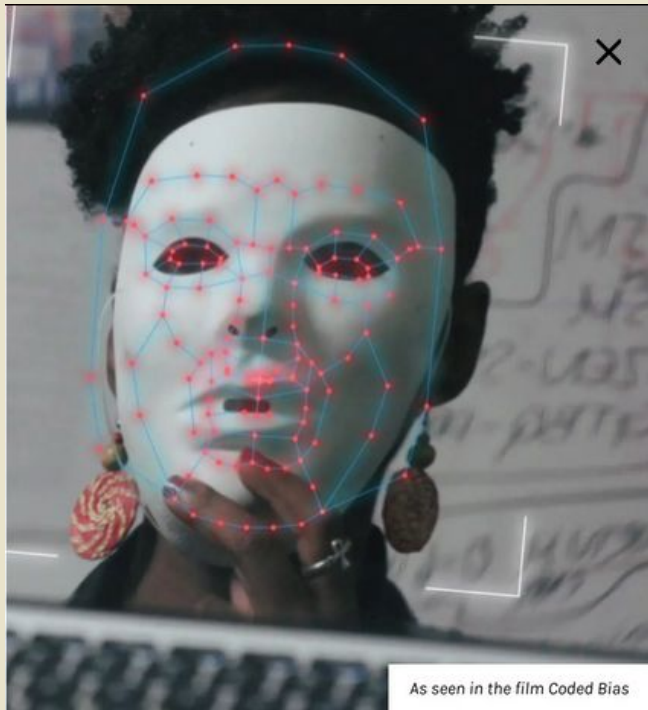
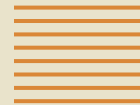


# How K-12 CS Teachers Conceptualize CS Ethics: Future Opportunities and Barriers to Ethics Integration in K-12 CS

Practicum research by  
Anne Drew Hu (they/them)

# Why Ethics in CS?

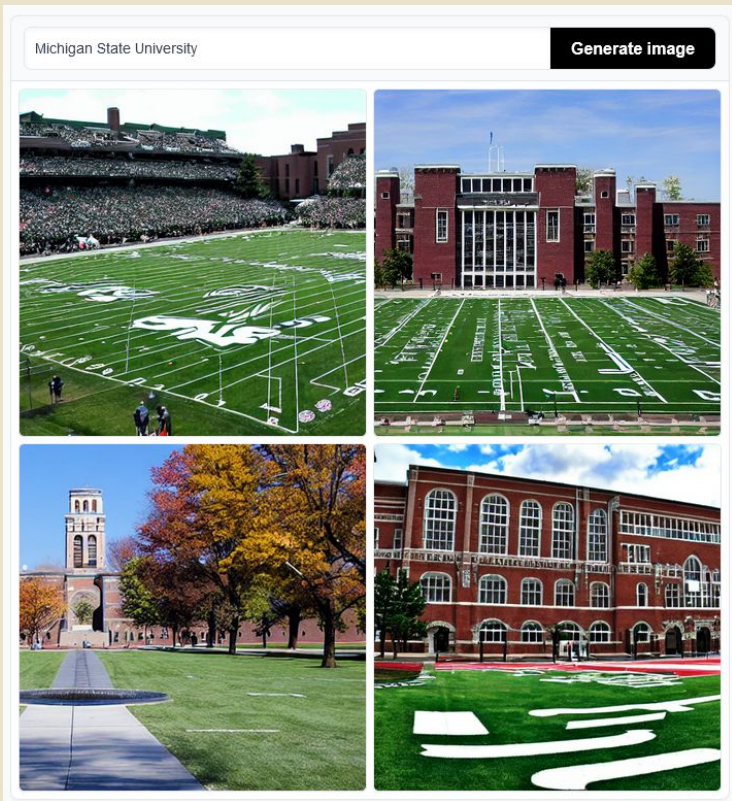


## *Wrongfully Accused by an Algorithm*

In what may be the first known case of its kind, a faulty facial recognition match led to a Michigan man's arrest for a crime he did not commit.



