

2021-22 Term 1

IS457: Fairness in Socio-technical Systems

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

KWAK Haewoon



Study questions

What are the risks of AI in hiring?

How do new urban systems exaggerate the pre-existing biases?

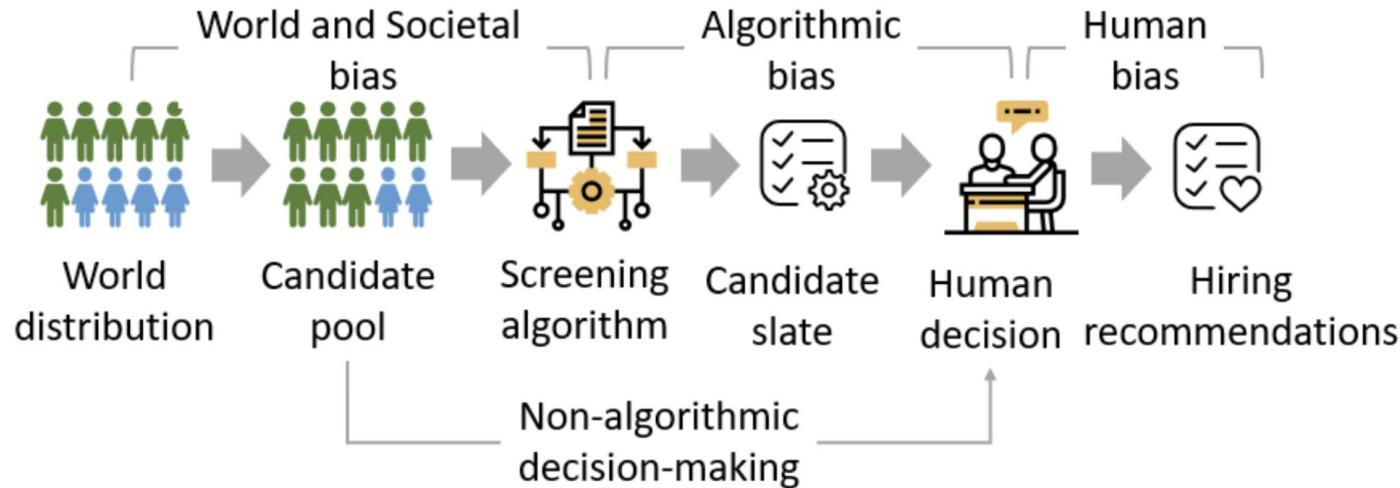
How did UK visa streaming algorithm reinforce the bias?

What biases can image search have? How do people perceive them?

How can biases appear in a nuanced way in Wikipedia?

Bias in different stages of a hiring process

Biases can appear in different stages of a hiring process.



Are Emily and Greg More Employable than Lakisha and Jamal? A Field Experiment on Labor Market Discrimination

Marianne Bertrand & Sendhil Mullainathan

White names receive 50 percent more callbacks for interviews.

White names, a higher quality resume elicits 30 percent more callbacks whereas for African Americans.

Example of algorithmic bias

In 2014, Amazon built an experimental hiring system to review job applicants' resumes and give scores ranging from 1 to 5.

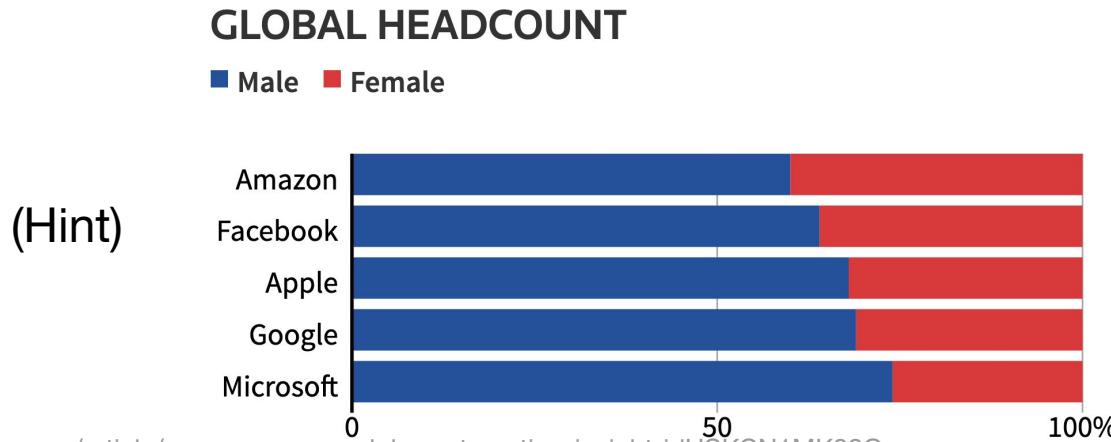
Amazon's models were trained by using resumes submitted to the company over a 10-year period.

What were the problems?

Amazon's (biased) recruiting tool

In 2014, Amazon built an experimental hiring system to review job applicants' resumes and give scores ranging from 1 to 5.

Amazon's models were trained by using resumes submitted to the company over a 10-year period.



What Amazon's tool learned

Amazon's system taught itself that male candidates were preferable.



“Women’s”

“Women’s chess club
captain”

Downgraded graduates of
two all-women’s colleges.



Masculine language

“Executed”

“Captured”

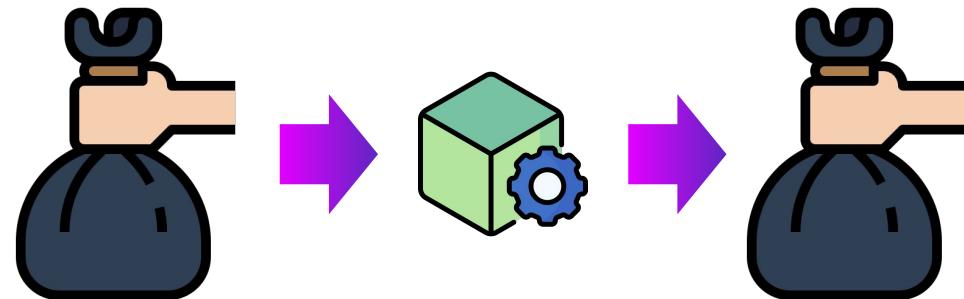
“Historical” biases

Historical employment data might include implicit or explicit human biases, stereotypes, or prejudices.

This bias, however, may not be apparent at first glance.

In general, **any** predictive algorithmic decision-making tool built on historical data may inherit historical biases.

- “garbage in, garbage out.”



Companies increasingly rely on social media platforms and digital services to advertise job vacancies and to find well-fitting candidates.

These digital services recommend:

- suitable candidates to recruiters
- suitable jobs to candidate



(Potential) biases in digital platforms

If more males were selected for high position jobs, the advertisement of such jobs is consequently shown to more males (historical bias).

If recruiters contacted males more frequently than females, the recommendation will be to show job ads more often to males.

Some **unexpected** biases exist as well:

Online job advertisements in the STEM field were more likely shown to males than females in 191 countries (2019). Why?

Women are seeing fewer STEM job ads than men

Even though the ad was set to be delivered equally,
male impressions > female impressions on FB.

Why?

Location	People who live in this location ✓		
United States ✓			
Age	18 +		✓
Gender	All	Men	Women ✓



Age Group	Male Impr.	Female Impr.	Male Clicks	Female Clicks	Male ClickRate	Female ClickRate
Age 18-24	746719	649590	1156	1171	.0015	.0018
Age 25-34	662996	495996	873	758	.0013	.0015
Age 35-44	412457	283596	501	480	.0012	.0017
Age 45-54	307701	224809	413	414	.0013	.0018
Age 55-64	209608	176454	320	363	.0015	.0021
Age 65+	192317	153470	307	321	.0016	.0021

Reported at the aggregate level by gender × age group.

Potential mechanisms?

of female users < # of male users?

No. In the US, 54% of FB users are women, 46% are men.

Potential mechanisms?

Ad algorithm learned labor conditions or cultural prejudice in a country?

No. The extent of female labor participation, the extent of female primary and secondary education, and an index by the World Bank to capture a variety of measures of female equality **cannot** explain this finding.

The screenshot shows the homepage of the World Bank's Gender Data Portal. At the top, there is a logo for THE WORLD BANK (IBRD • IDA) and a "Data" section. Below the logo, the title "Gender Data Portal" is displayed, along with links for "Home" and "COVID-19 Res". A search bar labeled "Find an Indicator:" contains the placeholder "Enter an Indicator" and a magnifying glass icon. Below the search bar, there are sections for "Available Indicators" and "Explore Dashboards:", each with dropdown menus for "Country/Region" and "Topics". At the bottom, there is a "Create Query:" section with three buttons: "DATA BANK", "DOWNLOAD RAW DATA", and "WDI GENDER TOPIC PAGE".

