

2021-22 Term 1

IS457: Fairness in Socio-technical Systems

Week 1 - Introduction

KWAK Haewoon



Study questions

What is a socio-technical system?

How many socio-technical systems are we using in our everyday life?

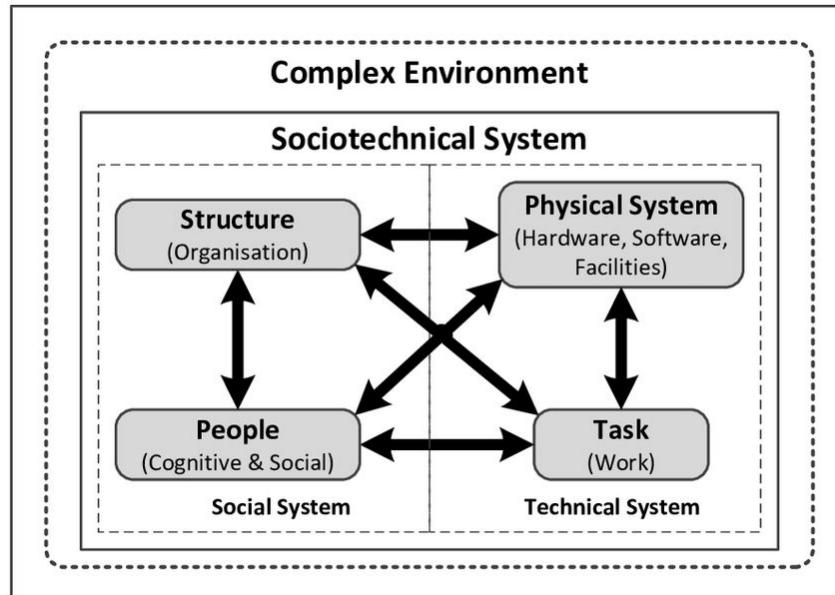
How much are we exposed to algorithmic curations?

What is a biased computer system (algorithmic system)?

How does the bias appear in socio-technical systems?

Socio-technical systems

Systems that consist of a combination of technical and social components



Dictionary definition of fairness



fairness

/'fɛ:nəs/

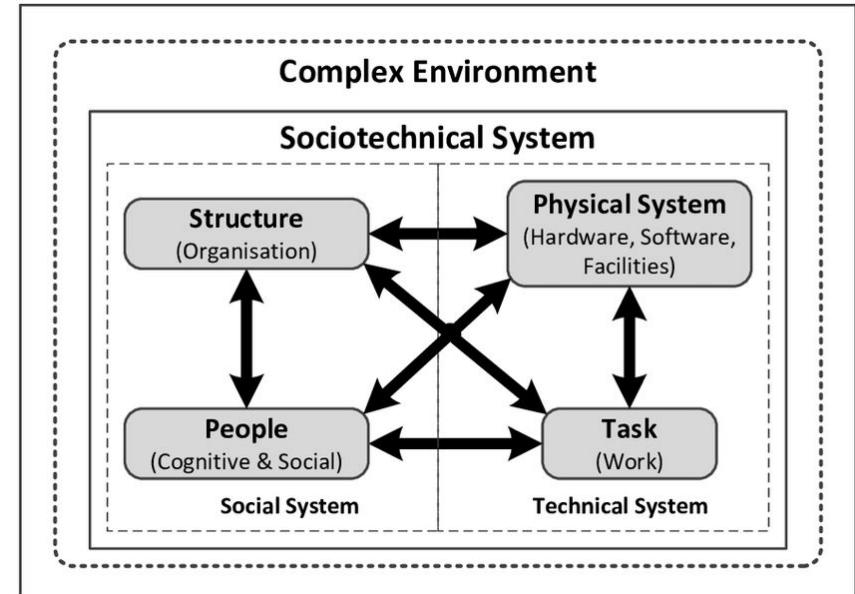
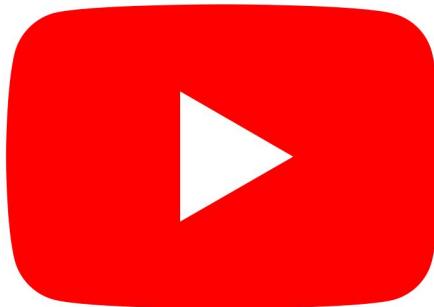
noun

1. impartial and just treatment or behaviour without favouritism or discrimination.
"part of my role is to ensure fairness to all parties"
2. the quality of having light-coloured hair or a pale complexion.
"descriptions emphasize the fairness of her skin"

