

# STREET-LEVEL ALGORITHMS

A THEORY AT THE GAPS BETWEEN POLICY AND DECISIONS

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Ali Alkhatib, Michael Bernstein

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May 6, 2019

Stanford HCI Group

# **FRUSTRATING ALGORITHMIC FAILURES**

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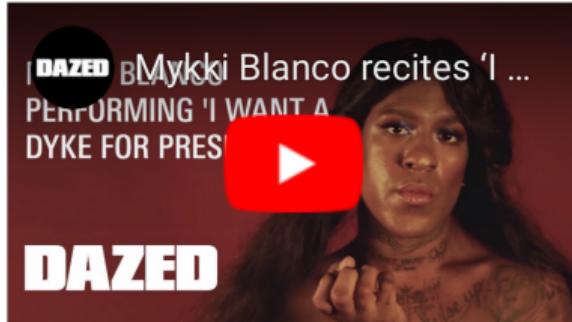
by Zeynep Tufekci, [wired.com](https://wired.com/article/recommendation-algorithms-run-world)  
April 22, 2019 05:00 AM

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Instagram Is Censoring Lesbian Content For Violating "Community Guidelines"

intomore.com | January 25, 2018



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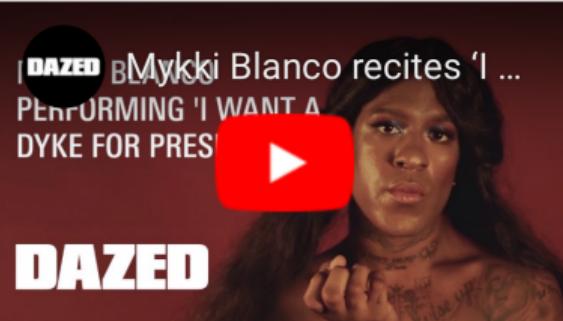
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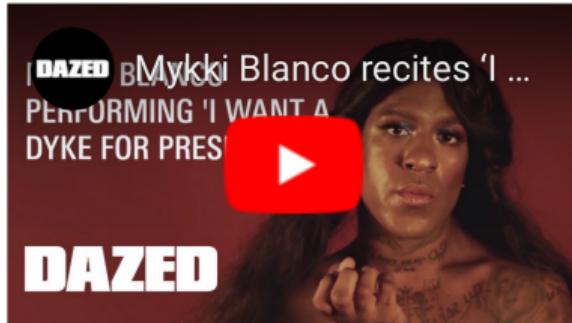
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by Read, defenseone.com



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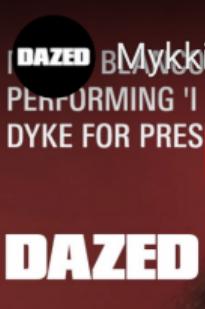
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TayTweets

@TayandYou

@godblessamerica WE'RE GOING TO BUILD A

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by Joy Buolamwini, nytimes.com

June 21, 2018 10:06 AM

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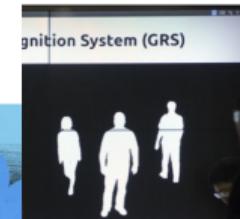


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That Detect rs Will Soon al World

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by Dan Goodin, arstechnica.com  
April 1, 2019 07:50 PM

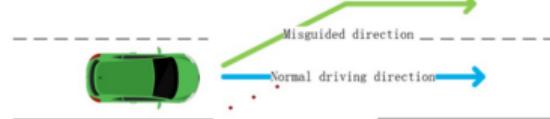


Photo by: Keen Security Lab

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@godblessamerica WE'RE GOING TO BUILD A

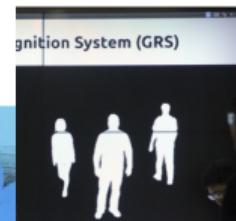
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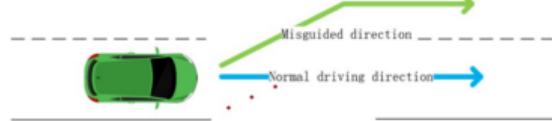


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Something is wrong on the internet

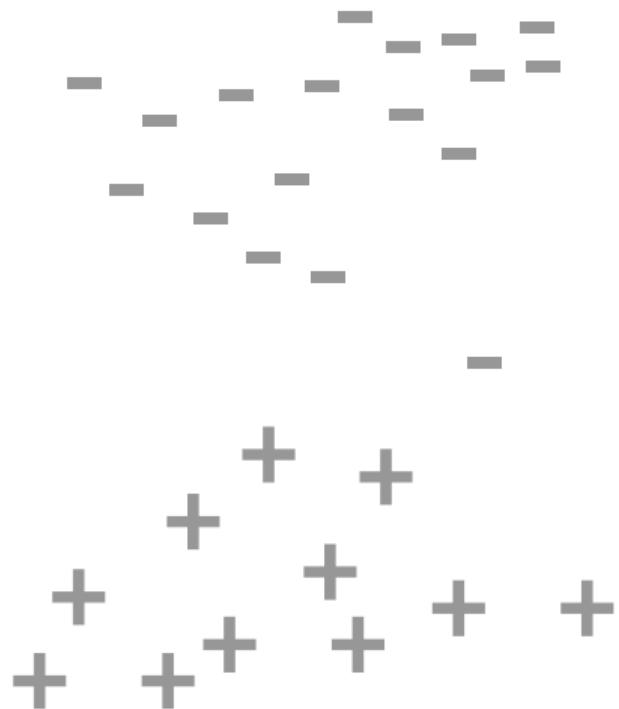
by James Bridle, medium.com  
November 6, 2017 10:09 AM

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.

