

# Face Recognition Technology

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A Forensic Without the Science

NACDL Fourth Amendment Center

[cgarvie@nacdl.org](mailto:cgarvie@nacdl.org)



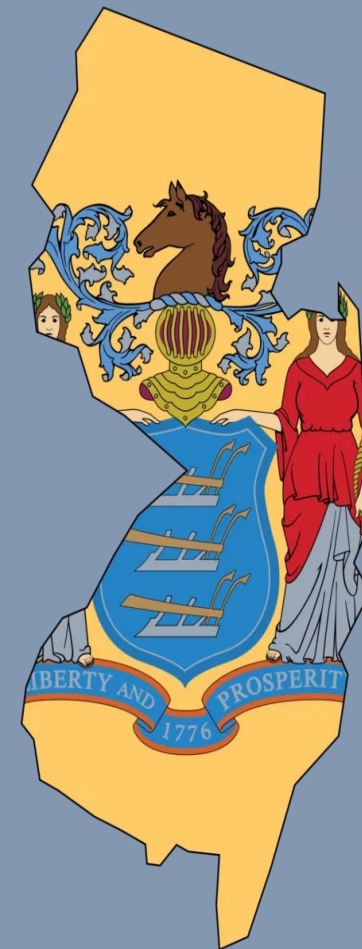
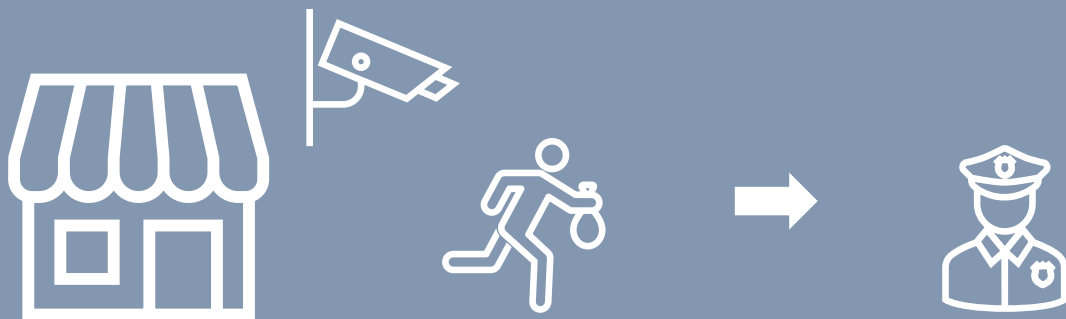


## ***New Jersey v. Arteaga, No. A-3078-21 (2023)***



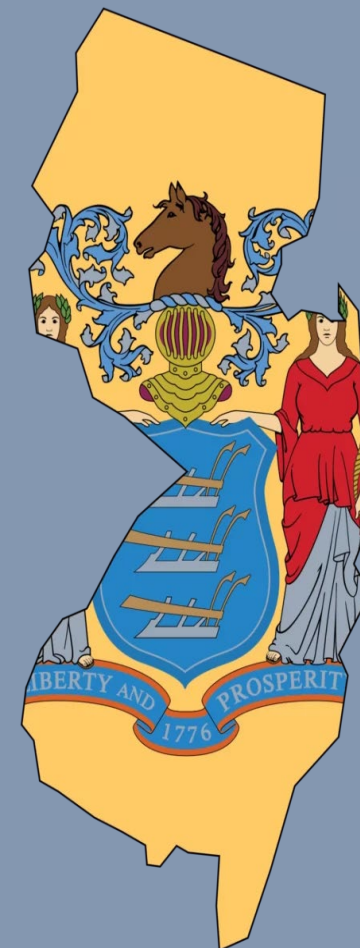


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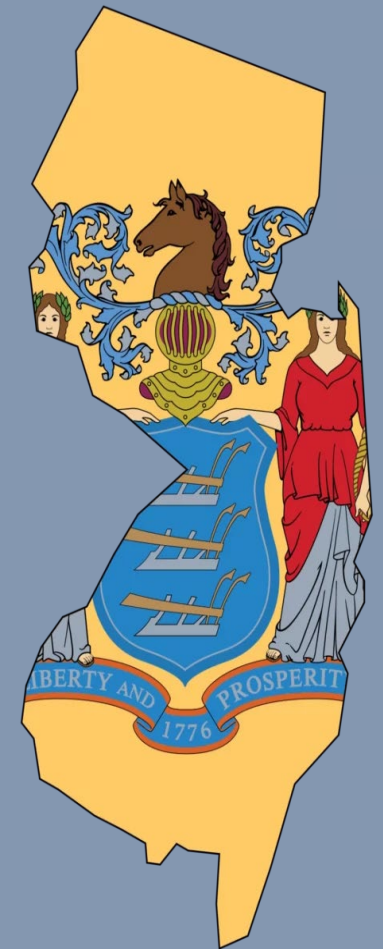


## *New Jersey v. Arteaga, No. A-3078-21 (2023)*





## *New Jersey v. Arteaga*, No. A-3078-21 (2023)





# New Jersey v. Arteaga, No. A-3078-21 (2023)

FILED, Clerk of the Appellate Division, May 23, 2022, AM-000567-21, M-005141-21, AMENDED  
REAL TIME CRIME CENTER – FACIAL IDENTIFICATION SECTION



## FACIAL IDENTIFICATION SECTION SEARCH RESULT REPORT



### POSSIBLE MATCH

THIS IS NOT A POSITIVE IDENTIFICATION AND IS NOT PROBABLE CAUSE TO ARREST, MERELY A LEAD. FURTHER INVESTIGATION IS NEEDED TO DEVELOP PROBABLE CAUSE TO ARREST.

IMAGE SUBMITTED	FIS POSSIBLE MATCH CANDIDATE
	
	FRANCISCO ARTEAGA NYSID # 01529992.J
INCIDENT IDENTIFIERS	

## Facial Identification Section Search Result Report

### POSSIBLE MATCH

“This is not a positive identification and is not probable cause to arrest, merely a lead. Further investigation is needed to develop probable cause to arrest.”





16 12 4

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.

DIA Identifier: BID-39641-19

Requester: CA X...



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## *New Jersey v. Arteaga, No. A-3078-21 (2023)*

*“Further investigation is needed to develop probable cause to arrest.”*

- Photo arrays for 2x witnesses each select Defendant
- Trial court:
  - ID procedure = Fine
  - Brady material = Nope
- Appellate court: not so fast...







*...and face recognition more broadly*

1. Is this a reliable ID method?
2. When do we meet the PC threshold?
3. Is the defense entitled to info about how the face recognition search was run (investigative tool v. ID procedure)?







# 1. How reliable is this technique?

NEWS

## Innocent Black Man Jailed After Facial Recognition Got It Wrong, His Lawyer Says

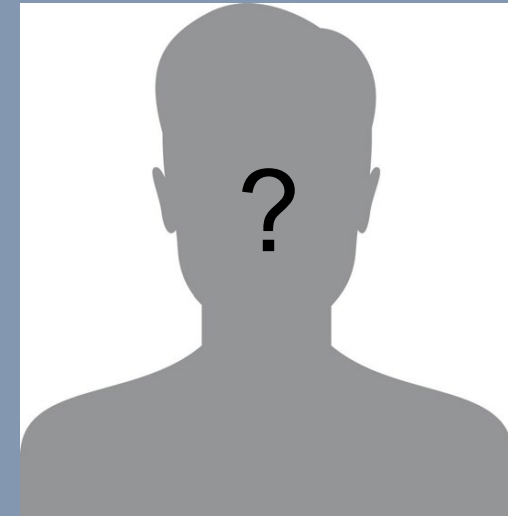
An algorithm sent a Black man to jail in Louisiana, a state he'd never visited, according to his lawyer. Experts say he won't be the last.

