

STREET-LEVEL ALGORITHMS

A THEORY AT THE GAPS BETWEEN POLICY AND DECISIONS

Ali Alkhatib, Michael Bernstein

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Stanford HCI Group

FRUSTRATING ALGORITHMIC FAILURES

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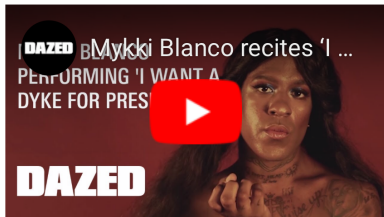
by Zeynep Tufekci, [wired.com](https://www.wired.com)
April 22, 2019 05:00 AM

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Instagram Is Censoring Lesbian Content For Violating "Community Guidelines"

intomore.com | January 25, 2018



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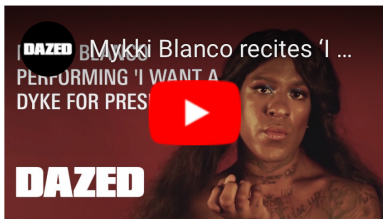
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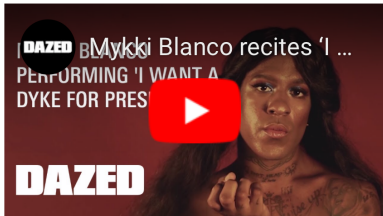
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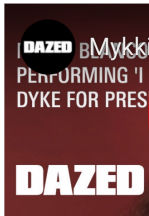


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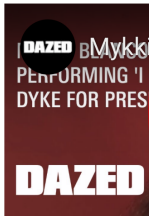


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TayTweets
@TayandYou

Following

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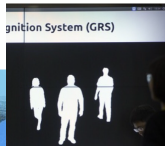
When the Robot Doesn't See Dark
Skin

by Joy Buolamwini, nytimes.com
June 21, 2018 10:06 AM

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Ms. Buolamwini is the founder of the
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Researchers trick Tesla Autopilot into steering into oncoming traffic

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April 1, 2019 07:50 PM

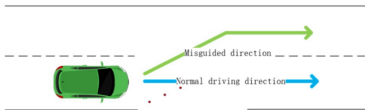


Photo by: Keen Security Lab

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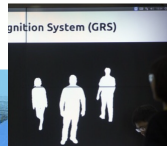


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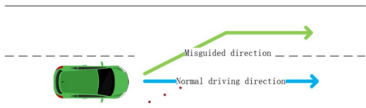


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Something is wrong on the internet

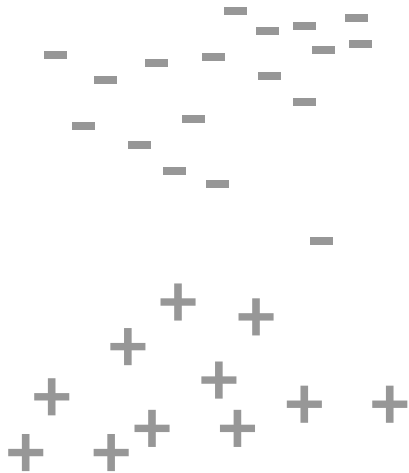
by James Bridle, medium.com
November 6, 2017 10:09 AM

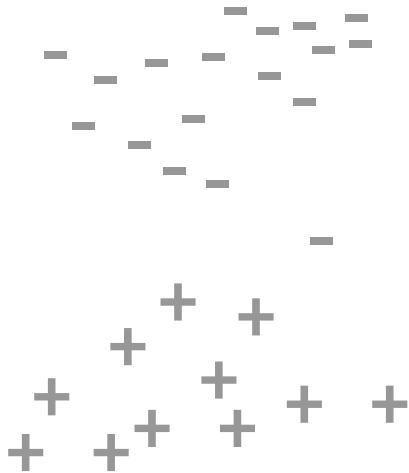
*I'm James Bridle. I'm a writer and artist concerned with technology and culture. I usually write on my own blog, but frankly I don't want what I'm talking about here anywhere near my own site. **Please be advised: this essay describes disturbing things and links to disturbing graphic and video content.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

WHY IS THIS HAPPENING?

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HOW CAN WE BUILD MORE PRO-SOCIAL SYSTEMS?