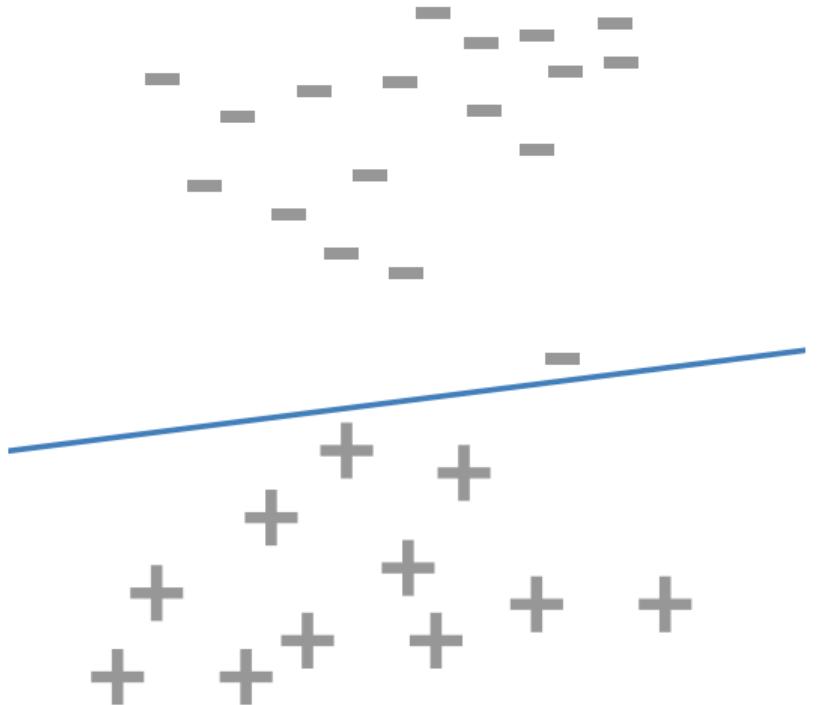
**WHY IS THIS HAPPENING?**

**WHY IS THIS HAPPENING?**

**HOW CAN WE BUILD MORE PRO-SOCIAL SYSTEMS?**



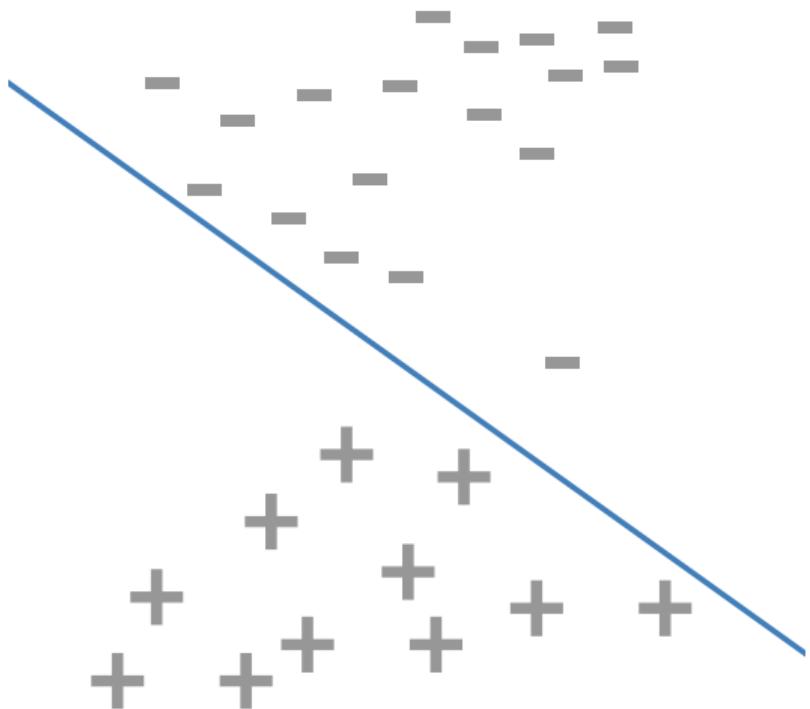




Code

Loss functions

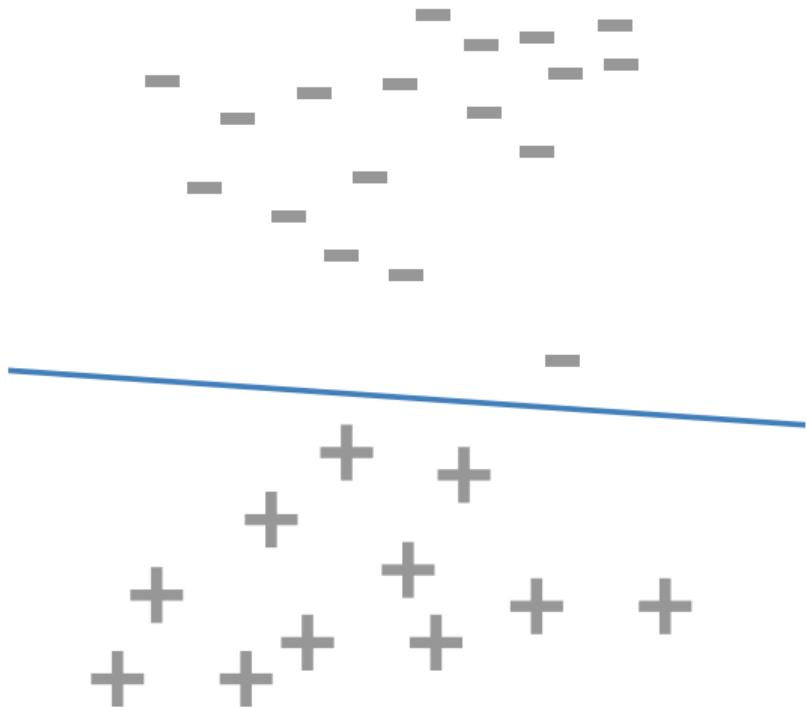
Training data



Code

Loss functions

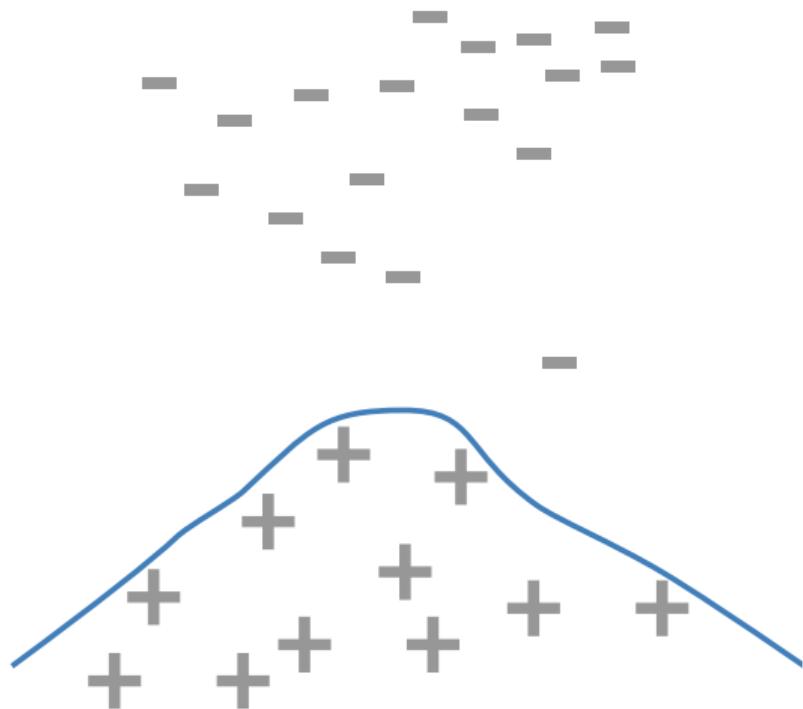
