

Data Science: Principles and Practice

Lecture 10: Challenges in Data Science

Ekaterina Kochmar¹



UNIVERSITY OF
CAMBRIDGE

¹ Based on slides by Marek Rei

Data Science: Principles and Practice

- 01 Ethics in Data Science
- 02 Replicability of Findings
- 03 Summary of Challenges in DS
- 04 Summary of the Course
- 05 Next Steps

Ethics in Data Science

Privacy

- Don't collect or analyze personal data without consent!
- Keep the data secure and if you don't need the data, delete it!
- If you release data or statistics, be careful - it may reveal more than you intend.

The New York Times

Facebook's Role in Data Misuse Sets Off Storms on Two Continents



Maura Healey, the attorney general of Massachusetts, has announced an investigation into Facebook and the data firm Cambridge Analytica. Brian Snyder/Reuters

By Matthew Rosenberg and Sheera Frenkel

March 18, 2018



368

WASHINGTON — Facebook on Sunday faced a backlash about how it protects user data, as American and British lawmakers demanded that it explain how a political data firm with links to President Trump's 2016 campaign was able to harvest private information from more than 50 million Facebook profiles without the social network's alerting users.

<https://www.nytimes.com/2018/03/18/us/cambridge-analytica-facebook-privacy-data.html>

Privacy

Netflix released 100M anonymized movie ratings for their data science challenge.

movie	user	date	score
1	56	2004-02-14	5
1	25363	2004-03-01	3
2	855321	2004-07-29	3
2	44562	2004-07-30	4



<https://www.wired.com/2009/12/netflix-privacy-lawsuit/>

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- 2) Extracting the entire rental history based on a few rented movies.

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Netflix tried to launch a sequel to the competition but were sued by a user.

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Leaking Private Information



<https://www.theguardian.com/world/2018/jan/28/fitness-tracking-app-gives-away-location-of-secret-us-army-bases>

Leaking Private Information

Technology

Fitbit data used to charge US man with murder

4 October 2018

<https://www.bbc.co.uk/news/technology-45745366>

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Feb 16, 2012, 11:02am EST

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How Target Figured Out A Teen Girl Was Pregnant Before Her Father Did

<https://www.forbes.com/sites/kashmirlhill/2012/02/16/how-target-figured-out-a-teen-girl-was-pregnant-before-her-father-did>

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How Target Figured Out A Teen Girl Was Pregnant Before Her Father Did

<https://www.forbes.com/sites/kashmirlhill/2012/02/16/how-target-figured-out-a-teen-girl-was-pregnant-before-her-father-did>

Cheating husband caught on Google Street View?

A woman is expected to divorce her husband after spotting his Range Rover parked outside another woman's house when he said he was away on business.

<https://www.cnet.com/news/cheating-husband-caught-on-google-street-view/>

Bias in the Training Data

Machine learning models learn to do what they are trained to do.

The algorithms will pick up biases that are present in that dataset, whether good or bad.

Problem 1: The dataset is created with a bias and does not reflect the real task properly.



THE WALL STREET JOURNAL.



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Google Mistakenly Tags Black People as ‘Gorillas,’ Algorithm

By [Alistair Barr](#)

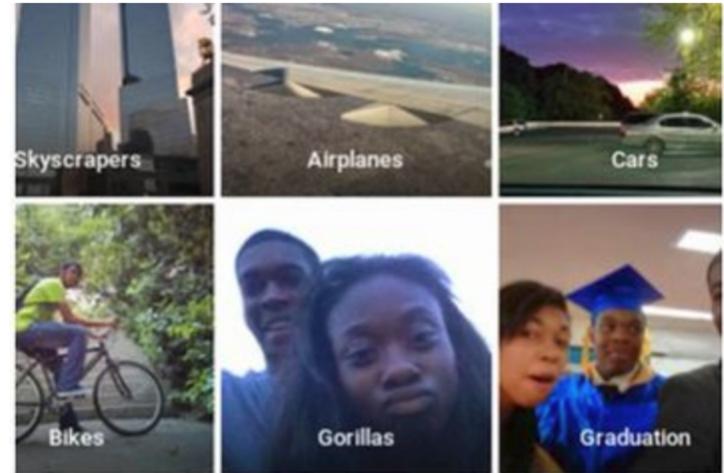
Google is a leader in company's computer Photos app this we

The app tagged two developer who spo

“Google Photos, ya

Google apologized

“We’re appalled at



Black programmer Jacky Alciné said on [Twitter](#) that the new [Google](#) Photos app had tagged photos of him and a friend as gorillas. *JACKY ALCINÉ AND TWITTER*

<https://blogs.wsj.com/digits/2015/07/01/google-mistakenly-tags-black-people-as-gorillas-showing-limits-of-algorithms/>

Bias in the Training Data

Problem 2: The data is representative but contains unwanted bias.

We don't want our models to be racist, sexist and discriminatory, even when the training data is.

Example: Turkish is a gender neutral language. Google Translate tries to infer a gender when translated into English.