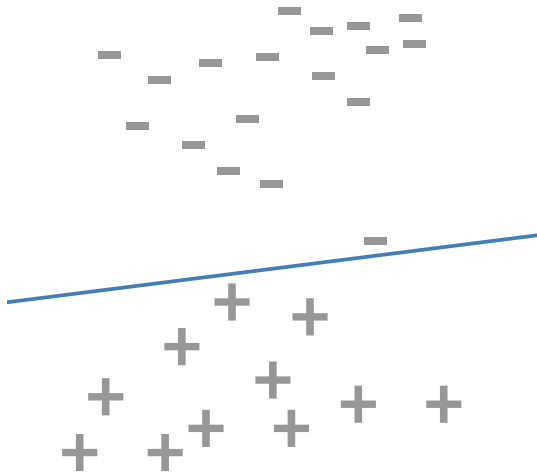




Code

Loss functions

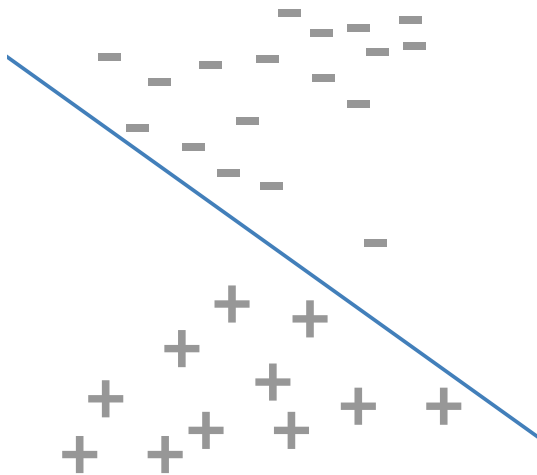
Training data



Code

Loss functions

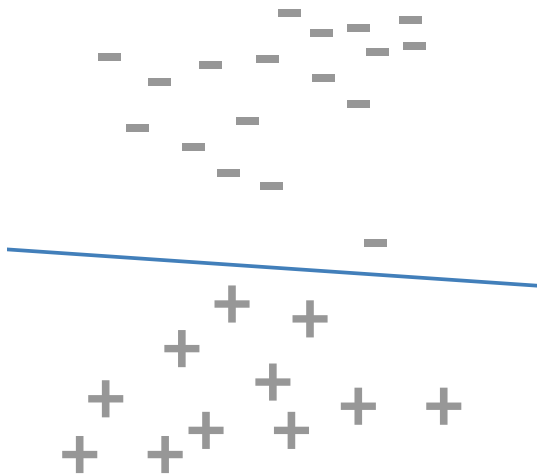
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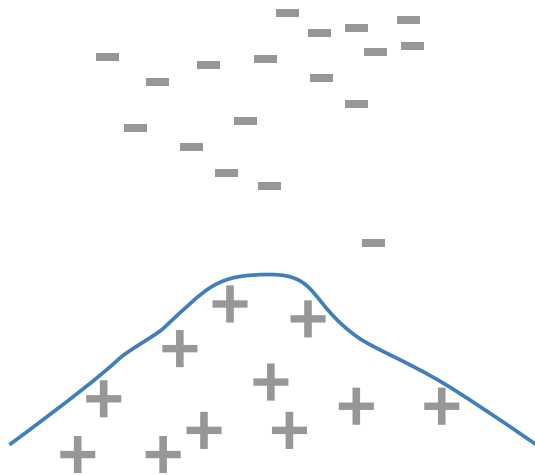
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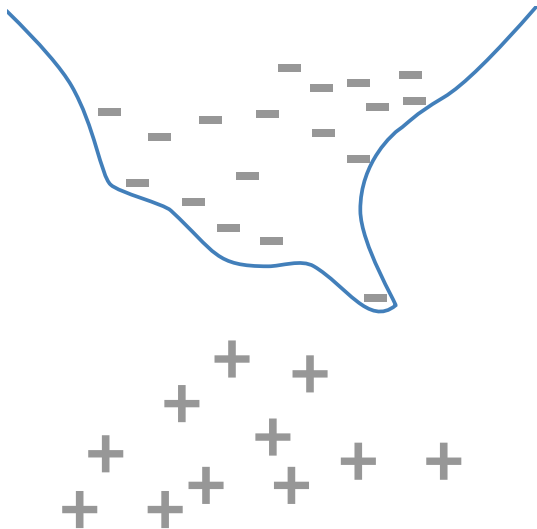
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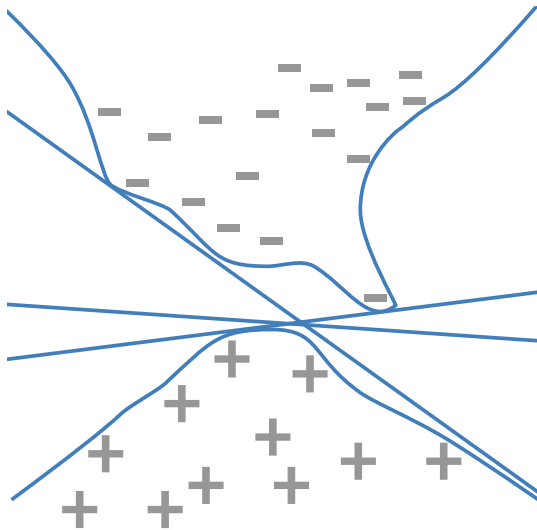