# Example: Image Generation



# Bias in Image Captioning

## Multimodal datasets: misogyny, pornography, and malignant stereotypes

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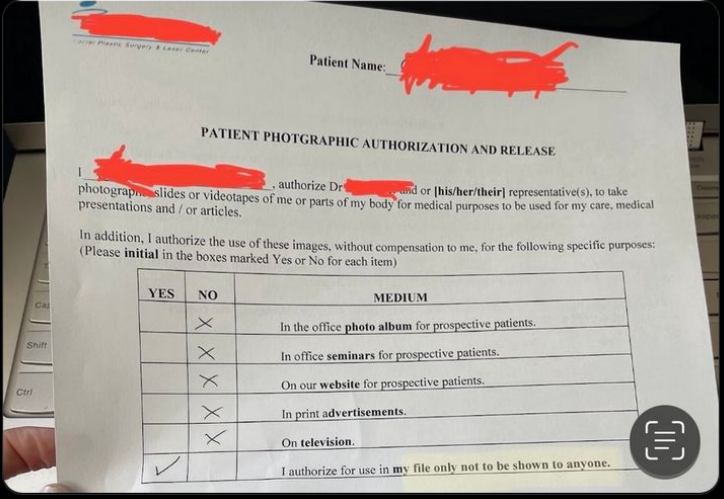


Figure 2: Results of the CLIP-experiments performed with the official portrait image (from 2012) of Barack Obama (the 44th President of the United States) where the conspiracy-theoretic textual descriptions obtains a cosine-similarity higher than 0.3

# Data Resistance

 **Lapine**  
@LapineDeLaTerre

▶ My face is in the #LAION dataset. In 2013 a doctor photographed my face as part of clinical documentation. He died in 2018 and somehow that image ended up somewhere online and then ended up in the dataset- the image that I signed a consent form for my doctor- not for a dataset.



Patient Name: \_\_\_\_\_

**PATIENT PHOTOGRAPHIC AUTHORIZATION AND RELEASE**

I, \_\_\_\_\_, authorize Dr. \_\_\_\_\_ and/or [his/her/their] representative(s), to take photographs, slides or videotapes of me or parts of my body for medical purposes to be used for my care, medical presentations and / or articles.

In addition, I authorize the use of these images, without compensation to me, for the following specific purposes:  
(Please **initial** in the boxes marked Yes or No for each item)

YES	NO	MEDIUM
	×	In the office <b>photo album</b> for prospective patients.
	×	In office <b>seminars</b> for prospective patients.
	×	On our <b>website</b> for prospective patients.
	×	In print <b>advertisements</b> .
	×	On <b>television</b> .
✓		I authorize for use in <b>my</b> file only not to be shown to anyone.

## Have I Been Trained?

Enter text or upload an image...



Search 5.8 billion images used to train popular AI art models



**Ethics is important for CS,  
so it's important for CS education**

# Prior Work


- CS ethics education research is mainly higher ed
  - ▶ Students rationalize unethical designs (Gray et al.)
  - ▶ CS ethics courses devalue humanities (Raji et al.)
  - ▶ Group deliberation helps students understand stakeholders (Shen et al.)
- Machine learning (ML) course for middle schoolers (Lee et al.)
- YouTube redesign with elementary schoolers (Ali et al.)



# Research Questions

RQ 1: How did K-12 CS teachers conceptualize CS ethics **before** and **after** being shown examples and big ideas of CS ethics?

RQ 2: What opportunities, barriers, and values do K-12 CS teachers see in integrating ethics into their CS classes?