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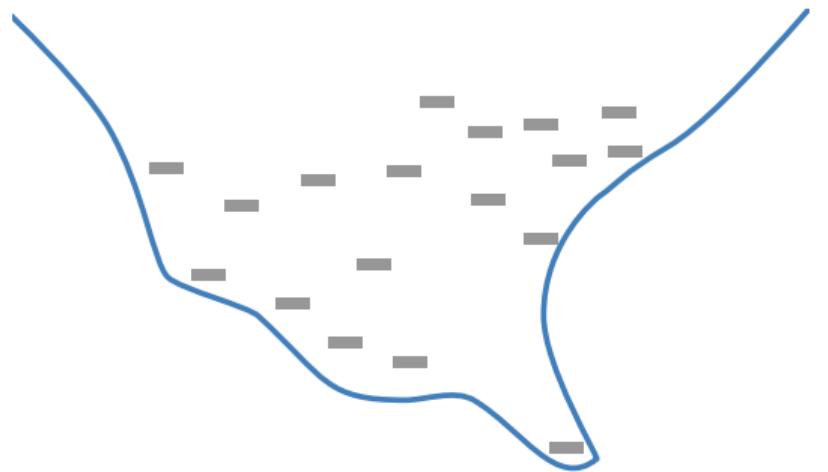
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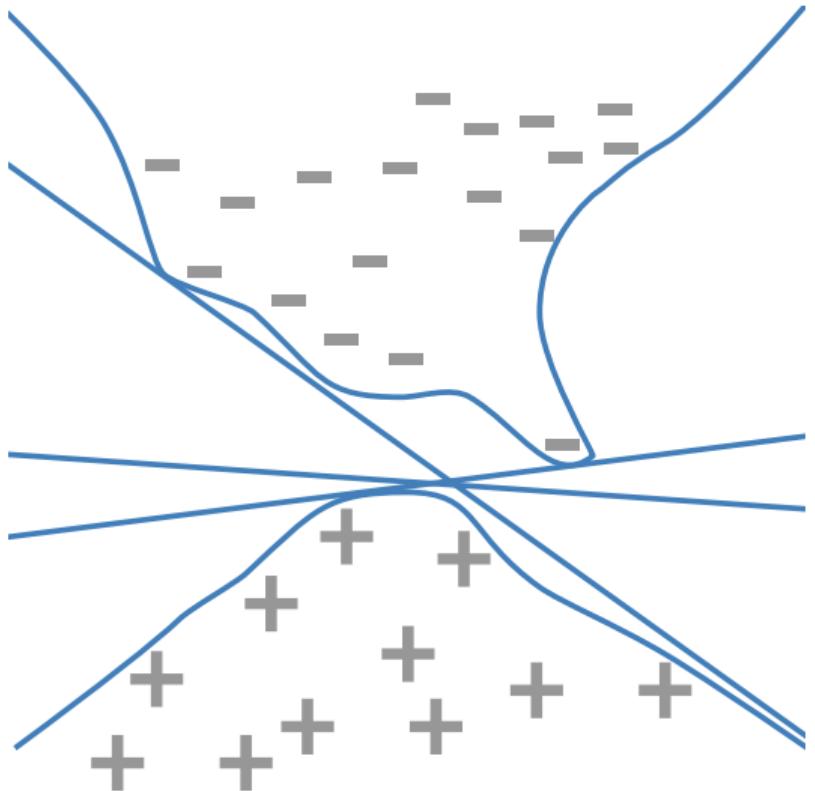
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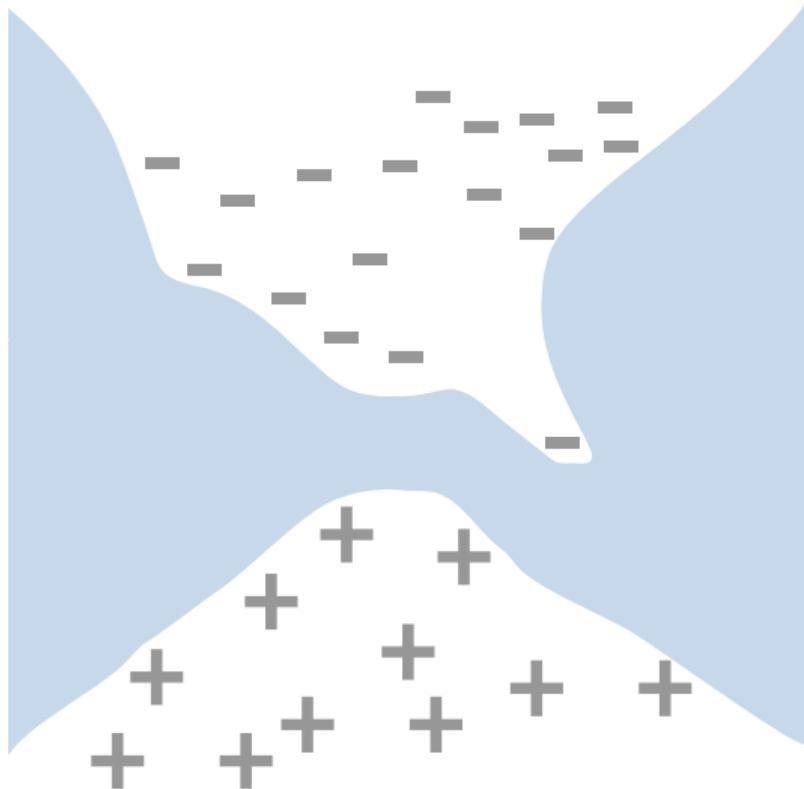
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Code