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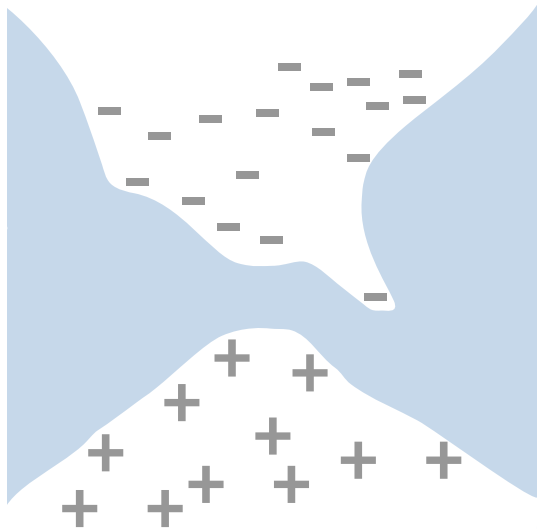
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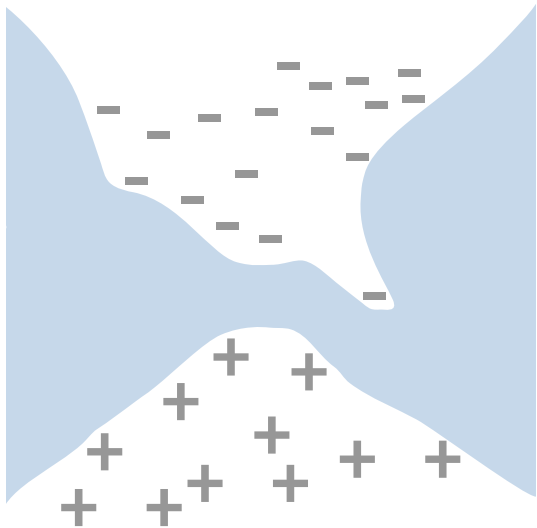
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FILLING IN THE GAPS

“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

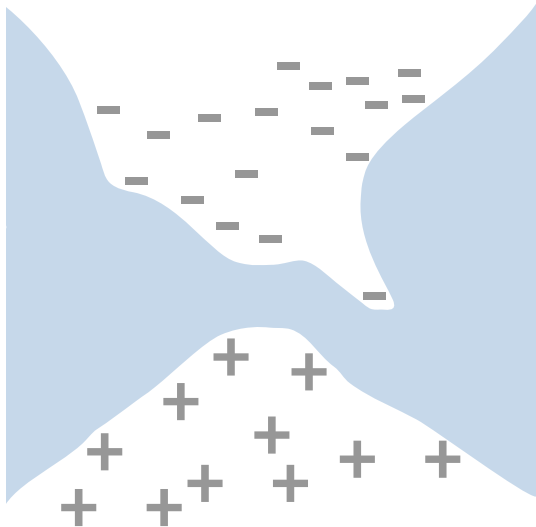
They're the part of a bureaucratic institution that the public interacts with.

