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FLORIDA'S STEM UNIVERSITY

# Face Quality As a Gate for Launching Forensic Searches

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**(Research in collaboration with Dr. Kevin Bowyer, University of Notre Dame)**

**EAB/NIST FACE IMAGE QUALITY WORKSHOP (Virtual) Date: November 07, 2023**

# This talk is

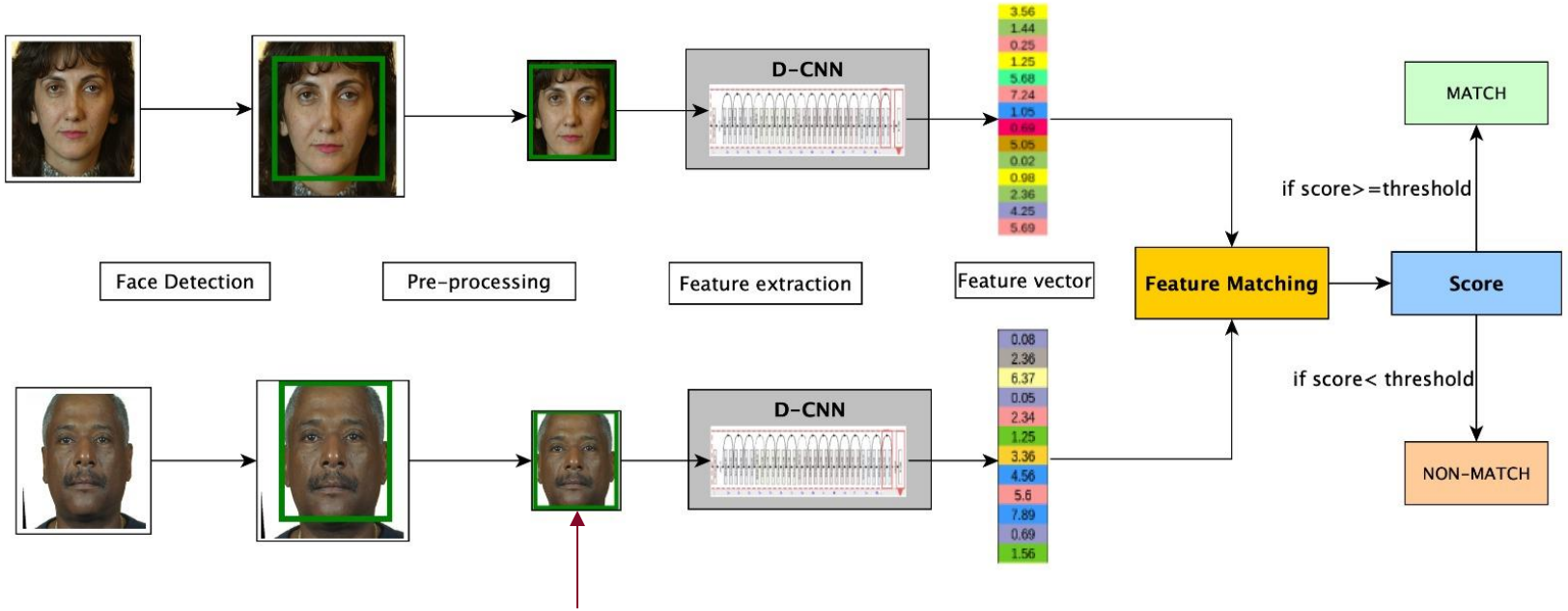
- Not to bash the technology
- Not an anti law enforcement message
- Is a request the we implement stronger safeguards on what data gets processed by an AFR engine for low level crimes.

# Two Common Statements on AFR (1st)

- “With good quality portrait photos, the most accurate algorithms will find matching entries, when present, in galleries containing 12 million individuals, with rank one miss rates of approaching 0.1%.” [NIST FRVT 1:N Report]

https://pages.nist.gov/frvt/reports/1N/frvt_1N_report.pdf

# DCNN FR Model/Process




Note the input resolution is usually about 112x112

# Two Common Statements on AFR (2nd)

- "Facial recognition systems misidentify Black faces at a high rate. Facial recognition is less accurate in identifying people with darker skin tones—especially women. This can result in the misidentification of Black protesters or false positive matches in image databases." [Amnesty International]

https://www.amnesty.ca/surveillance/racial-bias-in-facial-recognition-algorithms/#:~:text=Facial%20recognition%20systems%20misidentify%20Black,positive%20matches%20in%20image%20databases.

