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Review Article
Editor's Choice Article

Comparison of human and computer performance across face recognition experiments☆

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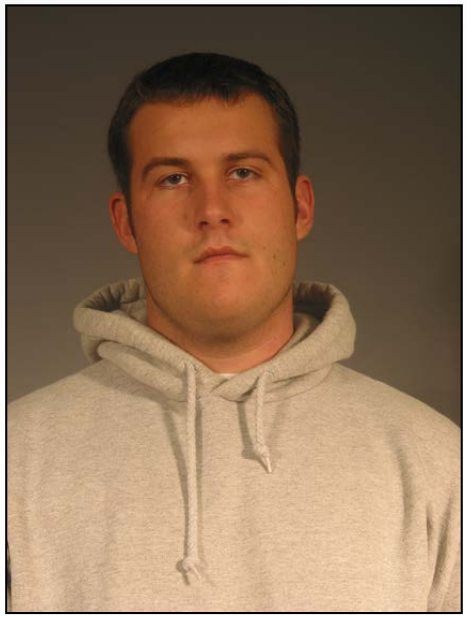
Who is this person?

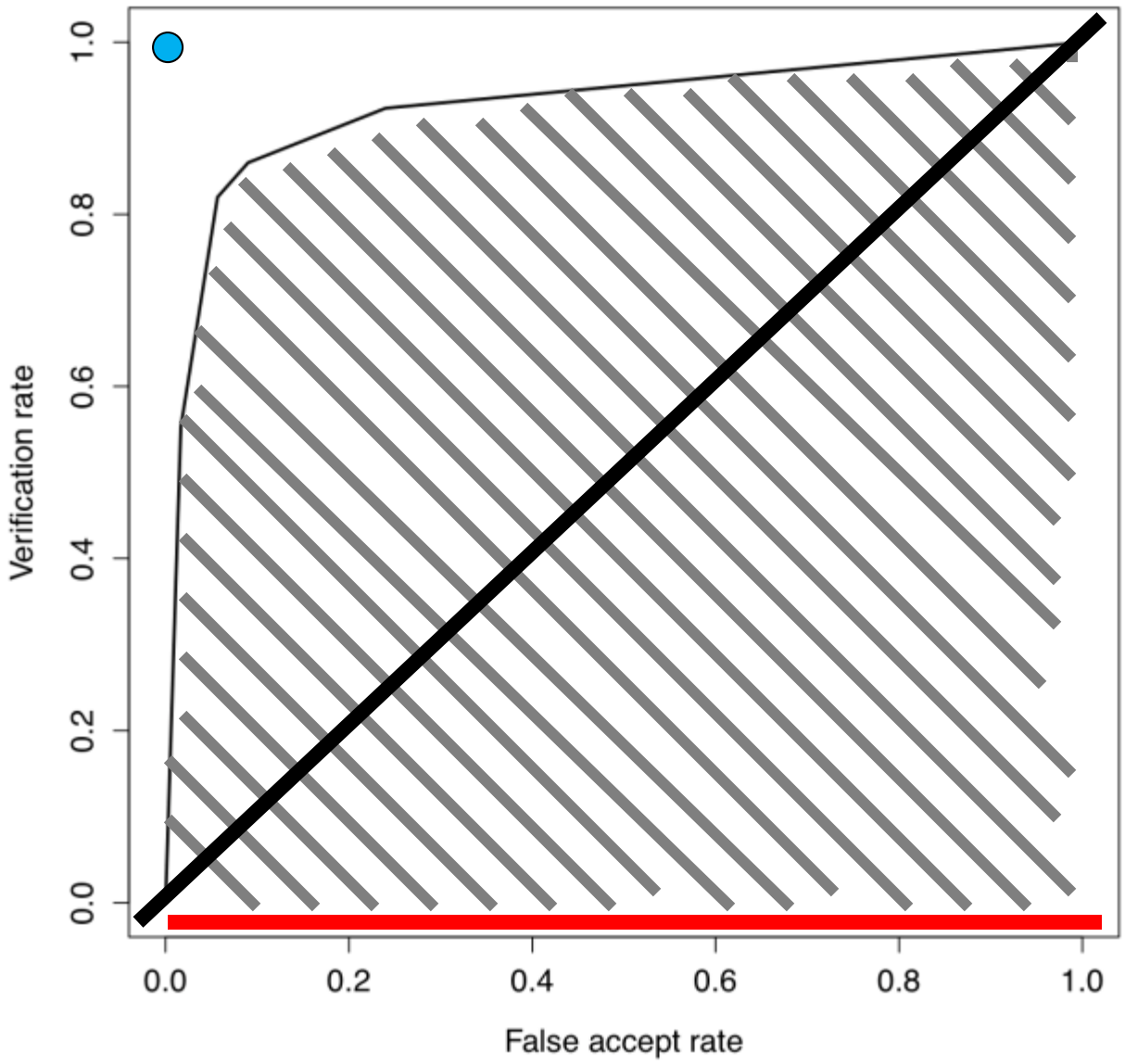
Is this same person?

