Fair and accountable AI

Super Day 2019

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Fair and accountable AI: why bother?

Amazon scraps secret AI recruiting tool that showed bias against women

Jeffrey Dastin

8 MIN READ

SAN FRANCISCO (Reuters) - Amazon.com Inc's (AMZN.O) machine-learning specialists uncovered a big problem: their new recruiting engine did not like women.

De VN-rapporteur voor de mensenrechten Philip Alston heeft ernstige zorgen over Nederland. De reden is een systeem dat uitkeringsfraude moet opsporen. In een brief aan de rechtbank in Den Haag schrijft Alston dat het systeem in strijd is met de mensenrechten omdat het mensen met weinig geld en mensen met een migratie-achtergrond discrimineert.


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11 November 2019
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Complex systems raise concern

- Why this ad?
- Why this discount?
- Why this recommendation?
- Why was I rejected?
- Can I change the outcome?
- When will the system fail?

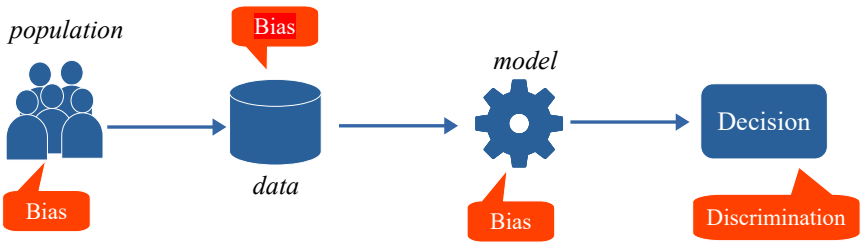
"Algorithms are written and maintained by people, and machine learning algorithms adjust what they do based on people's behavior. As a result algorithms can reinforce human prejudices."

C.C. Miller. When algorithms discriminate, NYT, 2019.

What is bias?

- Systematic errors that create unfair outcomes
- Sources: algorithm design, biased data collection or selection
- Algorithms learn and perpetuate bias

Bias occurs throughout the algorithmic pipeline

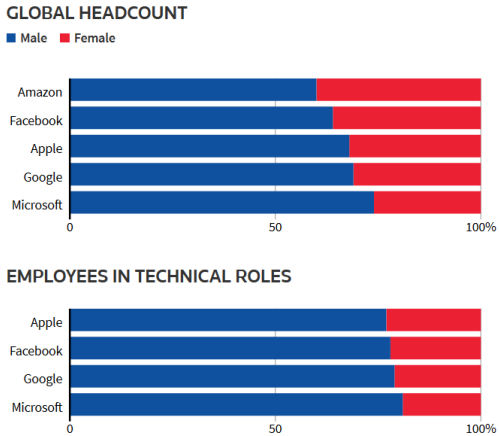


Types of bias

- **Historical bias** reflects structural societal issues
- **Representation bias** certain groups are under-represented in the training data
- **Measurement bias** training data are proxies for some ideal features and labels

simplifed from Suresh & Guttag. A Framework for understanding unintended consequences of machine learning, 2019.

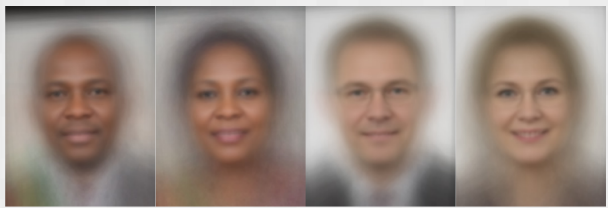
Historical bias



Note: Amazon does not disclose the gender breakdown of its technical workforce.
Source: Latest data available from the companies, since 2017.
By Han Huang | REUTERS GRAPHICS

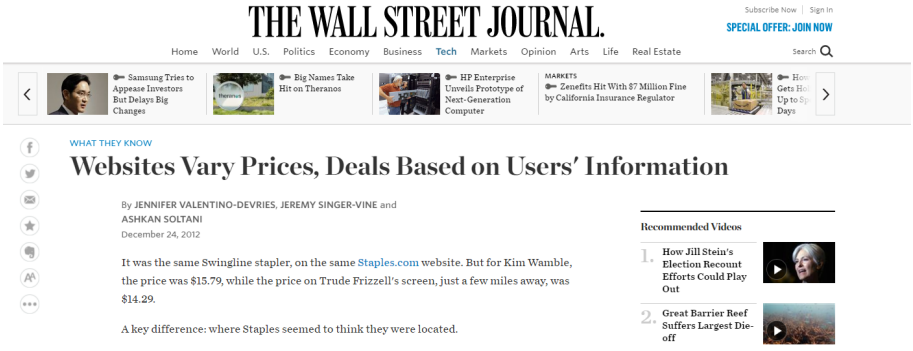
Representation bias

Gender Classifier	Darker Male	Darker Female	Lighter Male	Lighter Female	Largest Gap
Microsoft	94.0%	79.2%	100%	98.3%	20.8%
FACE++	99.3%	65.5%	99.2%	94.0%	33.8%
IBM	88.0%	65.3%	99.7%	92.9%	34.4%



http://gendershades.org/overview.html

Measurement bias



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By JENNIFER VALENTINO-DEVRIES, JEREMY SINGER-VINE and ASHKAN SOLTANI