KHARI JOHNSON

BUSINESS FEB 28, 2023 7:00 AM

## Face Recognition Software Led to His Arrest. It Was Dead Wrong

Alonzo Sawyer's misidentification by algorithm made him a suspect for a crime police now say was committed by someone else—feeding debate over regulation.





# 1. How reliable is this technique?



## *Robert Williams*

- Non-witness performs video / photo array comparison
- Robert Williams wrongfully arrested



## 1. How reliable is this technique?

### *Porcha Woodruff*

- Eyewitness erroneously selects Porcha Woodruff's 7+ year old mugshot from a six-pack
- She was 8 months pregnant at the time







## 1. How reliable is this technique?



### *Nijeer Parks*

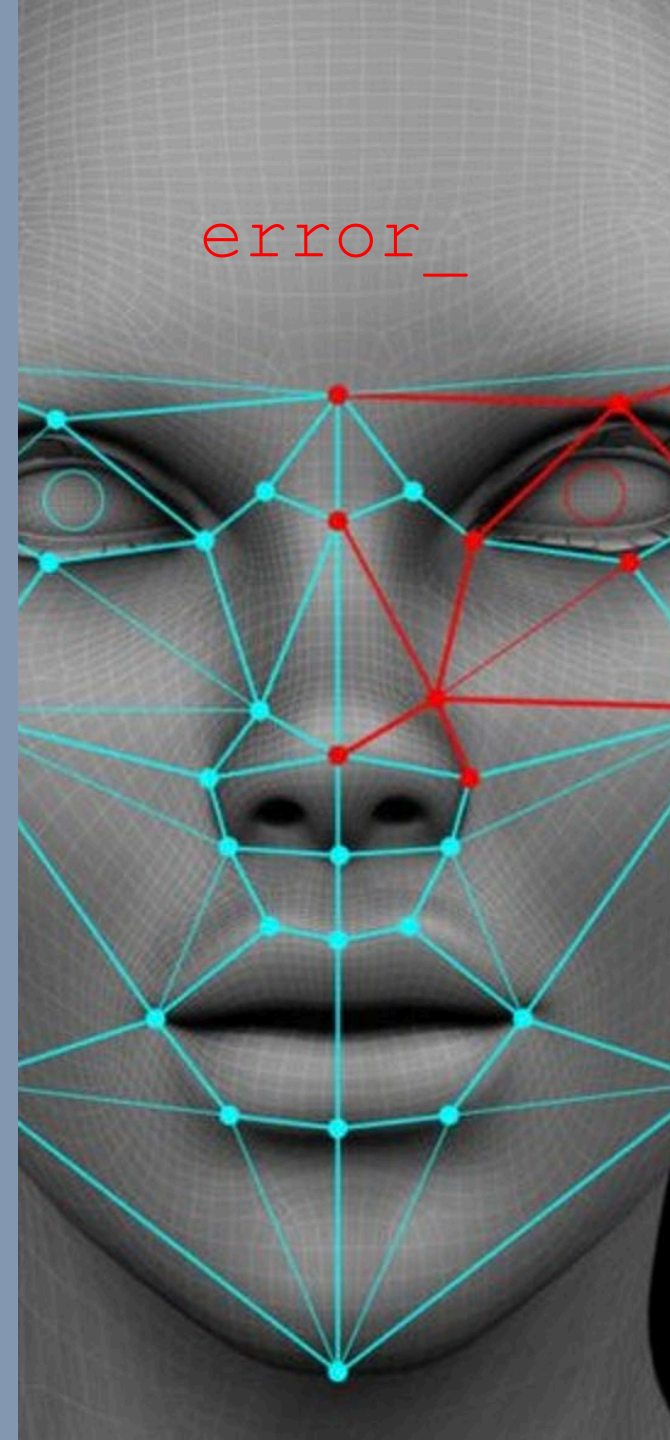
- Non-witness officer makes “visual comparison” and positive ID determination
- *“I knew I didn’t do it, but it’s like, I got a chance to be home, spending time with my son, or a got a chance to come home and he’s a grown man and might have his own son.”*





# 1. How reliable is this technique?

*Answer: ...?*





## A Forensic... Without the Science

2009 Nat. Research Council

2016 PCAST Report

- Subjective feature comparison method
- Empirical testing under operational conditions
- *“Without estimates of accuracy, an examiner’s statement that two samples are similar ... is scientifically meaningless; **it has no probative value.**”*

## STRENGTHENING FORENSIC SCIENCE IN THE UNITED STATES

A PATH FORWARD



### REPORT TO THE PRESIDENT Forensic Science in Criminal Courts: Ensuring Scientific Validity of Feature-Comparison Methods

Executive Office of the President  
President’s Council of Advisors on  
Science and Technology

September 2016





## A Forensic... Without the Science



# FaceMe® Highly Accurate, Tested by NIST

National Institute of Standard & Technology, NIST

**CyberLink**

VISA  
FMR: 1E-4

TAR **99.70%**

VISA  
FMR: 1E-6

TAR **98.95%**

VISA Border  
FMR: 1E-6

TAR **99.06%**

WILD  
FMR: 1E-4

TAR **97.17%**

With FaceMe®, CyberLink is ranked **18<sup>th</sup>** globally and ranked **8<sup>th</sup>** if China & Russia vendors are excluded in NIST FRVT 1:1 in March, 2020.