Measuring Human Performance

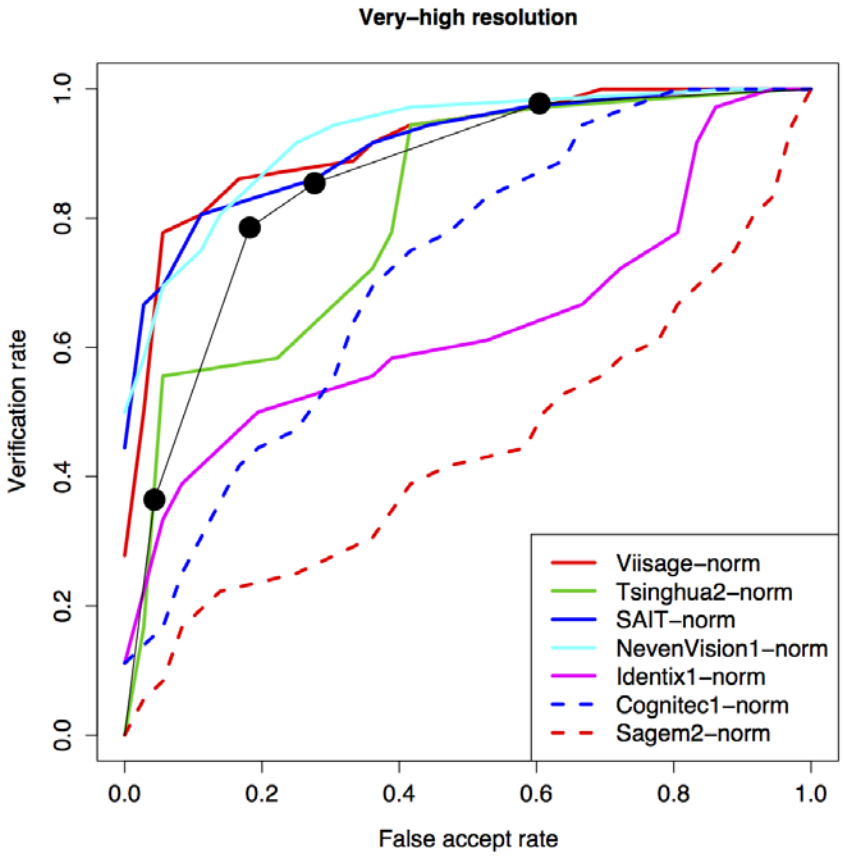


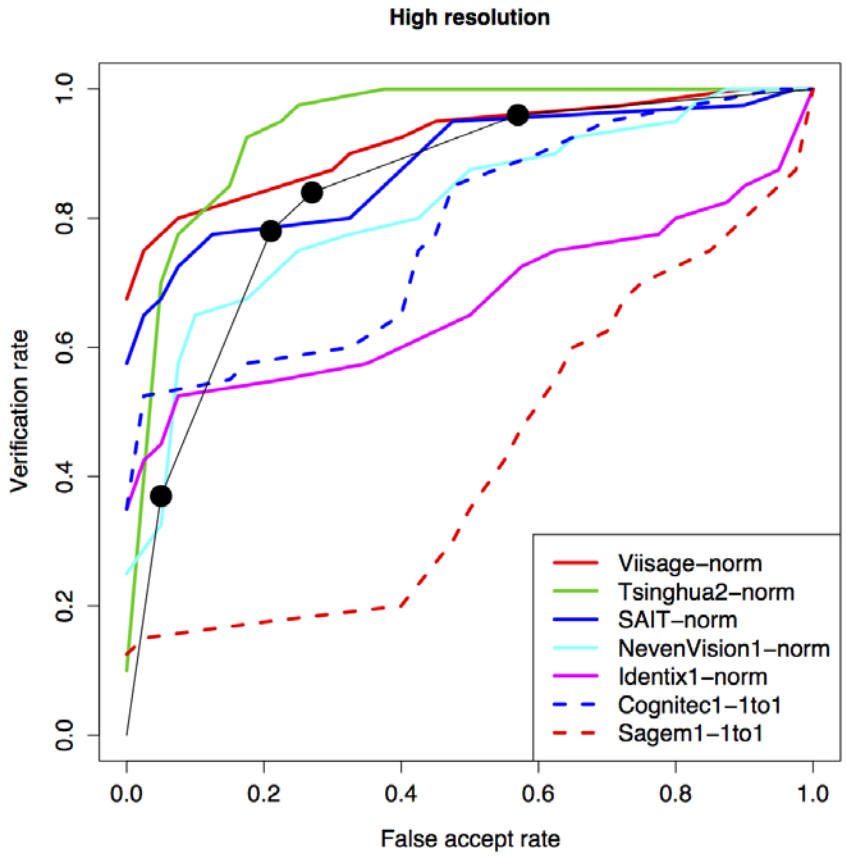
- Human subject raters respond…
  - 1. sure they are the same person
  - 2. think they are the same person
  - 3. not sure
  - 4. think they are not the same person
  - 5. sure they are not the same person

Area Under Curve (AUC)



FRVT 2006


Very−high resolution
Verification rate
False accept rate
0.0
0.2
0.4
0.6
0.8
1.0
Viisage−norm
Tsinghua2−norm
SAIT−norm
NevenVision1−norm
Identix1−norm
Cognitec1−norm
Sagem2−norm