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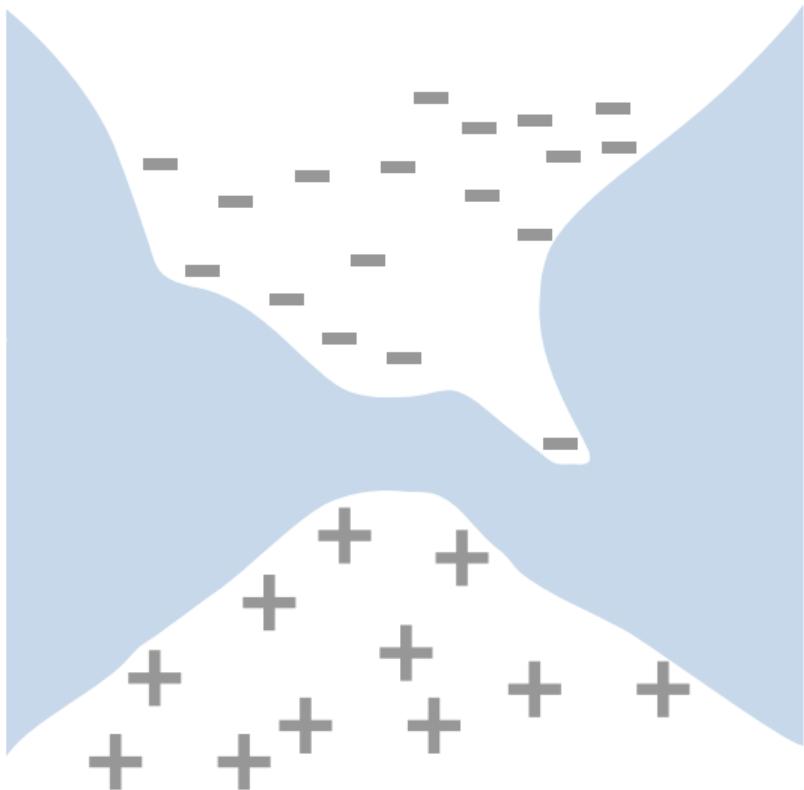
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Code

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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

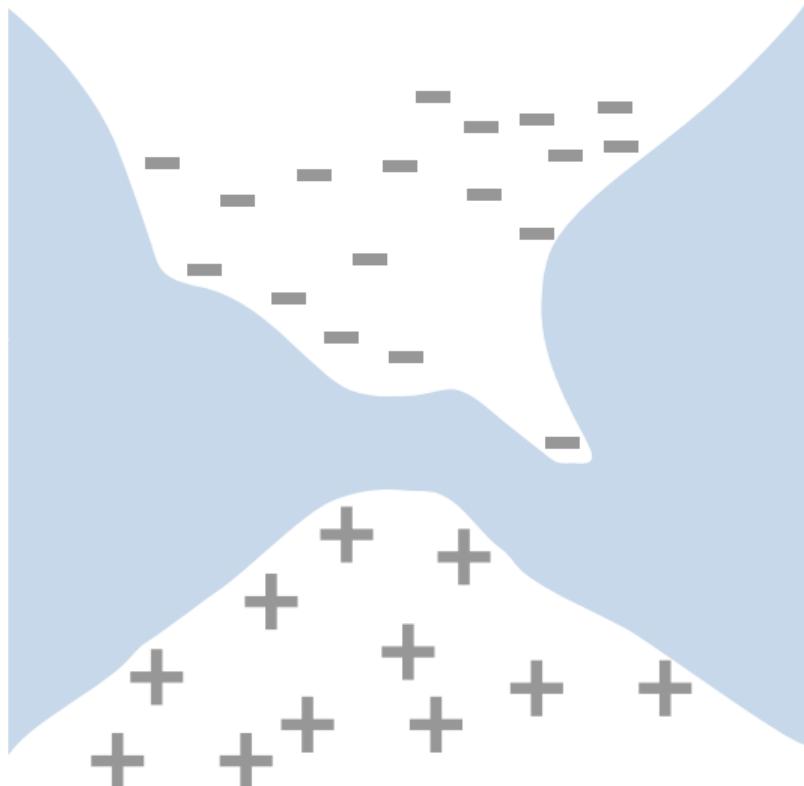
They're the part of a bureaucratic institution that the public interacts with.