Source: NIST Facial Recognition Vendor Test 1:1, March 25, 2020





## A Forensic... Without the Science

### *Five Step Search Process*

1. Sourcing a probe photo
2. Selecting a database
3. Photo “preprocessing”
4. Algorithmic search
5. Candidate review







# A Forensic... Without the Science

## *Five Step Search Process*

1. Sourcing a probe photo
2. Selecting a database
3. Photo “preprocessing”
4. Algorithmic search
5. Candidate review

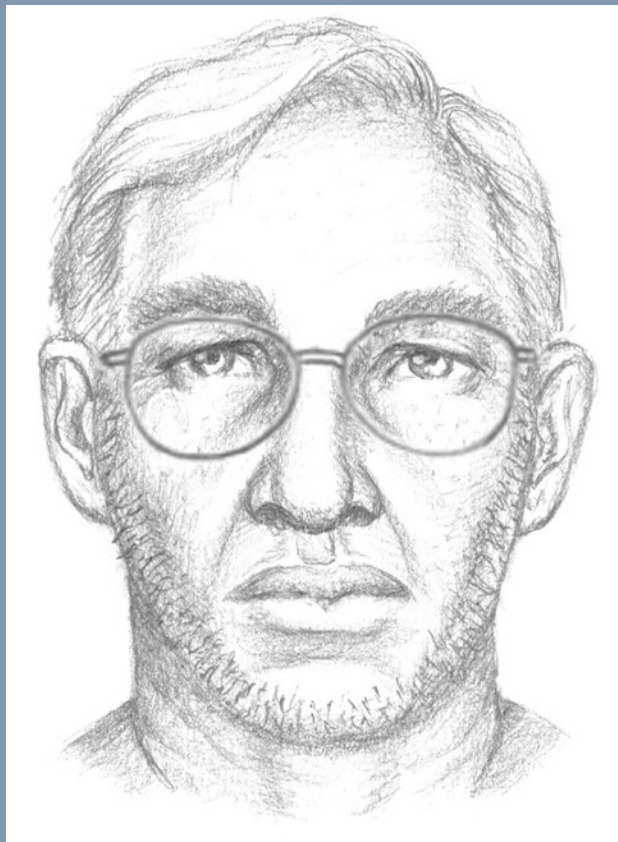
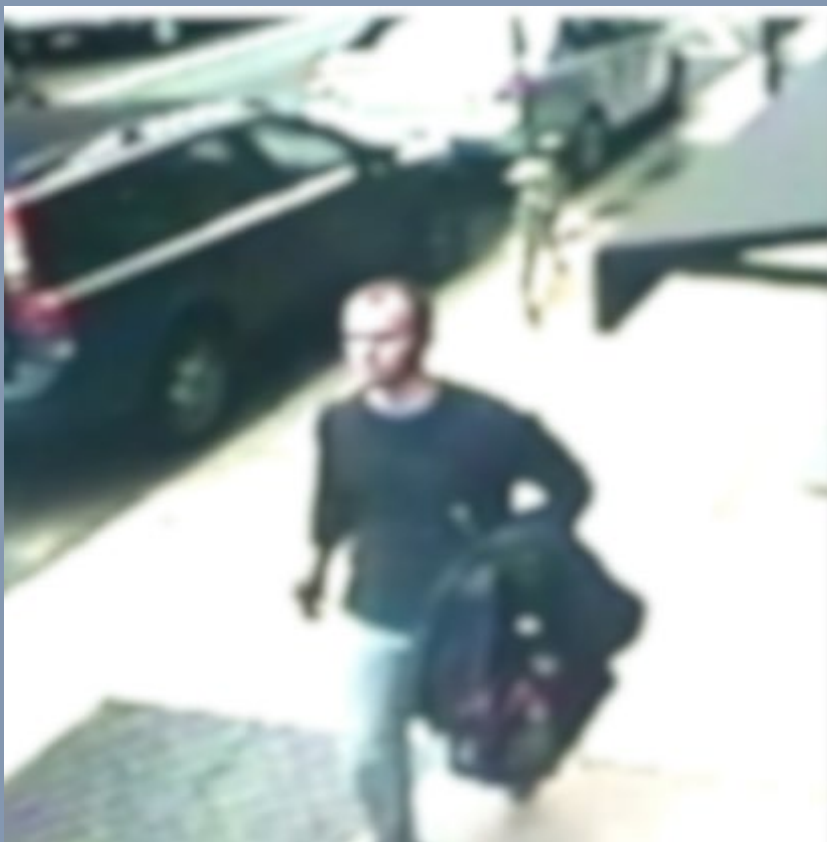




# 1. Sourcing the Probe Photo



# 1. Sourcing the Probe Photo






# 1. Sourcing the Probe Photo

**REAL TIME CRIME CENTER**


**Facial Identification Section**  
**Celebrity Comparison**

POLICE DEPARTMENT CITY OF NEW YORK | DETECTIVE BUREAU | POLICE DEPARTMENT CITY OF NEW YORK  
Wanted Flyer # 00479648

**WANTED FOR PETT LARCENY**



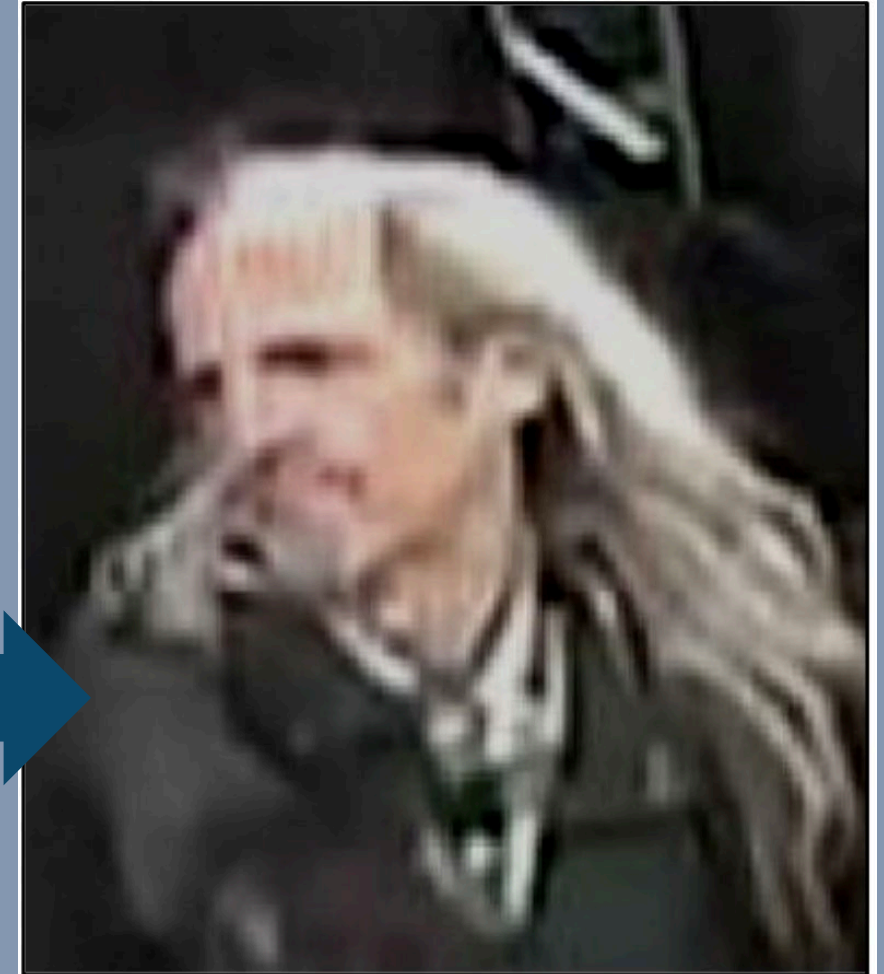
On April 20th, 2017, at approximately 0448hrs, the above male white entered CVS located at 253 1 Avenue and proceeded to take beer from the aisle without permission nor authority and forder exited without paying for said item.



- ❖ Suspect was wanted for Larceny in the confines of the 13 Pct.
- ❖ Complainant provided the 13 Pct. Detectives with a photo from video surveillance from location.
- ❖ Image from video resulted in negative results utilizing facial recognition software.