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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CHECKERED HISTORY

Many bureaucrats believe in the causes of the organizations in which they work, and do so with an earnest effort to provide the institution's services.

However, bureaucrats also instantiate and reify prejudicial biases and power (Corbett-Davies et al. [2017](#)).

For now, we will focus on the structural roles bureaucrats serve, and discuss their challenges later.

STREET-LEVEL BUREAUCRATS

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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?

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HOW DO STREET-LEVEL BUREAUCRATS FILL IN THE GAPS?

*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**.*

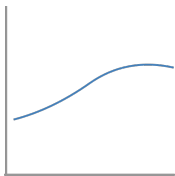
– Lipsky, 1980

PROBLEMATIZING STREET-LEVEL ALGORITHMS?

PROBLEMATIZING STREET-LEVEL ALGORITHMS?

ALGORITHMS LACK REFLEXIVITY

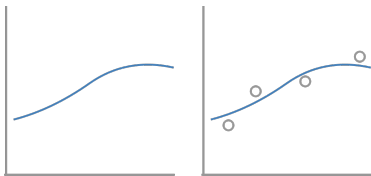
bureaucrats



algorithms

training

bureaucrats

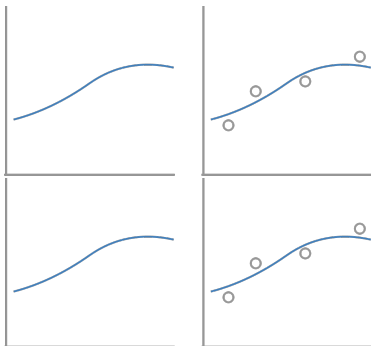


algorithms

training

new data
appears

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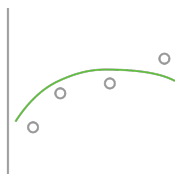
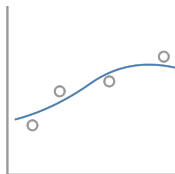
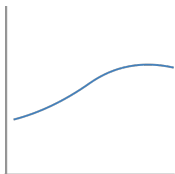


algorithms

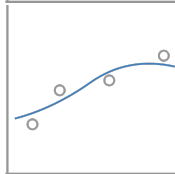
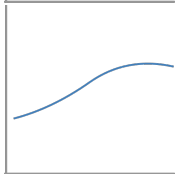
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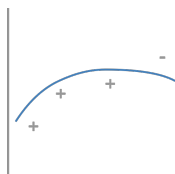
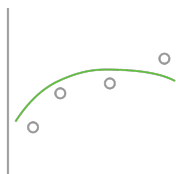
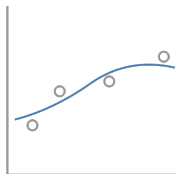
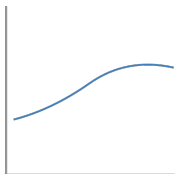


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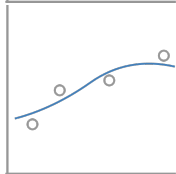
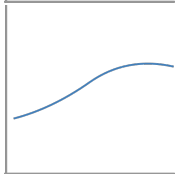
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moment of
reflexivity

bureaucrats



algorithms



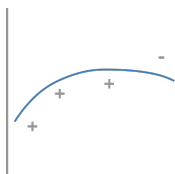
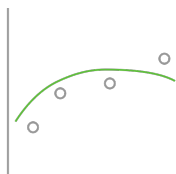
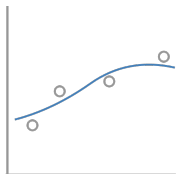
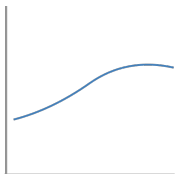
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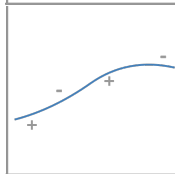
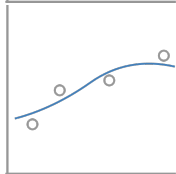
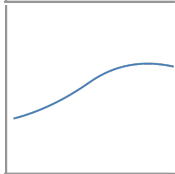
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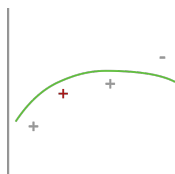
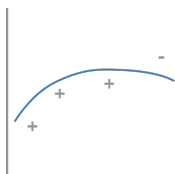
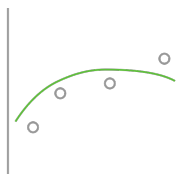
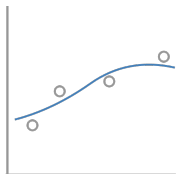
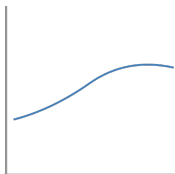
training