December 24, 2012

It was the same Swingline stapler, on the same Staples.com website. But for Kim Wamble, the price was $15.79, while the price on Trude Frizzell's screen, just a few miles away, was $14.29.

A key difference: where Staples seemed to think they were located.

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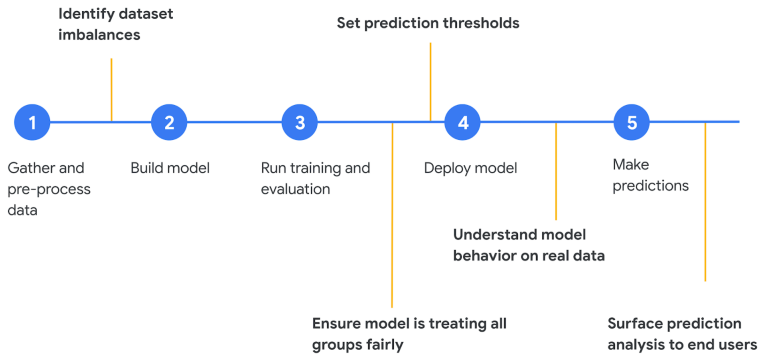
How can we avoid bias?

Best practice



Source: `https://ai.google/`

Regulation: GDPR

"Data subjects have a right to **meaningful information** about the **logic involved** and to the significance and the **envisaged consequence** of automated decision-making"

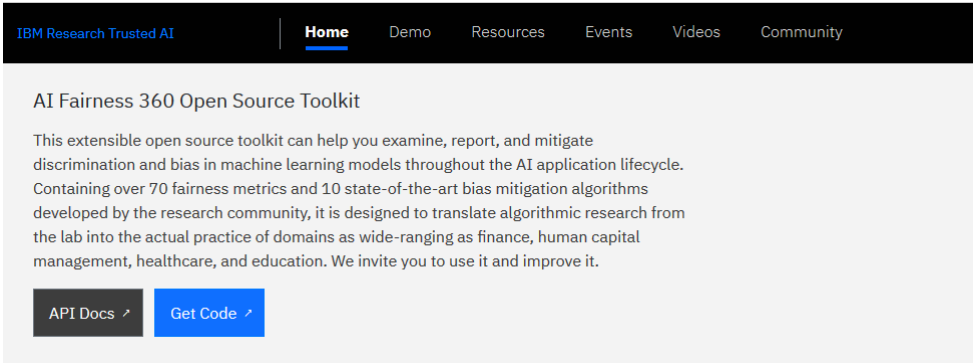
Ethics


European Commission
INDEPENDENT
HIGH-LEVEL EXPERT GROUP ON ARTIFICIAL INTELLIGENCE
SET UP BY THE EUROPEAN COMMISSION
AI
ETHICS GUIDELINES FOR TRUSTWORTHY AI

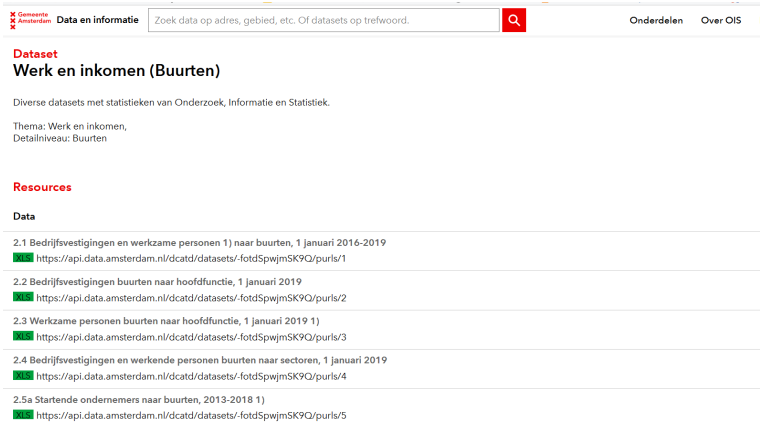
FAT AI: Fairness Accountability & Transparency in AI