ONE POLICE PLAZA

62






# 1. Sourcing the Probe Photo

**REAL TIME CRIME CENTER**

**Facial Identification Section**  
**Celebrity Comparison**


POLICE DEPARTMENT CITY OF NEW YORK  
 DETECTIVE BUREAU  
 Wanted Flyer # 00470648  
 POLICE DEPARTMENT CITY OF NEW YORK

**WANTED FOR PETT LARCENY**



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## 2. Selecting the Database



## 2. Selecting the Database



**FBI NGI IPS: 640+ million photos**

- 20+ DMV databases
- 8 jurisdiction mugshots
- Visas, Passports
- DoD databases





## 2. Selecting the Database

### Clearview AI

- 30+ billion images
- Internet sources





### 3. Photo “preprocessing”

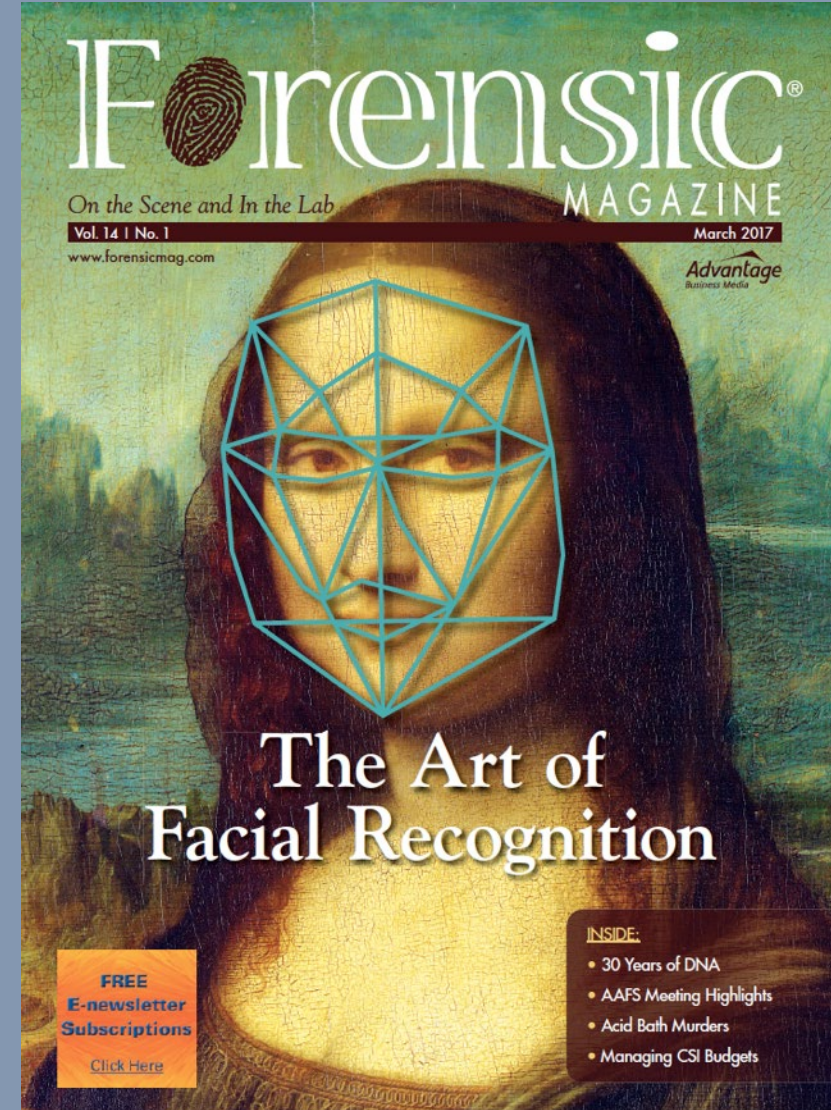


### 3. Photo “preprocessing”

“...the technique of **graphically replacing closed eyes with a set of open eyes** in a probe image has yielded hundreds if not thousands of returns.

This important yet simple enhancement technique changes the entire dynamic of the facial recognition search...

The color of the eyes doesn't even need to match.”







### 3. Photo “preprocessing”

- Removal of facial expression
- Insertion of eyes
- Mirrored effect on partial face
- Creating a virtual probe
- Using the Blur Effect
- 3D modeling