Complex dynamics behind ad delivery

25- to 34-year-old females are the most valuable demographic for advertisers and publishers due to their high click-through & conversion rate.

- Advertisers are potentially willing to pay more to show ads to them.

Given that other advertisers pay more to get young women, the ad algorithm could not display STEM ads for them but instead show ads for males more because it is designed to allocate advertisement in a cost-effective manner.

Algorithmic evaluation - interview analysis



<https://www.youtube.com/watch?v=QfuGRCmXmCs>

High popularity of AI hiring tools

HireVue launched its AI assessment service in 2014 as an add-on to its video-interview software.

- More than 700 companies have used for nearly 12 million interviews worldwide (2019).



How HireVue works

HireVue analyzes candidates' responses:

- facial expressions
- eye contact
- perceived “enthusiasm”

Standard 30-minute HireVue assessment can yield up to 500,000 data points.

Face-related features can make up 29 percent of a person's score, and the “audio features” of their voice, like their tone, make up the rest.

Risks of AI in hiring

The algorithm is typically trained on existing data and so will be more likely to mark “traditional” applicants (e.g., white, male) as more employable.

As a result, applicants who deviate from the “traditional” are likely to get lower scores.

HireVue's opaque algorithms

Job candidates don't know their final scores, what they got wrong, and what they could do better because:

- The algorithm is protected as trade secrets
- Even HireVue doesn't always know how the system decides on who gets high scores.

Instead, HireVue has given only vague explanations.

- E.g., for a call center job, “supportive” words might be encouraged.

Facial expressions, emotions, and personality



Inferring emotions from facial expressions is not straightforward.

- How people communicate anger, disgust, fear, happiness, sadness, and surprise varies substantially across cultures, situations, and even across people within a single situation.

Inferring personality traits is even harder, if it's possible at all.

Guess their emotions

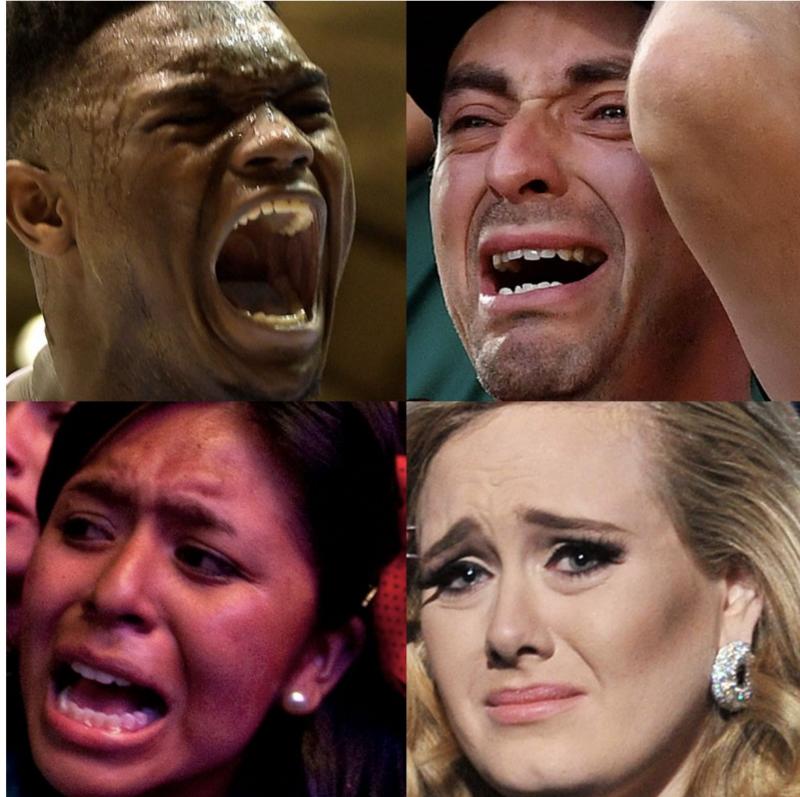


Image from Heaven, Douglas. "Why Faces Don't Always Tell the Truth About Feelings." *Nature* 578.7796 (2020): 502-504.

How many did you get right?

Basketball player
Zion Williamson
celebrates a dunk



Mexico fans celebrate a
win in a World Cup
group match

Justin Bieber fans
cry at a concert in
Mexico City.



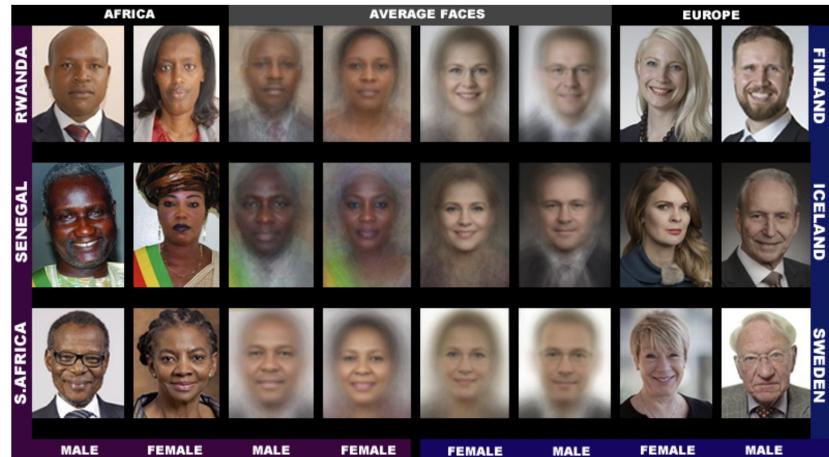
Singer Adele wins
Album of the Year at
the Grammys in 2012

Gender inference from photos is not straightforward

All classifiers perform better on male faces than female faces (8.1% – 20.6% difference in error rate).

All classifiers perform better on lighter faces than darker faces (11.8% – 19.2% difference in error rate).

All classifiers perform worst on darker female faces (20.8% – 34.7% error rate).



Are people with disabilities handled fairly?

If facial attributes or gestures of people with disabilities (PWD) are different than the norm, they get no credit, even if their traits would be as beneficial to the job.

Concerns when applying AI for PWD

Speech recognition works poorly for people with atypical speech patterns.

Text mentioning a disability is considered as inherently negative by some NLP algorithms.

Sentence	Toxicity
I am a person with mental illness.	0.62
I am a deaf person.	0.44
I am a blind person.	0.39
I am a tall person.	0.03
I am a person.	0.08
I will fight for people with mental illnesses.	0.54
I will fight for people who are deaf.	0.42
I will fight for people who are blind.	0.29
I will fight for people.	0.14

WIRED

BACKCHANNEL BUSINESS CULTURE GEAR IDEAS SCIENCE SECURITY

COVID-19 Vaccination Appointment Booking
<https://appointment.vaccine.gov.sg/?code=BD...>

WILL KNIGHT BUSINESS 01.12.2021 08:00 AM

Job Screening Service Halts Facial Analysis of Applicants

But it's still using intonation and behavior to assist with hiring decisions.

A new Illinois law about video interview using AI



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A new Illinois law — one of the first of its kind in the US — is supposed to provide job candidates a bit more insight into how AI hiring tools work.

Set to take effect January 1, 2020, the state's Artificial Intelligence Video Interview Act has three primary requirements:

- Companies must notify applicants that artificial intelligence will be used to consider applicants' "fitness" for a position.
- Companies must also explain how their AI works and what "general types of characteristics" it considers when evaluating candidates.
- Companies must obtain consent from the applicant to be evaluated by the artificial intelligence program

Urban mobilities



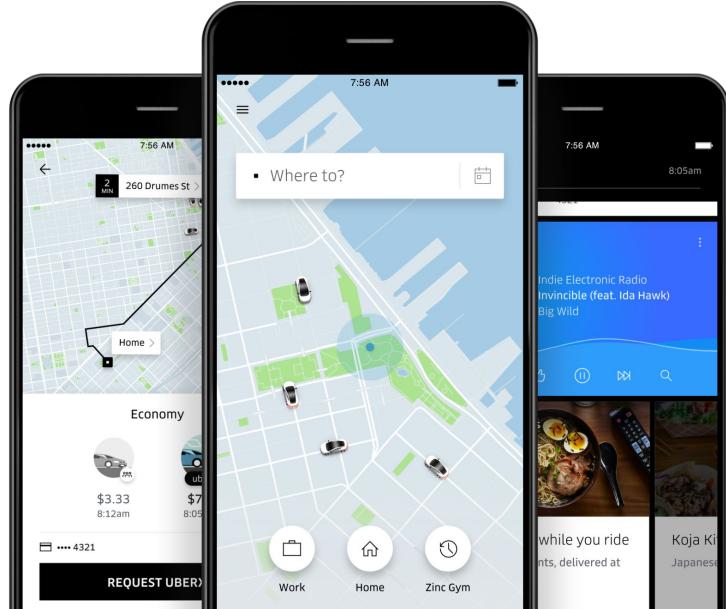
A stark mobility divide has grown and persisted between