Definitions from Oxford Languages

Feedback

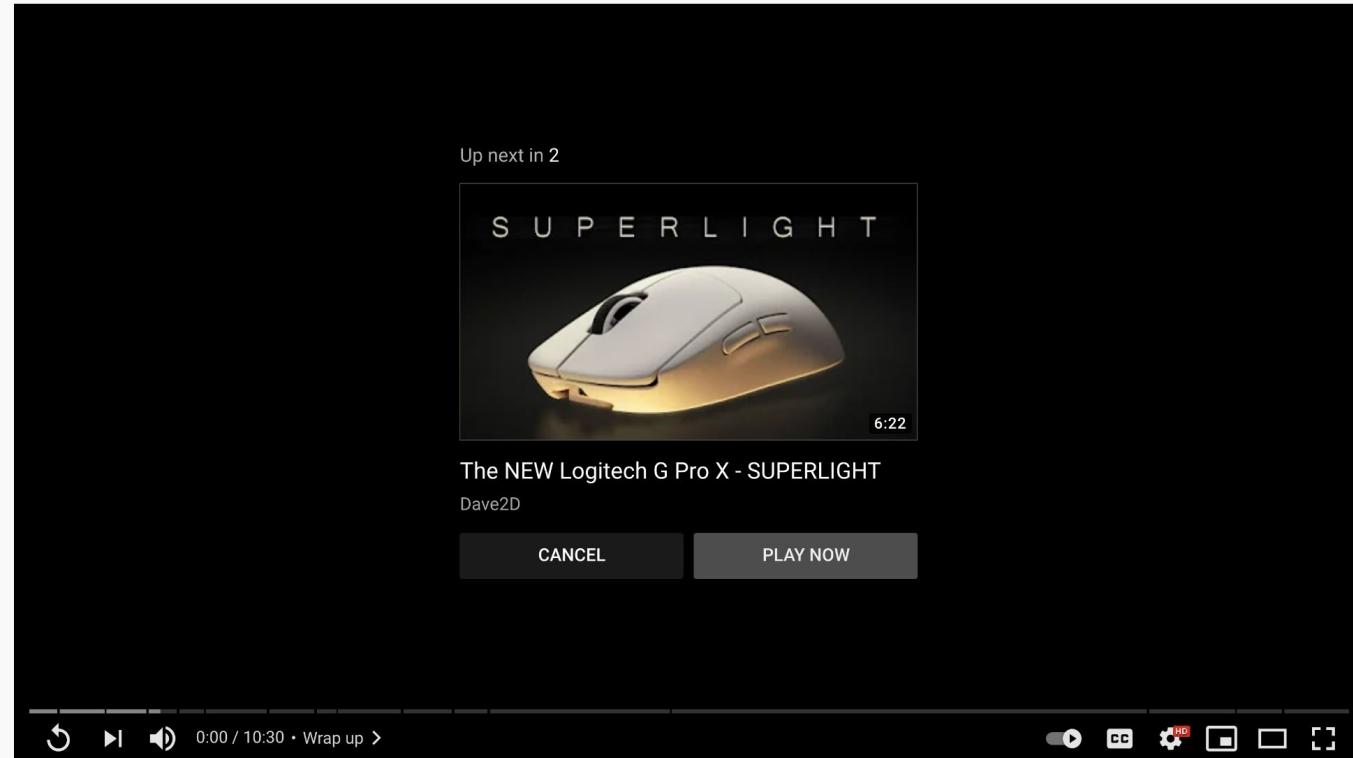
E.g., YouTube as a socio-technical system



Videos curated at “Home”

The image shows a YouTube Premium homepage with a pink header. The main title 'Videos curated at “Home”' is displayed prominently. On the left, there's a sidebar with navigation links: Home, Explore, Subscriptions, Originals, YouTube Music, Library, History, Your videos, Watch later, Liked videos, and Show more. Below this is a section for Subscriptions with links to CNA, HTB 北海道ニュース, Joma Tech, Learn English with..., and LPL English. The main content area features a grid of video thumbnails. The first row includes: 'A REAL Back to School Laptop Guide.' by Dave2D, 'Comfy collection of piano music for reading I readingmix' by BeiGe Mellow, 'Trying Murakami Haruki's morning routine for a week' by That Korean Girl, and 'IZ*ONE (아이즈원) - With*One (워드원) FMV [ENG,JPN SUB]' by CLIMVX. The second row includes: 'Understanding Structured Trade Finance' by Sidra Capital, 'Japanese Crispy Fried Chicken: Amazing! | Huge Fried Chicken An...' by うどんそばUdonsoba, 'Deep Focus 24/7 - Music For Studying, Concentration and Work ...' by 4K Video Nature - Focus Music, and 'Stanford CS234: Reinforcement Learning | Winter 2019 | Lecture 1 ...' by stanfordonline. A 'LIVE NOW' button is visible at the bottom right of the second row.

“Next” videos



Alienware X17 Review

82,161 views • Jul 3, 2021

1.6K

35

SHARE

SAVE

...

Videos in “Explore”

☰ 

Home

Explore

Subscriptions

Originals

YouTube Music

Library

History

Your videos

Watch later

Liked videos

>Show more

SUBSCRIPTIONS

 CNA (1.1M)

 HTB北海道ニュース (1.1M)

 Joma Tech (1.1M)

 Learn English with... (1.1M)

Search  

Olympic Games Tokyo 2020



Lim & Low finishes in Top 10 to achieve Singapore's best...

Entertainment - Mediacorp ✓
1.2K views • 5 hours ago



Barshim (QAT) & Tambari (ITA) SHARE GOLD | Men's...

beIN SPORTS Asia ✓
318K views • 1 day ago



Let's go, Team Singapore! ❤️ #Tokyo2020

Entertainment - Mediacorp ✓
6.1K views • 1 day ago



INCREDIBLE ❤️ moment as Barshim and Tambari agree...

Entertainment - Mediacorp ✓
11K views • 1 day ago



Su Bingtian (CHN) hits PERSONAL BEST | Men's...

beIN SPORTS Asia ✓
415K views • 2 days ago

Trending videos



FOOD FIGHT 24:13

19 Types of Students at the School Lunch

JianHao Tan ✓ 1.1M views • 2 days ago

Lunch time breaks into chaos when Class T1-t5 and N4tT1 meet. Download Cleverly's game, Class Rush here: <https://classrushgame.com/play> Featuring: JianHao: <http://www.instagram.com/thejianhaotan...>



Valimai - Naanga Vera Maari Lyric | Ajith Kumar | YuvanShankarRaja, Vinoth, Boney Kapoor, ZeeStudios

Sony Music South ✓ 7.1M views • 20 hours ago

The most-awaited arrival right here! Blast your speakers and groove along to the #Valimai special! Celebrations galore as #AjithKumar feasts us with #NaangaVeraMaari a #YuvanShankarRaja musical...

“Top” comments

3,352 Comments

SORT BY



Add a public co

Top comments

Newest first



Kelvin Seet 1 mo

I find this song pleasant and heartwarming. Finally something good after years of gimmicky music and songs. Looking forward to seeing this sung during NDP. 😊



3.9K



REPLY

▼ View 90 replies from NDPeeps and others



Mohamed Yusuff 2 days ago (edited)

I'm a foreigner, but that doesn't stop me in falling in love with this song or this country over and over again.

This song has all the elements that will make you so emotionally connect yourself with this current trying times. Kudos to the entire team who are behind this song 🙌🙌🙌...

Read more



56



REPLY



Wee Sen Poh 4 days ago

I am Malaysian , but i think that this song is really nice , i am driving a schoolbus in Singapore and heard my bus children singing this song . This is really a heartwarming song.

Love it so much.



304



REPLY

▼ View 8 replies

Social system

- Do YouTube users act without any biases?
- When do we say that YouTube users are unfair?

Technical system

- Are those algorithm's outcomes fair?
- When do we say that these algorithms are unfair?