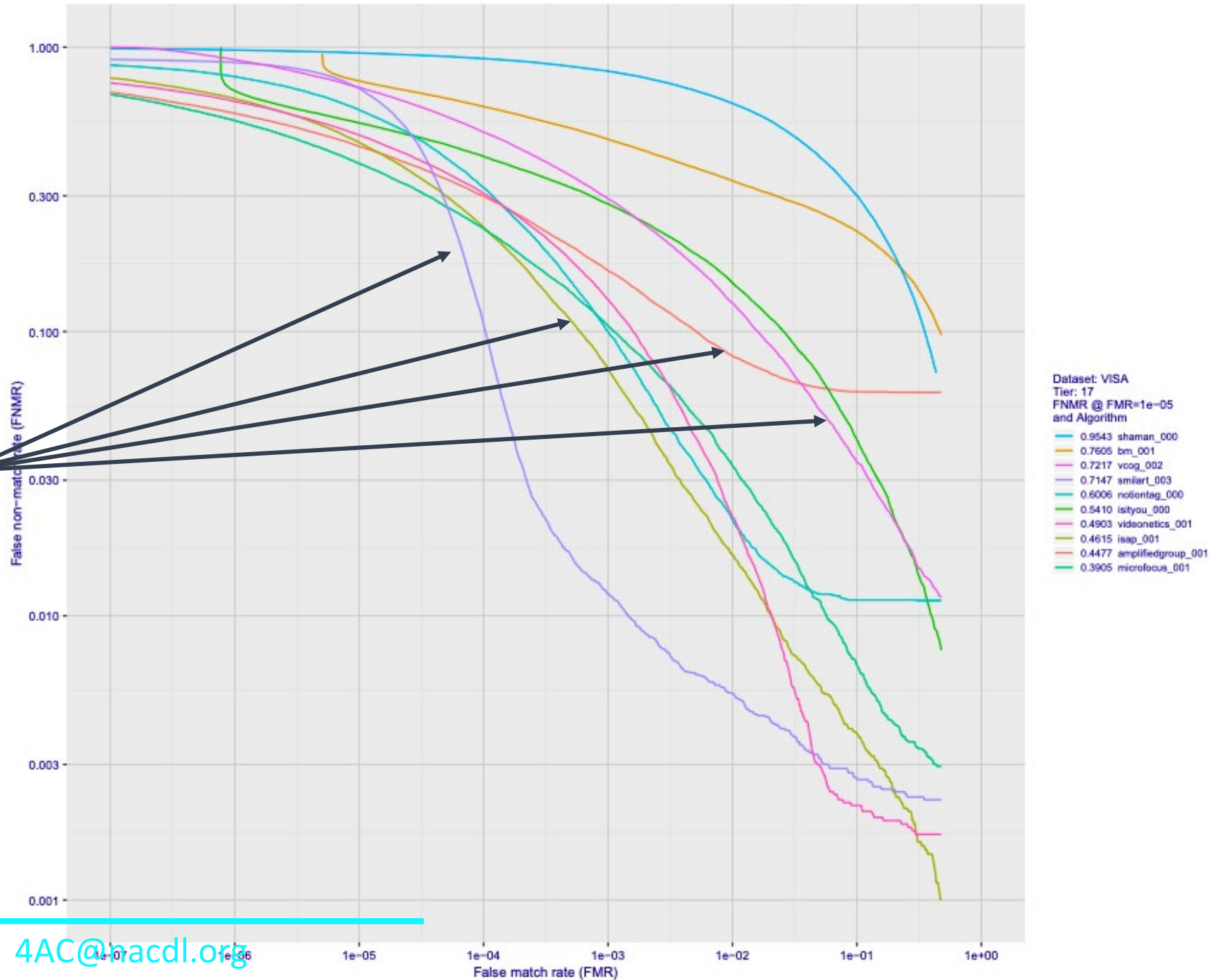




## 4. Algorithmic Search



Different algorithms perform differently



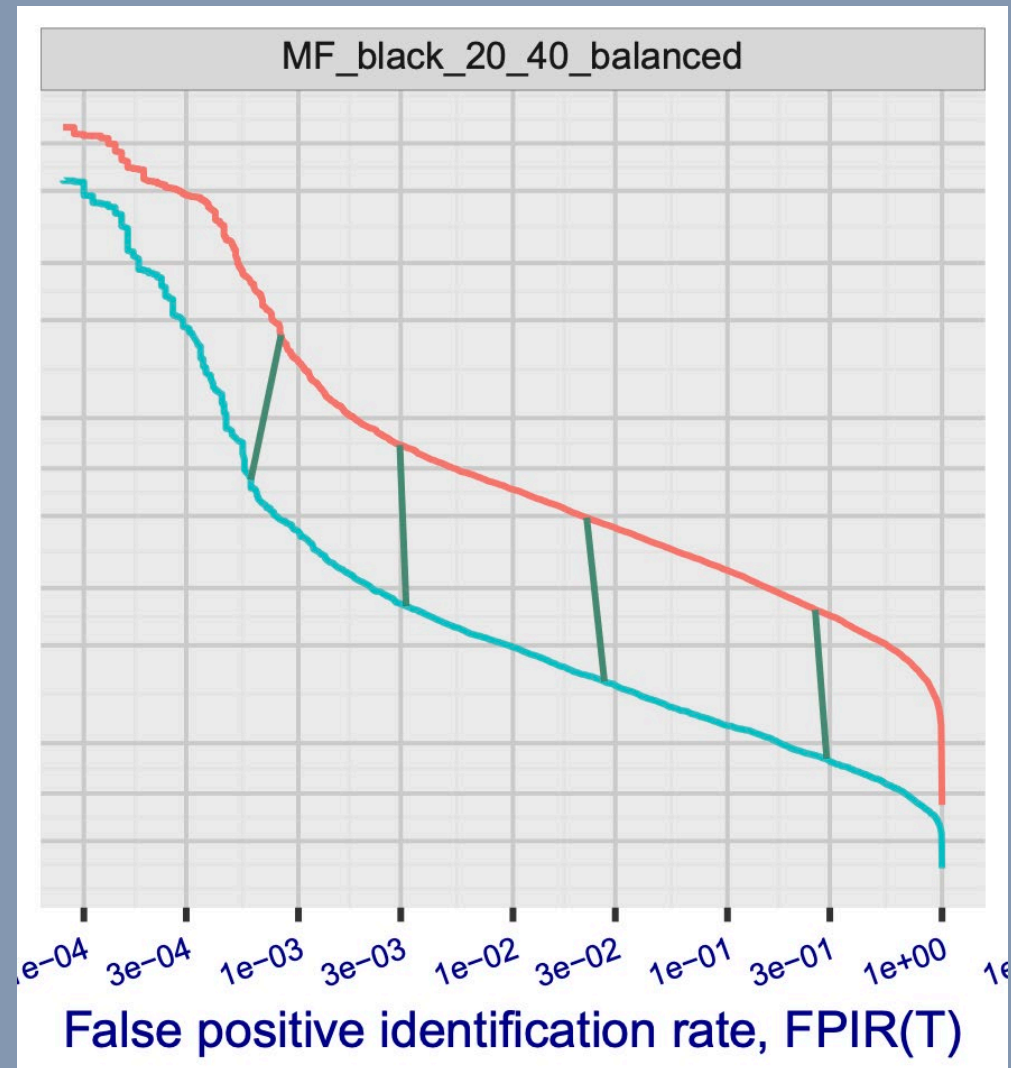




## 4. Algorithmic Search

Algorithms perform differently on different demographics:

*"We found empirical evidence for the existence of demographic differentials in a majority of the contemporary algorithms that we evaluated."*



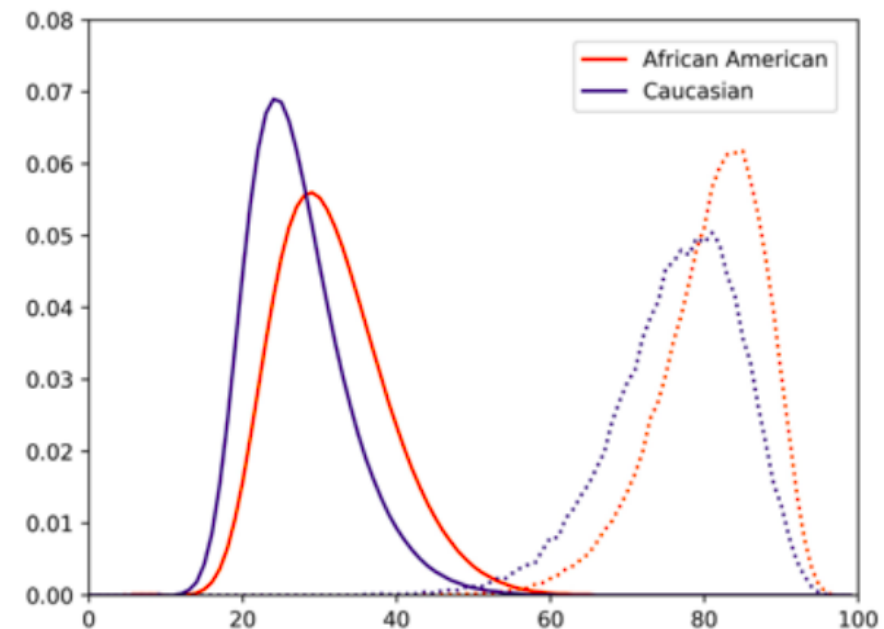


## 4. Algorithmic Search

Tl;dr:

- Accuracy statements & FRVT results NOT dispositive
- Perf. poorly understood by system designers
- Age of algorithm matters
- Demographics affect perf.
- *Good resources exist!*

### ResNet Authentic & Imposter Distributions (Race)



**African-American Impostor and Authentic both shifted to higher similarity scores.**



## 5. Candidate Review





## 5. Candidate Review

FILED, Clerk of the Appellate Division, May 23, 2022, AM-000567-21, M-005141-21, AMENDED

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## 5. Candidate Review

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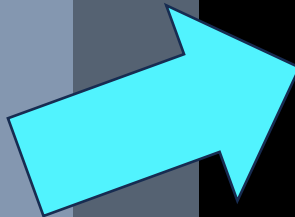
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## 5. Candidate Review

Higher match scores



Lower match scores





## 5. Candidate Review

### The “human in the loop”

- This task is hard; people aren’t innately good at it.





## 5. Candidate Review

### The “human in the loop”

- This task is hard
- Experience doesn't guarantee reliability

Experience with forensic face identification is insufficient to guarantee reliability; studies show that without specialized training, police officers are as likely as the average person to produce identification errors.<sup>155</sup> The 1999 experiments on low-quality video tested the abilities of 20 officers with an average of 13.5 years on the job and experience in performing forensic face identifications. The study found no significant difference between their performance and that of college students; the officers “performed as poorly as other subjects unfamiliar with the targets.”<sup>156</sup> A 2014 study of face matching error rates in Australian passport officers





## 5. Candidate Review

### The “human in the loop”

- This task is hard
- Experience isn't enough
- Lots of room for error  
(2,430 possible matches, anyone?)