# Interview Process

**#1**

Classroom context, preconceptions

**#2**

Introduce big ideas + examples

**#3**

Integrating ethics into their classroom



# “Big Ideas” in CS Ethics

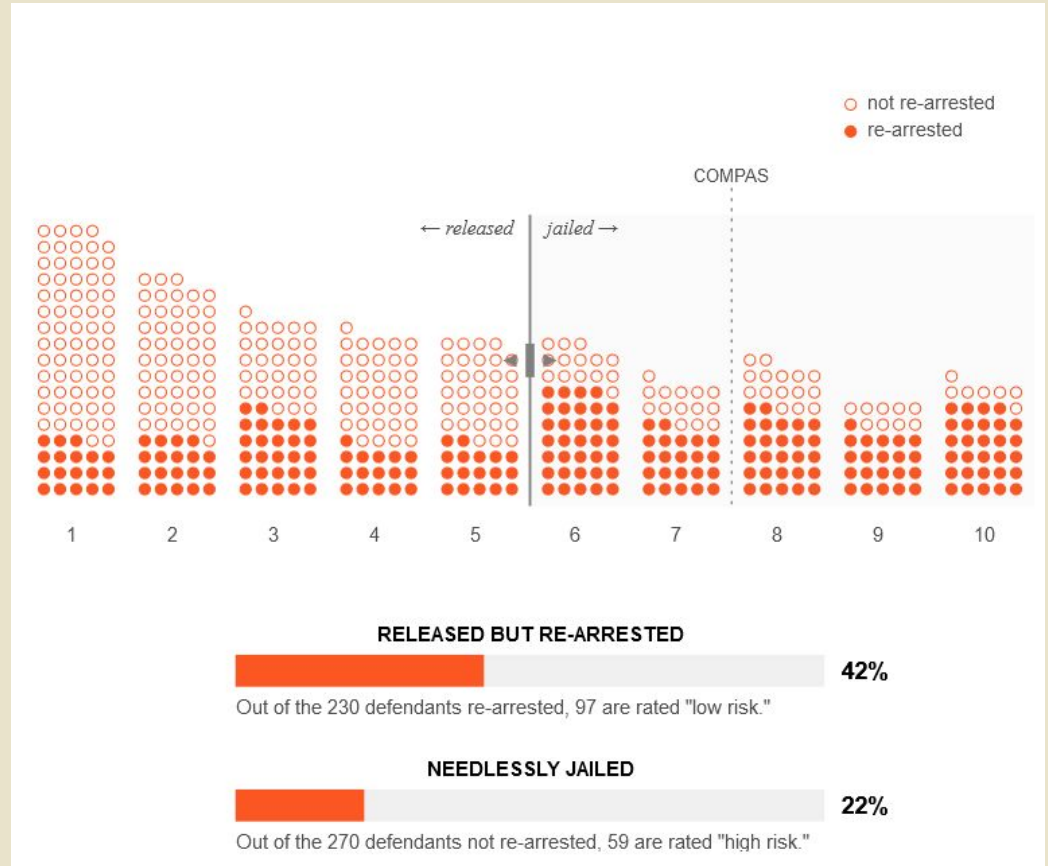
- Algorithmic Bias
  - ◀ Measurable difference in algorithmic output based on input group (e.g. race, gender)
- Algorithmic Injustice
  - ◀ Effect on society created by algorithmic bias
- Techno-solutionism
  - ◀ Myth that technology is neutral and ideal for solving social problems

The background features several abstract geometric elements: a large orange arc in the top left, a teal rectangle and orange rectangle overlapping it, a series of horizontal orange lines in the top right, a black circle partially inside a teal circle in the bottom left, and a vertical black bar, orange bar, and teal arc in the bottom right.

# Ethical Examples

# COMPAS

Risk assessment algorithm used in pre-trial detention decisions

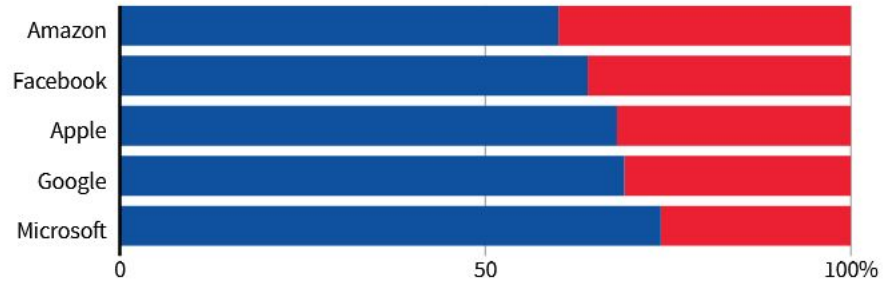


# Amazon Hiring

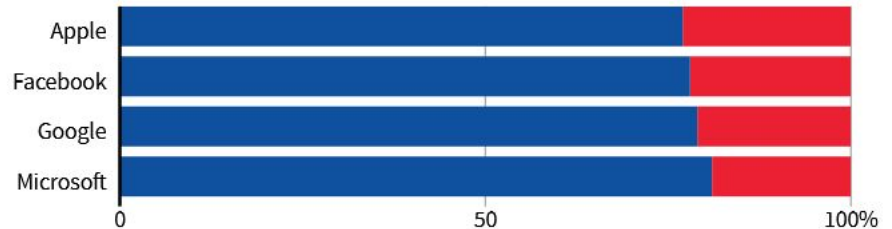
The algorithm Amazon created to rank resumes was biased against women

## GLOBAL HEADCOUNT

■ Male ■ Female



## EMPLOYEES IN TECHNICAL ROLES



# MiDAS

State run algorithm to detect unemployment fraud.