# Publicity about face recognition "bias"

The New York Times | TECHNOLOGY | Wrongfully Accused by an Algorithm

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## He spent 10 days in jail after facial recognition software led to the arrest of the wrong man, lawsuit says

Updated Dec 29, 2020; Posted Dec 28, 2020

Nijeer Parks, 33, of Paterson. Photo courtesy of Daniel Sexton

MICHIGAN STATE POLICE

# INVESTIGATIVE LEAD REPORT

LAW ENFORCEMENT SENSITIVE

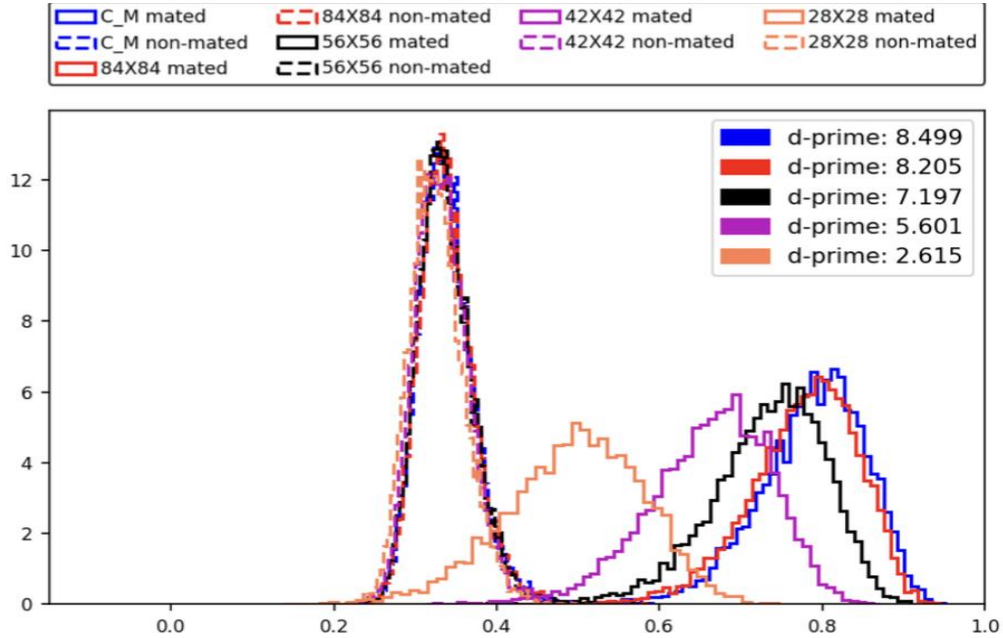
**THIS DOCUMENT IS NOT A POSITIVE IDENTIFICATION. IT IS AN INVESTIGATIVE LEAD ONLY AND IS NOT PROBABLE CAUSE TO ARREST. FURTHER INVESTIGATION IS NEEDED TO DEVELOP PROBABLE CAUSE TO ARREST.**

| | |
|---|---|
| BID DIA Identifier: BID-39641-19 | Requester: CA Yager, Rathe |
| Date Searched: 03/11/2019 | Requesting Agency: Detroit Police Department |
| Digital Image Examiner: | Case Number: 1810050167<br>File Class/Crime Type: 3000 |

| Probe Image | Investigative Lead |
|---|---|
|  |  |


# Probe Resolution Impacts Accuracy

**As the resolution decreases, the mated scores decrease and get closer to non-mated**




Bhatta, A., Pangelinan, G., King, M. C., & Bowyer, K. W. (2023). Demographic Disparities in 1-to-Many Facial Identification. *ArXiv*. /abs/2309.04447

# Probe Photo in Nijeer Parks Case

- Scan of fake driver's license dropped at scene saved as pdf doc.
- AFR Probe image was derived from PDF document.

