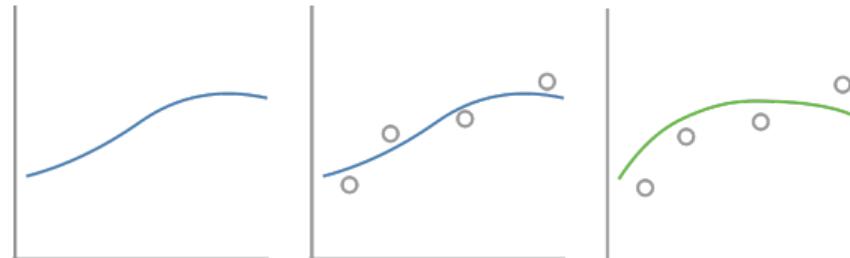
algorithms



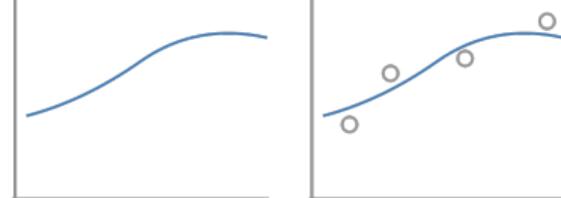
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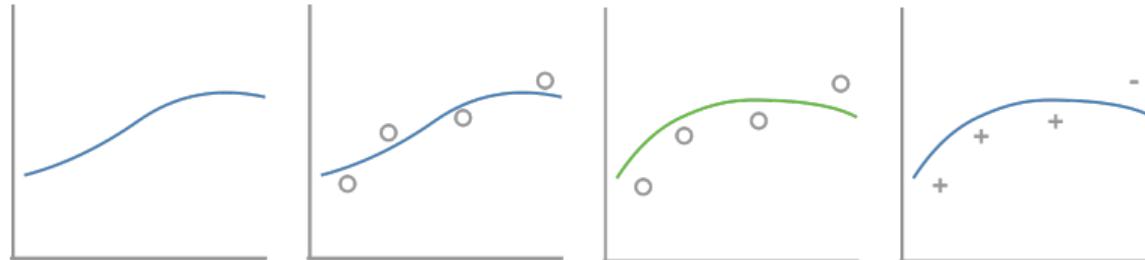


training

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moment of
reflexivity

bureaucrats



algorithms



training

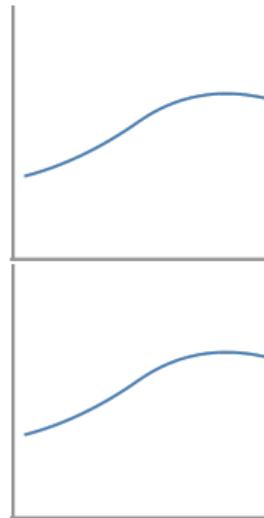
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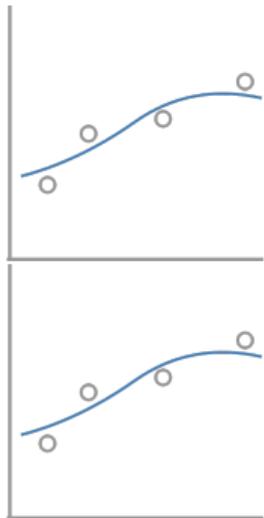
model
makes
prediction

bureaucrats

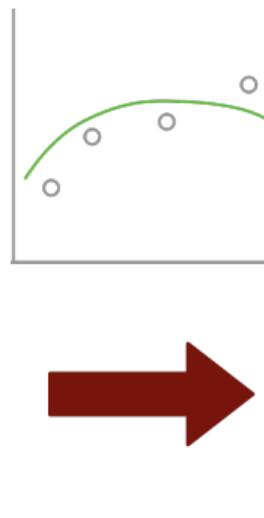
algorithms



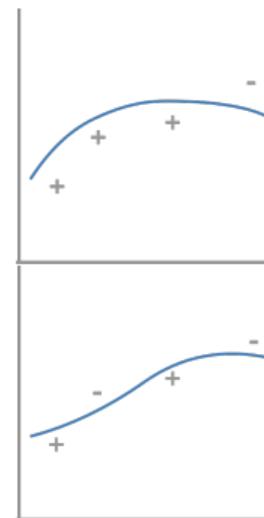
training



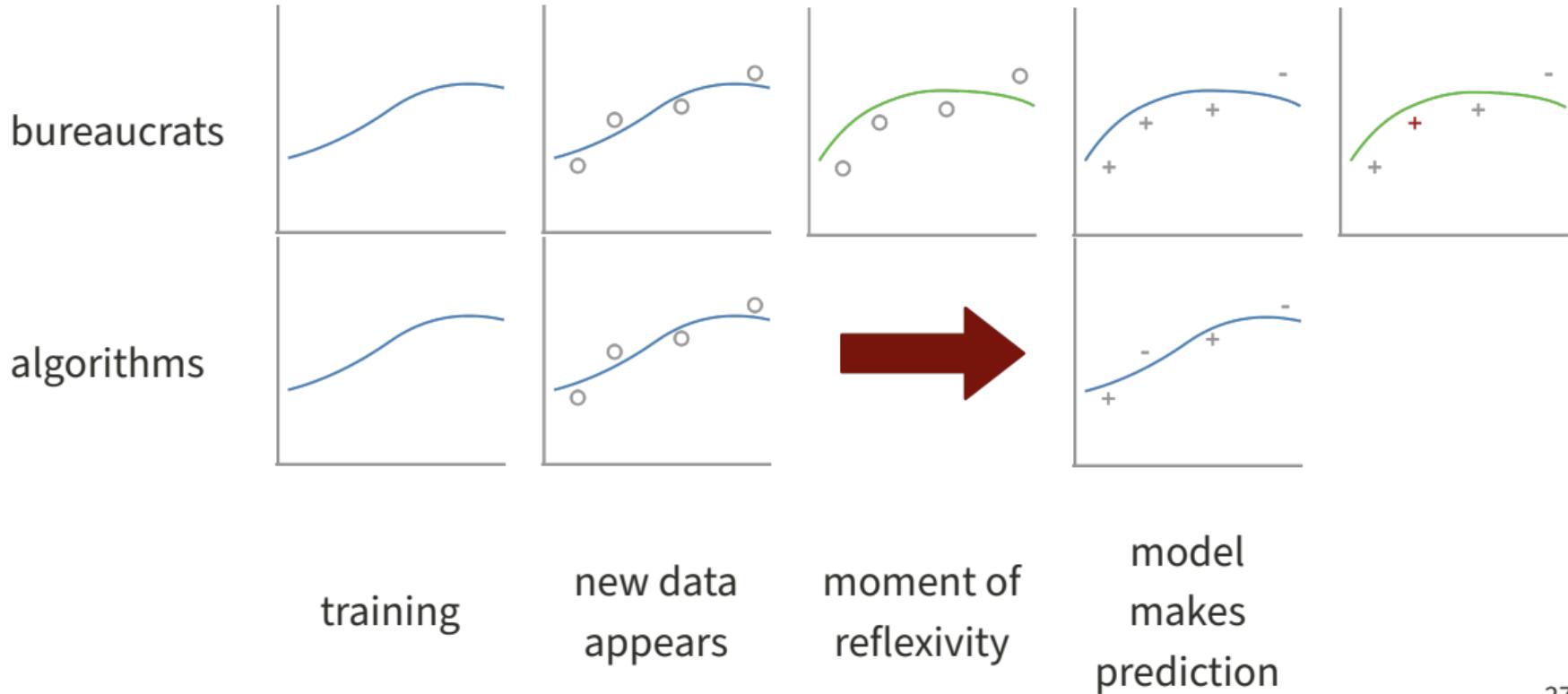
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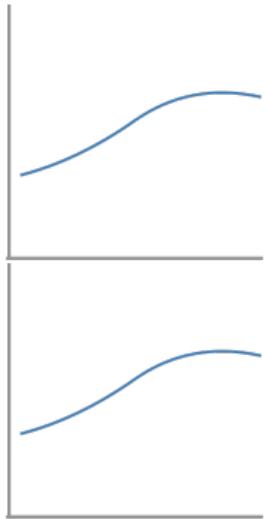
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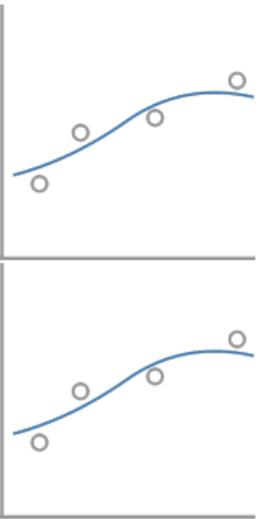
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bureaucrats



algorithms



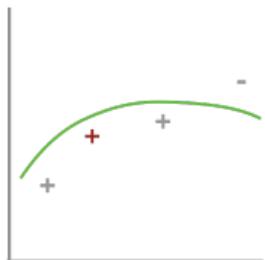
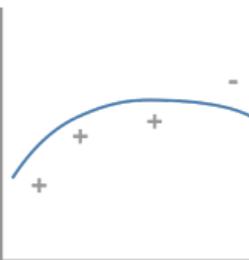
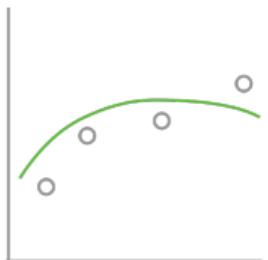
training



new data
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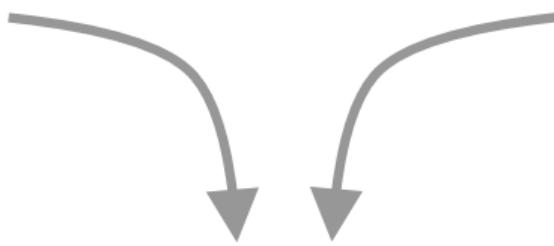
moment of
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Behavior