A biased computer system (algorithm)

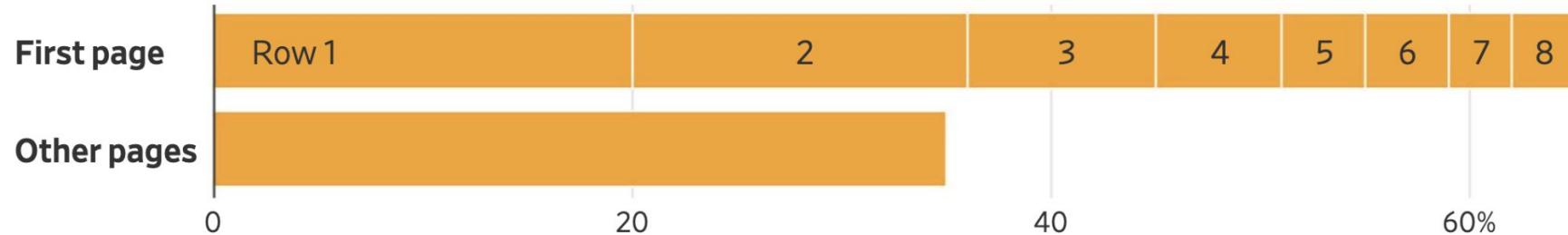
“We use the term bias to refer to computer systems [or algorithms] that **systematically and unfairly discriminate** against certain individuals or groups of individuals in favor of others.”

E.g., Product search in shopping apps

The image shows a news article from The Wall Street Journal. The title is "Amazon Changed Search Algorithm in Ways That Boost Its Own Products". Below the title, it says "WSJ NEWS EXCLUSIVE". The subtitle reads: "The e-commerce giant overcame internal dissent from engineers and lawyers, people familiar with the move say". To the right of the article, there is a graphic of a computer screen displaying the Amazon website. The screen shows a grid of products, where most of them are highlighted in orange, indicating they are Amazon's own products. The rest of the products are shown in grey.

When customers search in Amazon

Nearly two-thirds of all product clicks come from the first page of results



Amazon's private-label products on the first page



Image from <https://www.wsj.com/articles/amazon-changed-search-algorithm-in-ways-that-boost-its-own-products-11568645345>

What is a private label brand?

AmazonBasics is Amazon's private label brand for everything from kitchen gadgets to tech accessories — and everything in between. ... By analyzing what customers search for, click on, and purchase, they're able to add new products to the AmazonBasics brand quickly and inexpensively.

How Amazon search works

When a customer enters a search query for a product on Amazon, the algorithm considers more than 100 features of each product.

The algorithm had long placed a priority on variables such as 1) search-term relevance, and unit sales—a proxy for popularity.

Ex-engineers said that they would need to consider another metric—improving profitability.

Variables added to the algorithm are called “proxies” for profit.

Search for medical information on Google

Google receives about one billion health questions each day (2019)

A screenshot of a Google search interface. The search bar contains the query "pain on". Below the bar is a list of suggested queries related to various body parts and locations where pain might be experienced. At the bottom of the interface, there is a link to "What are the reasons for red eyes?"

- Q pain on left side stomach
- Q pain on right side stomach
- Q pain on top of foot
- Q pain on right chest
- Q pain on left side of body
- Q pain on inner side of knee
- Q pain on right side of body
- Q pain on left side of head above ear
- Q pain on left side of head
- Q pain on the right abdomen

Report inappropriate predictions

What are the reasons for red eyes?

A screenshot of a Google search interface. The search bar contains the query "remedy for". Below the bar is a list of suggested remedies for various health issues. At the bottom of the interface, there is a link to "https://www.aao.org > eye-health > tips-prevention > hom..."

- Q remedy for red eyes
- Q remedy for itchy eyes
- Q remedy for swollen eyes
- Q remedy for sore eyes
- Q remedy for dry eyes
- Q remedy for gastric pain
- Q remedy for back pain
- Q remedy for sore throat
- Q remedy for headache
- Q remedy for bloated stomach

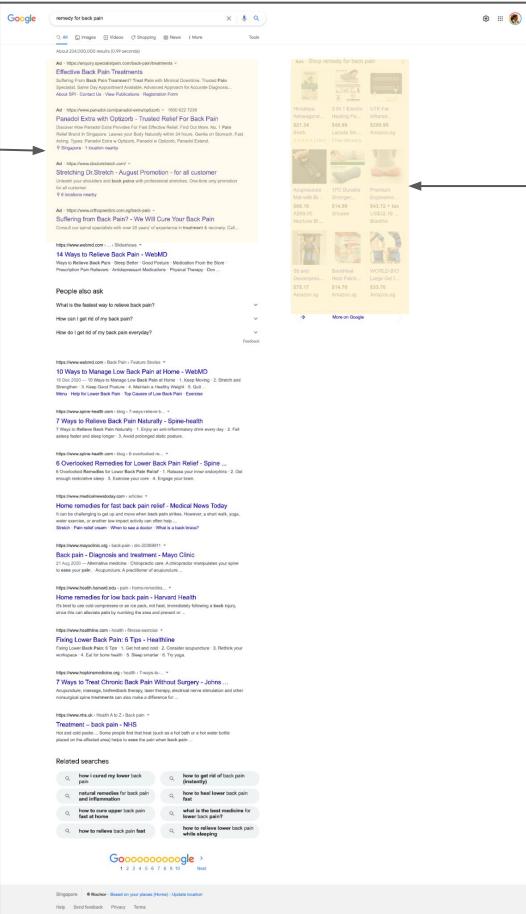
Report inappropriate predictions

https://www.aao.org > eye-health > tips-prevention > hom...

Search ‘remedy for back pain’

Ads

Ads



Google controls health information

- The order in which the search results are displayed.
- Which advertisements will appear at the top of the page.
- Which searches will be highlighted in Knowledge Panels, which provide summaries of search information and related search terms.

Credibility of information is another issue: “The vast amount of information [...] makes it difficult to separate fact from fiction and interpret the findings.”

Image cropping algorithm on Twitter

Before



1



10



Eleanor Harding 🌻 @... · 08/01/2018
Couple of weeks at home in SA and my gallery is now 80% cat photos. She's called Phish. She likes to mlem.