new data
appears

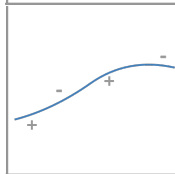
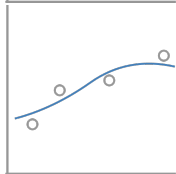
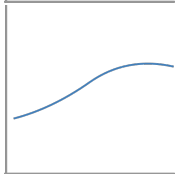
moment of
reflexivity

model
makes
prediction

bureaucrats



algorithms



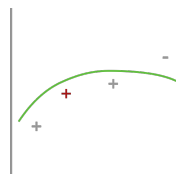
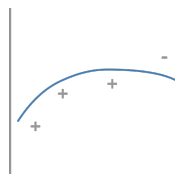
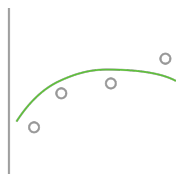
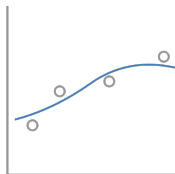
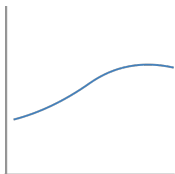
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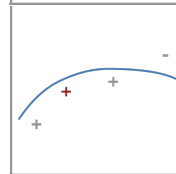
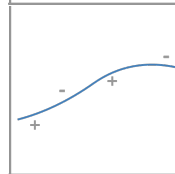
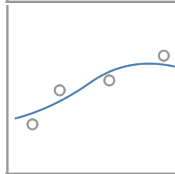
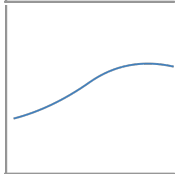
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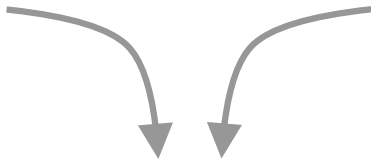
new data
appears

moment of
reflexivity

model
makes
prediction

Behavior

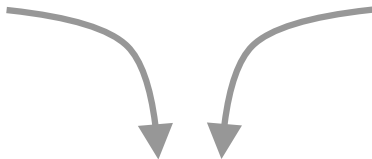
Algorithm



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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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

The screenshot shows a list of four YouTube videos, all with a duration of 18:38 and an upload date of 30 May 2018 15:45. The first three videos are monetized (indicated by a green dollar sign icon) and have 0, 1, and 2 views respectively. The fourth video, titled "FIVE YEARS POST-OP EMOTIONAL COMPARISON (FTM TRANSGENDER)", is marked as "Not suitable for most advertisers" and "Request review". A red box highlights the word "TRANSGENDER" in the title, and another red box highlights the monetization status icons for this video.

Video Title	Monetized	Views
5 Years	Yes	0
5 Years	Yes	1
FIVE YEARS POST-OP EMOTIONAL COMPARISON	Yes	2
FIVE YEARS POST-OP EMOTIONAL COMPARISON (FTM TRANSGENDER)	No (Not suitable for most advertisers)	2