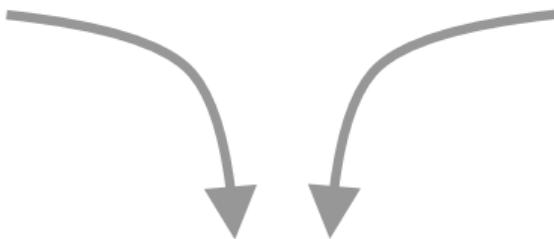
Algorithm



Judgment

Behavior

**Algorithm
Bureaucrat**



**Judgment
Application of
reflexivity**

YOUTUBE DEMONETIZATION

YOUTUBE DEMONETIZATION ALGORITHM

YouTube enforces many of its policies algorithmically:

- copyright
- advertiser guidelines
 - controversial issues
 - dangerous substances
 - harmful acts
 - inappropriate language
 - sexually suggestive content

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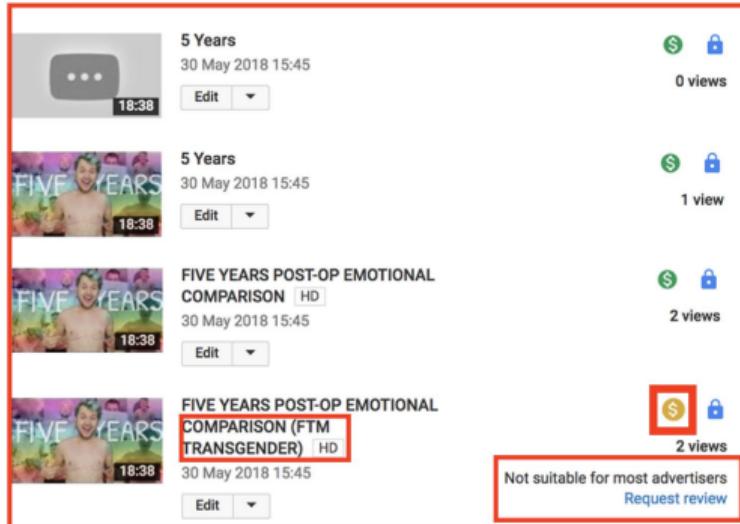
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YouTubers can still upload, but **the algorithm** determines their eligibility to earn
Demonetized videos earn no money for the YouTuber

**BUT THE DEMONETIZATION ALGORITHM MAKES
MISTAKES**

LGBTQ YOUTUBERS GETTING DEMONETIZED

TELL ME AGAIN HOW “TRANSGENDER”
DOESN’T TRIGGER THE ALGORITHM



Videos about **gender identity** are not necessarily about **sex** at all.

The algorithm learned to associate gendered terms with sex because the training data had that association.

In these videos, that association doesn't exist.

LGBTQ YOUTUBERS GETTING DEMONETIZED

TELL ME AGAIN HOW “TRANSGENDER”
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5 Years
30 May 2018 15:45
Edit

5 Years
30 May 2018 15:45
Edit

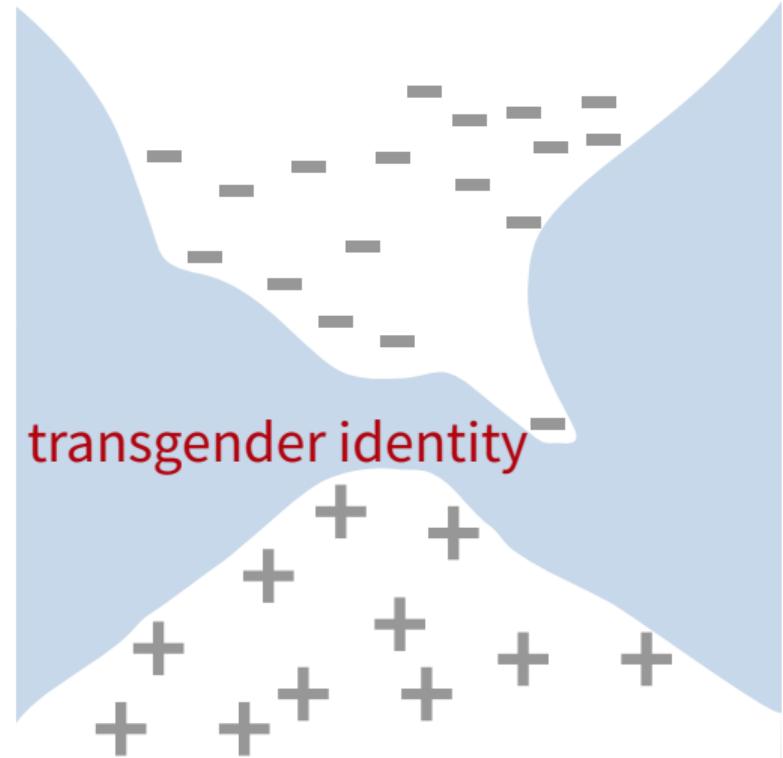
FIVE YEARS POST-OP EMOTIONAL COMPARISON HD
30 May 2018 15:45
Edit

FIVE YEARS POST-OP EMOTIONAL COMPARISON (FTM TRANSGENDER) HD
30 May 2018 15:45
Edit

Not suitable for most advertisers
Request review

 @CHASEROSS

 /UPPERCASECHASE1



FALSE NEGATIVES



Videos of children's character Peppa Pig being tortured in the dentist's office were, by all appearances, monetized normally

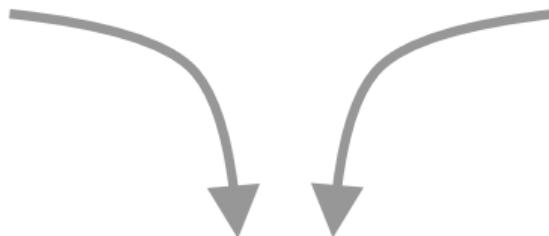
In some cases they were included in YouTube Kids

Behavior

User-created videos

Algorithm

YouTube demonetization



Judgment

Does this video look similar
to previous videos that were
demonetized?

Behavior

Street performances
("buskers")



Bureaucrat

Police tasked with
enforcing busking
ordinances in cities

Judgment

Is this performance pushing
the envelope, or does it
cross a line?

Behavior

Millions of street performances

Algorithm

Quasi-police force tasked with making street performance judgments at massive scale

Judgment

Ideally

Recognize new situations and navigate them culturally and contextually appropriately

In reality

Trained on yesterday's data, before today's cultural movements began



Behavior

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TAKEAWAYS

It's unlikely we can avoid these problems algorithmically

- Having **more training data** would not have helped us avoid this problem
- Experimentation and provocation is often the **point** of performance and art
- Street-level algorithms can only adapt **after** they make the wrong call

ON-DEMAND WORKER WAGE THEFT

ON-DEMAND WORK

Algorithmic systems determine the quality of on-demand workers' work and whether workers get paid.

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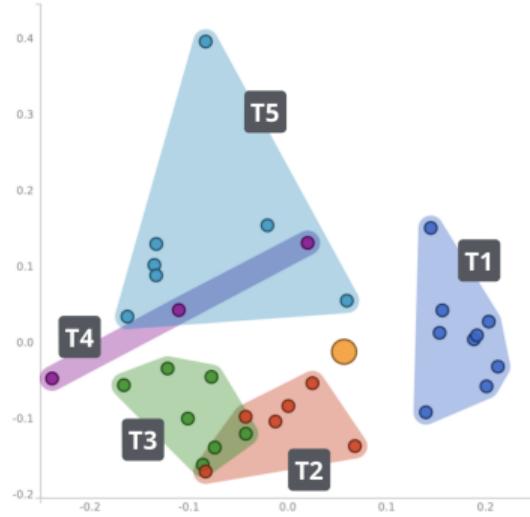
These systems have been accused of wage theft (Dombrowski, Alvarado Garcia, and Despard 2017; McInnis et al. 2016).

ON-DEMAND WORK

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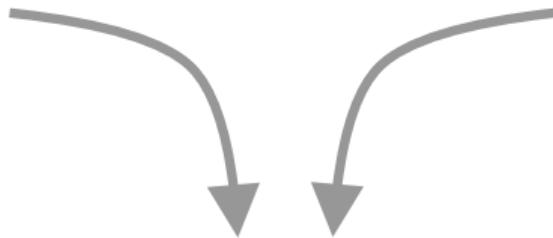
On-demand workers might reasonably interpret tasks in varied ways (Kairam and Heer 2016), but algorithmic systems don't seek novel or obscure interpretations.