**RANK #319**

**REAL TIME CRIME CENTER**

Facial Identification Section  
Robbery of Elderly Male

❖ FIS enhanced the poor quality image, displaying more detailed facial features.  
❖ The enhanced reversed image was submitted for facial recognition search resulting in  
Candidate: [REDACTED] (**Rank #319**) who resides in the Bronx.  
❖ A detailed analysis of the facial features displayed similar hair lines, eyebrows, nose and ear structure.

ONE POLICE PLAZA

NYPD Re-Production Dec 2020  
000542



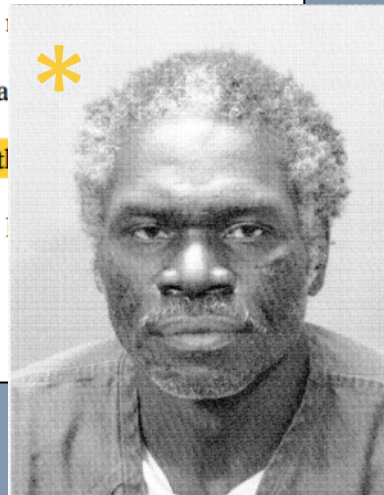
## 5. Candidate Review

### The “human in the loop”

- This task is hard
- Experience isn't enough
- Lots of room for error
- No training / certification program for analysts

10-11). She did not know the maximum number of stars a particular photo could have (Sec Supp R I 11). She testified, “I can’t speak to the algorithms about how it puts one, two, three, four, five but it does from my understanding arrange the photos based on what’s most likely to the photo that you uploaded” (Sec Supp R I 11). She testified that the program does not give percentages for its match determination (Sec Supp R I 10-11). She testified that she did not know how the computer program’s algorithms worked (Sec Supp R I 11). At that point, she visually compared the photo of the drug seller to the photos generated by the computer program in the Duval County database as potential matches (Sec Supp R I 10). She determined that a photo of Appellant, which was the first photo in the list of potential matches, was most like the drug seller (Sec Supp R I 10). Appellant’s photo had a yellow star next to it (Sec Supp R I 11-12). She forwarded only Appellant’s photo to the prosecutor and told him that she thought Appellant was the drug seller (Sec Supp R I 11-12).

14

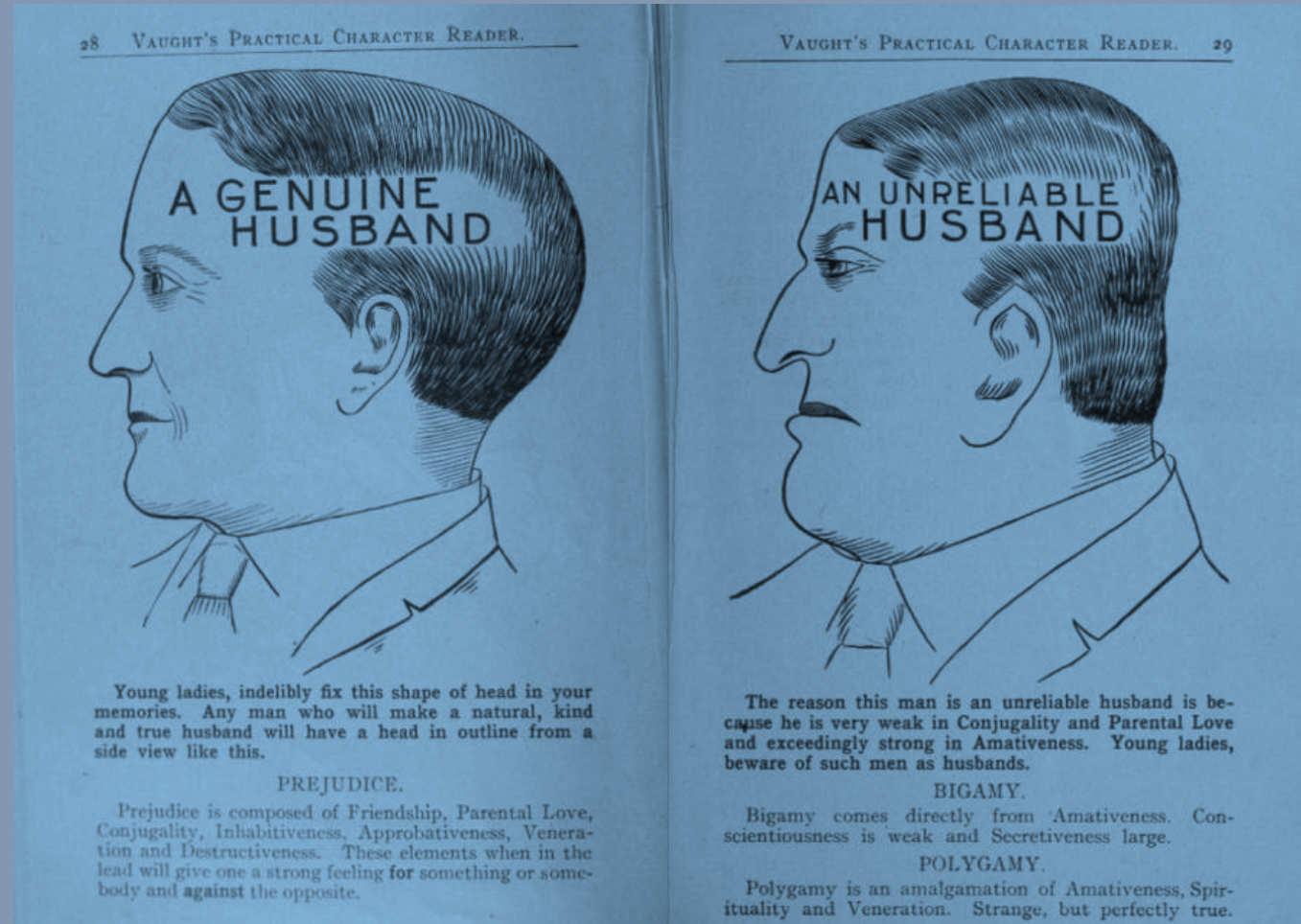




## 5. Candidate Review

### The “human in the loop”

- This task is hard
- Experience isn't enough
- Lots of room for error
- No training / certification
- No protection against bias







## How Reliable is this Technique?



## How Reliable is this Technique?

*Answer:*

Unknown, but consider the chance of error to be high ... and the information created by the search as potentially exculpatory.



“...further investigation is needed

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REAL TIME CRIME CENTER – FACIAL IDENTIFICATION SECTION



**FACIAL IDENTIFICATION SECTION  
SEARCH RESULT REPORT**



**POSSIBLE MATCH**

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IMAGE SUBMITTED	FIS POSSIBLE MATCH CANDIDATE
	
	FRANCISCO ARTEAGA NYSID # 01529992J
INCIDENT IDENTIFIERS	

**Facial Identification Section Search Result Report**

**POSSIBLE MATCH**

“This is not a positive identification and is not probable cause to arrest, merely a lead. Further investigation is needed to develop probable cause to arrest.”





“...further investigation is needed

Two things...

- Remember Nijeer Parks?  
(non-witness officer makes positive ID)





“...further investigation is needed

Two things...