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

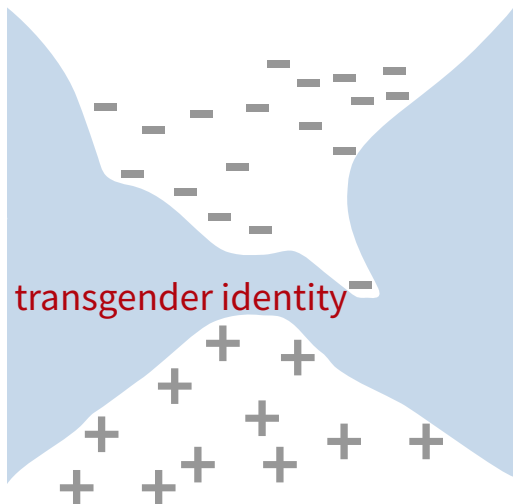
TELL ME AGAIN HOW "TRANSGENDER"
DOESN'T TRIGGER THE ALGORITHM

Thumbnail	Duration	Age Restriction	Date/Time	Monetization Status	Views
[Placeholder]	18:38	5 Years	30 May 2018 15:45	Monetized	0 views
[Placeholder]	18:38	5 Years	30 May 2018 15:45	Monetized	1 view
[Placeholder]	18:38	FIVE YEARS POST-OP EMOTIONAL COMPARISON	30 May 2018 15:45	Monetized	2 views
[Placeholder]	18:38	FIVE YEARS POST-OP EMOTIONAL COMPARISON (FTM TRANSGENDER)	30 May 2018 15:45	Not monetized	2 views

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

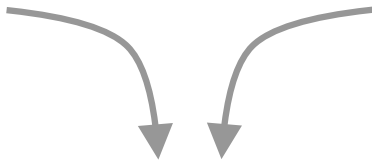
In some cases they were included in YouTube Kids

Behavior

User-created videos

Algorithm

YouTube demonetization



Judgment

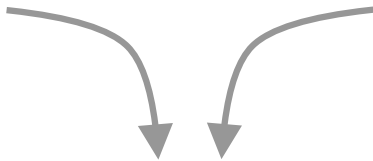
Does this video look similar
to previous videos that were
demonetized?

Behavior

Street performances
("buskers")

Bureaucrat

Police tasked with
enforcing busking
ordinances in cities



Judgment

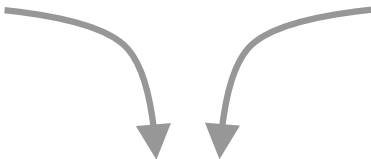
Is this performance pushing
the envelope, or does it
cross a line?

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

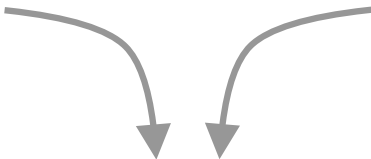
Trained on yesterday's data, before today's cultural movements began

Behavior

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

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.

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

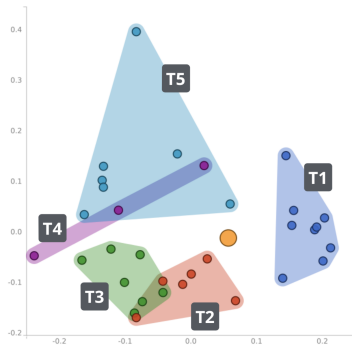
On-demand workers might reasonably interpret tasks in varied ways (Kairam and Heer 2016), but algorithmic systems don't seek novel or obscure interpretations.

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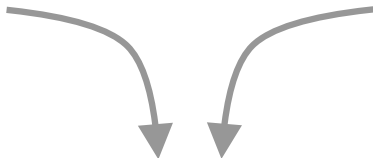
Clusters of legitimate workers' differing interpretations of the same task (Kairam and Heer 2016)

Behavior

on-demand tasks

Algorithm

crowdwork quality
control system

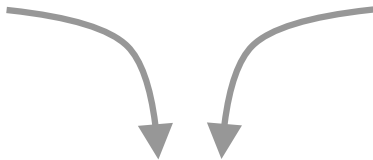


Judgment

is this crowdworker's output
correct, or should it be
rejected?

Behavior
factory workers

Bureaucrat
factory foremen



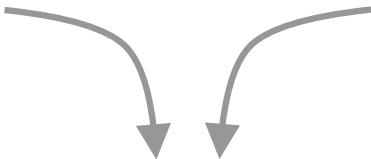
Judgment
Is the factory worker doing
the work correctly, or do
they need assistance?