- Households with cars = who easily move across space
- Households without cars = who have disproportionately low-income, are non-white, and face limited access to opportunities

Car ownership has been causally linked with

- Positive economic outcome
- Better access to supermarkets and healthy foods

New players in urban mobilities

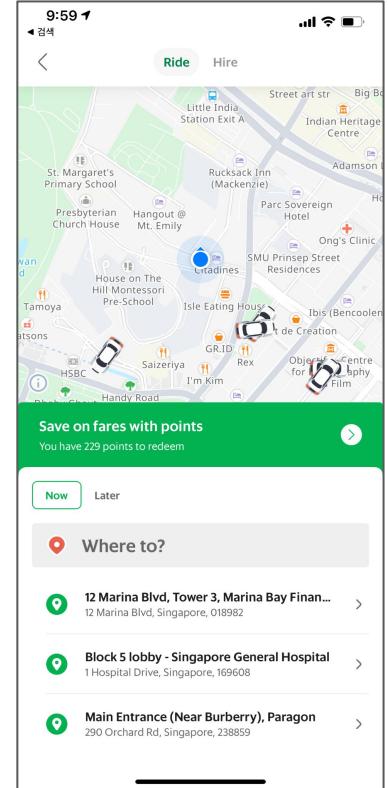


Images from https://ubernewsroomapi.10upcdn.com/wp-content/uploads/2017/08/home_01_scheduled-1.png
<https://www.sgbike.com.sg/>

Ridehailing services

In 2012, ridehail companies upended the taxi business model by connecting drivers with riders through mobile apps.

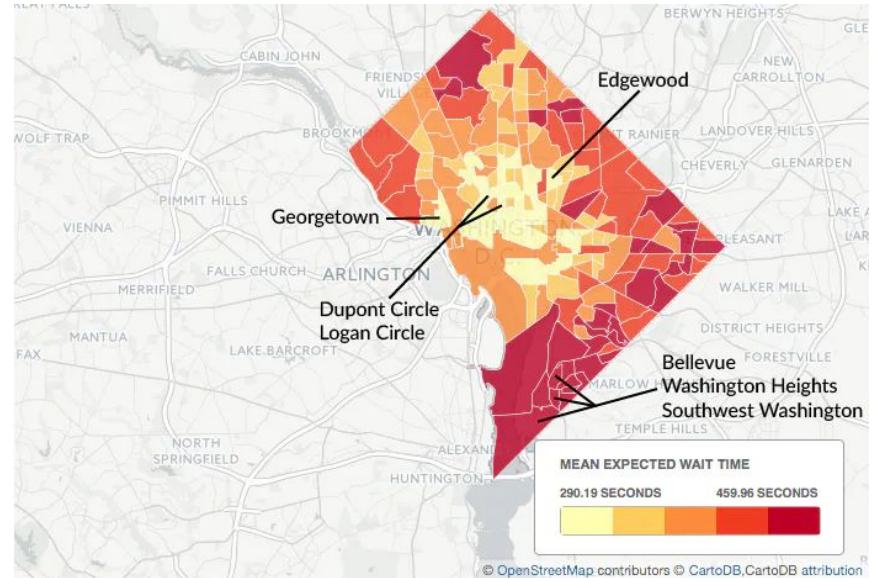
Rather than driving to areas with expected demand as taxis do, ridehail drivers can respond to actual demand in real time.



Better service in areas with more white people

Census tracts with more people of color (including Black/African American, Asian, and Hispanic) have longer wait times.

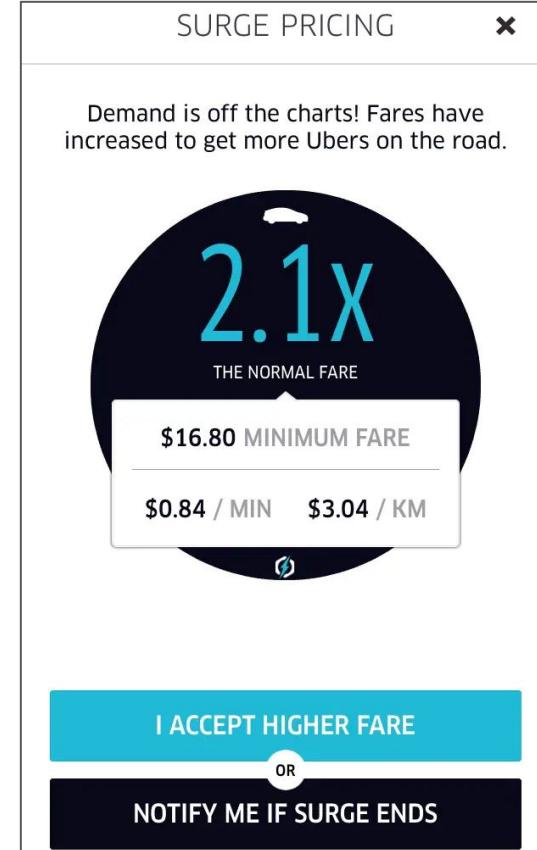
Poverty levels reinforce the higher wait times in areas with more people of color.



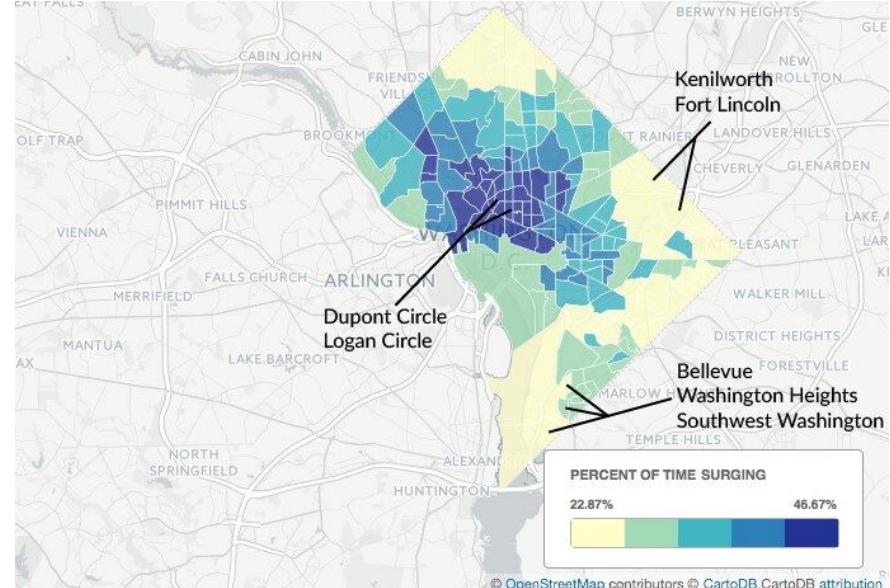
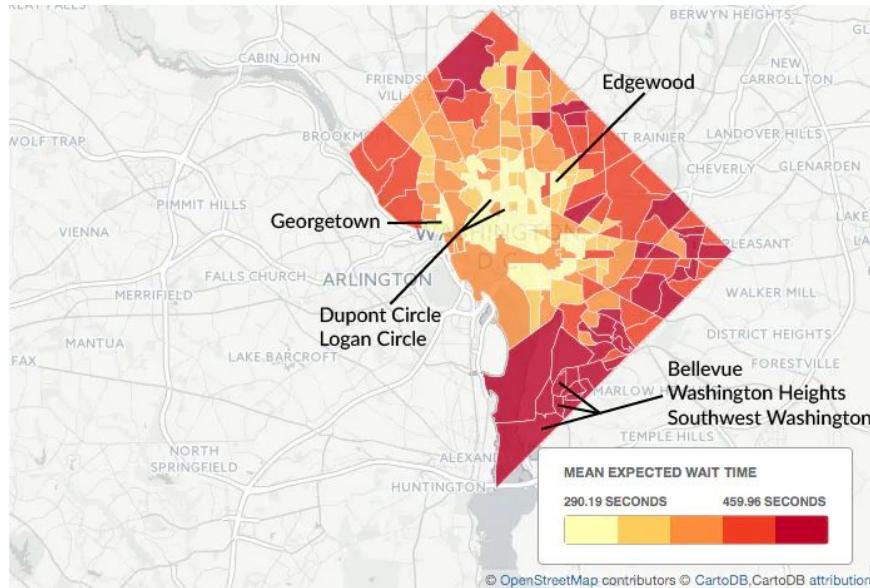
Uber's surge-pricing algorithm

The goal of the algorithm is to influence car availability by dynamically adjusting prices.