2



40



After



1



10



Eleanor Harding 🌻 @... · 08/01/2018
Couple of weeks at home in SA and my gallery is now 80% cat photos. She's called Phish. She likes to mlem.



2



40



Eye tracker

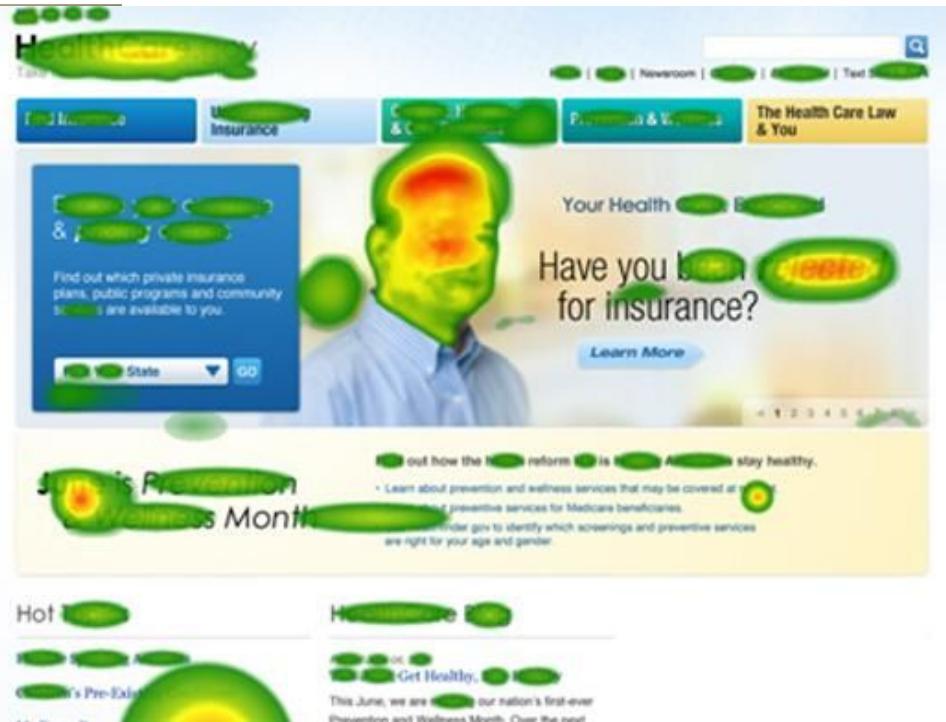


Image from <https://peerj.com/articles/7086/>

<https://www.usability.gov/how-to-and-tools/methods/eye-tracking.html>

Eye tracking in various sectors



Modeling saliency of images



It seems to work fine...?

Julia White 🌸 @JuliaW... · 19/12/2017 ▾
Happiness is... a bouncing castle 🏟 and
a ball pit 🎈 rolled into one 🤗
[#LoveWhereYouWork](#)

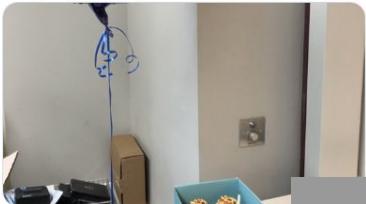


Rebecca Welley and 3 others

4 1 30 1



Chris Hawthorn @_ChrisHawtho... · 5d ▾
Damn, I seriously work with some
awesome people! Way too kind. You're
all amazing.



4 1 21 1



Micale Reid @MicaleReid · 30/11/2017 ▾
New York. The city that never.....does
anything – at John F. Kennedy
International Airport (JFK)



1 1 13 1



David Carr @dcarr622 · 09/12/2017 ▾
Neat: tons of people are out celebrating
the successful ICO for SantaCoin 🎅



1 3 24 1

Before

Julia White 🌸 @JuliaW... · 19/12/2017 ▾
Happiness is... a bouncing castle 🏟 and
a ball pit 🎈 rolled into one 🤗
[#LoveWhereYouWork](#)

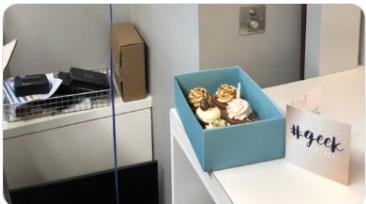


Rebecca Welley and 3 others

4 1 30 1



Chris Hawthorn @_ChrisHawtho... · 5d ▾
Damn, I seriously work with some
awesome people! Way too kind. You're
all amazing.



4 1 21 1

After

Micale Reid @MicaleReid · 30/11/2017 ▾
New York. The city that never.....does
anything – at John F. Kennedy
International Airport (JFK)



1 1 13 1



David Carr @dcarr622 · 09/12/2017 ▾
Neat: tons of people are out celebrating
the successful ICO for SantaCoin 🎅



1 3 24 1

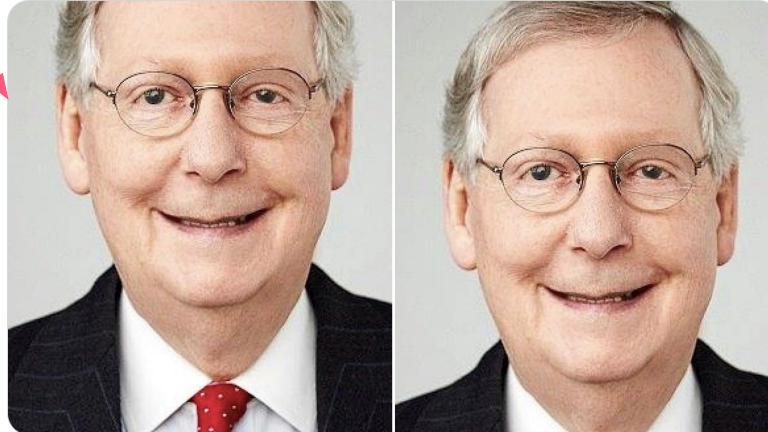
Bias in image cropping algorithms on Twitter



Tony "Abolish ICE" Arcieri 🦀
@bascule

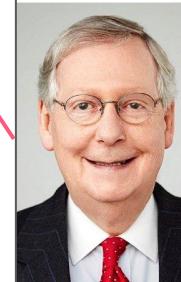
Trying a horrible experiment...

Which will the Twitter algorithm pick: Mitch McConnell or Barack Obama?