Clusters of legitimate workers' differing interpretations of the same task (Kairam and Heer 2016)

Behavior

On-demand tasks



Algorithm

Crowdwork quality control systems

Judgment

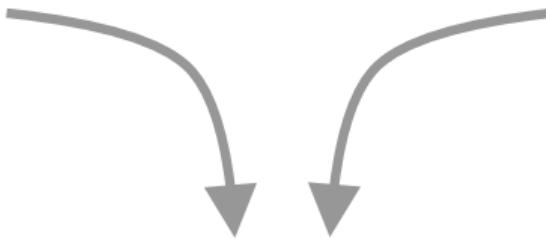
Is this crowdworker's output
correct, or should their work
be rejected?

Behavior

Factory workers

Bureaucrat

Factory foremen



Judgment

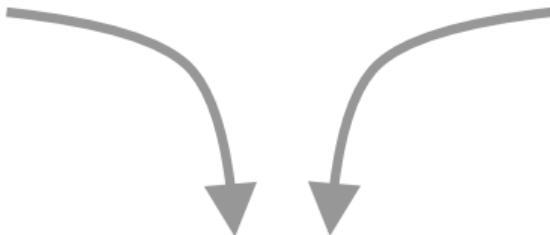
Is the factory worker doing
the work correctly, or do
they need assistance?

Behavior

Massive amounts of creative information work

Algorithm

Foremen tasked with accepting or rejecting work



Judgment

Ideally

Acknowledge when workers need to deviate from script, provide necessary resources, and give feedback

In reality

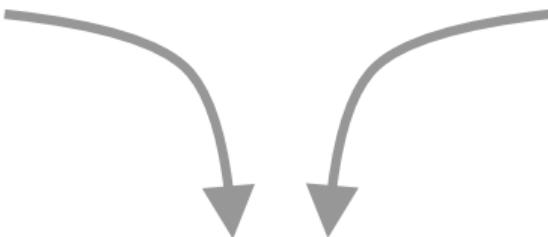
Frustratingly inflexible quality control algorithms deter creative effort and encourage gaming

Behavior

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Algorithm

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Judgment

Ideally

Acknowledge when workers need to deviate from script, provide necessary resources, and give feedback

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Frustratingly inflexible quality control algorithms deter creative effort and encourage gaming

TAKEAWAYS

Algorithms can't cope with novelty, which is what we want from increasingly complex and creative on-demand work

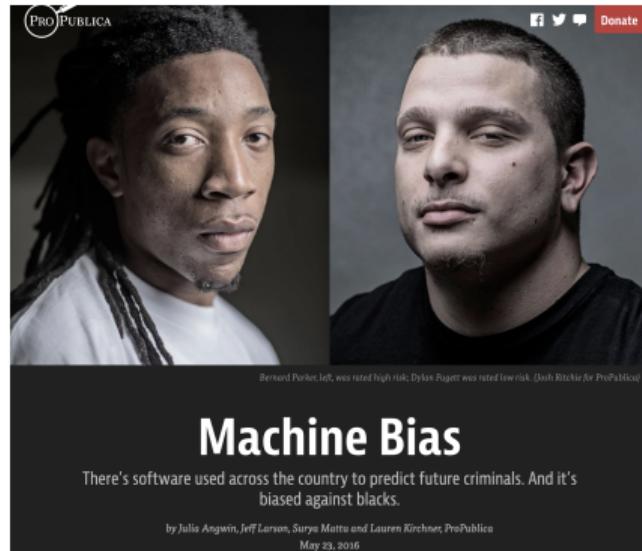
- Algorithmic foremen can't distinguish novel answers from wrong answers
- There's a catch-22 of training data
- Street-level algorithms here never have the data they need to distinguish between bad and novel

ALGORITHMIC BIAS IN JUSTICE

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Algorithmic systems predict whether defendants are likely to appear at their court date, recommending the level at which to set bail.

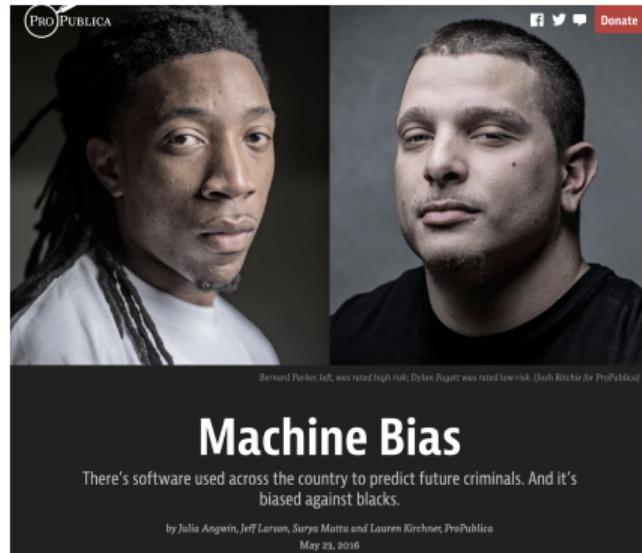
These algorithms reflect and amplify racial biases in society (Buolamwini and Gebru 2018; Lambrecht and Tucker 2018; Thebault-Spieker, Terveen, and Hecht 2015).



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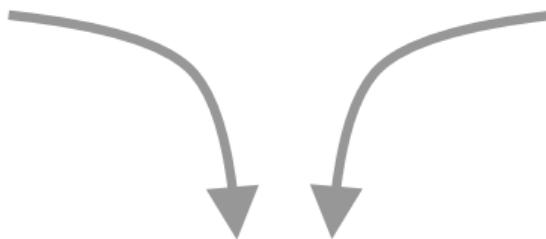


Behavior

Defendant's situation
and behavior

Bureaucrats

Judges



Judgment

Should this defendant be
eligible to go free on bail?

Behavior

Defendants from many different jurisdictions, environments, backgrounds

Algorithm

Algorithmic judges tasked with predicting whether defendants will return for trial

Judgment

Ideally

Account for the circumstances of defendants' environments

In reality

Re-enact old cases, even if new & intersectional ones arise



Behavior

Defendants from many different jurisdictions, environments, backgrounds

Algorithm

Algorithmic judges tasked with predicting whether defendants will return for trial

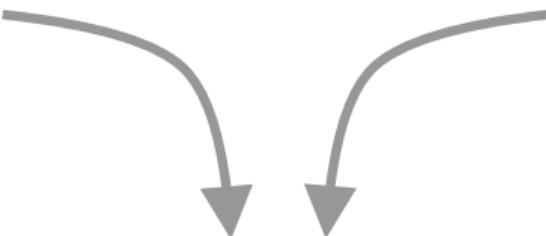
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Ideally

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TAKEAWAYS

Here we have something new: a street-level bureaucrat interacting with a street-level algorithm. Bureaucrats can resist or buffer the algorithm's recommendations when needed (Christin 2017; Veale, Van Kleek, and Binns 2018).

Even a perfectly fair, transparent, and accountable algorithm will make errors of generalization in cases at the margin. Bureaucrats reason by extension from precedent and case law. How should an algorithm reason?

Good theories give us analytical power

for the past

for the present

for realities to come

IMPLICATIONS

A theory of street-level algorithms suggests that, when faced with algorithmic failure, we should reflect on the mechanisms and processes at play with street-level bureaucrats.

- Ensuring that the person or system reviewing the appeal does not overlap with the person or system who made the initial judgment
- Predefined rules for recourse, (e.g. compensating lost income)
- Requirements to publish plain-language descriptions of complex systems

CONCERNS

Street-level bureaucrats reflect and exercise discretion to support the goals of the institution, but that's resulted in historically, systematically, marginalized groups, by way of:

- Systematic brutality committed against people of color, trans people, and other marginalized communities
- Criminalization of disempowered groups.

CONCERNS

Street-level bureaucrats reflect and exercise discretion to support the goals of the institution, but that's resulted in historically, systematically, marginalized groups

Street-level algorithms are replicating **the same old patterns**

LGBTQ
YouTubers

Financially precarious
crowd workers

People of color in the
criminal justice system

CONCERNS

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CONCERNS

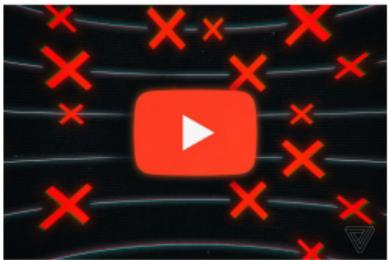
LGBTQ YouTubers

LGBTQ YouTubers are suing YouTube over alleged discrimination

Including suppressing video recommendations and demonetization

By Julia Alexander | Aug 14, 2019, 9:16am EDT

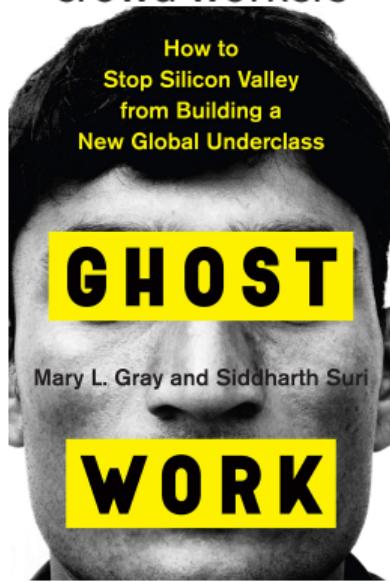
f t  SHARE



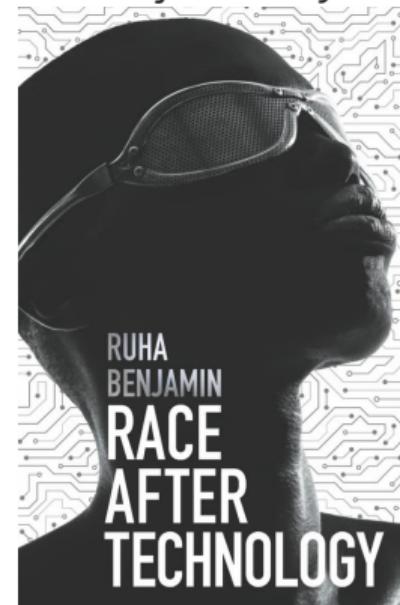
The Verge

A group of YouTube creators is suing YouTube for allegedly discriminating against their LGBTQ-focused videos by suppressing recommendations and