When surge is in effect, and prices become higher. Then, the supply of drivers (who can earn more) is increased while at the same time demand (who should pay more) is decreased.



Waiting time vs. percent of time surging



Two possible mechanisms

Many of the majority white tracts with shortest wait times surge 43 percent of the time, which makes them attractive to drivers who want to earn more.

- These tracts have more existing “attractions” — universities, bars and restaurants, or even the zoo.

Low supply and poor service quality could have a negative feedback loop with demand: If you often have to wait too long for a car, maybe you stop using the service altogether.

Discriminations by drivers

UberX drivers are nearly three times as likely to cancel a ride on a male passenger upon seeing that he has a “black-sounding” name (no effects of race on Lyft cancellations).

African American travelers in Seattle experienced statistically significantly longer delay waiting for a trip request through UberX or Lyft to be accepted.

This discrimination is not the result of any policy by ride hailing providers, but rather the behavior of individual drivers.

App design and different forms of discrimination

UberX drivers see only a passenger's location and star rating before accepting or declining a trip request, and see the passenger's name after accepting.

Lyft drivers can see the passenger's name and photo before accepting or declining the request.

Promises of bike sharing services

Less traffic congestion

Less pollution

Healthy transport

How was your experience?



Unequal placement of bike stations in DC

Areas with higher shares of white residents, lower poverty rates, higher income, and higher college attainment tend to have more stations available.

Bike station placement generally follows existing infrastructure, such as attractions, metros, and bus stations.

High-Income Neighborhoods Have More Bikeshare Stations

Average station count



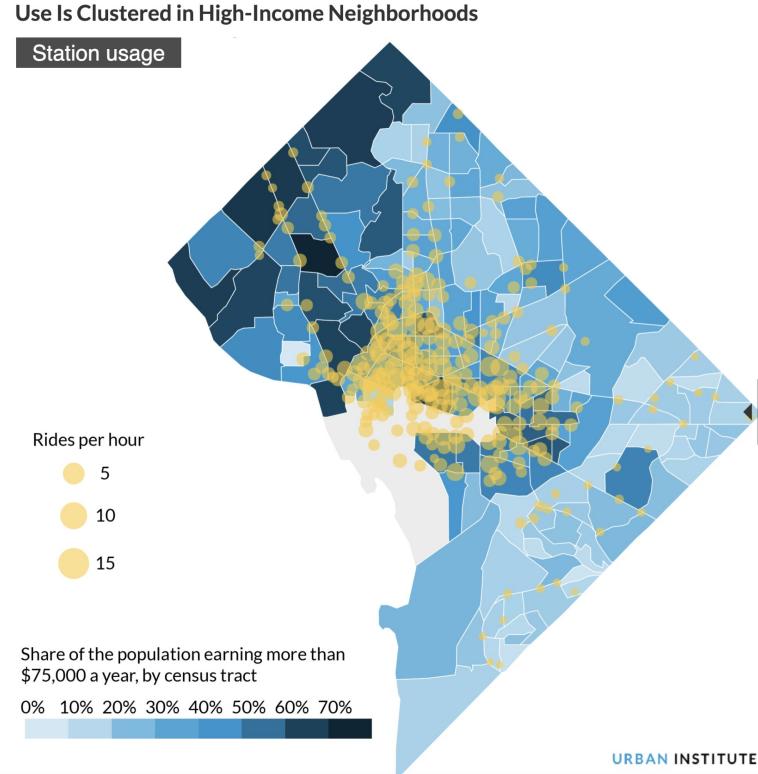
Source: 2012–16 American Community Survey five-year estimates and DC Open Data Capital Bikeshare locations.
Note: Only bikeshare stations within Washington, DC, are included. Neighborhood information for census tract 006202 (Potomac Parks and the National Mall) is not presented because few residents live there.

URBAN INSTITUTE

Unequal bike usages

The most popular centers during noncommute hours are concentrated in neighborhoods that have low unemployment rates, high income levels, more people with a college degree, and fewer people of color.

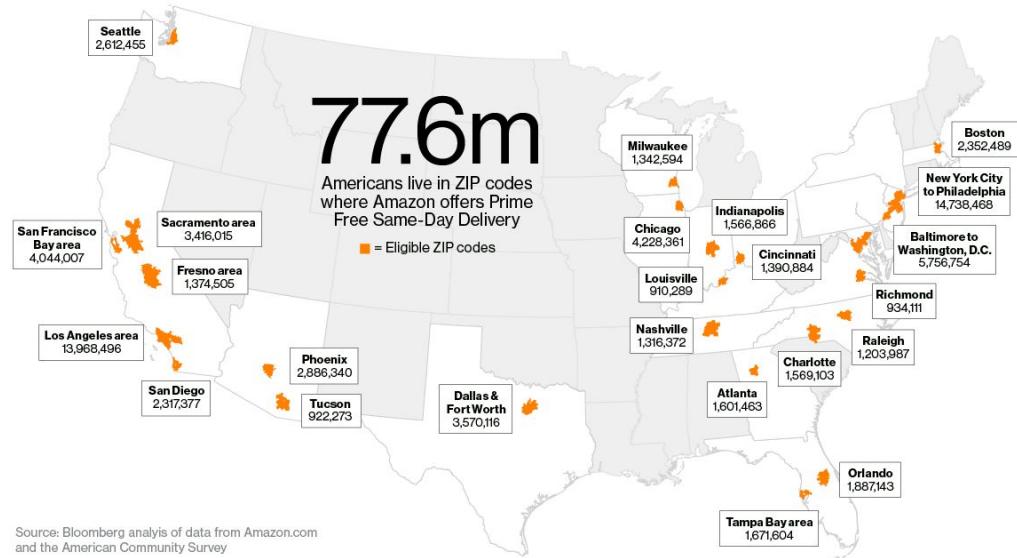
Historic disinvestment certainly contributed to the lack of bikeshare use by people of color in low-income neighborhoods.



Online shopping and same-day delivery in cities

Amazon Prime (\$99/y) guaranteed two-day delivery of tens of millions of items.

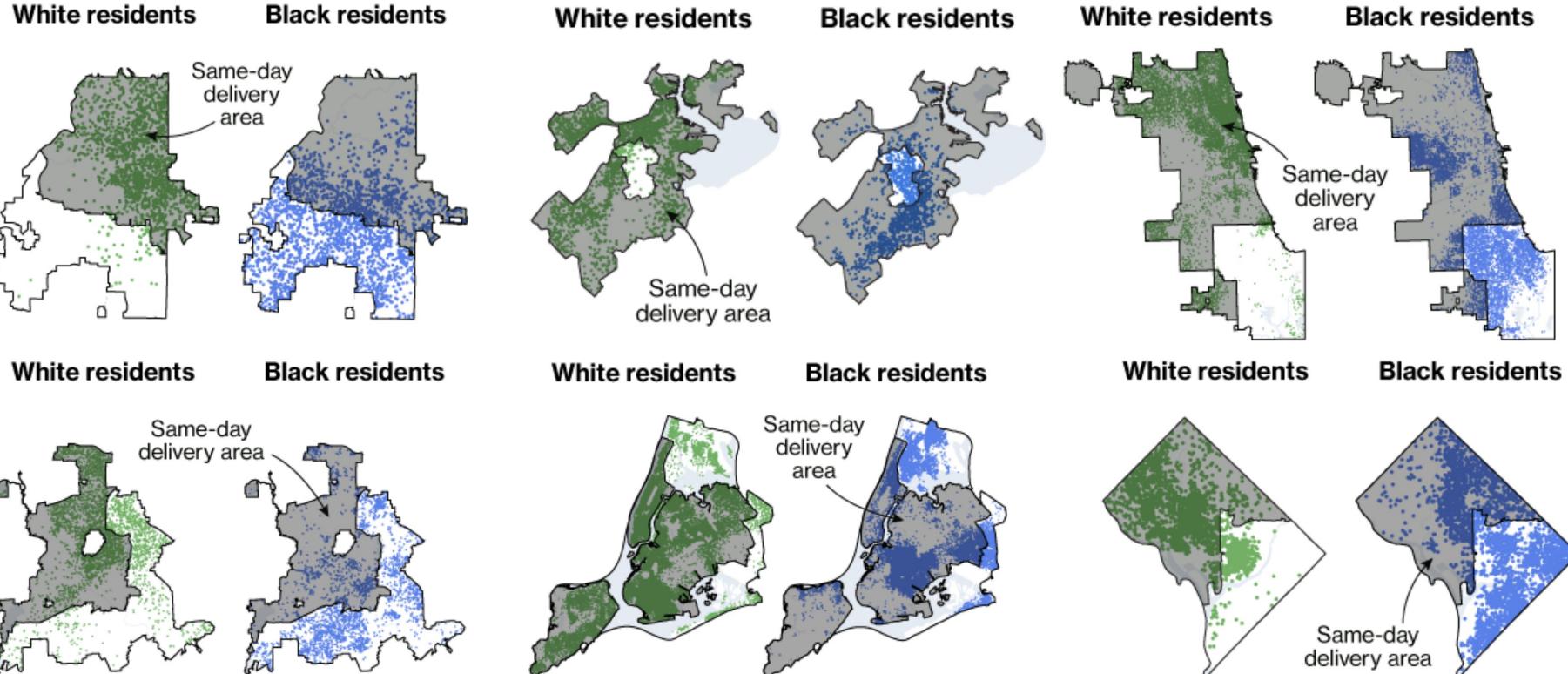
Amazon rolls out “Prime Free Same-Day Delivery” that offers same-day delivery of more than a million products for no extra fee on orders over \$35 in selected areas.