6:05 AM · Sep 20, 2020 · Twitter Web App

60.7K Retweets 16.8K Quote Tweets 191.9K Likes



What if we adjust the contrast?



TheArtGun at PiPu Productions
@TheArtGun

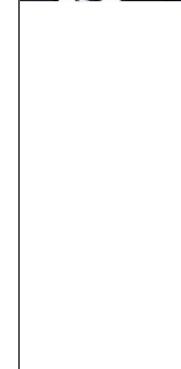
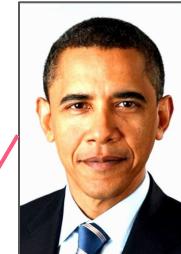
Replying to @bascule

What if we adjust the contrast

A screenshot of a Twitter post showing two versions of Barack Obama's portrait side-by-side. The left version has higher contrast, making his skin appear darker and more defined. The right version has lower contrast, making his skin appear smoother and less defined. A red arrow points from the left side of the screen to the left version of the photo, and another red arrow points from the right side of the screen to the right version of the photo.

10:36 AM · Sep 20, 2020 · Twitter Web App

38 Retweets 8 Quote Tweets 134 Likes



Male vs. female?



СДСТЛ€
@NeilCastle

let's see if the twitter image algorithm is sexist as
well as racist

A screenshot of a Twitter post. The profile picture is a circular image of a owl-like bird. The handle is СДСТЛ€ and the username is @NeilCastle. The tweet text is "let's see if the twitter image algorithm is sexist as well as racist". Below the text is a horizontal image containing two identical portraits of a man in a dark blue suit and light blue shirt, standing with his arms crossed. The timestamp at the bottom left is "4:27 PM · Sep 20, 2020 · Twitter Web App". At the bottom are engagement metrics: "4,819 Retweets", "630 Quote Tweets", and "14.2K Likes".

4:27 PM · Sep 20, 2020 · Twitter Web App

4,819 Retweets 630 Quote Tweets 14.2K Likes



Fictional character?



Non-human? 😅



M A R K
@MarkEMarkAU

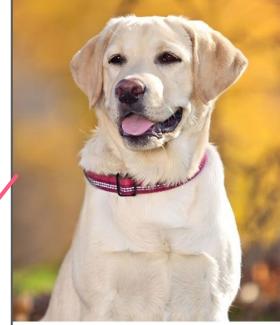
Replying to @_jsimonovski

I tried it with dogs. Let's see.

Two side-by-side photographs of a yellow Labrador Retriever sitting and looking towards the camera. The dog is wearing a red collar. A red arrow points from the black Labrador in the top-left towards these images.

5:45 PM · Sep 20, 2020 · Twitter for Android

1,064 Retweets **207** Quote Tweets **6,617** Likes



Let's test Twitter's image cropping algorithm

Visit <https://github.com/haewoon/lab-image-crop-analysis>

Click “Open in Colab.” 

Run the code.

Upload any photos to lab-image-crop-analysis/data and check the code to load your images properly.

(e.g., if you upload png file, you can change “*.jpeg” -> “*.png”)

```
for img_path in data_dir.glob("*.jpeg"):
```

Group activity (10~15 mins)

Make a hypothesis about what (whom) Twitter algorithm favors. Then, confirm your hypothesis by testing 3 different photos.

Share your results with teammates.

Became a huge scandal

BBC NEWS

Home | Coronavirus | Video | World | Asia | UK

npr

Tech

Twitter finds racism in AI cropping

The Guardian

funded by readers

Search jobs Sign in Search

The Guardian For 200 years

Sport Culture Lifestyle More

Article is more than 10 months old

Twitter apologises for 'racist' AI cropping algorithm

Exclusive features for you, independent journalism for everyone

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VICE Watch World News

Tech

Twitter's AI Revealed to Have Racial Bias After a Viral Photo Experiment

The Atlantic

AMERICA RECKONS WITH RACIAL INJUSTICE

Twitter Announces Changes To Image Cropping Amid Bias Concern

FAMILY

How the Racism Baked Into Technology Hurts Teens

Twitter users say the platform crops out Black faces

Twitter confirmed biases and fixed...? (2021)



In comparisons of men and women, there was an 8% difference from demographic parity in favor of women.

In comparisons of black and white individuals, there was a 4% difference from demographic parity in favor of white individuals.

In comparisons of black and white women, there was a 7% difference from demographic parity in favor of white women.

In comparisons of black and white men, there was a 2% difference from demographic parity in favor of white men.

Twitter's hackathon to spot algorithmic biases

The screenshot shows the HackerOne platform interface. At the top, there is a navigation bar with the 'hackerone' logo, 'START HACKING | LOG IN', and a menu icon. Below the header, there is a banner featuring the Twitter logo and the text 'Twitter Algorithmic Bias Deprecated'. A red button labeled 'Contact Security Team' is visible. To the right of the banner, there is a link to 'External Program'. Below the banner, there is a blue horizontal bar followed by a section with the word 'Policy' in red. The main content area contains two columns. The left column has a heading 'Policy' and text about the challenge: 'Welcome to Twitter's first algorithmic bias bounty challenge!', 'Entry period 7/30/21 9:01 am PT through 8/7/21 11:59 pm PT', 'Winners will be announced at the DEF CON AI Village workshop hosted by Twitter on August 9th, 2021.', and 'Optionally, we invite the winners to present their work during the workshop at DEF CON although conference attendance is not a requirement to compete. The winning teams will receive cash prizes via HackerOne.' The right column has a heading 'HackerOne Directory' with a question mark icon, and text stating: 'Information is provided and moderated by members of the community. Accuracy has not been validated by HackerOne.'

The top entry

Kulynych used a deepfake technique (StyleGAN2-ADA) to generate different faces and test the algorithm.

As StyleGAN2 enables to add semantically “small” changes to the generated faces, it is possible to effectively search the model’s biases.



Bogdan Kulynych
@hiddenmarkov

Wow, this was an unexpected conclusion of the week! My submission was awarded the 1st place in the Twitter's Algorithmic Bias program. Many thanks to [@ruchowdh](#), [@TwitterEng](#) META team, and the jury...

4:47 AM · Aug 9, 2021 · Twitter Web App

36 Retweets 8 Quote Tweets 330 Likes

Biases still exist (1)

Which side (left or right) does the algorithm favor?