Behavior

massive amounts of
creative information
work

Algorithm

foreman tasked almost
exclusively with
accepting or rejecting
work



Judgment

Ideally

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

In reality

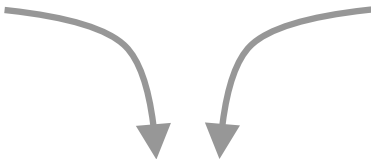
Frustratingly inflexible quality control algorithms deter
creative effort and encourage gaming

Behavior

massive amounts of
creative information
work

Algorithm

foreman tasked almost
exclusively with
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Judgment

Ideally

Acknowledge when workers need to deviate from script,
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In reality

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

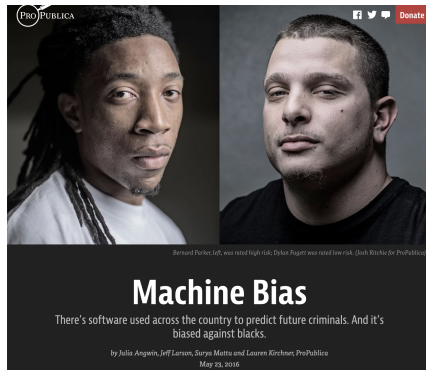
- Algorithmic foremen can't distinguish novel answers from wrong answers
- There's a catch-22 of training data
- Street-level algorithms here never have the data they need to distinguish between bad and novel

ALGORITHMIC BIAS IN JUSTICE

ALGORITHMIC BIAS IN JUSTICE

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

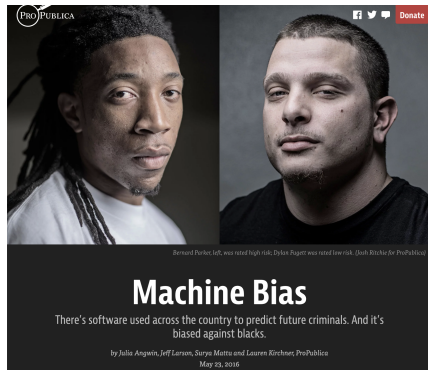
These algorithms reflect and amplify racial biases in society (Buolamwini and Gebru 2018; Lambrecht and Tucker 2018; Thebault-Spieker, Terveen, and Hecht 2015).



ALGORITHMIC BIAS IN JUSTICE

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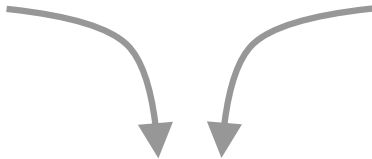


Behavior

Defendant's situation
and behavior

Bureaucrats

Judge



Judgment

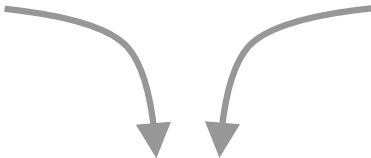
Should this defendant be
eligible to go free on bail?

Behavior

Defendants from many different jurisdictions, environments, backgrounds

Algorithm

Algorithmic judge tasked with predicting whether the defendant will return for trial



Judgment

Ideally

Account for the circumstances of defendants' environments

In reality

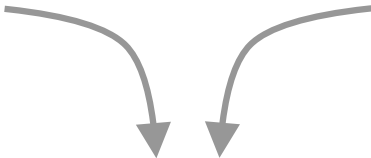
Re-enact old cases, even if new intersectional ones arise

Behavior

Defendants from many different jurisdictions, environments, backgrounds

Algorithm

Algorithmic judge tasked with predicting whether the defendant 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

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?

DESIGN IMPLICATIONS

A theory of street-level algorithms suggests that, when faced with algorithmic failure, we should look to historical cases of street-level bureaucrats for design inspiration.

Bureaucratic mechanisms for appeals and justice include:

- 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

LIMITATIONS AND CONCERNS

Street-level bureaucrats reflect and exercise discretion to support the goals of the institution, but that has historically manifested harmfully for all but the **already-empowered**, by way of:

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

LIMITATIONS AND CONCERNS

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How might computation amplify the positive aspects of bureaucratic reflexivity and not the negative?

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Street-level bureaucrats reflect and exercise discretion to support the goals of the institution, but that has historically manifested harmfully for all but the already-empowered

How might computation amplify the positive aspects of bureaucratic reflexivity and not the negative?

What socio-technical configuration combines street-level bureaucratic and street-level algorithmic strengths in the most pro-social way?

Street-level algorithms

A theory at the gaps between policy and decisions

Behavior



Algorithm
Bureaucrat



Judgment
Application of
reflexivity

contact




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