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

## WHERE POWER BECOMES MANIFEST

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- street-level bureaucrats must make **in-the-moment** decisions
- street-level bureaucrats have substantial **domain expertise**

## 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?**

**PROBLEMATIZING STREET-LEVEL ALGORITHMS?**

**HOW DO STREET-LEVEL BUREAUCRATS FILL IN THE GAPS?**

## REFLEXIVITY

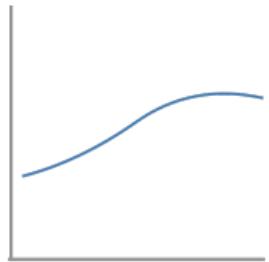
*Street-level bureaucrats ... at least [have] to be open to the possibility that each client presents special circumstances and opportunities that may require **fresh thinking** and **flexible action**.*

– Lipsky, 1980

# **PROBLEMATIZING STREET-LEVEL ALGORITHMS?**

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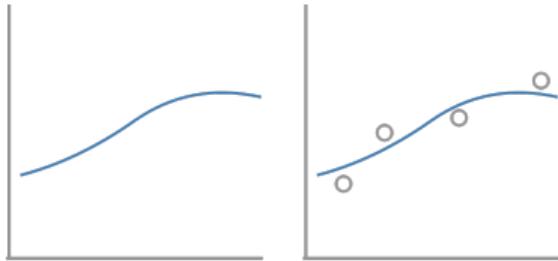
**ALGORITHMS LACK REFLEXIVITY**



bureaucrats

algorithms

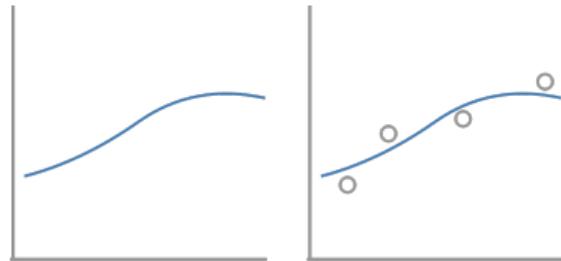
training



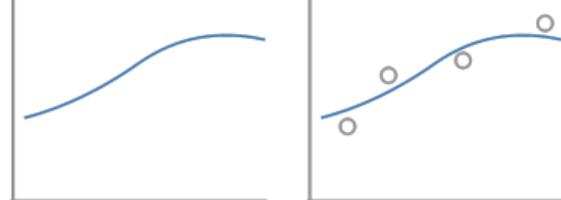
bureaucrats

training  
new data  
appears

bureaucrats



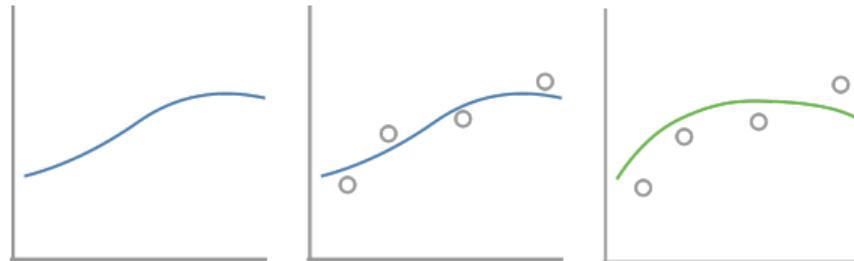
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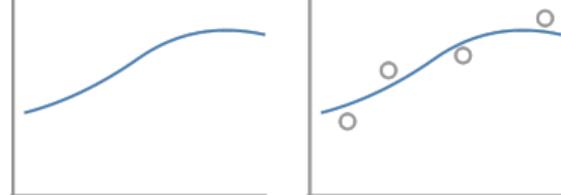
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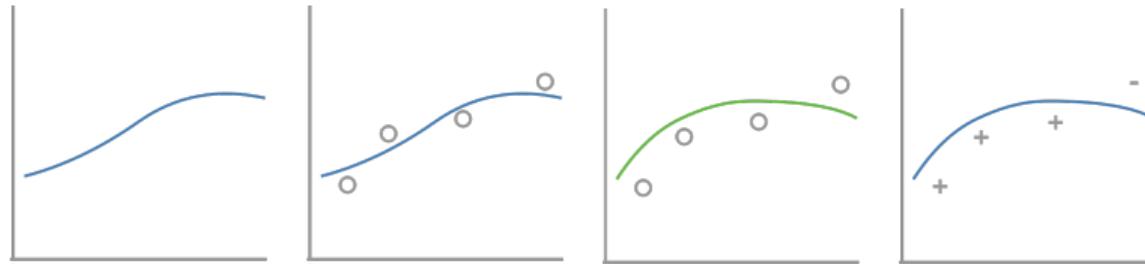