- Remember Porcha Woodruff?  
(six-pack eyewitness ID)
  - Courts haven't established a PC threshold
  - Look for impermissible taint



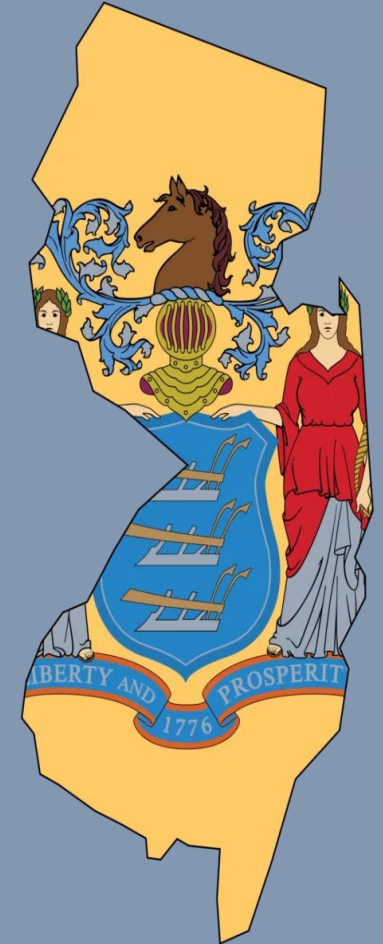


# Defense Strategies





# Defense Strategies





## Defense Strategies

### Title 25 § 6001: Facial surveillance

- State system operated by BMV; State PD can request searches of other juxes or FBI
- “Serious crimes” only (1+ year), some Class D & E
- Probable cause; deceased, missing, endangered persons
- *“...does not, w/o other evidence, establish PC.”*
- *“State Police and the BMV shall maintain logs that track all requests for searches received and performed”*
- Searches in violation of the law subject to exclusion





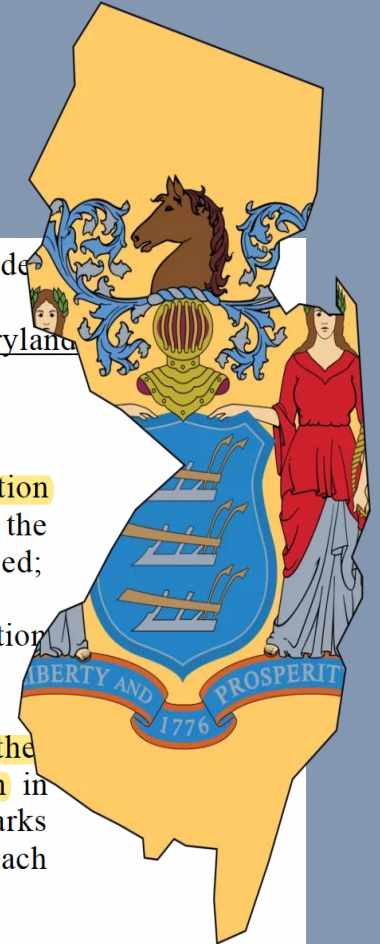
# Defense Strategies

## 1. Discovery *New Jersey v. Arteaga*

*“...we reverse and remand for entry of an order directing the State to provide the eleven remaining items of discovery requested by the defense.”*

Upon learning FRT played a role in identifying defendant, defense counsel sent the State a letter pursuant to Rule 3:13-3 and Brady v. Maryland, 373 U.S. 83 (1963), seeking the following discovery:

1. The name and manufacturer of the facial recognition software used to conduct the search in this case, and the algorithm(s) version number(s) and year(s) developed;
2. The source code for the face recognition algorithm(s);
3. A list of what measurements, nodal points, or other unique identifying marks are used by the system in creating facial feature vectors including, if those marks are weighted differently, the scores given to each respective mark;
4. The error rates for the facial recognition system used, including false accept and false reject rates (also called false match and false non-match rates—FMR







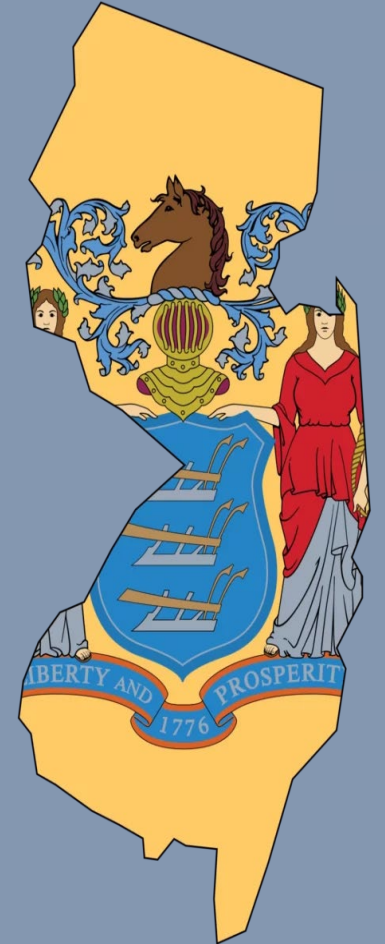
## Defense Strategies

1. Discovery

2. **Brady**

***New Jersey v. Arteaga***

*“The evidence sought here is directly tied to the defense’s ability to test the reliability of the FRT. As such, it is vital to impeach the witnesses’ identification, challenge the State’s investigation, create reasonable doubt, and demonstrate third-party guilt.”*



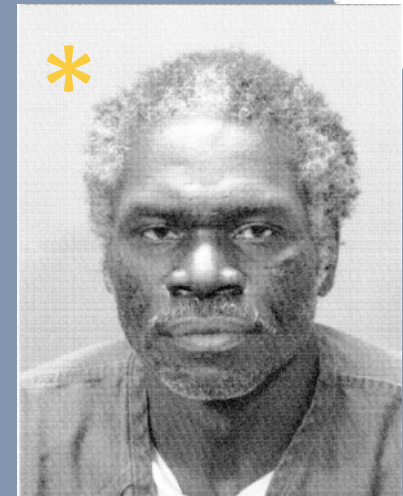


## Defense Strategies

1. Discovery
2. **Brady**

***Lynch v. Florida, No. 1D16-3290 (2018)***

*“Because [appellant] cannot show that the other photos in the database returned resembled him, he cannot show that they would have supported his argument that someone in one of those photos was the culprit.”*





## Defense Strategies

1. Discovery
2. *Brady*
3. **Reliability & Suppression**

*People v. Gomez*, Ind. No. 70498 (2022)

*Wade hearing necessary to determine whether face recognition ID procedure was “unduly suggestive” or “merely confirmatory.”*





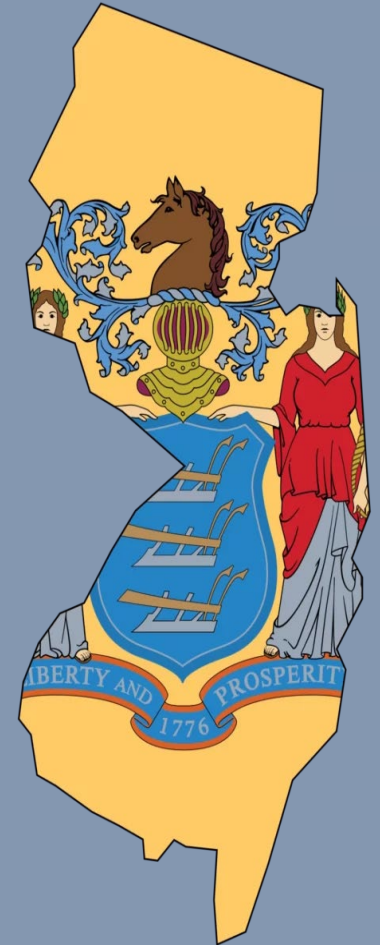


## Defense Strategies

1. Discovery
2. *Brady*
3. **Reliability & Suppression**

*United States v. Turner*, 2022 WL 279784

*“In light of these arguments the Court finds an evidentiary hearing is warranted to determine the admissibility of both the photo array and the Victim’s out-of-court identification.”*





## Defense Strategies

1. Discovery
2. *Brady*
3. Reliability & Suppression
4. Admissibility hearing?





# Defense Strategies

## Hutcherson v. State, 2014 Ark. 326 (2014)

438 S.W.3d 909

2014 Ark. 326  
Supreme Court of Arkansas.

Willie HUTCHERSON, Appellant

v.

