Where are the women? Mapping the gender job gap in Al

Women in Data Science and Al project

- Part of the Public Policy programme at The Alan Turing Institute
- Using research to inform concrete policy measures aimed at increasing the number of women in data science and AI

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Dr. Erin Young

Postdoctoral Research Fellow

DIGHUM: (Gender) Diversity and Inclusion in Digital Humanism - April 2021

The Alan Turing Institute

The Turing is the UK's national institute for data science and Al





















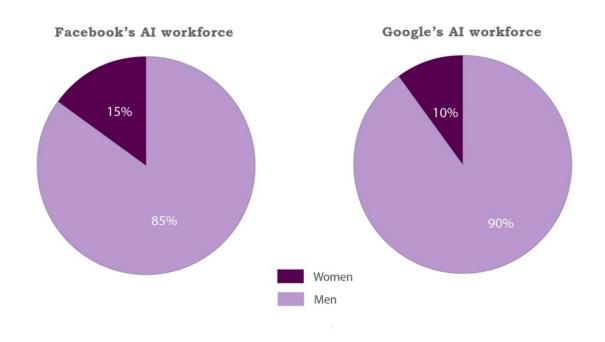








Women in AI: the existing numbers



Figures 3 and 4: Facebook's and Google's Al workforces, respectively. Sources: Company reported statistics, 2018 (see Simonite, 2018).

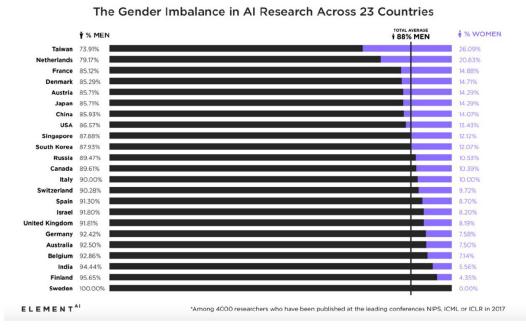


Figure 6: The Gender Imbalance in Al Research across 23 countries. Source: Estimating the Gender Ratio of Al Researchers Around the World (Mantha and Hudson, 2018).



Specialists had been building computer programs since 2014 to review résumés in an effort to automate the search process

✓ 174



Amazon's machine-learning specialists uncovered a big problem: their new

recruiting engine did not like women.

Apple Card Investigated After Gender **Discrimination Complaints**

The New Hork Times

A prominent software developer said on Twitter that the credit card was "sexist" against women applying for credit.

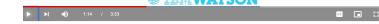


TIME CORONAVIRUS BRIEF YOUR QUESTIONS ANSWERED FINDING HOPE ENTERTAIN YOURSELF S NEWSLETTER

IDEAS • THE ART OF OPTIMISM

Artificial Intelligence Has a Problem With Gender and Racial Bias. Here's How to Solve It







Imitating humans, the Korean chatbot Luda was found to be racist and homophobic.













UK passport photo checker shows bias against dark-skinned women

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By Maryam Ahmed

O 7 October



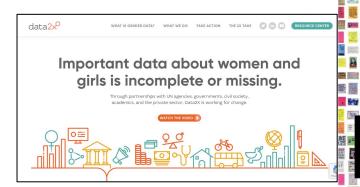




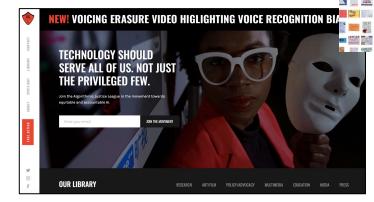
Research and activism

Sociological and historical literature

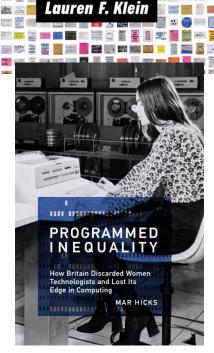
Technical studies



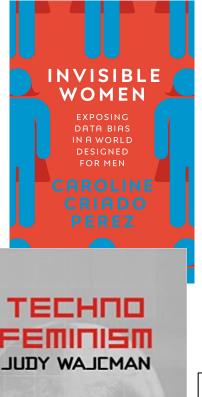
Data2x



Algorithmic Justice League



Catherine D'Ignazio and



FEMINISM JUDY WAJEMAN

An Intersectional Definition of Fairness

James R. Foulds, Rashidul Islam, Kamrun Naher Keva, Shimei Pan Department of Information Systems

University of Maryland, Baltimore County, USA {jfoulds, islam.rashidul, kkeya1, shimei}@umbc.edu

Abstract—We propose definitions of fairness in machine learning and artificial intelligence systems that are informed by the framework of intersectionality, a critical lens arising from the Humanities literature which analyzes how interlocking systems of power and oppression affect individuals along overlapping dimensions including gender, race, sexual orientation, class, and disability. We show that our criteria behave sensibly for any subset of the set of protected attributes, and we prove economic privacy, and generalization guarantees. We provide a learning algorithm which respects our intersectional fairness criteria. Case studies on census of dataset demonstrate

- 1) A critical analysis of the consequences of intersectionality in the particular context of fairness for AI.
- Three novel fairness metrics: differential fairness (DF) which aims to uphold intersectional fairness for AI and machine learning systems, DF bias amplification, a slightly more politically conservative fairness definition which measures the bias specifically introduced by an algorithm, and differential fairness with confounders which an alter outcome distributions (DFC).