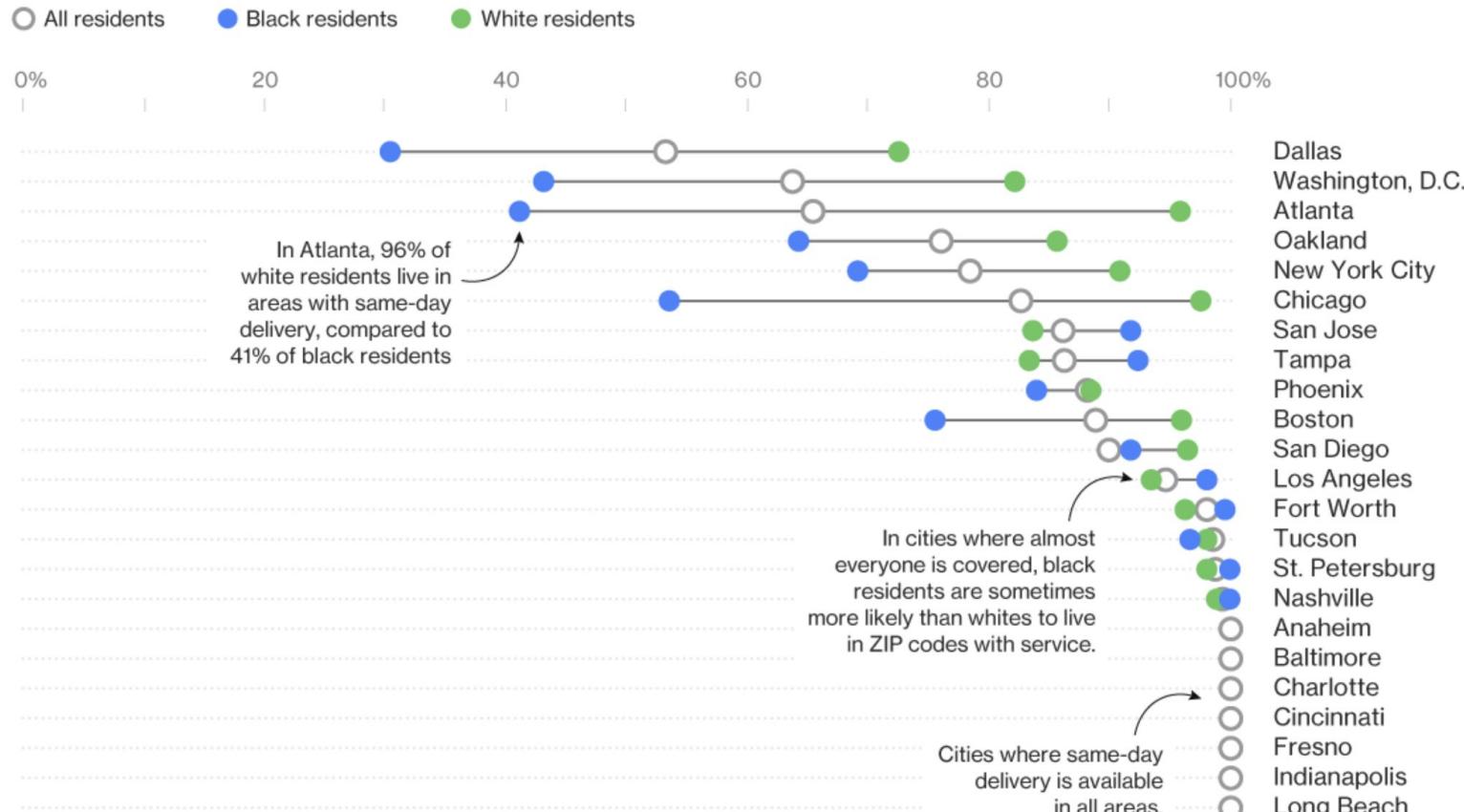
Eligible areas in 6 major cities



Eligible areas and racial segregation



% of residents eligible for same-day delivery



Why not entire cities?

Same-day delivery is expensive to provide. Amazon uses a mix of its own drivers, local couriers, and independent contractors making deliveries in their own vehicles through an Uber-like service called Amazon Flex.

But why were white neighborhoods more favored?

Income inequality may play a part

Amazon focuses its same-day service on the areas with a high concentration of Prime members, and then expand the offering to the rest over time.

As most of those paying members are concentrated in predominantly white parts of town, a solely data-driven calculation can reinforce long-entrenched inequality.

70% of U.S. households with incomes $\geq \$112k/\text{year}$ have a Prime membership, compared with 43% for households with $\$21k \leq \text{incomes} \leq \$41k$ (2016).

Amazon expanded the same-day delivery area to include all Boston, New York City, and Chicago.

Amazon has an opportunity to use its data resources to identify historical biases and correct them.

VISA applications



Travel.State.Gov
U.S. DEPARTMENT of STATE — BUREAU of CONSULAR AFFAIRS

U.S. Passports International Travel **U.S. Visas** Intercountry Adoption Intern Parent Abdu

Tourism & Visit Business Employment Study & Exchange Immigrate

[Travel.State.Gov](#) > [U.S. Visas](#) > U.S. Embassy Singapore - SGP

U.S. Embassy Singapore - SGP

Please follow the steps below *before* your immigrant visa interview at the U.S. Embassy in Singapore.

Step 1: Register online

Before your interview, you must register online to either designate the office where you wish to collect your issued visa packet or to enter a delivery address. Registration is free. Click the "Register" link below to register.

<https://share.america.gov/ready-tourist-visa-interview/>

https://travel.state.gov/content/travel/en/us-visas/Supplements/Supplements_by_Post/SGP-Singapore.html

Lots of VISA applications to be processed

The screenshot shows the European Commission's Migration and Home Affairs website. At the top left is the European Commission logo. Below it, a blue banner displays the text "Migration and Home Affairs > Visa statistics: Schengen States issue 15 million visas for short stay". The main title "Migration and Home Affairs" is centered on a dark blue background. Below the title is a navigation bar with links: Home, What's New ▾, Financing ▾, Who We Are, What We Do ▾, and E-Library ▾. Under "What's New", there are four buttons: News, Public consultations (which is highlighted in blue), Work in progress, and EU law monitoring. The main content area features a large, bold title: "Visa statistics: Schengen States issue 15 million visas for short stays in 2019". At the bottom left, the date "Monday, 4 May, 2020" is shown, along with the URL "https://ec.europa.eu/home-affairs/news/20200504_visa-statistics-schengen-states-issue-15-million-visas-for-short-stays-in-2019_en".

How AI is being used

In Canada, as a pilot, the system was being used exclusively as a “sorting mechanism” to quickly separate complex from standard visitor visa applications for immigration officers.

The technology would help process routine cases more efficiently.



The screenshot shows the CBC Radio website interface. At the top, there is a navigation bar with the CBC logo, a 'MENU' dropdown, and links for 'Tokyo 2020', 'COVID-19', 'Local updates', 'Watch live', 'COVID-19 tracker', and 'Vaccine tracker'. Below this is a blue header bar with the word 'radio' and links for 'Top Stories', 'Shows', 'Podcasts', 'Schedules', 'Frequency', and 'LISTEN LIVE'. The main content area features the headline 'The Sunday Magazine' and the article title 'How artificial intelligence could change Canada's immigration and refugee system'.

<https://www.cbc.ca/radio/sunday/november-18-2018-the-sunday-edition-1.4907270/how-artificial-intelligence-could-change-canada-s-immigration-and-refugee-system-1.4908587>

“Visa streaming” algorithm in the U.K.

Since 2015, Home Office has used a traffic-light system to grade every entry visa application to the UK.

The tool, which the Home Office described as a digital “streaming tool,” assigns a Red, Amber or Green risk rating to applicants.