Financially precarious crowd workers



People of color in the criminal justice system



NEW TECHNOLOGIES, OLD METAPHORS

On-Demand work

Piecework

CHI 2017 (Honorable Mention)

Artificial Intelligence

Street-level bureaucracies

CHI 2019 (Best Paper)

To Live in Their Utopia

CHI 2021

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CHI 2021

To LIVE IN THEIR UTOPIA

ALKHATIB @ CHI '21

“STREET-LEVEL ALGORITHMS” AND ITS ISSUES

Street-level algorithms begins to answer why algorithms make the wrong calls in the “moment of decision”

“STREET-LEVEL ALGORITHMS” AND ITS ISSUES

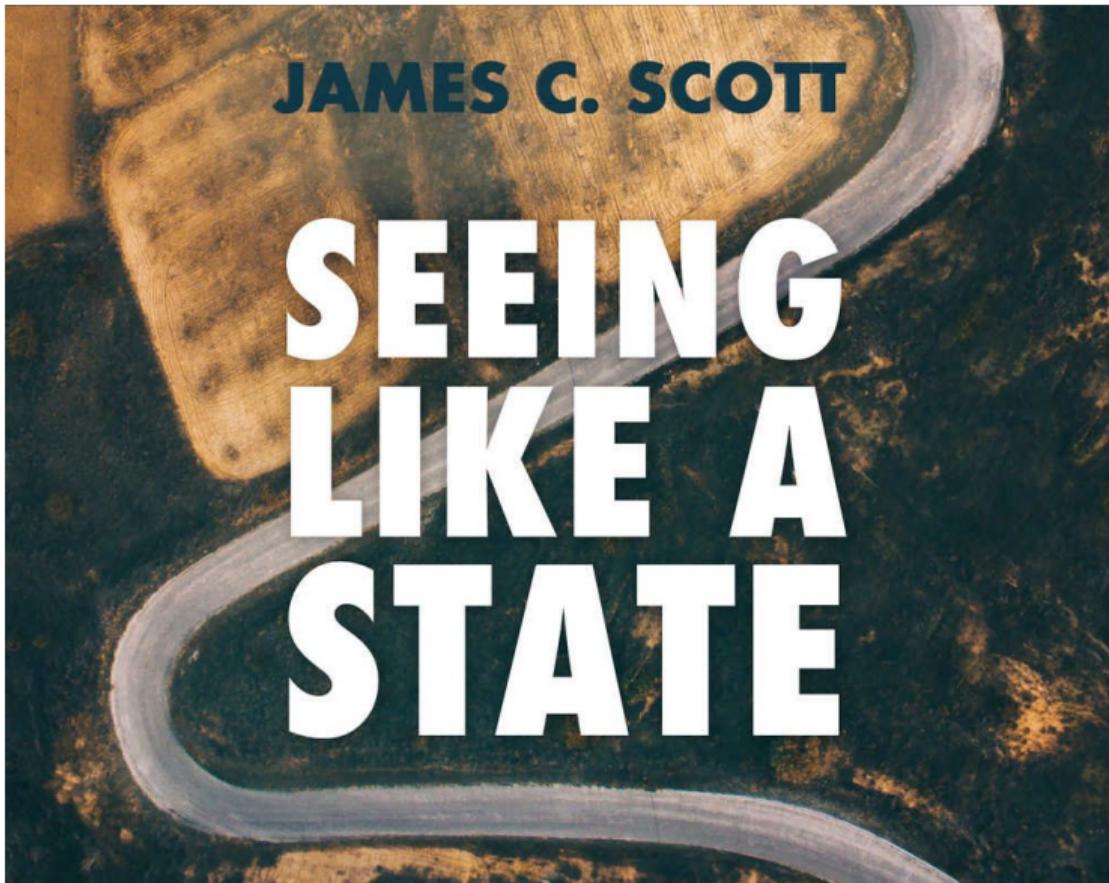
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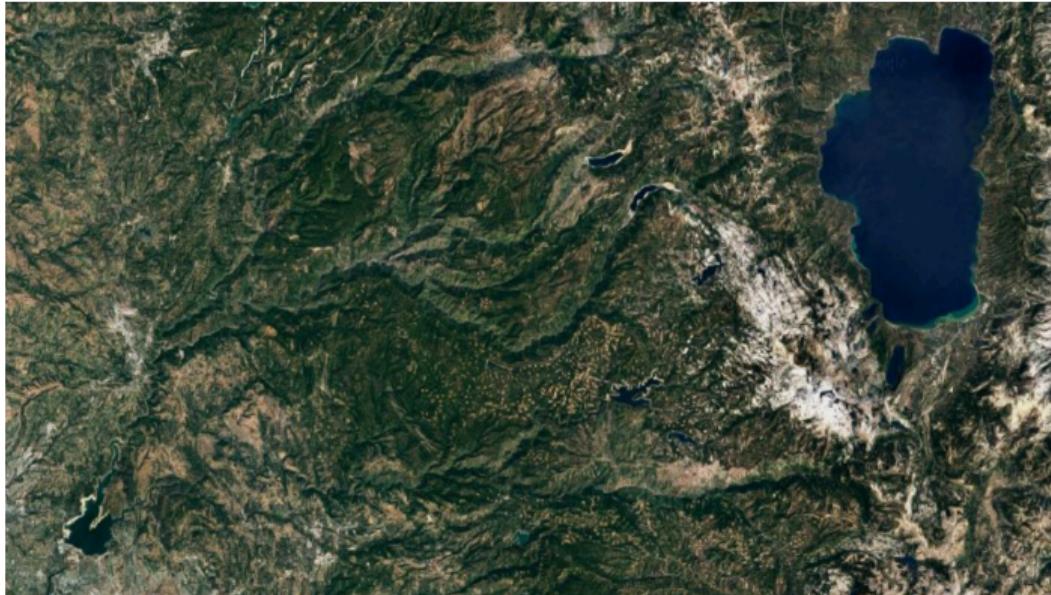
It doesn’t address deeper structural mechanisms of marginalization