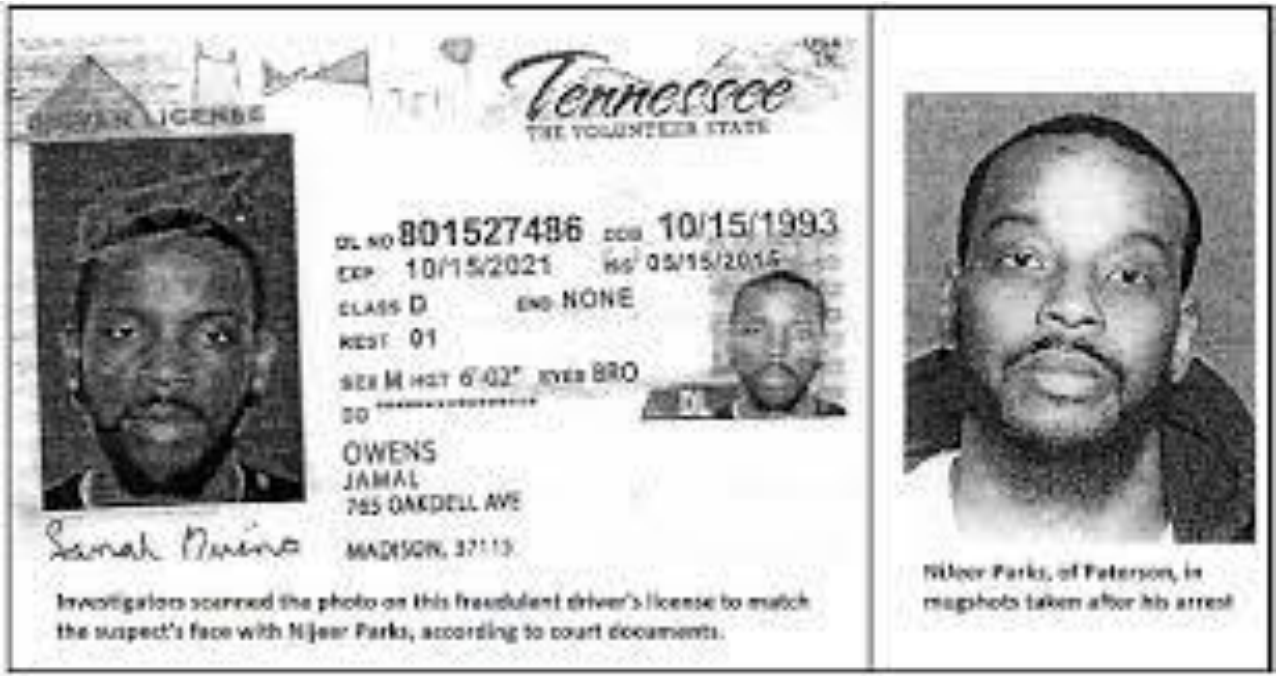



Image source: https://dagblog.com/reader-blogs/arrested-and-jailed-based-faulty-facial-recognition-software-33456

**Probe Images**

# My Face Compared to Images in Morph (Top 10). I am not in the dataset)

**Probe Image**

(0.3388)

(0.3325)

(0.3290)

(0.2997)

(0.2957)

(0.2927)

(0.2923)

(0.2890)

(0.2887)

(0.2840)

Scores above 0.7 are a likely match

# My Face Compared to Images in Morph (Top 10). I am not in the dataset)

**Probe Image**

Scores above 0.7 a likely match

(0.3744)

(0.3722)

(0.3463)

(0.3387)

(0.3351)

(0.3327)

(0.3295)

(0.3293)

(0.3291)

(0.3286)

# Key Messages

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- Without a doubt, automated face recognition technology is highly accurate
- Demographic differentials in accuracy are also an issue (more of an issue for some algorithms than others.)
- For the investigative lead use-case, the error rate using top performing algorithms should be nearly the same for each demographic. (with caveats: such as size/composition of the gallery, number of searches performed, etc.)
- Rejecting poor quality probe images in low-level criminal searches may be necessary to prevent wrongful arrests
- Continue to correct the narrative: ”leads” versus “hits” or “matches”

# What's My Skin Tone?



Color: 10-Walnut (Sephora)
*"deep with neutral undertones"*
September 29th, 2019


Lancôme, Chicago, Il; October 26th, 2019

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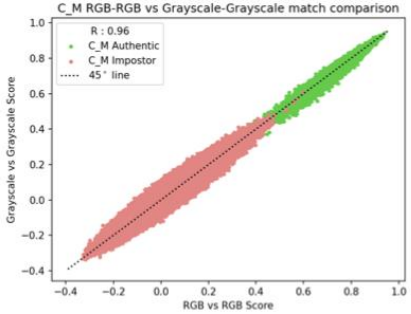
# The CHRoMA-FIT Dataset:

## Characterizing Human Ranges of MelAnin For Increased Tone-awareness

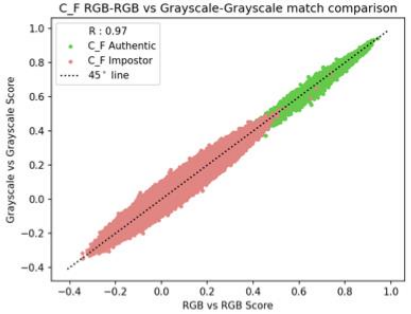
Florida Tech Identity Lab Team in Collaboration with the University of Houston, University of Miami, and New Mexico State University

# Our Deep CNN Face Matchers Have Developed Achromatopsia

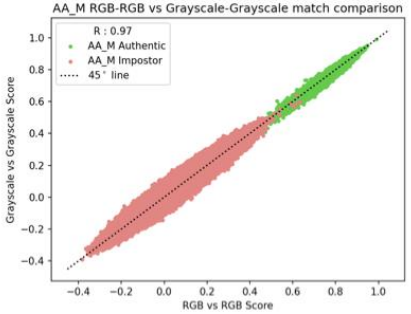
*scatter plots of similarity scores from color-trained matcher*



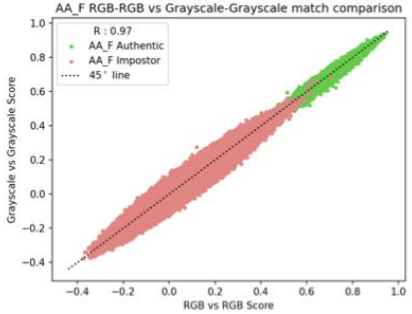

(a) Caucasian Male




(b) Caucasian Female




(c) African-American Male




(d) African-American Female

*similarity score on X axis*

*similarity score on Y axis*

*https://arxiv.org/pdf/2309.05180.pdf*

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***Thank you for your attention.***

***Questions ?***

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