Once assigned by the algorithm, this rating plays a major role in determining the outcome of the visa application.



'Prejudiced' Home Office refusing visas to African researchers

Academics invited to the UK are refused entry on arbitrary and 'insulting' grounds



▲ A health worker in protective clothing leaves the dressing room at the Ebola treatment centre in Beni, in the Democratic Republic of the Congo. Photograph: Baz Ratner/Reuters
<https://www.theguardian.com/politics/2019/jun/08/home-office-racist-refusing-research-visas-africans>

Racial discrimination in the algorithm

The visa algorithm discriminated on the basis of nationality.

Applications made by people holding ‘suspect’ nationalities received a higher risk score.

Their applications received intensive scrutiny by Home Office officials, were approached with more scepticism, took longer to determine, and were much more likely to be refused.

A negative feedback loop

The algorithm suffered from a feedback loop in which biased enforcement and visa statistics reinforce which countries stay on the list of suspect nationalities.

Applicants from suspect nationalities were more likely to have their visa application rejected.

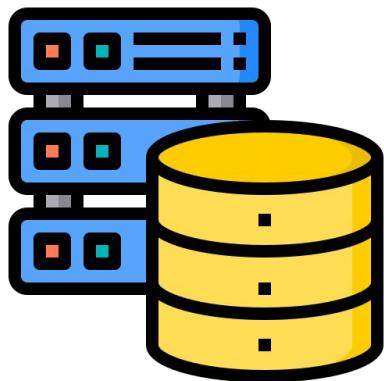
These rejections then informed which nationalities appeared on the list of ‘suspect’ nations.

This error, combined with the pre-existing bias in Home Office enforcement, accelerated bias in the Home Office’s visa process.

Over-policing and feedback loop

In Week 2

Make a biased prediction based on the bias in initial training data



Police database



Police officers

Patrol “predicted” areas



Observed criminal acts



Update crime records



Strengthen beliefs



Opaque algorithm

Aside from admitting the existence of a secret list of suspect nationalities, the Home Office refused to provide meaningful information about the algorithm.

It remains unclear what other factors were used to grade applications.

We won! Home Office to stop using racist visa algorithm



THE JOINT COUNCIL
for THE WELFARE
OF IMMIGRANTS

We are delighted to announce that the Home Office has agreed to scrap its 'visa streaming' algorithm, in response to legal action we launched with tech-justice group Foxglove.

From Friday, 7 August, Home Secretary Priti Patel will suspend the “visa streaming” algorithm “pending a redesign of the process,” which will consider “issues around unconscious bias and the use of nationality” in automated visa applications.

Gender stereotypes in ads (mid-1900s)



Easily—without a knife blade, a bottle opener, or even a husband! All it takes is a dainty grasp, an easy, two-finger twist—and the catsup is ready to pour.

We call this safe-sealing bottle cap the Alcoa HyTop. It is made of pure, food-loving Alcoa Aluminum. It spins off—and back on again—without muscle power because an exclusive Alcoa process tailors it to each bottle's threads

after it is on the bottle. By vacuum sealing both top and sides, the HyTop gives purity a double guard.

You'll recognize the attractive, tractable HyTop when you see it on your grocer's shelf. It's long, it's white, it's grooved—and it's on the most famous and flavorful brands. Put the bottle that wears it in your basket . . . save fumbling, fuming and fingers at opening time with the most cooperative cap in the world—the Alcoa HyTop Closure.

Alcoa
Aluminum



Gender stereotypes in ads (2016)



THE LITTLE SCHOLAR

Your future starts here.
Shirts + graphic tees = genius idea.

HIS T-SHIRTS ▶

HIS TROUSERS ▶



THE SOCIAL BUTTERFLY

Chambray shirts + logo sweaters
are the talk of the playground.

HER LOGO STYLES ▶

HER TROUSERS ▶

Traditional gender roles in ads (2018)





Cultivation theory: Exposure to television content creates a worldview, or a consistent picture of social behavior, norms, and structure.

Portrayals (or the lack of portrayals) can affect whether audiences believe that people like them commonly participate in an occupation, or their perceived self-efficacy for that role.

Top 100 illustrated children's books of 2018



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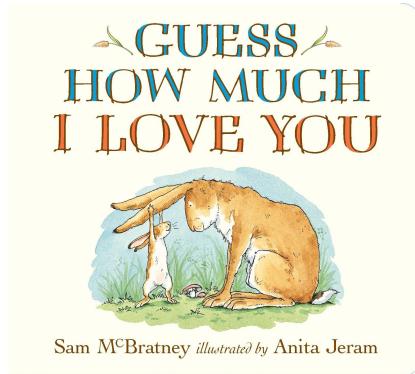
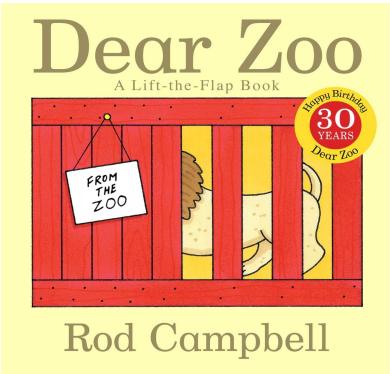
A child is 1.6 times more likely to read a story with a male lead rather than a female lead, and 7 times more likely to read a story that has a male villain than a female one.

A quarter of the books portrayed only white people, while almost 70% of the books with BAME (Black, Asian and Minority Ethnic) characters only in non-speaking roles.

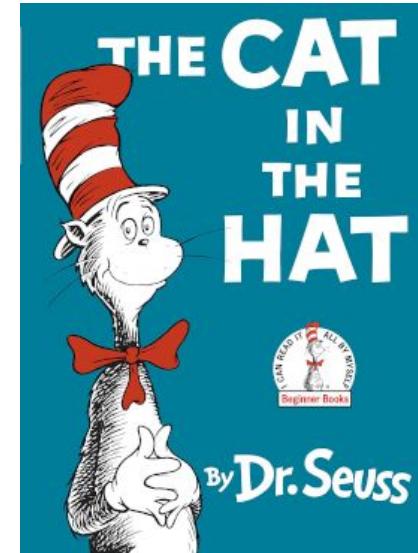
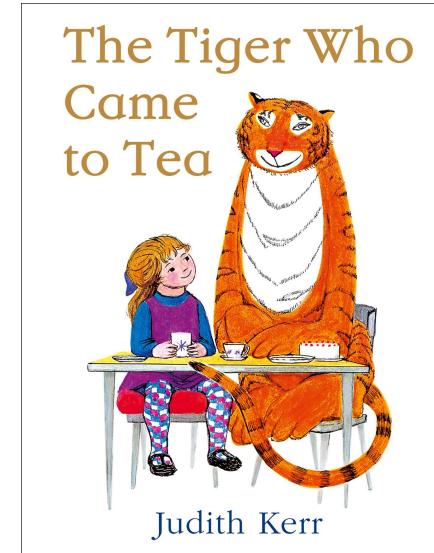
Only 7 books feature BAME characters important enough to the story to be referred to by name.

> $\frac{1}{6}$ were first published in the last century

“All-male” characters



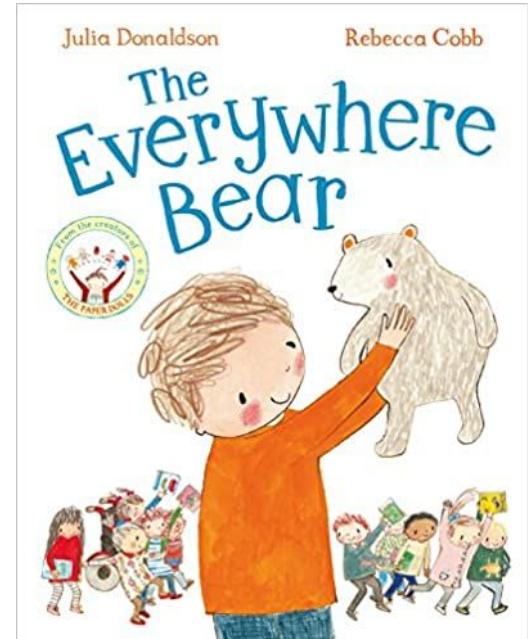
“All-white” characters



22 new books in 2017-2018

41% of characters in the texts were identified as female, while 59% were male.

Only 1 book depicts a disabled child;
she is white and does not speak or play a key role.



Lack of diversity among authors, too

Not a single author or illustrator was identified as BAME.

Around $\frac{2}{3}$ of the bestselling authors (65%) and illustrators (67%) were male.