TURNING TO ANTHROPOLOGICAL SCHOLARSHIP

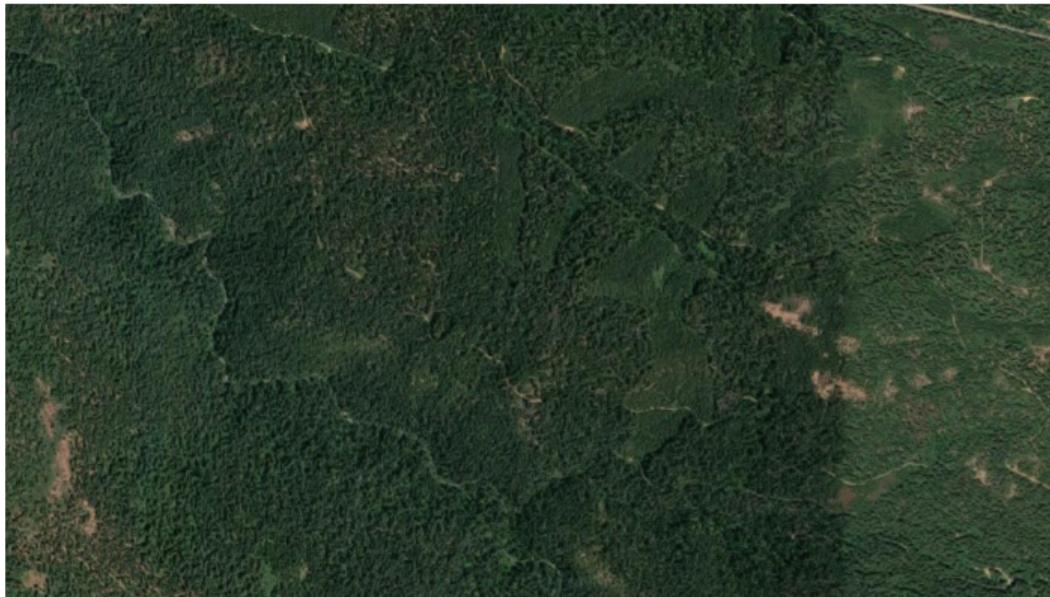


SCIENTIFIC FORESTRY

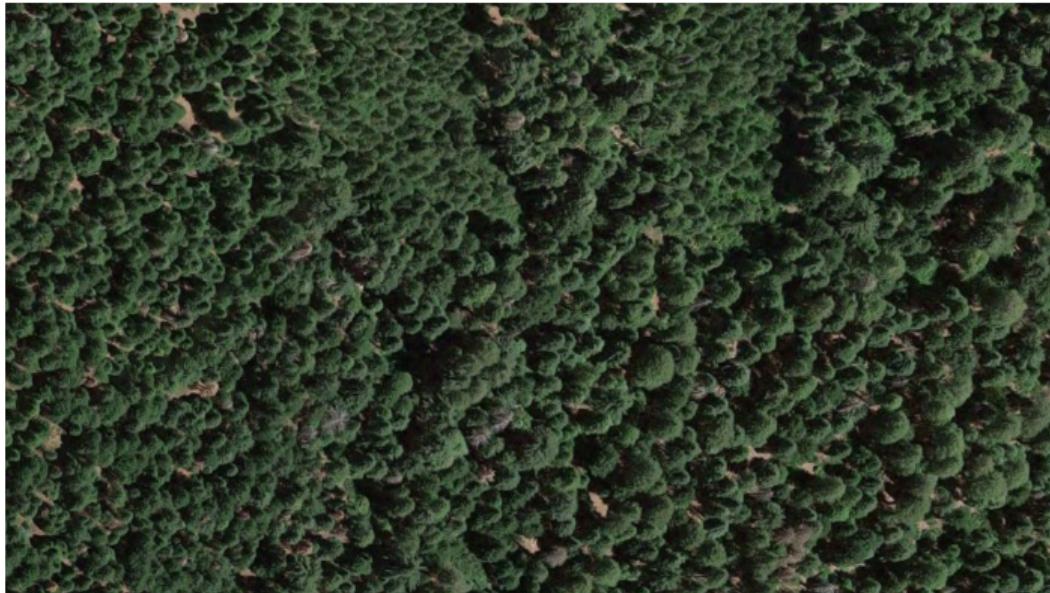
SCIENTIFIC FORESTRY



SCIENTIFIC FORESTRY



SCIENTIFIC FORESTRY



SCIENTIFIC FORESTRY



SCIENTIFIC FORESTRY



SCIENTIFIC FORESTRY



What about...

- Wildlife?
- People?
- Other trees and flora?

WE INTERPRET THE WORLD IN CONSTRAINED WAYS

WE INTERPRET THE WORLD IN CONSTRAINED WAYS

IT'S HOW WE COPE WITH TOO MUCH INFORMATION

INTERPRETATION TO IMPOSITION

INTERPRETATION TO IMPOSITION



DELAYED DISASTERS

- Things were fine for a while

DELAYED DISASTERS

- Things were fine for a while
- Then they weren't

DELAYED DISASTERS

- Things were fine for a while
- Then they weren't
 - Pests
 - Storms
 - Hollowing out of the ecosystem

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Waldsterben

DELAYED DISASTERS

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Waldsterben

Forest death

ECOLOGICAL DIVERSITY

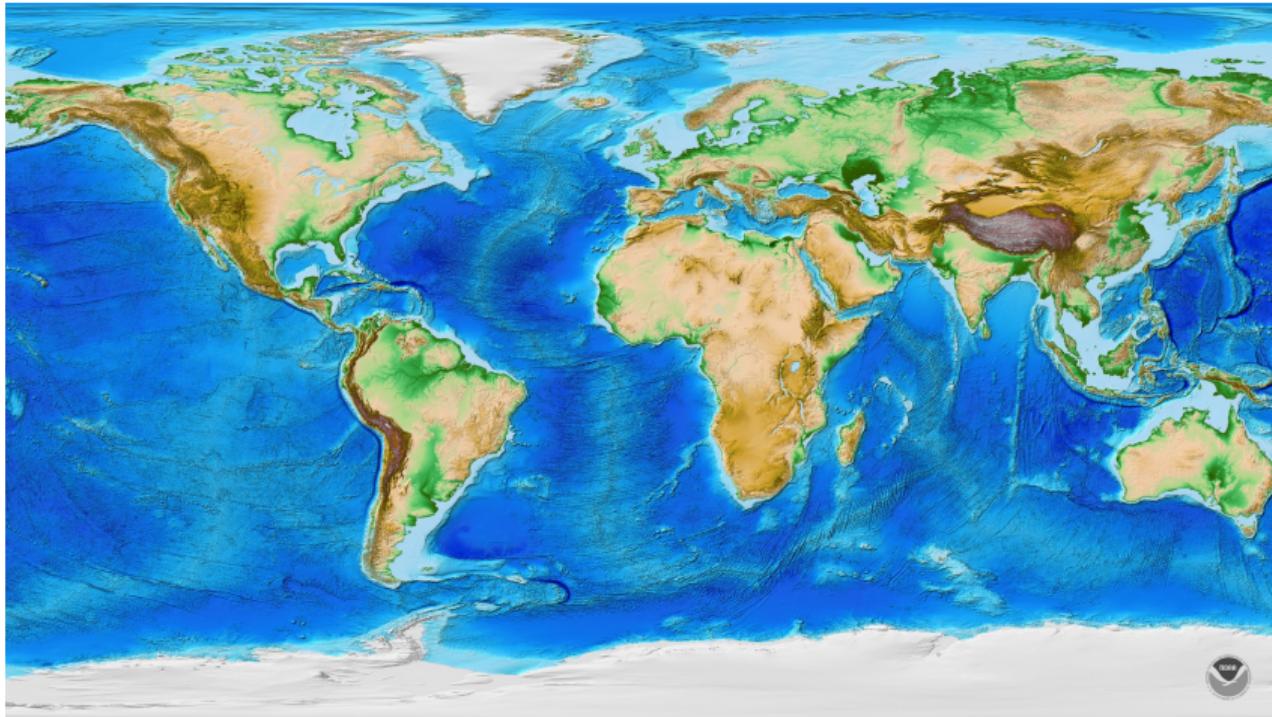
The forest was more than just the trees

ECOLOGICAL DIVERSITY

The forest was more than just the trees

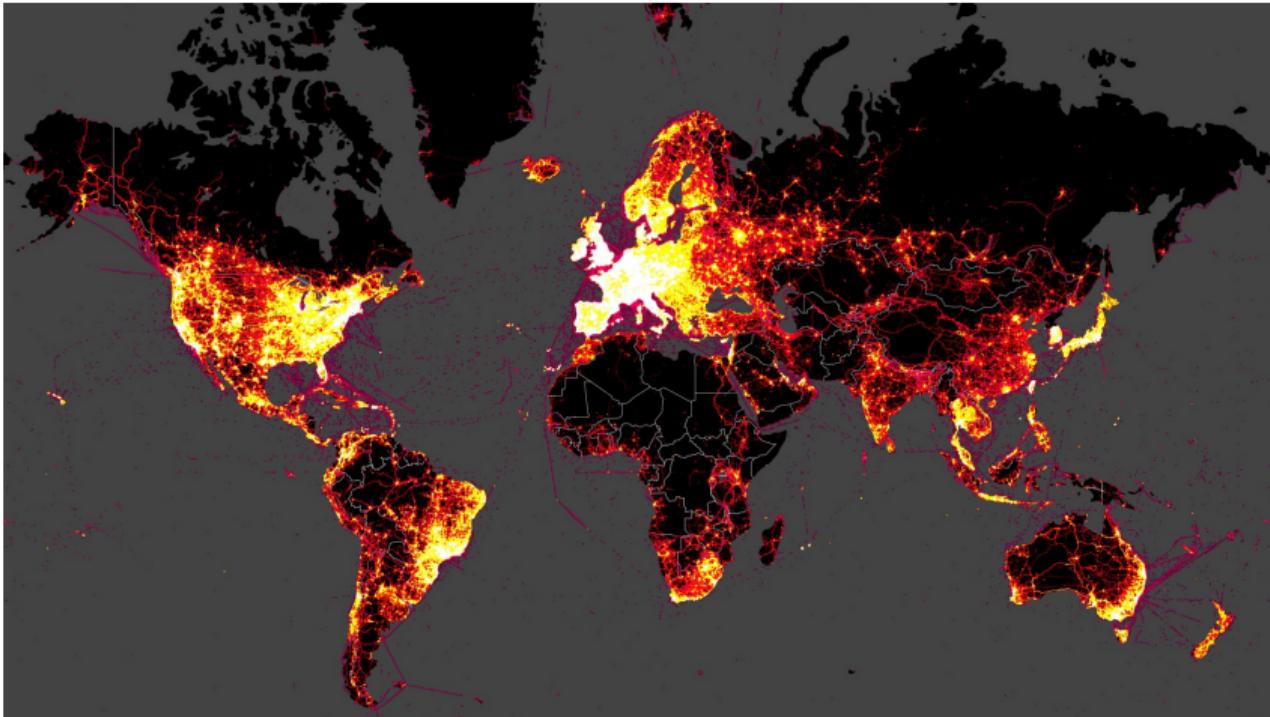
It was everything that lived in and passed through