STATE of Arkansas, Appellee.

No. CR-13-799.

### Synopsis

**Background:** Defendant was charged with robbery and other crimes. *Ark.App. 72, 47 S.*

writ of habeas corpus was dismissed, filed pleadings seeking fingerprint testing, DNA testing, and further examination of a videotape of one of the robberies. The Circuit Court, Pulaski County, *Herbert T. Wright, Jr., J.*, denied the pleadings as successive. Defendant appealed.

“...he does not demonstrate that the new technology is accepted in this state...”

**BUT**

## United States v. Lee, 451 F.Supp.3d 1 (2020)

451 F.Supp.3d 1  
United States District Court, District of Columbia.

UNITED STATES of America

v.

Hartley James LEE, Defendant.

*Criminal No. 10-cr-208 (KPD)*

“Weight of evidence” was strong and favored detention, given that: “facial recognition software” identified Lee...

Defendant was in custody following a magistrate judge's determination that pretrial detention was warranted, filed an emergency motion for release from custody due to the COVID-19 pandemic.



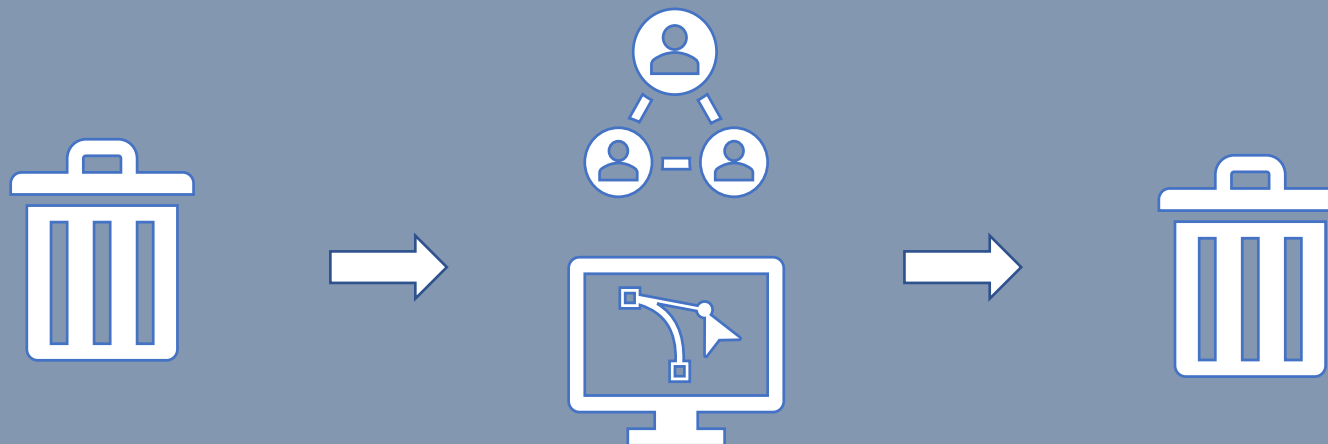


## In Sum:





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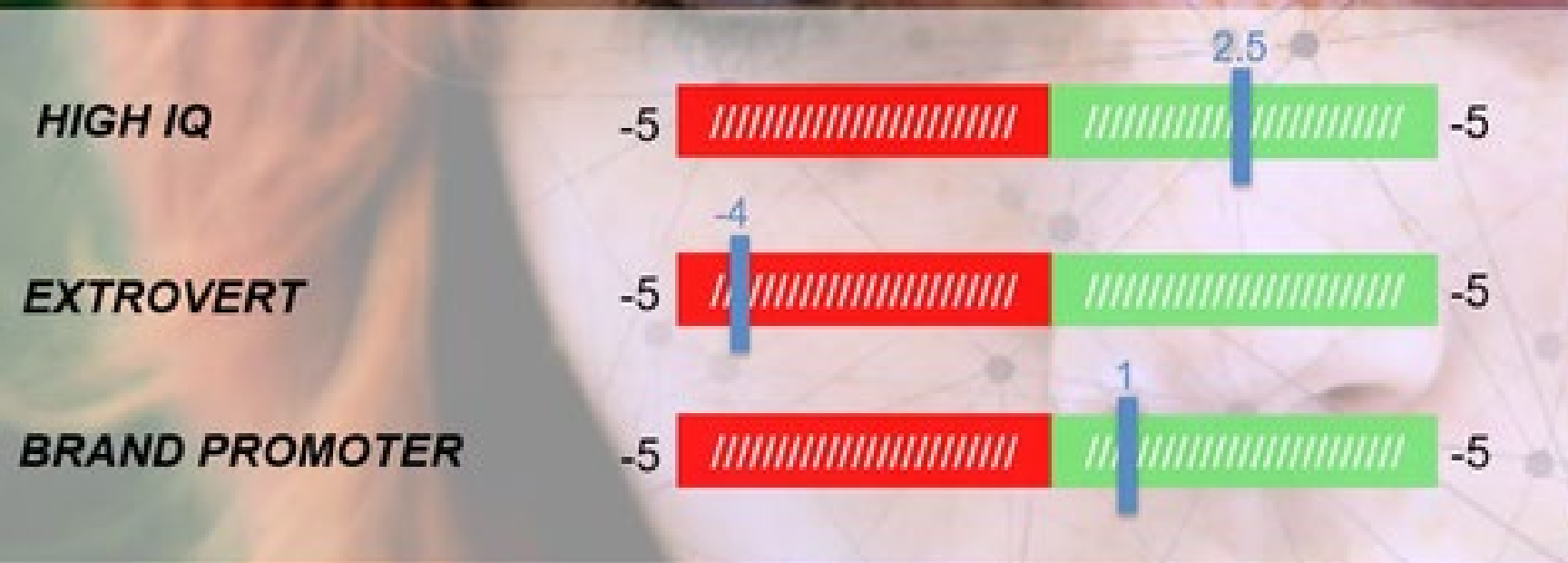


Poor quality images  
Editing  
Bias and lack of training  
Lack of policies and  
safeguards

Algorithm quality?  
Bias?  
Transparency?

Poor quality investigative  
lead  
*Brady* material  
Suppression  
Fails admissibility standards

## HOW ARE WE DIFFERENT?





**Thank you!**

**NACDL Fourth Amendment Center | [4AC@nacdl.org](mailto:4AC@nacdl.org)**

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