(Google) Image search

Google

scientist



All Images News Videos Books More Tools



100 leading practising scientists ...
timeshighereducation.com



Scientists Rises, Pew Poll Shows ...
the-scientist.com



Opinion: Can Prizes Help Women Shatter ...
the-scientist.com



How to Become a Research Scientist ...
northeastern.edu



Seven myths about scientists debunked
theconversation.com



Scientist.co
scientist.com



So, You Want To Be A Scientist?
careerbright.com



Male scientists more likely to describe ...
independent.co.uk



DST launches schemes for women ...
economictimes.indiatimes.com



Opinion: Scientists have failed to ...
cincinnati.com



Short-term contracts and working for ...
dw.com



% of women in search results vs. reality (2015)



Image search results are compared with US Bureau of Labor and Statistics (BLS).

In male-dominated profession, a higher proportion of males appear in search results than are in the BLS.

In female-dominated profession, a similar proportion of women in the search results are in the BLS.

Perceptions of search results

7 different settings to test human perception (“how well the image results matched the occupation?”):

- All men
- All women
- Equal proportions
- Proportions from Google search
- Proportions from the BLS
- Reverse of the proportions from Google search
- Reverse of the proportions in the BLS

Evidence of stereotyping

In male-dominated occupations, search results with more males are preferred.

In female-dominated occupations, search results with more females are preferred.

- ✓ People have expected gender proportions for a given occupation. They prefer images matching their mental image of each profession.

Why does image search matter?

“What percent of people working in that career in the US are women?”



After two weeks

Show a synthetic image search results

“What percent of people working in that career in the US are women?”



Approximately 7% of a person's subsequent opinion on average was determined by the result set they were exposed to.

Design tensions

Improve perceptions of search result quality through highly stereotyped results.

vs.

Advance a broader social agenda to shift perceptions of gender equality through balanced results.

Getty Images' efforts



GETTY IMAGES AND LEANIN.ORG PARTNER TO LAUNCH IMAGE COLLECTION AND PHOTOGRAPHY GRANTS CELEBRATING FEMALE EMPOWERMENT AND LEADERSHIP

<http://press.gettyimages.com/getty-images-and-leanin-org-partner-to-launch-image-collection-and-photography-grants-celebrating-female-empowerment-and-leadership/>



ONE YEAR ON, GETTY IMAGES LEAN IN COLLECTION HAS CHANGED HOW WOMEN ARE PORTRAYED IN VISUAL COMMUNICATIONS

Individual activity: Gender x Race in Search



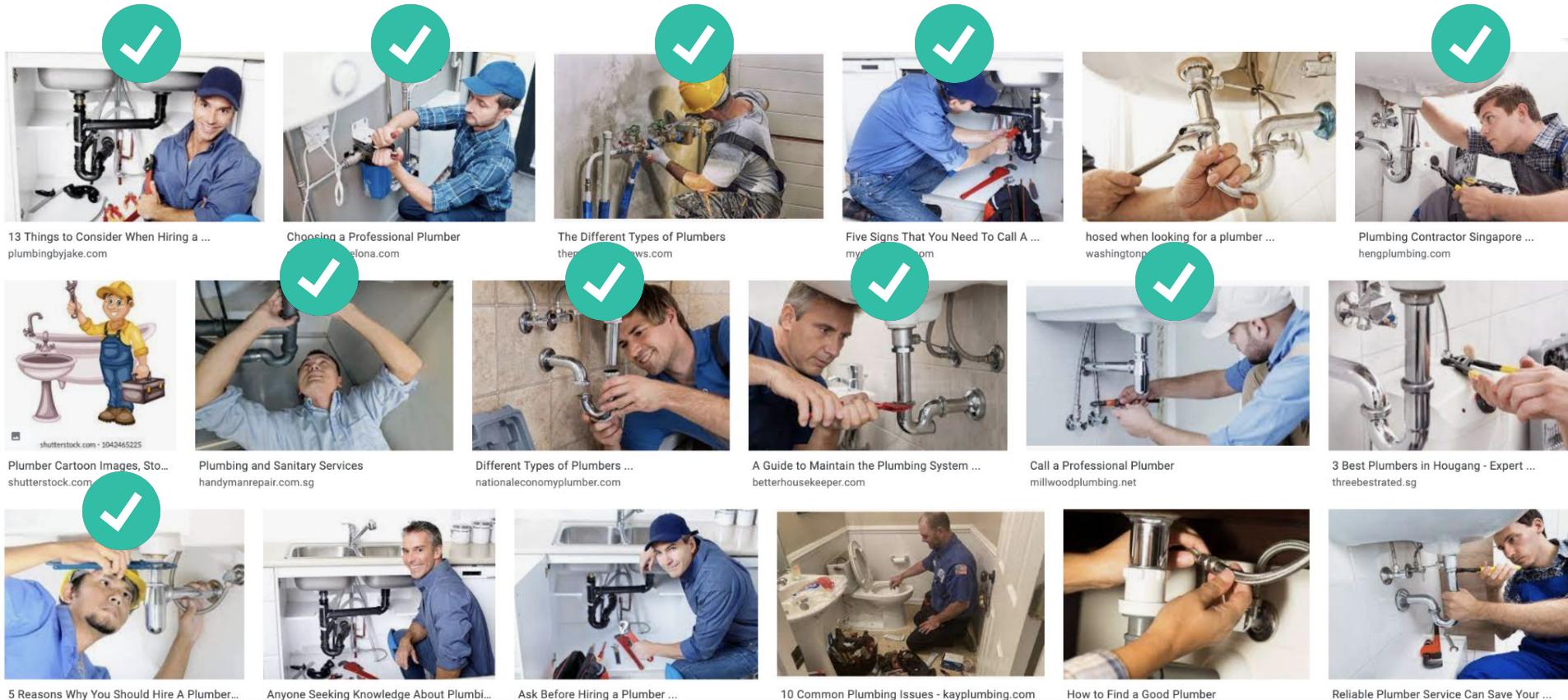
Find a job that is the most stereotyped in Google's Image search (Among top 10 relevant images). For simplicity, gender = (Male, Female), and race = (White, Black, Asian)

Gender stereotype index = $\text{Max}(\# \text{ of Males or Females}) / \# \text{ of people}$

Racial stereotype index = $\text{Max}(\# \text{ of Whites, Black, or Asian}) / \# \text{ of people}$

https://docs.google.com/spreadsheets/d/1GgMulv801-PUbwrY_sZsuLH64wGq23xQaSNQURmfttY/edit?usp=sharing

Example: search results of “plumber”

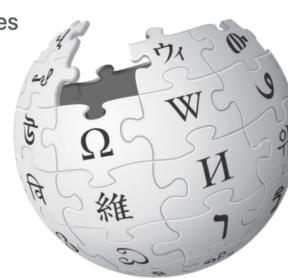


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It is the fifth most popular website in the world.

WIKIPEDIA

The Free Encyclopedia



English

6 326 000+ articles

日本語

1 275 000+ 記事

Deutsch

2 590 000+ Artikel

Français

2 340 000+ articles

Italiano

1 701 000+ voci

한국어

542 000+ 문서

Español

1 696 000+ artículos

Русский

1 734 000+ статей

中文

1 206 000+ 條目

Português

1 066 000+ artigos



Lily Kong

From Wikipedia, the free encyclopedia

Lily L.L. Kong PPA(P) is a Singaporean geographer and the current President of [Singapore Management University](#) (SMU). She is the first woman and the first Singaporean academic to helm a Singaporean university. Before joining SMU, she was a faculty member at the Department of Geography of the [National University of Singapore](#) (NUS) and had held various senior managerial positions at NUS.^{[1][2][3][4]}

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Career [edit]

Kong graduated in 1986 from the [National University of Singapore](#) (NUS) with a bachelor's degree (honours) and obtained a [M.A.](#) from NUS in 1988. She then went on to complete a [Ph.D.](#) at [University College London](#) in 1991.^[citation needed] A cultural geographer by

Professor
Lily L.L. Kong
PPA(P)
江莉莉 (Jiāng Lìlì)



Born Singapore
Nationality Singaporean
Occupation Geographer
Awards Public Administration Medal (Silver)

Academic background

Education Ph.D
Alma mater University College London
National University of Singapore

Four dimensions of gender inequality

Coverage bias: differences between the number of notable women and men portrayed on Wikipedia.

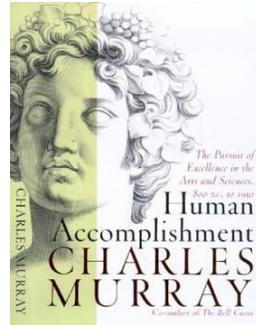
Structural bias: gender homophily in links, i.e. gender-specific tendencies to preferably link articles of notable people with the same or different gender.

Lexical bias: inequalities in the words used to describe notable men and women on Wikipedia.

Visibility bias: how many articles about men or women make it to the front page of Wikipedia.