High resolution
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0.0
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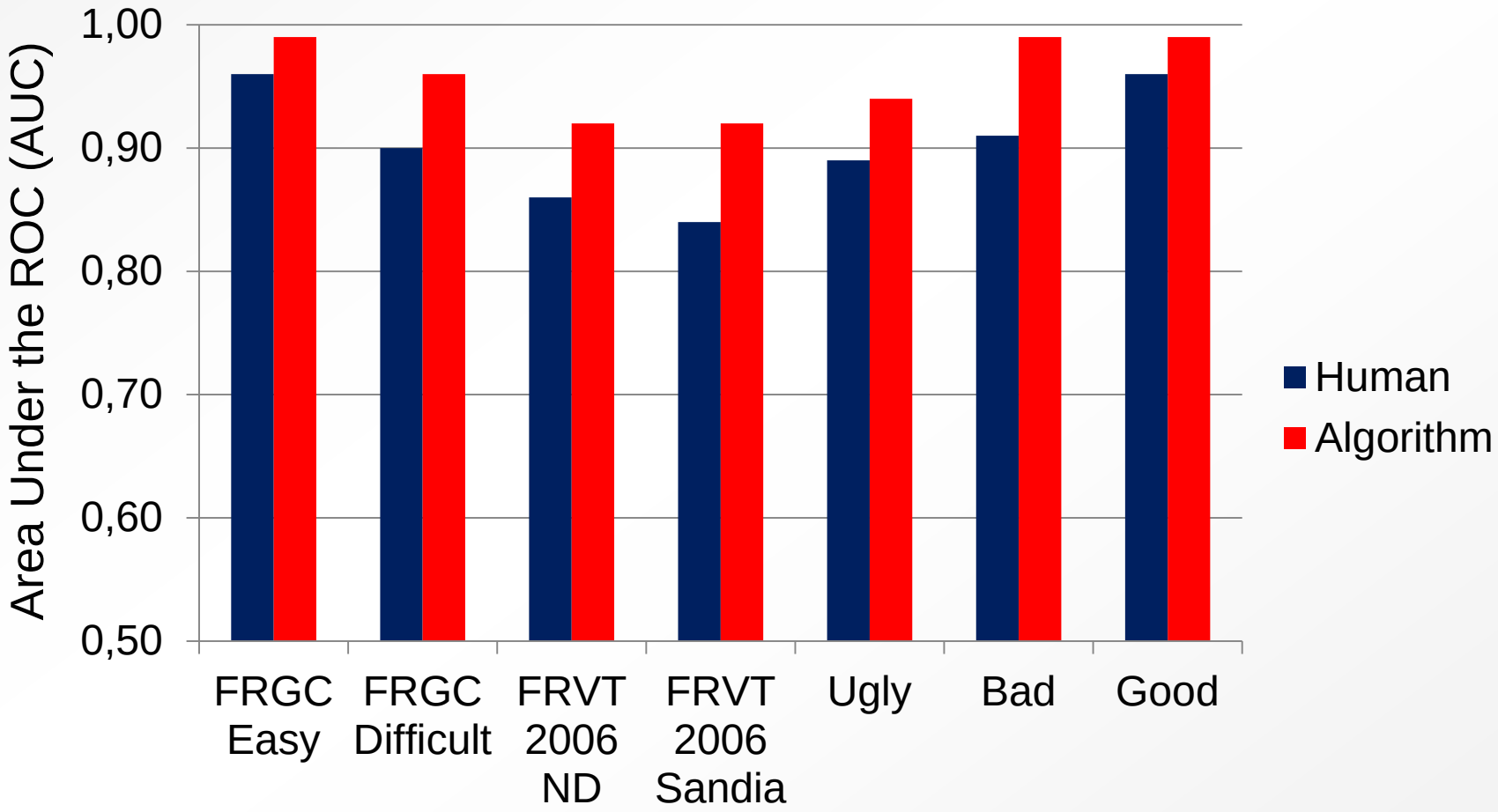
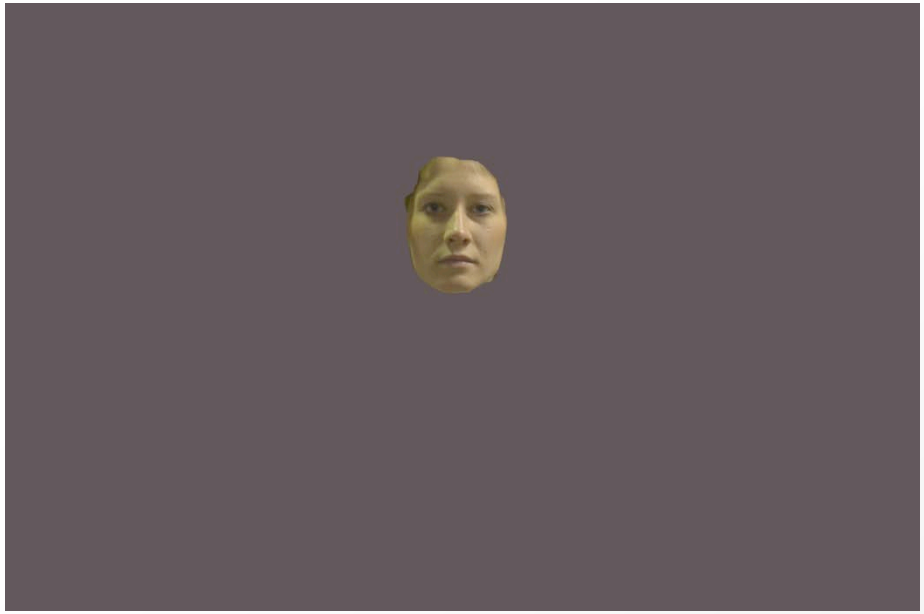
Viisage−norm
Tsinghua2−norm
SAIT−norm
NevenVision1−norm
Identix1−norm
Cognitec1−1to1
Sagem1−1to1