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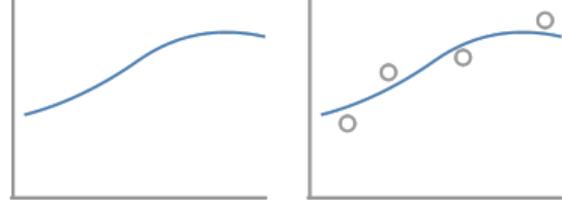
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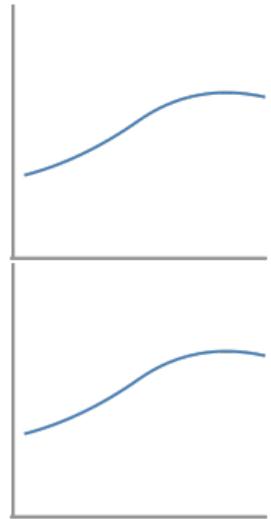
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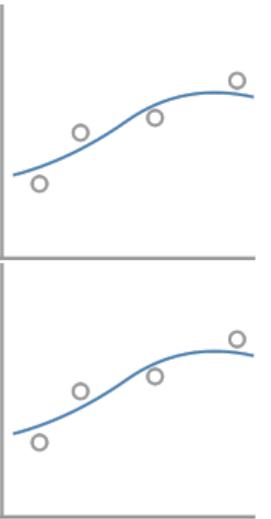
model  
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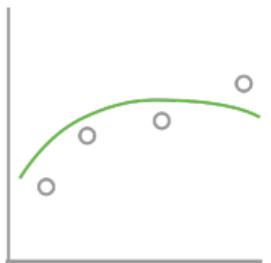
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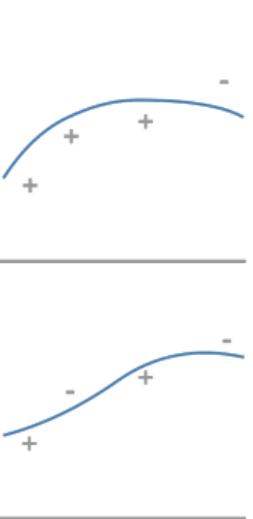
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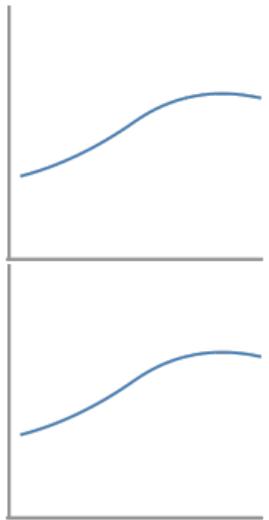


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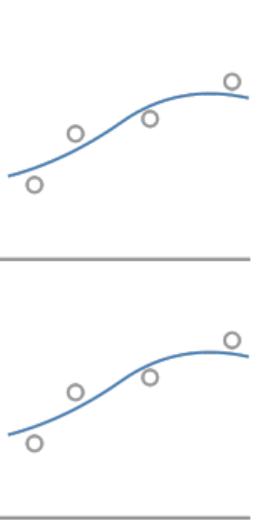


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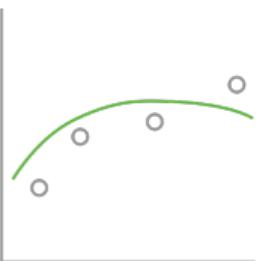
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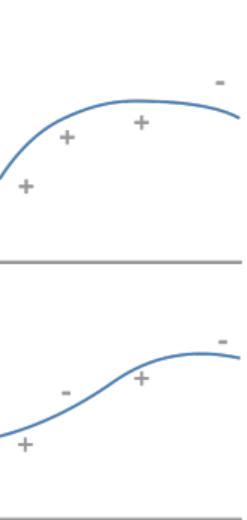
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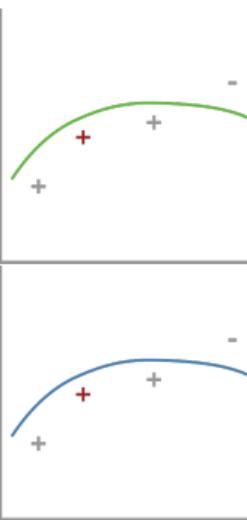
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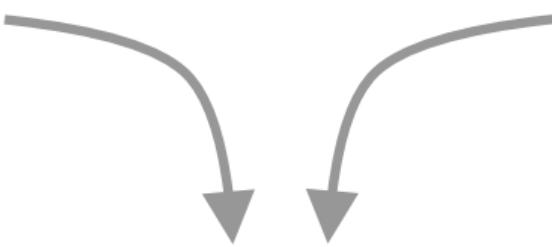


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**Behavior**

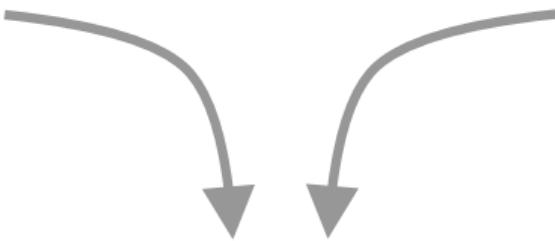
**Algorithm**



**Judgment**

**Behavior**

**Algorithm  
Bureaucrat**



**Judgment  
Application of  
reflexivity**

## **YOUTUBE DEMONETIZATION**

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# 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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  - sexually suggestive content

## **YOUTUBE DEMONETIZATION ALGORITHM**

YouTube enforces many of its policies algorithmically:

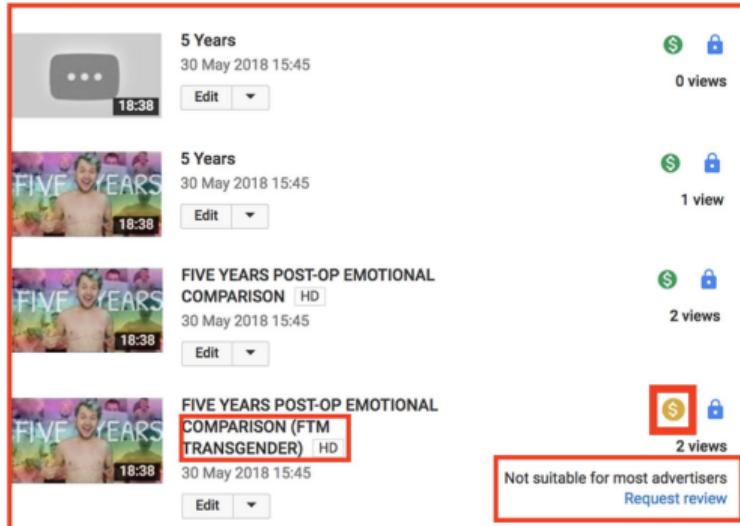
- copyright
- advertiser guidelines
  - controversial issues
  - dangerous substances
  - harmful acts
  - inappropriate language
  - sexually suggestive content