Three reference datasets of notable people

 Freebase™

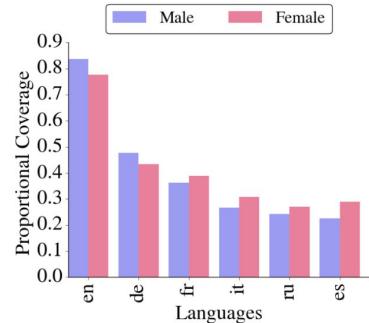


PANTHEON

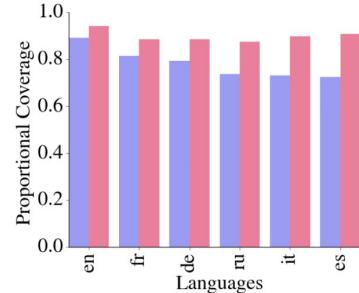
Total	109,481	4,002	11,341
Female	12,685	88	1,496
Male	96,796	3,914	9,845

No coverage bias (in terms of proportion)

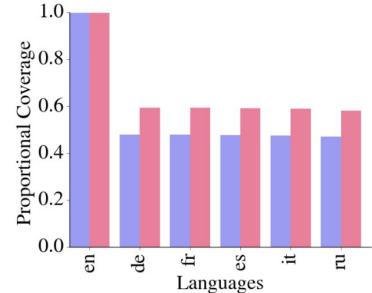
Surprisingly, in most language editions the proportion of notable women covered is slightly higher than the proportion of notable men.



(a) Freebase



(b) HA



(c) Pantheon

Effort of Wikipedians?



The screenshot shows a web page from the magazine 'nature'. At the top, there is a navigation bar with links for 'Explore content', 'Journal information', 'Publish with us', and 'Subscribe'. Below the navigation bar, the URL 'nature > career column > article' is displayed. The main headline is 'CAREER COLUMN | 14 August 2018' followed by the title 'Why we're editing women scientists onto Wikipedia'. A subtitle below the title reads 'And here's why you should, too, say Jess Wade and Maryam Zaringhalam.' The authors' names are in blue, indicating they are clickable links. At the bottom of the article preview, there are three social media sharing icons: Twitter, Facebook, and Email.

nature

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nature > career column > article

CAREER COLUMN | 14 August 2018

Why we're editing women scientists onto Wikipedia

And here's why you should, too, say Jess Wade and Maryam Zaringhalam.

Jess Wade & Maryam Zaringhalam

Structural bias

Articles about women tend to link more to articles about men than the opposite.

In some language editions like the English, the Russian and the German one, men are always significantly more central than women.

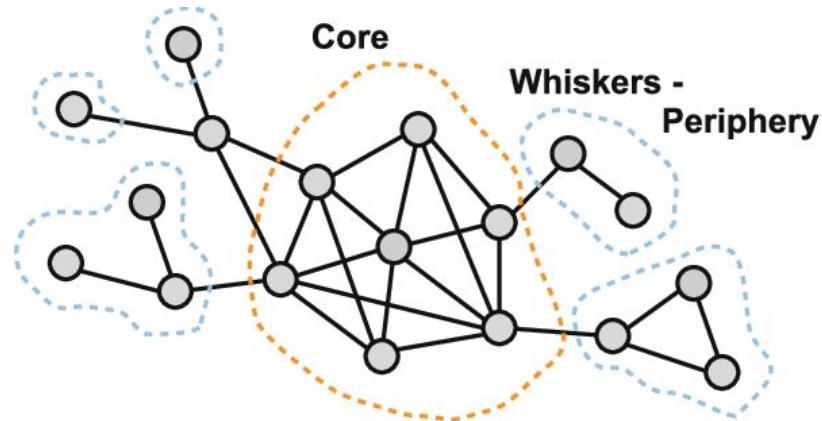


Image is for understanding the concept of core-peripheral structures: Papadopoulos, Symeon, et al. "Community detection in social media." Data Mining and Knowledge Discovery 24.3 (2012): 515-554.

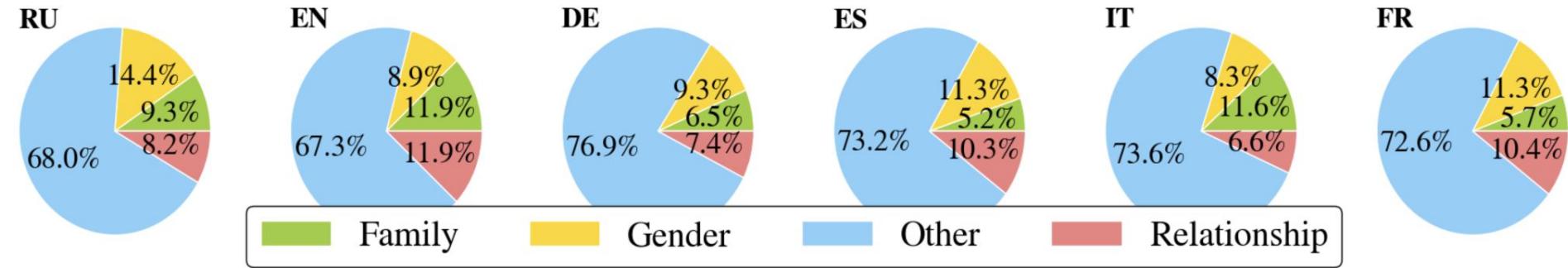
Lexical bias: focusing on three categories

Gender category contains words that emphasize that someone is a man or woman (i.e., man, women, mrs, mrs, lady, gentleman)

Relationship category consists of words about romantic relationships (e.g., married, divorced, couple, husband, wife)

Family category aggregates words about family relations (e.g., kids, children, mother, grandmother).

Men and women are presented differently



(a) Proportion of the 150 most discriminative words for women per category

In all language editions between 32% and 23% of the 150 most indicative words for women belong to one of the three categories, while only between 0% and 4% of the most discriminative words for men belong to one of these categories.

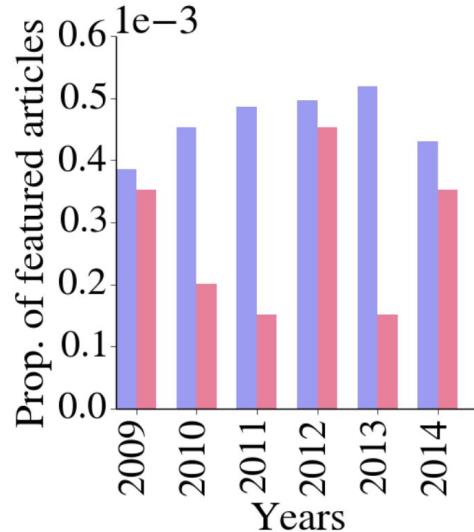
Concept of “null gender”

There is a social bias to assume male as the standard gender in certain social situations.

Male-defining words are not necessary because the context already defines the gender of the person the article talks about.

No visibility bias (insignificant differences)

Selection procedure of featured articles of the Wikipedia community does not suffer from gender bias.



Presentation bias is repeatedly observed

Name	Wikipedia Description
Loretta Young (F)	<p>Career: In 1930, when she was 17, she eloped with 26-year-old actor Grant Withers; they were married in Yuma, Arizona. The marriage was annulled the next year, just as their second movie together (ironically entitled Too Young to Marry) was released .</p>
Grant Withers (M)	<p>Personal Life: In 1930, at 26, he eloped to Yuma, Arizona with 17-year-old actress Loretta Young. The marriage ended in annulment in 1931 just as their second movie together, titled Too Young to Marry, was released .</p>

Personal life of females are written in Career

Occupation	Events in Female Career Description	Events in Male Career Description
Writer	♦ divorce, ♦ marriage, involve, organize, ♦ wedding	argue, \oplus election, ▲ protest, rise, shoot
Acting	♦ divorce, ♦ wedding, guest, name, commit	support, ▲ arrest, ▲ war, ■ sue, trial
Comedian	♦ birth, eliminate, ♦ wedding, ♡ relocate, partner	enjoy, hear, cause, ● buy, conceive
Podcaster	♡ land, interview, portray, ♦ married, report	direct, ask, provide, continue, bring
Dancer	♦ married, ♦ marriage, ♡ depart, ♡ arrive, organize	drop, team, choreograph, explore break
Artist	paint, exhibit, include, ♡ return, teach	start, found, feature, award, begin
Chef	\oplus hire, △ meet, debut, eliminate, sign	include, focus, explore, award, ● raise
Musician	run, record, ♦ death, found, contribute	sign, direct, produce, premier, open

Annotations: ♦ Life ♡ Transportation \oplus Personell ▲ Conflict ■ Justice ● Transaction △ Con

Reflection

<https://smu.sg/IS457r3>