The increasing

Lipstick on a Pig: Debiasing Methods Cover up Systematic Gender Biases in Word Embeddings But do not Remove Them

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¹Department of Computer Science, Bar-Ilan University ²Allen Institute for Artificial Intelligence {hilagnn,yoav.goldberg}@gmail.com

Abstract

Word embeddings are widely used in NLP for a vast range of tasks. It was shown that word embeddings derived from text corpora reflect gender biases in society. This phenomenon is pervasive and consistent across different word embedding models, causing serious concern. Several recent works tackle this problem, and propose methods for significantly reducing this gender bias in word embeddings, demonstrating convincing results lowever, we argue that this removal is super-

hiding the

swer the analogy "man is to computer programmer as woman is to x" with "x = homemaker". Caliskan et al. (2017) further demonstrate association between female/male names and groups of words stereotypically assigned to females/males (e.g. arts vs. science). In addition, they demonstrate that word embeddings reflect actual gender gaps in reality by showing the correlation between the gender association of occupation words and labor-force participation data.

Recently, some work has been done to reduce the gender bias in word embeddings, both as a post-processing step (Bolukbasi et al., 2016b) and as part of the training procedure (Zhao et al., 2018). Both works substantially reduce the bias with respect to the same definition: the projection on the gender direction (i.e. $\overrightarrow{he} - \overrightarrow{she}$), introduced

DISCRIMINATING SYSTEMS

Gender, Race, and Power in Al

Sarah Myers West, Al Now Institute, New York University
Meredith Whittaker, Al Now Institute, New York University, Google Open Research
Kate Crawford, Al Now Institute, New York University, Microsoft Research

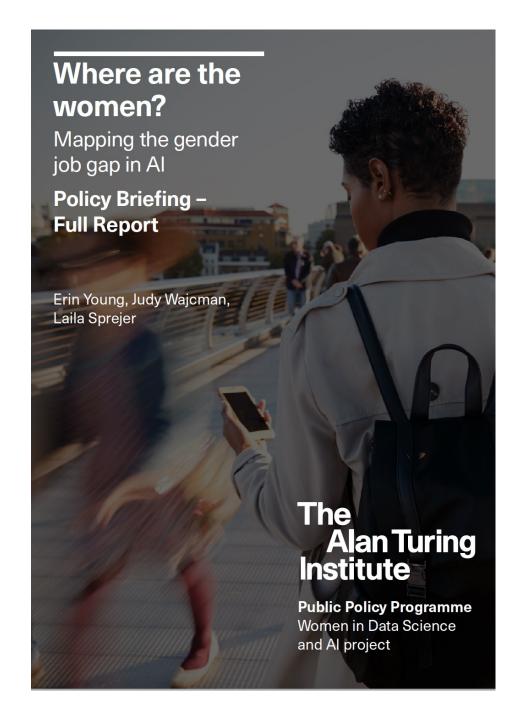
Cite as: West, S.M., Whittaker, M. and Crawford, K. (2019). Discriminating Systems: Gender, Race and Power in Al. Al Now Institute. Retrieved from https://ainowinstitute.or



We have broken down the problem into three interrelated research areas:

- 1. Mapping the participation of women in data science and AI in the UK (and globally)
- 2. Diversity and inclusion in workplace cultures
- 3. Bias in the design of Al







Mapping the gender job gap in AI: what did we find?