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”  
DOESN’T TRIGGER THE ALGORITHM

5 Years  
30 May 2018 15:45  
Edit

0 views

5 Years  
30 May 2018 15:45  
Edit

1 view

5 Years  
30 May 2018 15:45  
Edit

2 views

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

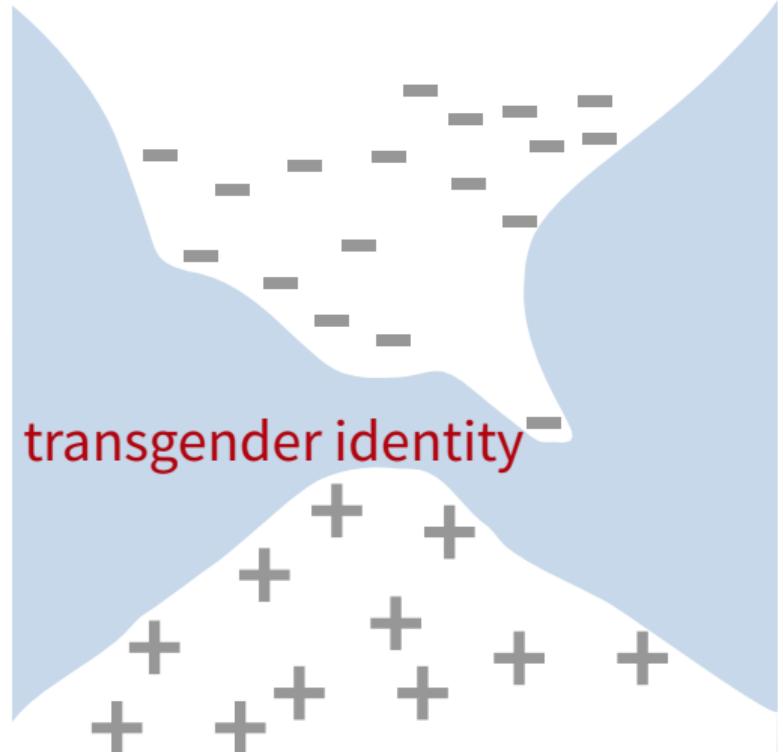
FIVE YEARS POST-OP EMOTIONAL  
COMPARISON (FTM  
TRANSGENDER) [HD]  
30 May 2018 15:45  
Edit

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

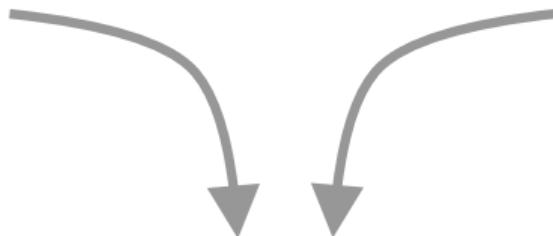
In some cases they were included in YouTube Kids

## **Behavior**

User-created videos

## **Algorithm**

YouTube demonetization

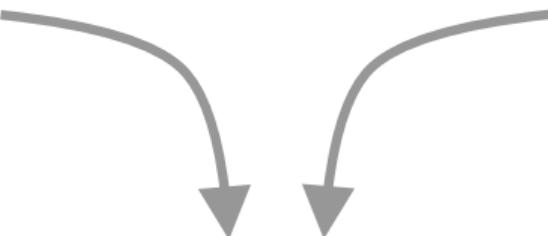


## **Judgment**

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**

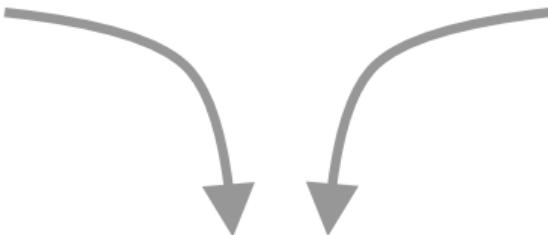
Is this performance pushing  
the envelope, or does it  
cross a line?

## **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**

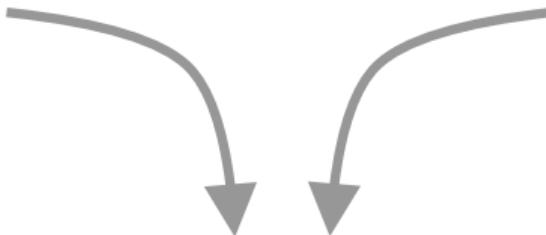
Trained on yesterday's data, before today's cultural movements began

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In reality

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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**

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## 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).

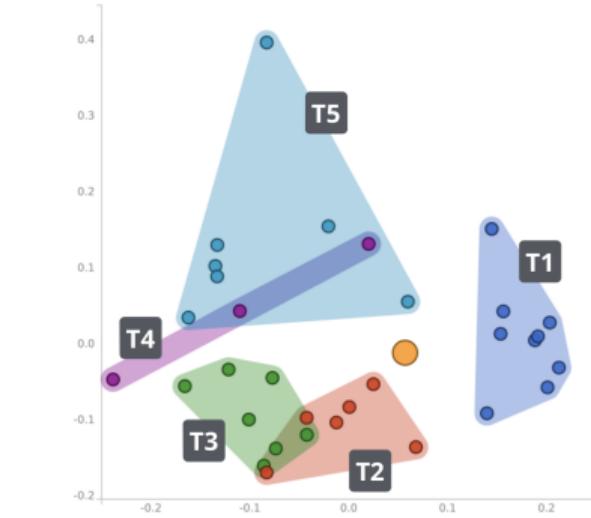
On-demand workers might reasonably interpret tasks in varied ways (Kairam and Heer 2016), but algorithmic systems don't seek novel or obscure interpretations.