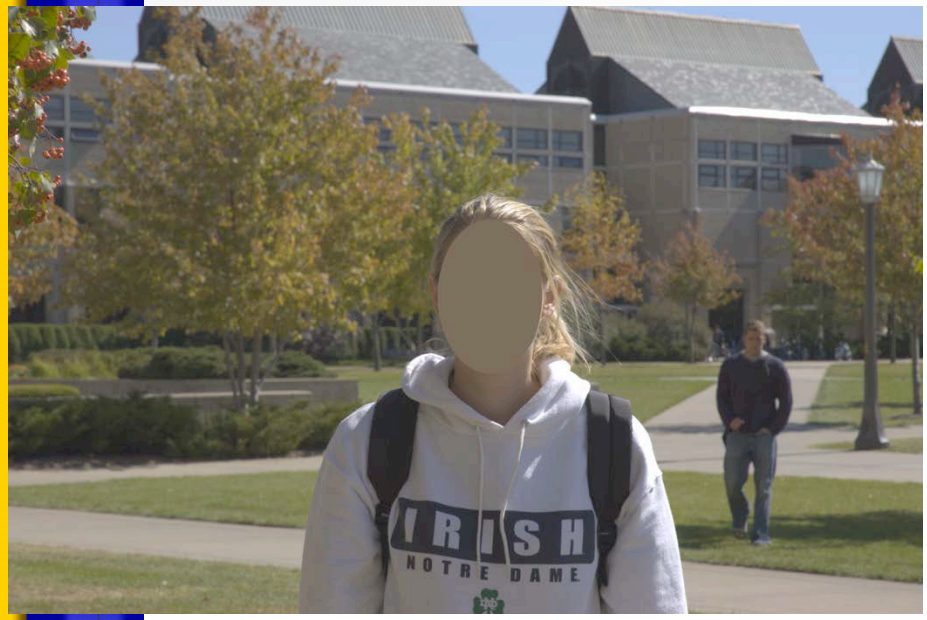
Frontal Still Face Performance