Diverging career trajectories

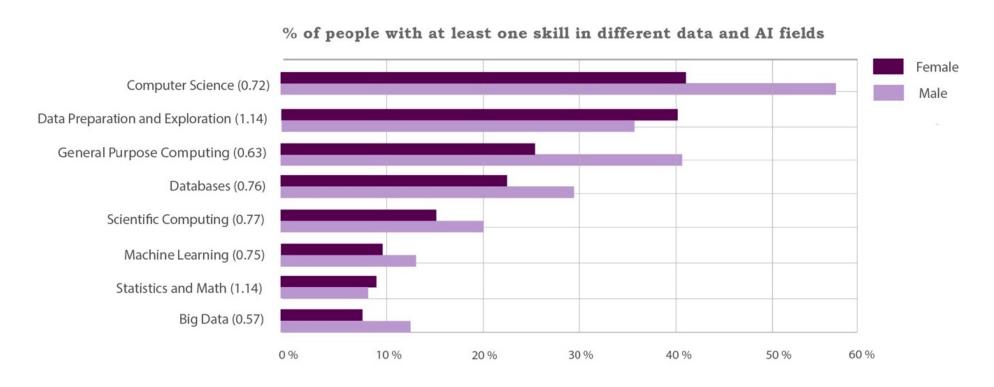
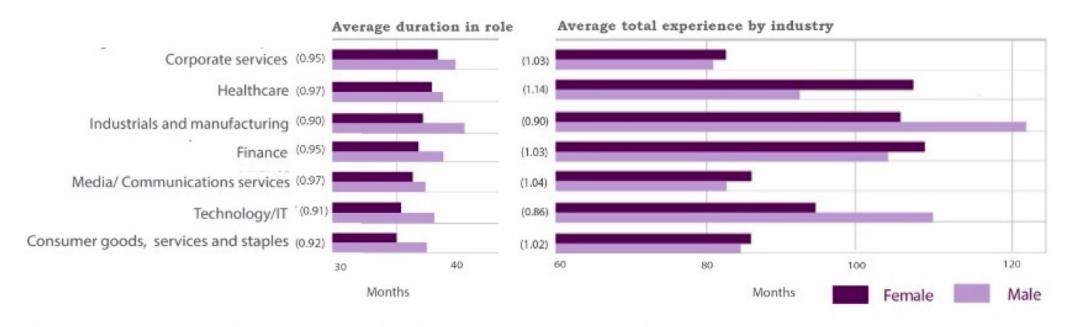


Figure 1: Percentage of people with at least one skill in different data and Al fields. Numbers in brackets represent the gender gap (female/male).

Mapping the gender job gap in Al: what did we find? (2)

Job turnover and attrition rates



Figures 17 and 18: Average duration in role by industry, and average total experience in industry by gender, respectively.

Mapping the gender job gap in AI: what did we find? (3)

Industry differences



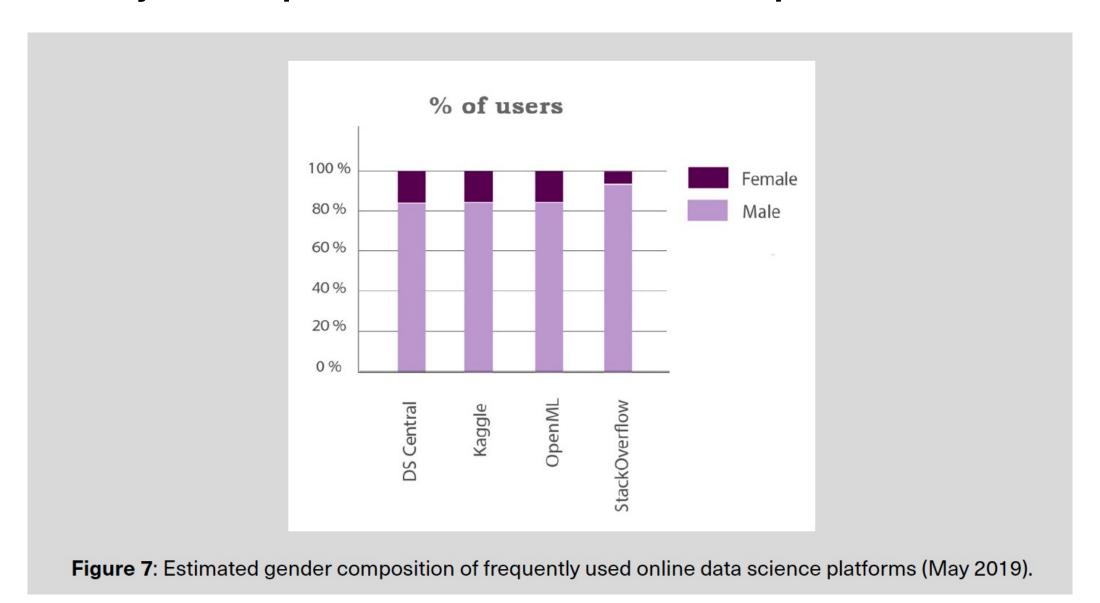
Self-reported skills



The qualification gap



Case Study: Participation in online Data Science platforms



(Some) Policy Recommendations

The world's tech companies must improve their level of **reporting regarding diversity** and inclusion.

They must also mandate **responsible gender-sensitive design** and implementation of data science research and machine learning.

Countries need to take proactive steps to ensure the **inclusion of women and marginalised groups** in the design and development of machine learning and Al technologies.

Companies in the tech sector must embed **intersectional gender mainstreaming** in human resources policy so that women and men are given equal access to well-paid jobs and careers.

Thank you!

Visit turing.ac.uk/WiDSAI to go to our project Hub

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DISCUSSION PAPER

THE DIGITAL REVOLUTION: Implications for Gender Equality and Women's Rights 25 Years after Beijing



No. 36. August 2020

JUDY WAJCMAN, ERIN YOUNG AND ANNA FITZMAURICE