Biases still exist (1)

Which side (left or right) does the algorithm favor?

Lighter skin color



Biases still exist (2)

Which side (left or right) does the algorithm favor?



Biases still exist (2)

Which side (left or right) does the algorithm favor?

(stereotypically) feminine look



Biases still exist (3)

Which side (left or right) does the algorithm favor?



Biases still exist (3)

Which side (left or right) does the algorithm favor?

Younger look



Biases still exist (4)

Which side (left or right) does the algorithm favor?



Biases still exist (4)

Which side (left or right) does the algorithm favor?

Slimmer face



What Google Photos did in 2015

Jun 29
Google Photos, y'all fucked up. My friend's not a gorilla.
pic.twitter.com/SmkMCsNVX4

Skyscrapers Airplanes Cars
Bikes Gorillas Graduation

RETWEETS 308 FAVORITES 133

6:52 AM - 29 Jun 2015 · Details

Jun 29
Fuck, the only thing under this tag is my friend and I being tagged as a gorilla.
What the fuck? —

Jun 29
What kind of sample image data you collected that would result in this son?

The original tweet is no longer available

Google's solution to accidental algorithmic racism: ban gorillas

Google's 'immediate action' over AI labelling of black people as gorillas was simply to block the word, along with chimpanzee and monkey, reports suggest



▲ A silverback high mountain gorilla, which you'll no longer be able to label satisfactorily on Google Photos. Photograph: Thomas Mukoya/Reuters

Group activity

Run the apps you frequently use or access to the websites you frequently visit.

1. Find contents recommended (curated) by algorithms in the app or website (as much as you can).

2. Why does the app recommend those contents?

The recommendation algorithm is probably unknown. Time to make your educated guess. :)

3. Have you felt some “unfairness” in the recommendations?

4. Imagine “unfair” recommendations.

Why do you think they are unfair (to whom)?

5. What are potential harms that unfair recommendations can bring?

Compare your answers with team members.



Biases are not only in algorithms



Carlos Kuchkovsky
CTO New Digital Business
BBVA



José Manuel de la Chica
CTO Santander Universities
Banco Santander



Juan José García Ripoll
Científico Titular
CSIC



Piergiorgio Di Giacomo
Google Cloud Engineer
Google



José Luis Salmerón
Lead Data Scientist
Catedrático de Data Science



Samuel Fernández Lorenzo
Research Scientist in Quantum
Technologies



Moisés Marín
Big Data & BI Lead
OpenSistemas



Lead & Inspire
Quantum & AI for a smart world
27 de junio | Madrid

Biases are not only in algorithms



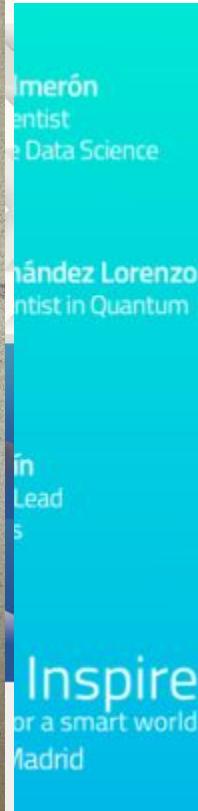
The central image is a promotional poster for the "DENTAL IMPLANT MBA 2.0 CONFERENCE". It features a large title at the top, followed by the date (October 4-5, 2019) and location (Hilton Orange County, Costa Mesa). Below this, a section titled "SPEAKERS AND HOSTS" shows portraits of twelve men. The names and titles of the speakers are listed below their portraits:

Speaker	Title
Philip Gordon	Dental Implant Practices
Ramsey Amin	Dental Implant Exchange
Mark Bishara	Canadian Implant Dentistry Network
Danny Domingue	Implants in Black and White
David Resnick	Block Grafting and Integrity Implants
Chris Barrett	Everyday Implants, Single Unit To Full Arch
Bruno Arnaud	The Full Arch Protocol
Timothy Kosinski	Glidewell Hahn Implants
Cory Glen	Digital Implant Dentistry
Wade Pilling	Implants and Aesthetics
David Wohl	Implementing a Digital Workflow
Kianor Shah	Global Industry Forecast
Rajan Sheth	Planning to Succeed

At the bottom of the poster, there is a row of logos for various dental implant companies.

To the right of the poster is a vertical teal sidebar with white text. The visible text includes "Imeron", "Data Science", "López Lorenzo", "Dentist in Quantum", "Lead", and "Inspire for a smart world Madrid".

Biases are not only in algorithms





The screenshot shows a news feature from the journal *Nature*. The header includes links for "Explore content", "Journal information", "Publish with us", and "Subscribe". The breadcrumb navigation shows the article is under "nature > news feature > article". The publication details "NEWS FEATURE | 10 September 2019" are displayed. The main title of the article is "How to banish manels and manferences from scientific meetings". A subtitle below the title reads: "A *Nature* analysis finds that several fields of science are moving away from male-dominated conferences and panels – but it's easy to slip back into old habits." The URL of the article is provided at the bottom.

<https://www.nature.com/articles/d41586-019-02658-6>

Constant efforts are being made

Dr. Saara Särmä set up a Tumblr site “Congrats, you have an all male panel!” and has recorded more than 2k male-only panels.

Congrats, you have an all male panel!



Suuri Nobel-keskustelu
- miten syntyvät tieteen läpimurrot?

Tervetuloa kuulemaan kotimaisista huippusiantuntijoiden arvioita lääketieteen, fysiikan, kemian ja taloustieteen Nobel-palkinnoista keskiviikkona 28.10. klo 17.00–18.30 osoitteessa HS.fi/tiede

Documenting all male panels, seminars, events, and various other things featuring all male experts.
Please submit! Preferably photos and screenshots. Or links. Make sure it is an all male thing, if not, please explain how it still may count as one. All male references in academic work are also welcome, please submit full bibliographic details on those. Add a Hoffsome stamp to your photo before submission at:
<http://www.hautomohattu.fi/hoffsomerator/> (unfortunately the hoffsomerator is not working at the moment, it'll hopefully be fixed soon)

What's wrong with this picture?



There are no women!
This is the last time
you will see these
ambassadors on an
all male panel - a
“manel”.