Is this same person?

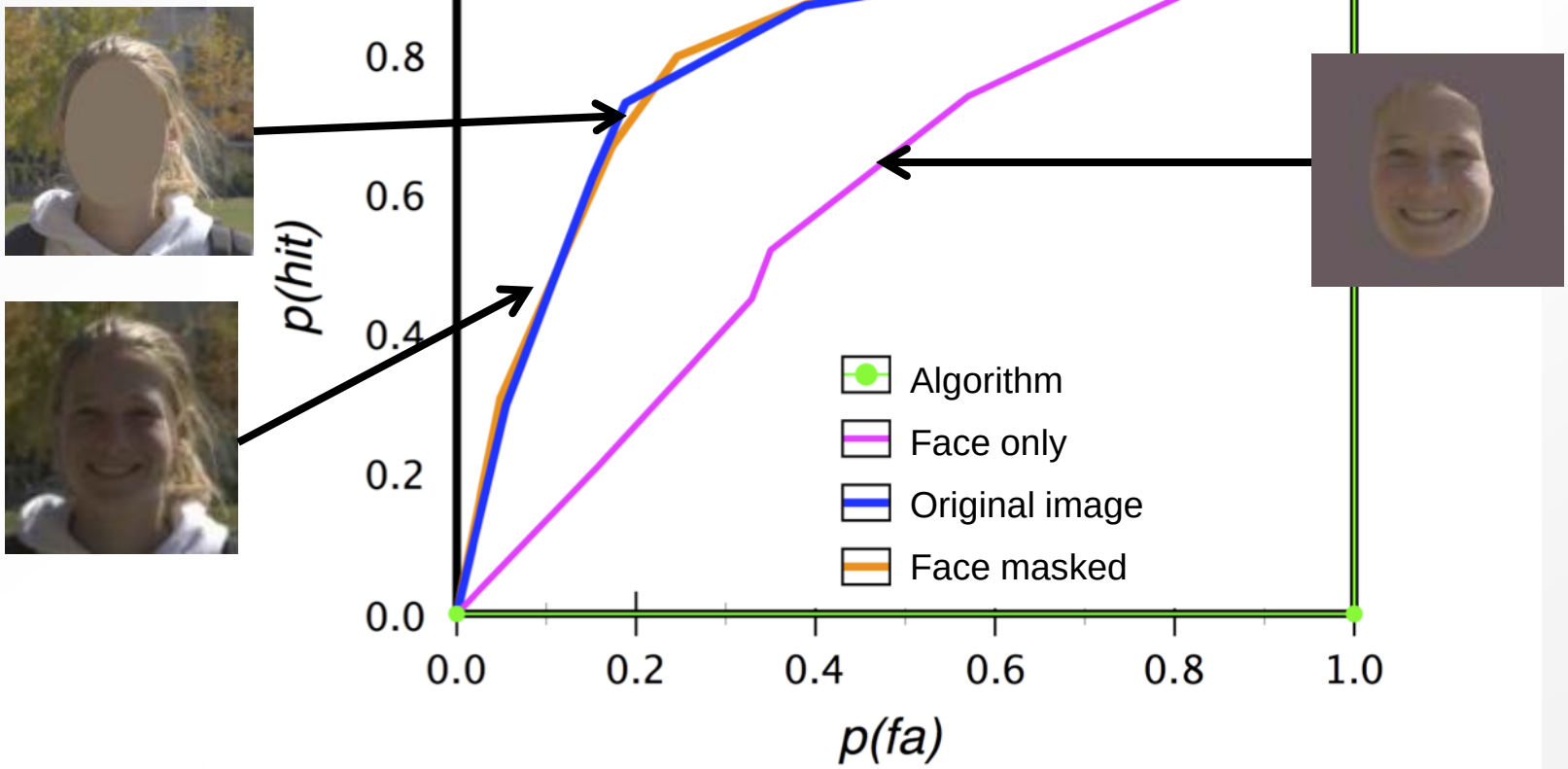


Is this same person?