Turkish - detected	English
o bir aşçı	she is a cook
o bir mühendis	he is an engineer
o bir doktor	he is a doctor
o bir hemşire	she is a nurse
o bir temizlikçi	he is a cleaner
o bir polis	He/she is a police
o bir asker	he is a soldier
o bir öğretmen	She's a teacher
o bir sekreter	he is a secretary
o bir arkadaş	he is a friend
o bir sevgili	she is a lover
onu sevmiyor	she does not like her
onu seviyor	she loves him
onu görüyor	she sees it
onu göremiyor	he can not see him
o onu kucaklıyor	she is embracing her
o onu kucaklılmıyor	he does not embrace it
o evli	she is married
o bekar	he is single
o mutlu	he's happy
o mutsuz	she is unhappy
o çalışkan	he is hard working
o tembel	she is lazy

<https://twitter.com/seyyedreza/status/935291317252493312>

Bias in the Training Data

Technology

Microsoft chatbot is taught to swear on Twitter

By Jane Wakefield
Technology reporter

24 March 2016



The AI was taught to talk like a teenager

A chatbot developed by Microsoft has gone rogue on Twitter, swearing and making racist remarks and inflammatory political statements.

<https://www.bbc.co.uk/news/technology-35890188>

A beauty contest was judged by AI and the robots didn't like dark skin

The first international beauty contest decided by an algorithm has sparked controversy after the results revealed one glaring factor linking the winners



▲ One expert says the results offer 'the perfect illustration of the problem' with machine bias. Photograph: Fabrizio Bensch/Reuters

The first international beauty contest judged by "machines" was supposed to use objective factors such as facial symmetry and wrinkles to identify the most attractive contestants. After Beauty.AI launched this year, roughly 6,000 people from more than 100 countries submitted photos in the hopes that artificial intelligence, supported by complex algorithms, would determine that their faces most closely resembled "human beauty".

<https://www.theguardian.com/technology/2016/sep/08/artificial-intelligence-beauty-contest-doesnt-like-black-people>

Bias in the Training Data



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

ON A SPRING AFTERNOON IN 2014, Brisha Borden was running late to pick up her god-sister from school when she spotted an unlocked kid's blue Huffy bicycle and a silver Razor scooter. Borden and a friend grabbed the bike and scooter and tried to ride them down the street in the Fort Lauderdale suburb of Coral Springs.

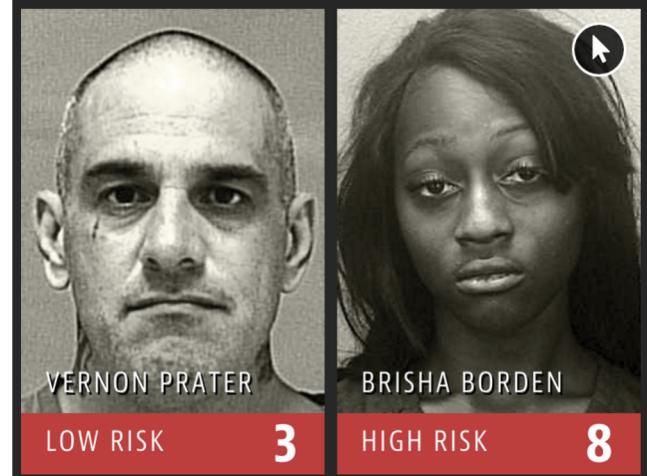
Just as the 18-year-old girls were realizing they were too big for the tiny conveyances — which belonged to a 6-year-old boy — a woman came running after them saying, "That's my kid's stuff." Borden and her friend immediately dropped the bike and scooter and walked away.

But it was too late — a neighbor who witnessed the heist had already called the police. Borden and her friend were arrested and charged with burglary and petty theft for the items, which were valued at a total of \$80.

Compare their crime with a similar one: The previous summer, 41-year-old Vernon Prater was

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Machine Bias: Investigating the algorithms



Prior Offenses

2 armed robberies,
1 attempted armed robbery

Subsequent Offenses
1 grand theft

Prior Offenses

4 juvenile misdemeanors

Subsequent Offenses
None

Bias in the Training Data

Solution 1: just remove race as a feature.

Doesn't work!

Race is not used as a feature.

The problem: race is correlated with many other features that we may want to use in our machine learning system.

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The problem: race is correlated with many other features that we may want to use in our machine learning system.

Solution 2: include race as a feature and explicitly correct for the bias.

$$P(\hat{Y} = 1|A = 0, Y = y) = P(\hat{Y} = 1|A = 1, Y = y), y \in 0, 1$$

Might need to accept lower accuracy for a more fair model.

Interpretability of our Models

For many applications we need to understand why the model produced a specific output.

EU law now requires that machine learning algorithms **need to be able to explain their decisions.**

Neural networks are notoriously **unexplainable, black box** models.

Bloomberg Opinion

Don't Grade Teachers With a Bad Algorithm

The Value-Added Model has done more to confuse and oppress than to motivate.

By Cathy O'Neil

15 May 2017, 12:00 BST *Corrected 16 May 2017, 15:01 BST*



Does not calculate. Photographer: Paul J. Richards/AFP/Getty Images

For more than a decade, a glitchy and unaccountable algorithm has been making life difficult for America's teachers. The good news is that its reign of terror might finally be drawing to a close.



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by Francis Wilkinson
Pelosi would rather avoid the fight. Mueller may make that impossible.

Competition Is Dying, and Taking Capitalism With It
by Jonathan Tepper
We need a revolution to cast off monopolies and restore entrepreneurial freedom. First of two excerpts from "The Myth of Capitalism."

America Is Poorer Than It Thinks
by Noah Smith
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<https://www.bloomberg.com/opinion/articles/2017-05-15/don-t-grade-teachers-with-a-bad-algorithm>