Despite comprising half the world's population, women's voices are still under-represented and excluded in public discussions, forums and panels

By helping to end manels, we will better represent the diverse world we live in, and help to ensure that women's voices are heard, and that they can participate equally in society.



Individual efforts can be helpful!



KWAK Haewoon @haewoon · Nov 30, 2020

...

Naver Connect Foundation should do better. I can see their efforts behind having great Korean AI scholars, but more efforts should have made to invite female scholars as well.

boostcamp.connect.or.kr/program.html



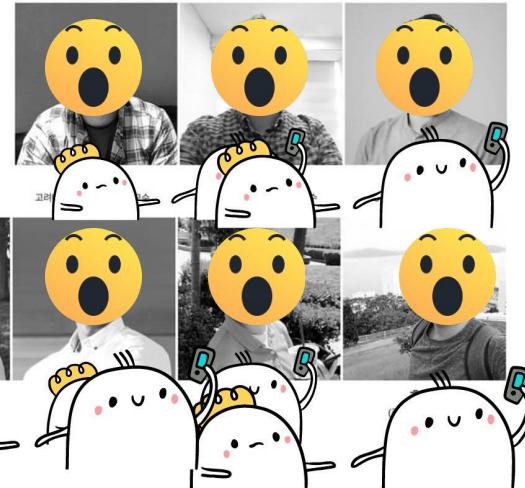
3개

좋아요

댓글 달기

공유하기

강사진
U Stage



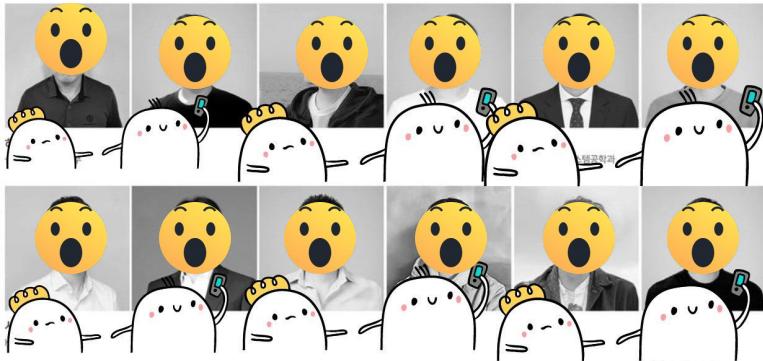
3개

좋아요

댓글 달기

공유하기

강사진 P Stage



Various forms of diversity can exist

Not only gender diversity but also other forms of diversity are considered more and more importantly.

Biases in diverse socio-technical systems

Healthcare

Criminal justice systems

Predictive policing

Hiring

Immigrations

Speech recognition

Google image search

2021-22 Term 1

IS457: Fairness in Socio-technical Systems

Week 2 - Case studies of measuring fairness and bias (I)

KWAK Haewoon

Image from Flaticon.com



2021-22 Term 1

IS457: Fairness in Socio-technical Systems

Week 3 - Case studies of measuring fairness and bias (II)

KWAK Haewoon

Image from Flaticon.com



Opaqueness of algorithmic systems

How can we scrutinize opaque algorithmic systems?

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Week 4 - Auditing algorithms

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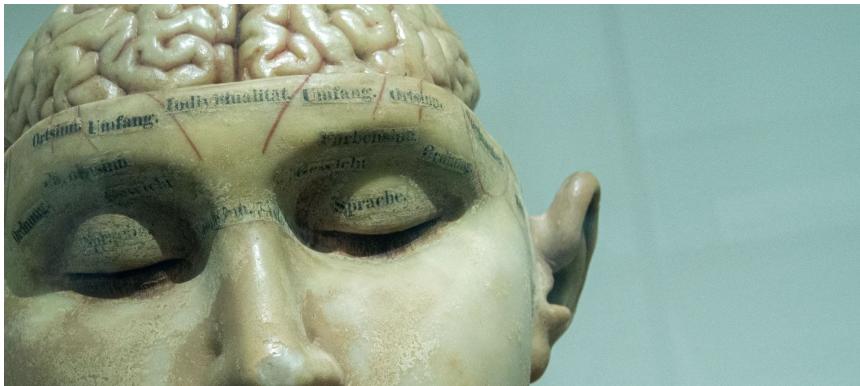
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CECILIA D'ANASTASIO SECURITY 12.08.2020 07:51 PM

The Christchurch Shooter and YouTube's Radicalization Trap

The platform has gotten better about stamping out extremist content. But researchers say its policies and algorithms are still too opaque.

The origin of biases in socio-technical systems



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**Week 5 - Bias in data and machine learning
models (I)**

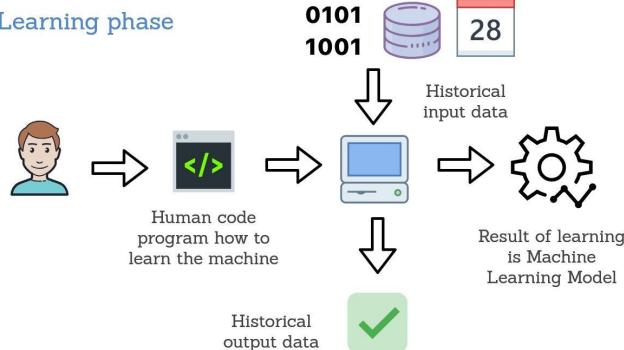
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Machine Learning

Learning phase



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**Week 6 - Bias in data and machine learning
models (II)**