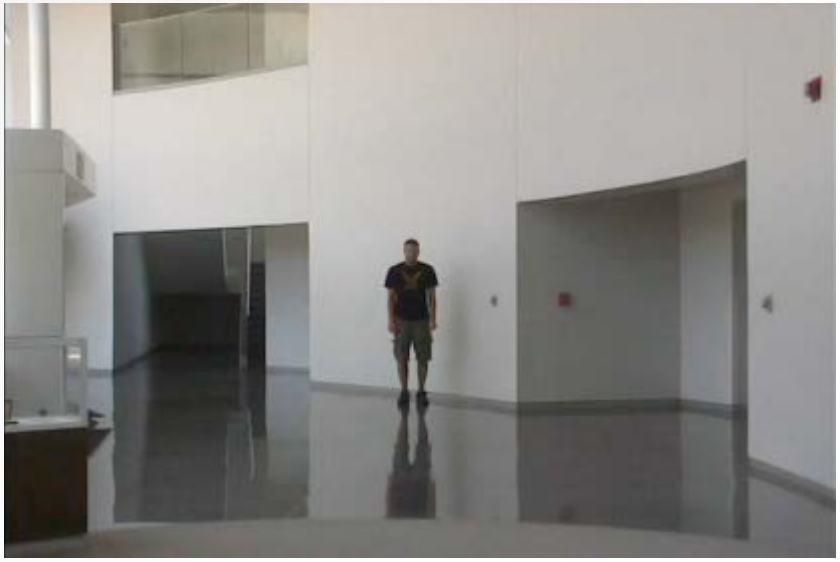


Is this same person?

Human Performance on Hard Face-Pairs



Video: Walking vs. Conversation



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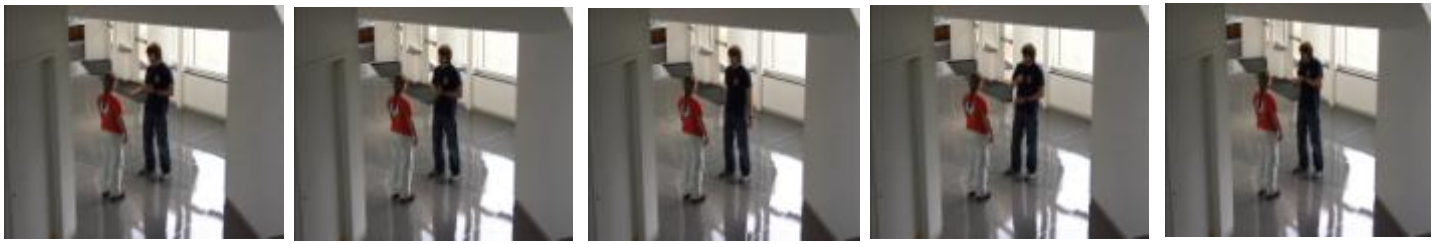
  - 5. sure they are not the same person