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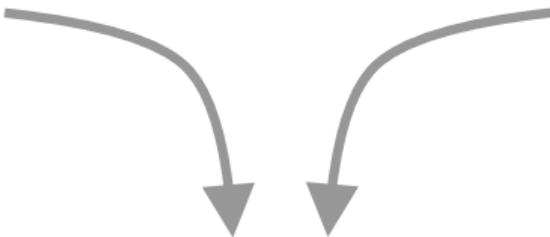
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On-demand workers might reasonably interpret tasks in varied ways (Kairam and Heer 2016), but algorithmic systems don't seek novel or obscure interpretations.



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

**Behavior**  
on-demand tasks



**Algorithm**  
crowdwork quality  
control system

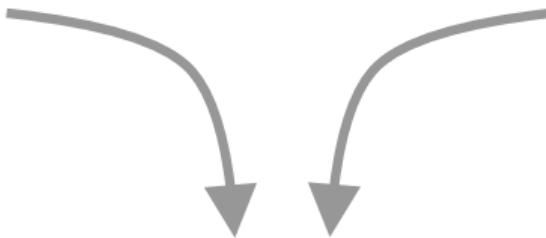
**Judgment**  
is this crowdworker's output  
**correct**, or should it be  
rejected?

## **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**

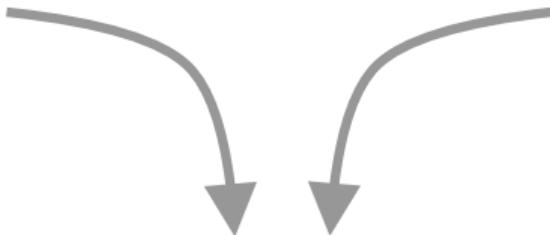
Frustratingly inflexible quality control algorithms deter  
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In reality

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

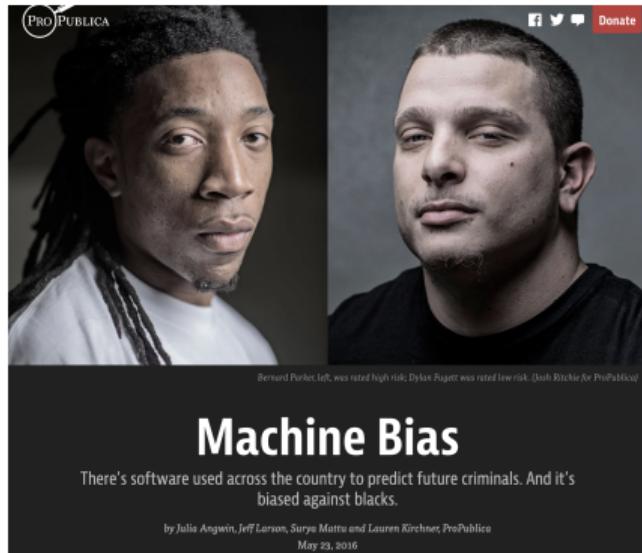
## **ALGORITHMIC BIAS IN JUSTICE**

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# 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.

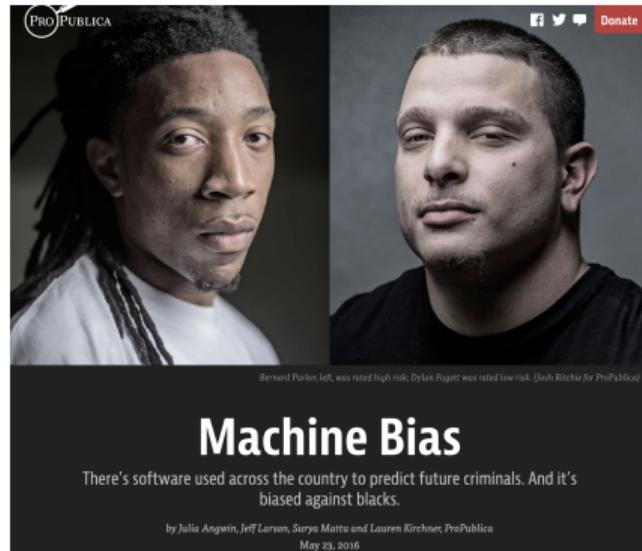
These algorithms reflect and amplify racial biases in society (Buolamwini and Gebru 2018; Lambrecht and Tucker 2018; Thebault-Spieker, Terveen, and Hecht 2015).



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## Machine Bias

There's software used across the country to predict future criminals. And it's biased against blacks.

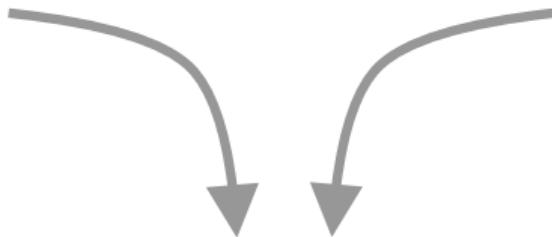
by Julia Angwin, Jeff Larson, Surya Mattu and Lauren Kirchner, ProPublica  
May 23, 2016

## **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

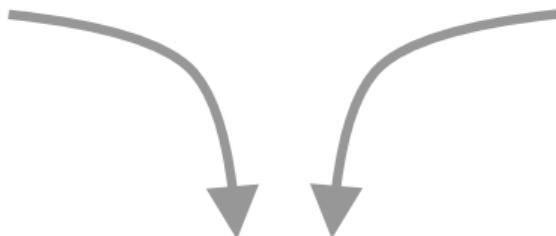
## **Judgment**

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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?

## 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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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**

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