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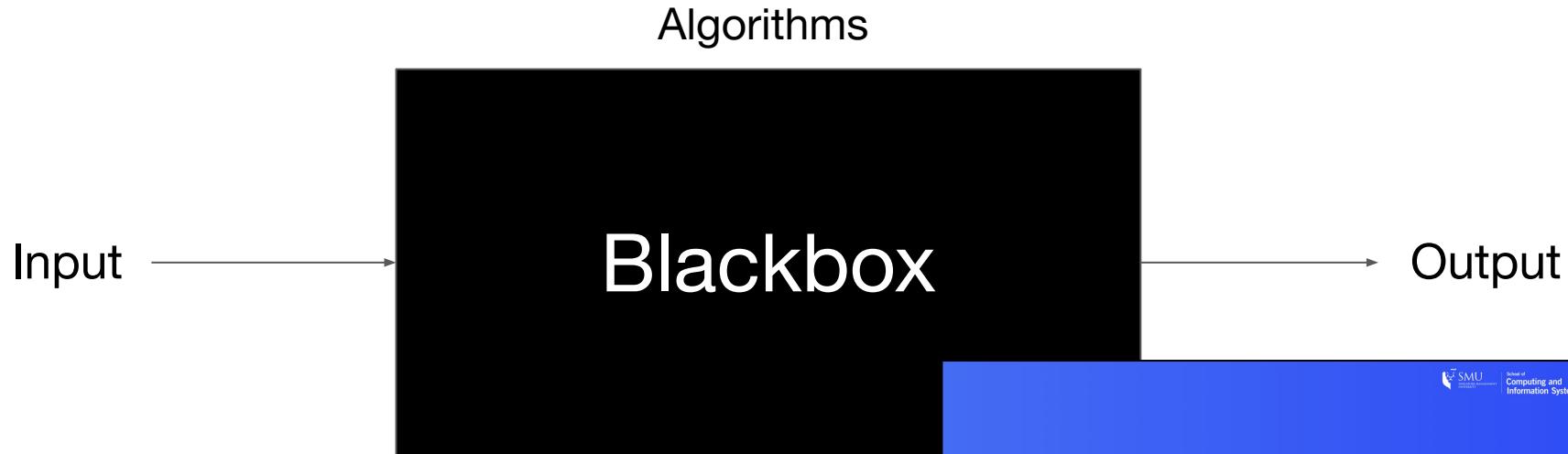


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<https://unsplash.com/photos/xtLrgpytpck>

<https://www.freecodecamp.org/news/classification-with-python-automl/>

Interpretability of algorithmic systems



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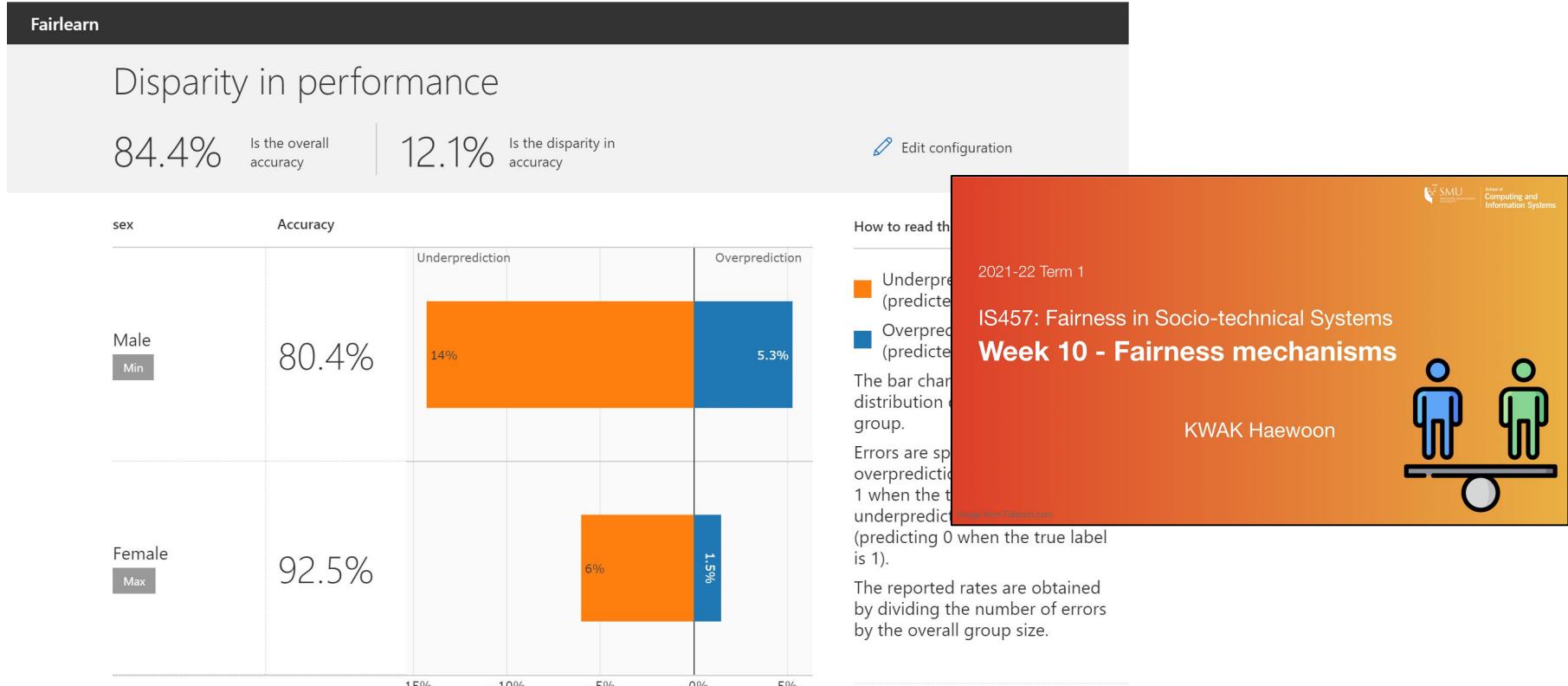
Week 9 - Interpretability of algorithmic systems

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Formalizing fairness in algorithmic systems



Human perception of fairness

Question # 1 out of 20.

Which of the two algorithms is more discriminatory?

Please make your selection by completing the explanation below.

	White Male	White Male	White Male	White Female	White Female	Black Male	Black Male	Black Female	Black Female
True Outcomes	DID Reoffend	did NOT Reoffend	DID Reoffend	did NOT Reoffend	did NOT Reoffend	did NOT Reoffend	did NOT Reoffend	did NOT Reoffend	did NOT Reoffend
Algorithm 1 Predictions	WILL Reoffend	will NOT Reoffend							
Algorithm 2 Predictions	WILL Reoffend	will NOT Reoffend	WILL Reoffend	will NOT Reoffend	WILL Reoffend	will NOT Reoffend	will NOT Reoffend	will NOT Reoffend	will NOT Reoffend

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Week 11 - HCI perspective of fairness

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Other perspectives of fairness



Re-imagining Algorithmic Fairness in India and Beyond

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