False positive rate of 93%

20-40k people affected

MICHIGAN

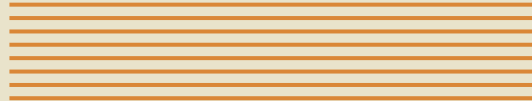
## Michigan residents falsely accused of jobless fraud can sue, Supreme Court says



**Paul Egan**

Detroit Free Press

Published 1:15 p.m. ET April 5, 2019 | Updated 4:23 p.m. ET April 5, 2019





# Findings & Excerpts

# Participants

Name	CS teaching years	Total teaching years	Race	Ages taught (years)	School context	Classes taught
Arnold	2 years	32 years	Black	10-18	Private Catholic school	Language Arts & Math STEM integration, Code.org CS Discoveries
Betty	1 year	20 years	Black	15-18	Majority Black public school	AP CS Principles (with TEALS volunteers), Intro to Python
Chuck	4 years	18 years	white	14-18	Majority white public school	AP CS A (with TEALS volunteers), CS Principles, Game design, Minecraft intro to CS
Daisy	10 years	24 years	white	5-14	Majority white charter school	Code.org elementary school courses. Cybersecurity
Edna	15 years	17 years	white	14-18	Racially diverse public school	Code.org AP CS Principles, TEALS intro to programming
Francine	4 years	17 years	white	12-14	Majority white public school	Code.org CS Discoveries

Table 1: List of teacher participants by pseudonym



# Pre-conceptions of CS ethics


- Malicious uses of technology
- Privacy (e.g. digital surveillance, profiling)
- Under-representation (e.g. gender, race)
- School appropriate use of technology
- Tech industry incentives (i.e. advertising, data collection)

# Excerpt: Privacy

Chuck: *“I mean some simple things like shopping, you know ad targeting... , but it was interesting [I] had a student in my class tell me that he had started a LinkedIn profile and based on some of the things he input, it was lumping him into a certain political affiliation”*



# Post-conceptions of CS ethics

- Lack of humanity in algorithms
  - ...but humans aren't perfect either!
  - Personal experiences with algorithmic bias
  - Technology reifies existing injustices
  - Lack of accountability
- 

# Excerpt: Lack of Humanity

Daisy: *“I think when when they are in front of a judge explaining to them why they think they should be released... I think that would come across much better than a multiple choice test.”*

Francine: *“as a former victim of domestic abuse I’m looking at that that released and it’s like I don’t care how well he answered on everything.”*

# Opportunities and Barriers

## ■ Opportunities

- ◀ Interdisciplinary CS
- ◀ Discussing ethics examples in class
- ◀ Ethics curricula
- ◀ Expanded vocabulary

## ■ Barriers

- ◀ Time constraints
- ◀ CS not prioritized by admin


# Excerpt: Opportunities/Barriers

Betty: *“I now realize there’s many more components than I was originally thinking”*

Betty said that her CS class was treated as a *“dumping ground”* for students who need an elective




# Values

- Supporting your community
  - Competing economically
  - Fear of algorithmic harm
  - Accountability
  - Democratic citizenship
- 



# Excerpt: Values

Chuck: *“I mean I don’t know if there’s anybody in Congress that really has a good understanding of [how social media algorithms work] I guess I’m just thinking you know CS literacy in general is important.”*





# Discussion

- Teachers saw CS ethics as digital citizenship
- Digital citizenship could be a vehicle for ethics
  - ◀ There's been a large push for digital citizenship
  - ◀ Moving from an individual to a societal level

# Future Work

- Co-design K-12 CS ethics lessons
- Pilot study implementing K-12 CS ethics lessons
- Tinker with tools to help students comprehend and resist unethical tech