CONCEPTUAL MAPS



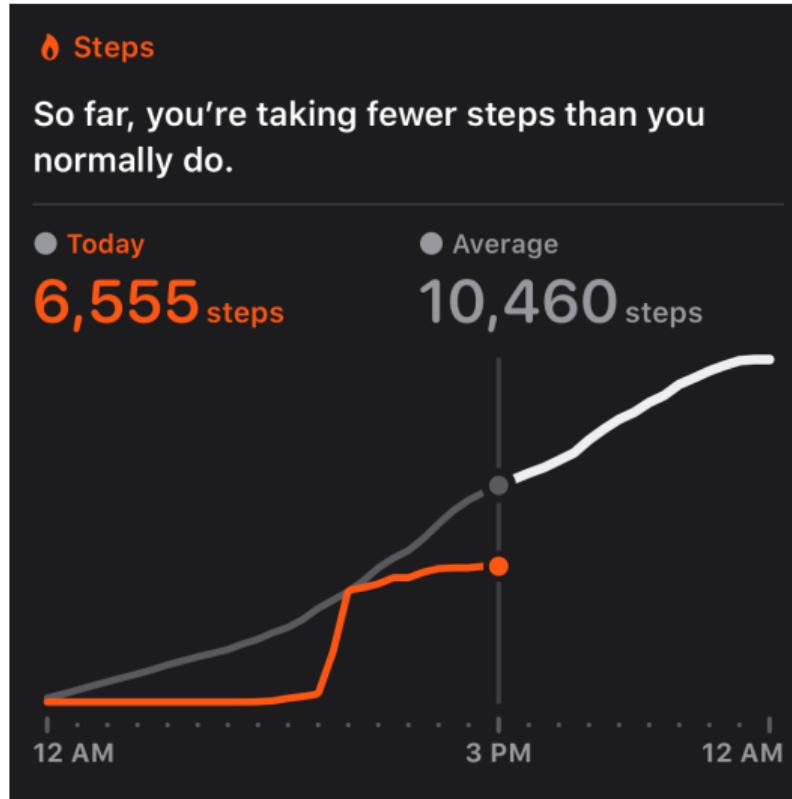
Topographical map by the NOAA

CONCEPTUAL MAPS

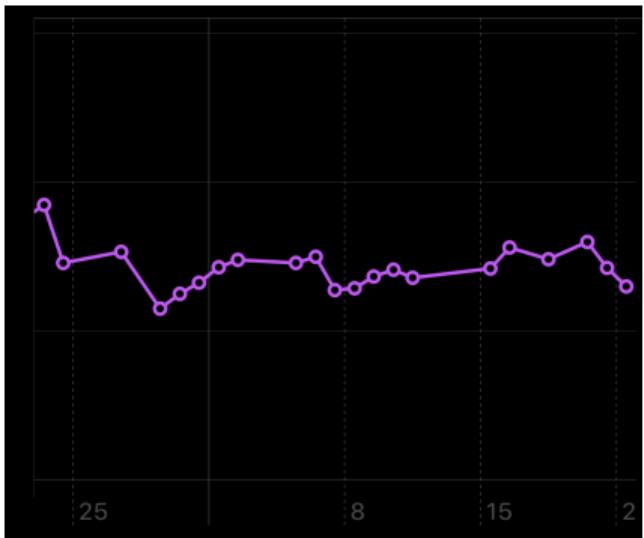


Strava heatmap

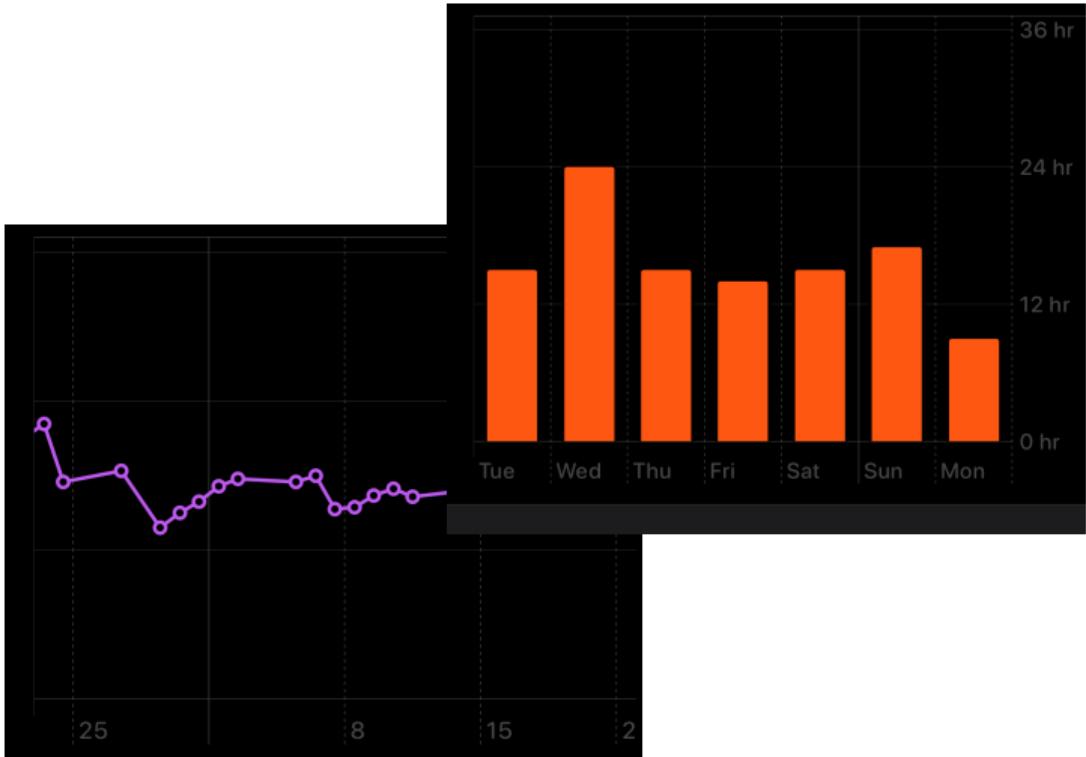
FRUSTRATIONS OF REDUCTIVE SYSTEMS



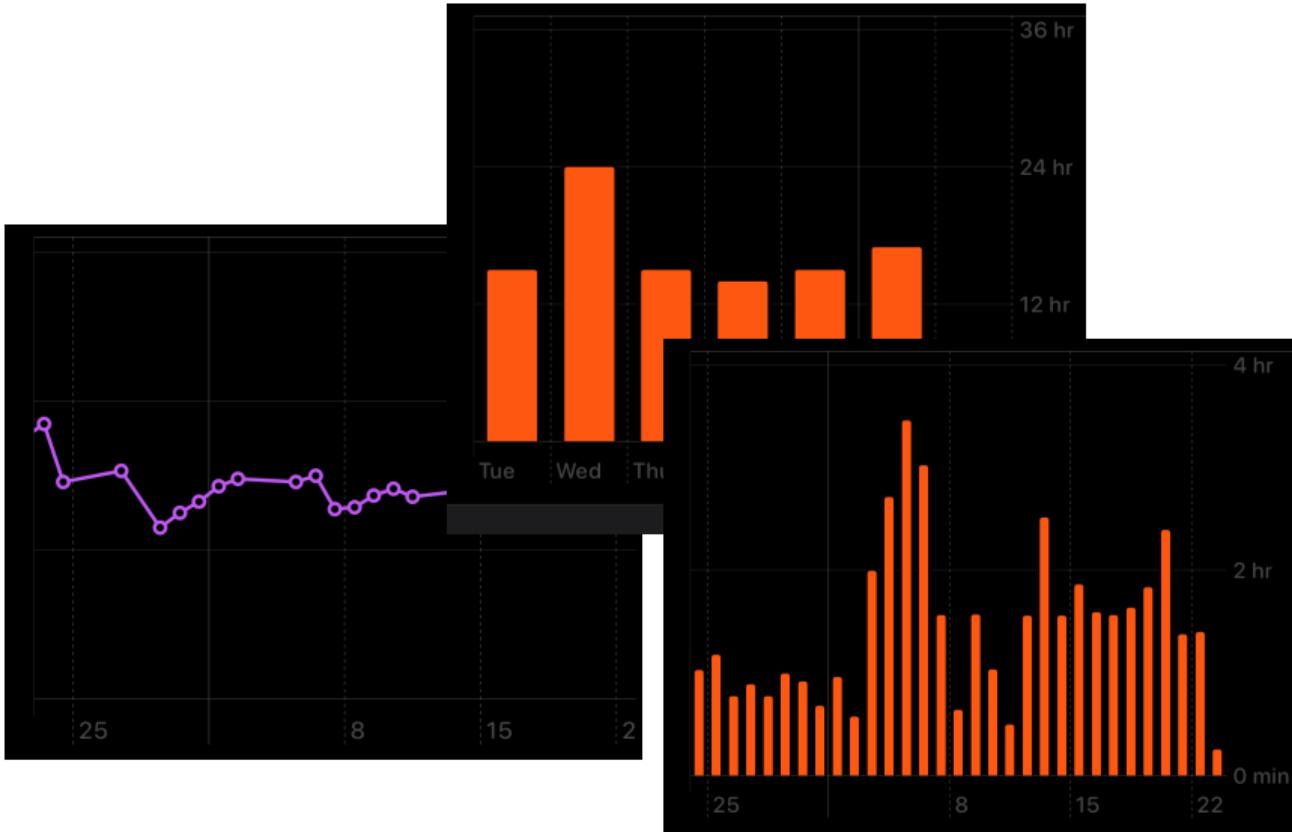
HOW SYSTEMS SEE US



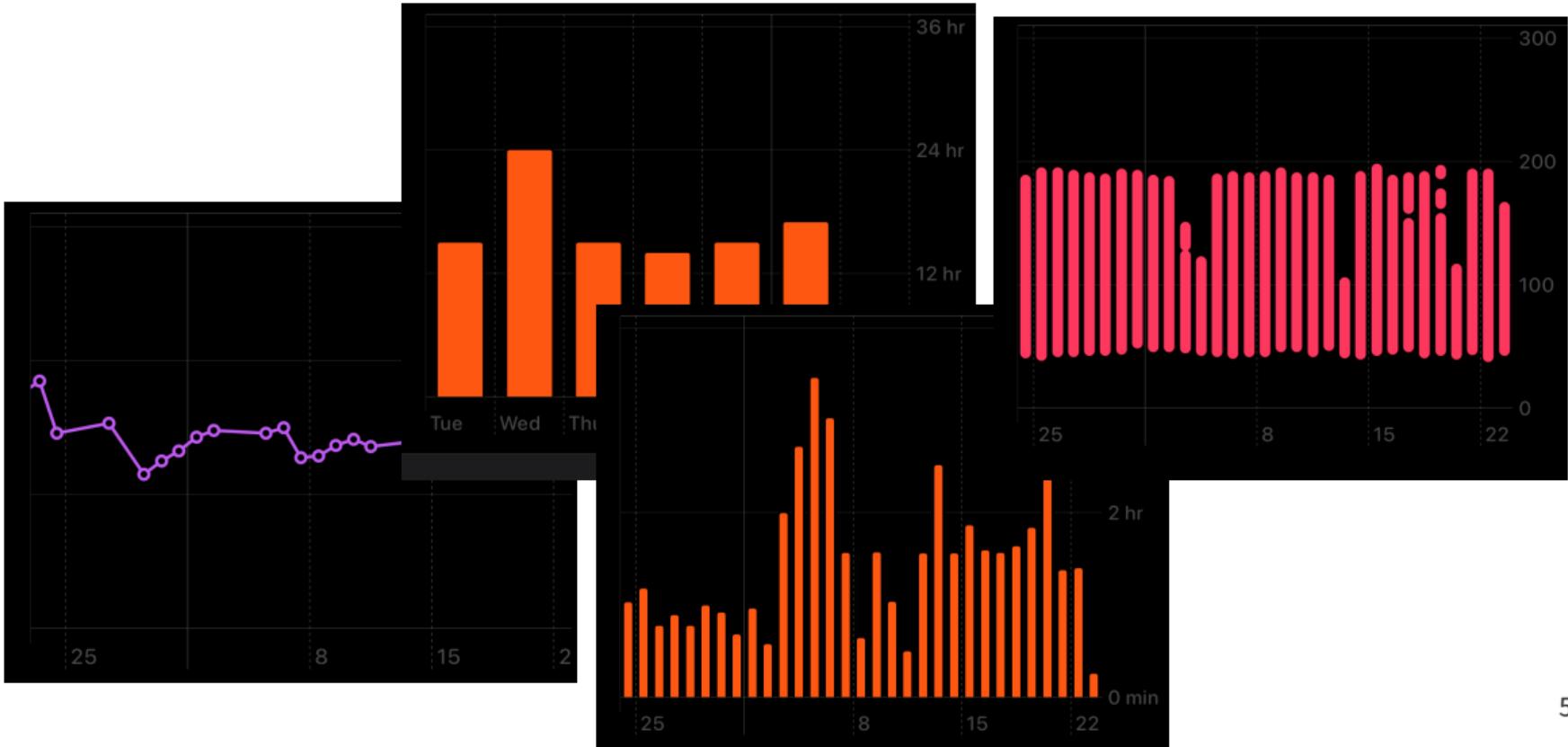
HOW SYSTEMS SEE US



HOW SYSTEMS SEE US



HOW SYSTEMS SEE US



LIVING IN THEIR UTOPIA

Wrongfully Accused by an Algorithm

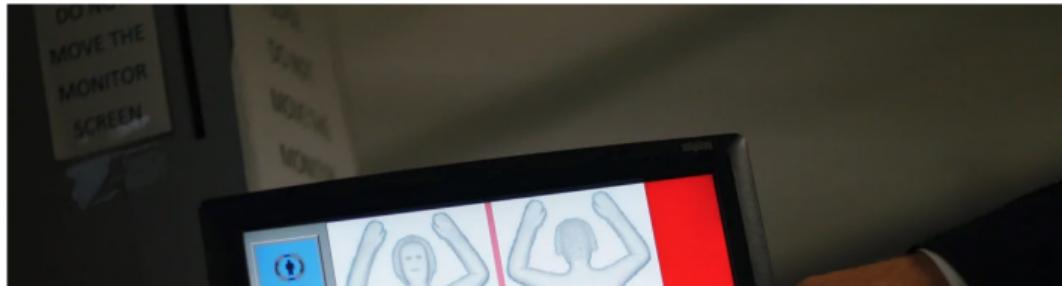
In what may be the first known case of its kind, a faulty facial recognition match led to a Michigan man's arrest for a crime he did not commit.



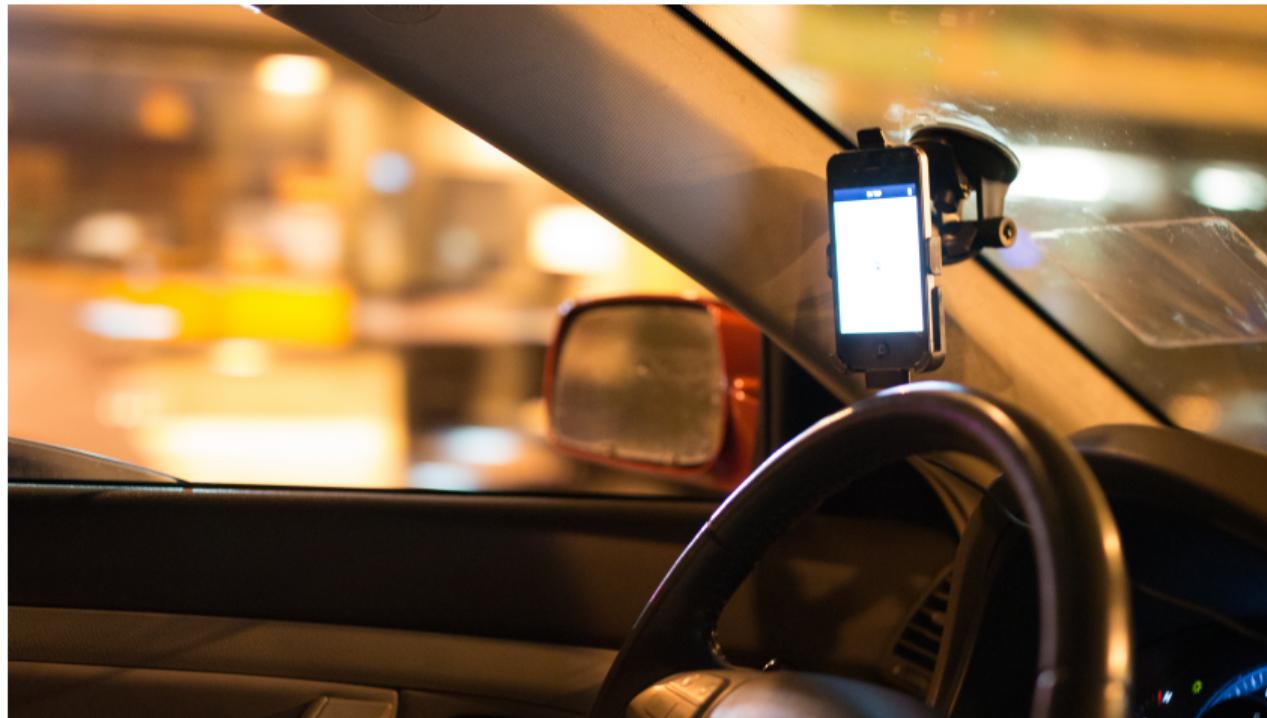
THE TSA'S TECHNOLOGY IS DISCRIMINATING AGAINST TRANS PEOPLE

The creator of the TSA's body-scanning tech says that a gender button is unnecessary and ineffective.

EMMA EISENBERG · AUG 5, 2019



LIVING IN THEIR UTOPIA



TAKEAWAYS

- Disempower algorithms
- Find ways to help people escape the algorithm's absurdity
- Interrogate and continuously study the power dynamics unfolding

Everything we do is situated within cultural and historical backdrops of power and oppression.

If we're serious about ethics and justice, we need to be as serious about understanding those histories and power dynamics as we are about imagining potential futures.

Thinking along these lines forces us to confront how we participate in violent, oppressive systems and practices, but that can inspire us.

NEW TECHNOLOGIES, OLD METAPHORS

On-Demand work

Piecework

CHI 2017 (Honorable Mention)

Artificial Intelligence

Street-level bureaucracies

CHI 2019 (Best Paper)

To Live in Their Utopia

CHI 2021

SEEING THE FOREST FOR THE TREES

SEEING THE FOREST FOR THE TREES

REFERENCES

- [1] Ali Alkhatib. “To Live in Their Utopia: Why Algorithmic Systems Create Absurd Outcomes”. In: *Proceedings of the 2021 CHI Conference on Human Factors in Computing Systems*. CHI ’21. Yokohama, Japan: Association for Computing Machinery, 2021. ISBN: 9781450380966. DOI: [10.1145/3411764.3445740](https://doi.org/10.1145/3411764.3445740). URL: <https://doi.org/10.1145/3411764.3445740>.