https://www.fatml.org/

Tools: bias testing and mitigation

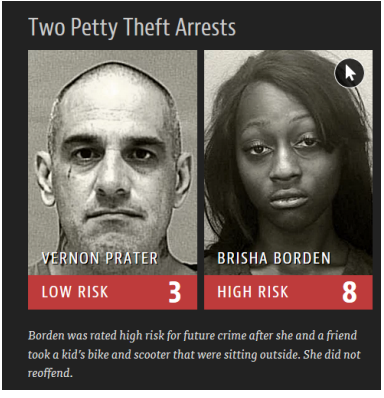


Open Data


Gemeente Amsterdam
Data en informatie
Zoek data op adres, gebied, etc. Of datasets op trefwoord.
Onderdelen
Over OIS
Dataset
Werk en inkomen (Buurten)
Diverse datasets met statistieken van Onderzoek, Informatie en Statistiek.
Thema: Werk en inkomen,
DetailNiveau: Buurten
Resources
Data
2.1 Bedrijfsvestigingen en werkzame personen 1) naar buurten, 1 januari 2016-2019
XLS https://api.data.amsterdam.nl/dcatd/datasets/-fotdSpwjmSK9Q/purls/1
2.2 Bedrijfsvestigingen buurten naar hoofdfunctie, 1 januari 2019
XLS https://api.data.amsterdam.nl/dcatd/datasets/-fotdSpwjmSK9Q/purls/2
2.3 Werkzame personen buurten naar hoofdfunctie, 1 januari 2019 1)
XLS https://api.data.amsterdam.nl/dcatd/datasets/-fotdSpwjmSK9Q/purls/3
2.4 Bedrijfsvestigingen en werkende personen buurten naar sectoren, 1 januari 2019
XLS https://api.data.amsterdam.nl/dcatd/datasets/-fotdSpwjmSK9Q/purls/4
2.5a Startende ondernemers naar buurten, 2013-2018 1)
XLS https://api.data.amsterdam.nl/dcatd/datasets/-fotdSpwjmSK9Q/purls/5

Open Data

"Through a public records request, ProPublica obtained two years worth of COMPAS scores from the Broward County Sheriff's Office in Florida. We received data for all 18,610 people who were scored in 2013 and 2014."



Challenges

Practical limitations

- Sensitive attributes are unknown
- Regulation constraints
- Realised outcomes are unavailable
- Fairness intervention impact is not monitored over time
- Stakeholders goals vs. fairness goals misaligned

Mitigation algorithms

Methods for fair classification

- Pre-processing: modify the train data
- In-processing: modify the algorithm's objective function to incorporate fairness constraints/penalty
- Post-processing: modifies the predictions produced by the algorithm

Mitigation algorithms

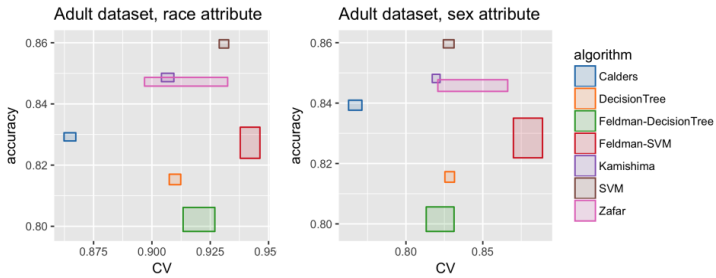
Fairness-preserving algorithms tend to be sensitive to fluctuations in dataset composition, and to different forms of pre-processing

- Adult data set: prediction task is predicting whether an individual makes more or less than $50,000 per year
- Fairness goal: group fairness/statistical parity (equal probability of positive outcomes across groups, 1 is prefect parity)

Friedler et al. A comparative study of fairness-enhancing interventions in machine learning, FAT* 2019

Mitigation algorithms: no easy fix

Each algorithm is tested on 10 random train/test splits and a rectangle centered on the mean, width/height equal to the standard deviation



Friedler et al. A comparative study of fairness-enhancing interventions in machine learning, FAT* 2019.

The way forward

Ask fundamental questions

1. Why do you need AI for this task?
2. Is the system transparent?
3. When and how does the system fail?
4. Who is responsible for the errors?

Algorithmic bias: no quick fix

> "Any real machine-learning system seeks to make some change in the world. To understand its effects, then, we have to consider it in the context of the larger socio-technical system in which it is embedded."

Barocas et al. Fairness and machine learning, fairmlbook.org, 2019.

Interdisciplinary research

Diverse Domains	Diverse Users	Diverse Criteria
e.g. aviation, justice	e.g. pilots, judges	e.g. fairness, privacy

social science – mathematics – computer science – law – ethics

Thank you

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github.com/hindantation