REFERENCES II

- [2] Ali Alkhatib and Michael Bernstein. "Street-Level Algorithms: A Theory at the Gaps Between Policy and Decisions". In: *Proceedings of the 2019 CHI Conference on Human Factors in Computing Systems* (Glasgow, Scotland UK). CHI 2019. Glasgow, Scotland UK: ACM, 2019, 530:1–530:13. ISBN: 978-1-4503-5970-2. DOI: [10.1145/3290605.3300760](https://doi.acm.org/10.1145/3290605.3300760). URL: <http://doi.acm.org/10.1145/3290605.3300760>.

REFERENCES III

- [3] Ali Alkhatib, Michael S. Bernstein, and Margaret Levi. "Examining Crowd Work and Gig Work Through The Historical Lens of Piecework". In: *Proceedings of the 2017 CHI Conference on Human Factors in Computing Systems* (Denver, Colorado, USA). CHI 2017. Denver, Colorado, USA: ACM, 2017, pp. 4599–4616. ISBN: 978-1-4503-4655-9. DOI: [10.1145/3025453.3025974](https://doi.acm.org/10.1145/3025453.3025974). URL: <http://doi.acm.org/10.1145/3025453.3025974>.
- [4] Engin Bozdag and Jeroen van den Hoven. "Breaking the filter bubble: democracy and design". In: *Ethics and Information Technology* 17.4 (2015), pp. 249–265.

REFERENCES IV

- [5] Taina Bucher. "The algorithmic imaginary: exploring the ordinary affects of Facebook algorithms". In: *Information, Communication & Society* 20.1 (2017), pp. 30–44.
- [6] Joy Buolamwini and Timnit Gebru. "Gender Shades: Intersectional Accuracy Disparities in Commercial Gender Classification". In: *Proceedings of the 1st Conference on Fairness, Accountability and Transparency*. Ed. by Sorelle A. Friedler and Christo Wilson. Vol. 81. Proceedings of Machine Learning Research. New York, NY, USA: PMLR, 2018, pp. 77–91. URL: <http://proceedings.mlr.press/v81/buolamwini18a.html>.

REFERENCES V

- [7] Edwin Chadwick. “Openi, at the Meeting of the National Association for the Promotion of Social Science, held at York, in September, 1864”. In: *Journal of the Statistical Society of London* 28.1 (1865), pp. 1–33. ISSN: 09595341. URL: <http://www.jstor.org/stable/2338394>.
- [8] Angèle Christin. “Algorithms in practice: Comparing web journalism and criminal justice”. In: *Big Data & Society* 4.2 (2017), p. 2053951717718855. DOI: [10.1177/2053951717718855](https://doi.org/10.1177/2053951717718855). URL: <https://doi.org/10.1177/2053951717718855>.

REFERENCES VI

- [9] William J. Cunningham. "Scientific Management in the Operation of Railroads". In: *The Quarterly Journal of Economics* 25.3 (1911), p. 539. DOI: [10.2307/1883615](https://doi.org/10.2307/1883615). URL: <http://dx.doi.org/10.2307/1883615>.

REFERENCES VII

- [10] Lynn Dombrowski, Adriana Alvarado Garcia, and Jessica Despard. “Low-Wage Precarious Workers’ Sociotechnical Practices Working Towards Addressing Wage Theft”. In: *Proceedings of the 2017 CHI Conference on Human Factors in Computing Systems*. CHI ’17. Denver, Colorado, USA: ACM, 2017, pp. 4585–4598. ISBN: 978-1-4503-4655-9. DOI: [10.1145/3025453.3025633](https://doi.acm.org/10.1145/3025453.3025633). URL: <http://doi.acm.org/10.1145/3025453.3025633>.
- [11] Motahhare Eslami et al. “First i like it, then i hide it: Folk theories of social feeds”. In: *Proceedings of the 2016 CHI conference on human factors in computing systems*. ACM. 2016, pp. 2371–2382.

REFERENCES VIII

- [12] Motahhare Eslami et al. ““I Always Assumed That I Wasn’t Really That Close to [Her]”: Reasoning About Invisible Algorithms in News Feeds”. In: *Proceedings of the 33rd Annual ACM Conference on Human Factors in Computing Systems*. CHI ’15. Seoul, Republic of Korea: ACM, 2015, pp. 153–162. ISBN: 978-1-4503-3145-6. DOI: [10.1145/2702123.2702556](https://doi.acm.org/10.1145/2702123.2702556). URL: <http://doi.acm.org/10.1145/2702123.2702556>.
- [13] Clifford Geertz. “Thick description: Toward an interpretive theory of culture”. In: New York: Basic Books, 1973, pp. 3–30.

REFERENCES IX

- [14] R Stuart Geiger. “The lives of bots”. In: *arXiv preprint arXiv:1810.09590* (2018).
- [15] B.M. Jewell. *The problem of piece work*. The Problem of Piece Work nos. 1-16. Bronson Canode Print. Co., 1921. URL:
<https://books.google.com/books?id=NN5NAQAAIAAJ>.

REFERENCES X

- [16] Sanjay Kairam and Jeffrey Heer. "Parting Crowds: Characterizing Divergent Interpretations in Crowdsourced Annotation Tasks". In: *Proceedings of the 19th ACM Conference on Computer-Supported Cooperative Work & Social Computing*. CSCW '16. San Francisco, California, USA: ACM, 2016, pp. 1637–1648. ISBN: 978-1-4503-3592-8. DOI: [10.1145/2818048.2820016](https://doi.acm.org/10.1145/2818048.2820016). URL: <http://doi.acm.org/10.1145/2818048.2820016>.
- [17] Anja Lambrecht and Catherine E Tucker. "Algorithmic bias? An empirical study into apparent gender-based discrimination in the display of STEM career ads". In: (2018).

REFERENCES XI

- [18] Min Kyung Lee et al. "Working with Machines: The Impact of Algorithmic and Data–Driven Management on Human Workers". In: *Proceedings of the 33rd Annual ACM Conference on Human Factors in Computing Systems*. CHI '15. ACM, 2015, pp. 1603–1612. ISBN: 978-1-4503-3145-6. DOI: [10.1145/2702123.2702548](https://doi.acm.org/10.1145/2702123.2702548). URL: <http://doi.acm.org/10.1145/2702123.2702548>.
- [19] Michael Lipsky. *Street-Level Bureaucracy: The Dilemmas of the Individual in Public Service*. Russell Sage Foundation, 1980.
- [20] Michael Lipsky. *Toward a theory of street-level bureaucracy*. Institute for Research on Poverty, University of Wisconsin, 1969.

REFERENCES XII

- [21] Brian McInnis et al. “Taking a HIT: Designing Around Rejection, Mistrust, Risk, and Workers’ Experiences in Amazon Mechanical Turk”. In: *Proceedings of the 2016 CHI Conference on Human Factors in Computing Systems*. CHI ’16. ACM, 2016, pp. 2271–2282. ISBN: 978-1-4503-3362-7. DOI: [10.1145/2858036.2858539](https://doi.acm.org/10.1145/2858036.2858539). URL: <http://doi.acm.org/10.1145/2858036.2858539>.

REFERENCES XIII

- [22] Katherine Panciera, Aaron Halfaker, and Loren Terveen. “Wikipedians Are Born, Not Made: A Study of Power Editors on Wikipedia”. In: *Proceedings of the ACM 2009 International Conference on Supporting Group Work*. GROUP ’09. ACM, 2009, pp. 51–60. ISBN: 978-1-60558-500-0. DOI: [10.1145/1531674.1531682](https://doi.acm.org/10.1145/1531674.1531682). URL: <http://doi.acm.org/10.1145/1531674.1531682>.

REFERENCES XIV

- [23] Emilee Rader and Rebecca Gray. "Understanding User Beliefs About Algorithmic Curation in the Facebook News Feed". In: *Proceedings of the 33rd Annual ACM Conference on Human Factors in Computing Systems*. CHI '15. Seoul, Republic of Korea: ACM, 2015, pp. 173–182. ISBN: 978-1-4503-3145-6. doi: [10.1145/2702123.2702174](https://doi.acm.org/10.1145/2702123.2702174). URL: <http://doi.acm.org/10.1145/2702123.2702174>.
- [24] Erica Schoenberger. In: *Environment and Planning D: Society and Space* 6.3 (1988), pp. 245–262.
- [25] Frederick Winslow Taylor. *The principles of scientific management*. Harper, 1911.

REFERENCES XV

- [26] Jacob Thebault-Spieker, Loren G Terveen, and Brent Hecht. "Avoiding the south side and the suburbs: The geography of mobile crowdsourcing markets". In: *Proceedings of the 18th ACM Conference on Computer Supported Cooperative Work & Social Computing*. ACM. 2015, pp. 265–275.
- [27] Steven Tolliday and Jonathan Zeitlin. *Between fordism and flexibility*. Oxford, 1986.

REFERENCES XVI

- [28] Michael Veale, Max Van Kleek, and Reuben Binns. “Fairness and Accountability Design Needs for Algorithmic Support in High-Stakes Public Sector Decision-Making”. In: *Proceedings of the 2018 CHI Conference on Human Factors in Computing Systems*. CHI ’18. Montreal QC, Canada: ACM, 2018, 440:1–440:14. ISBN: 978-1-4503-5620-6. DOI: [10.1145/3173574.3174014](https://doi.acm.org/10.1145/3173574.3174014). URL: <http://doi.acm.org/10.1145/3173574.3174014>.