Video Experiments

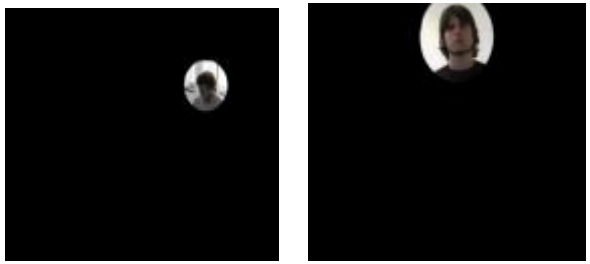
gait video

conversation video



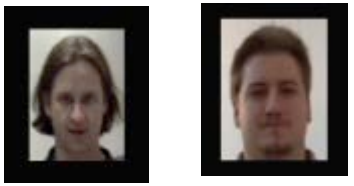
body only

face only

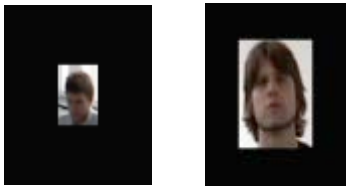


Static Face

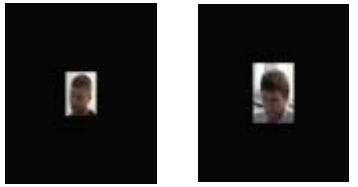
GG



CG



CC

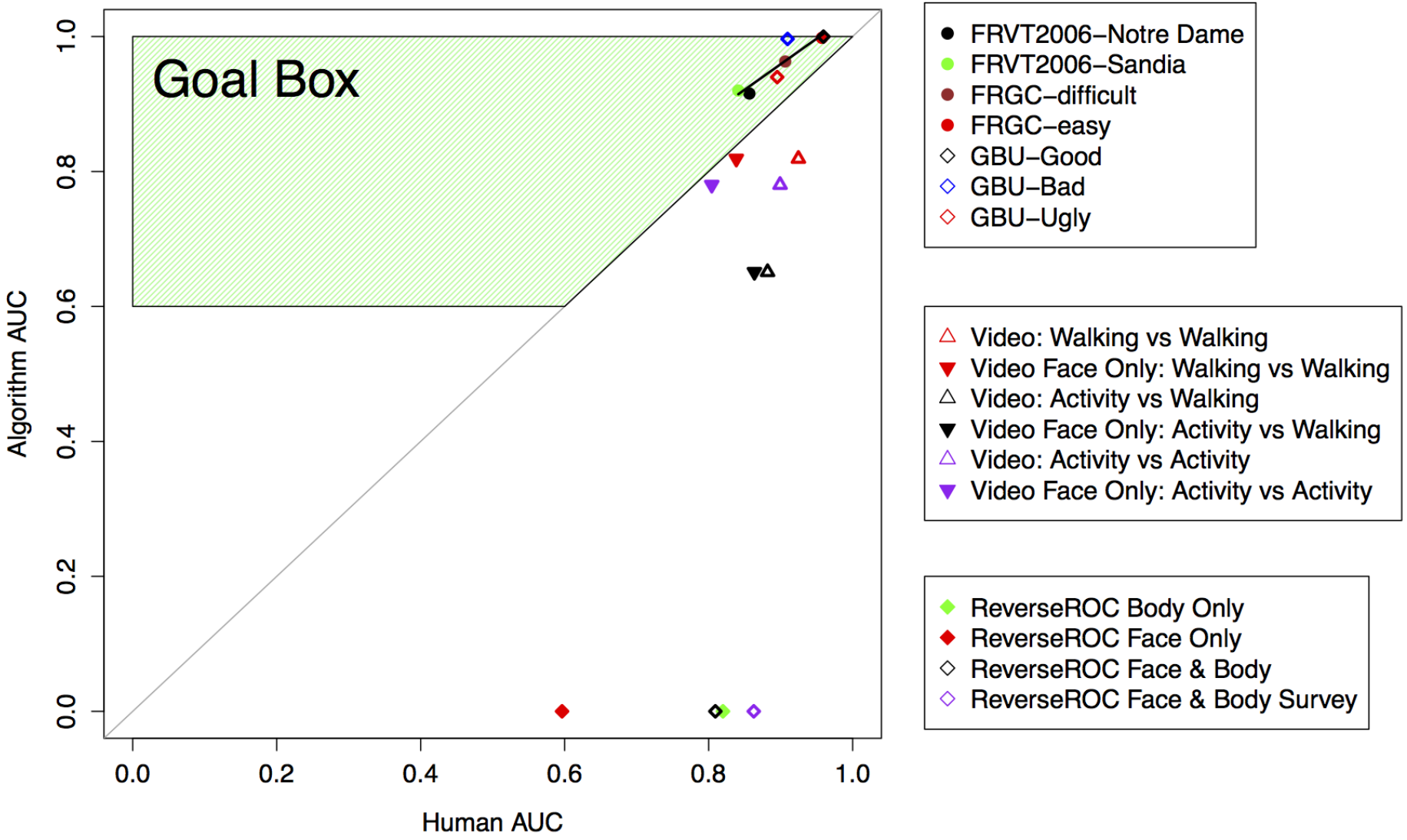


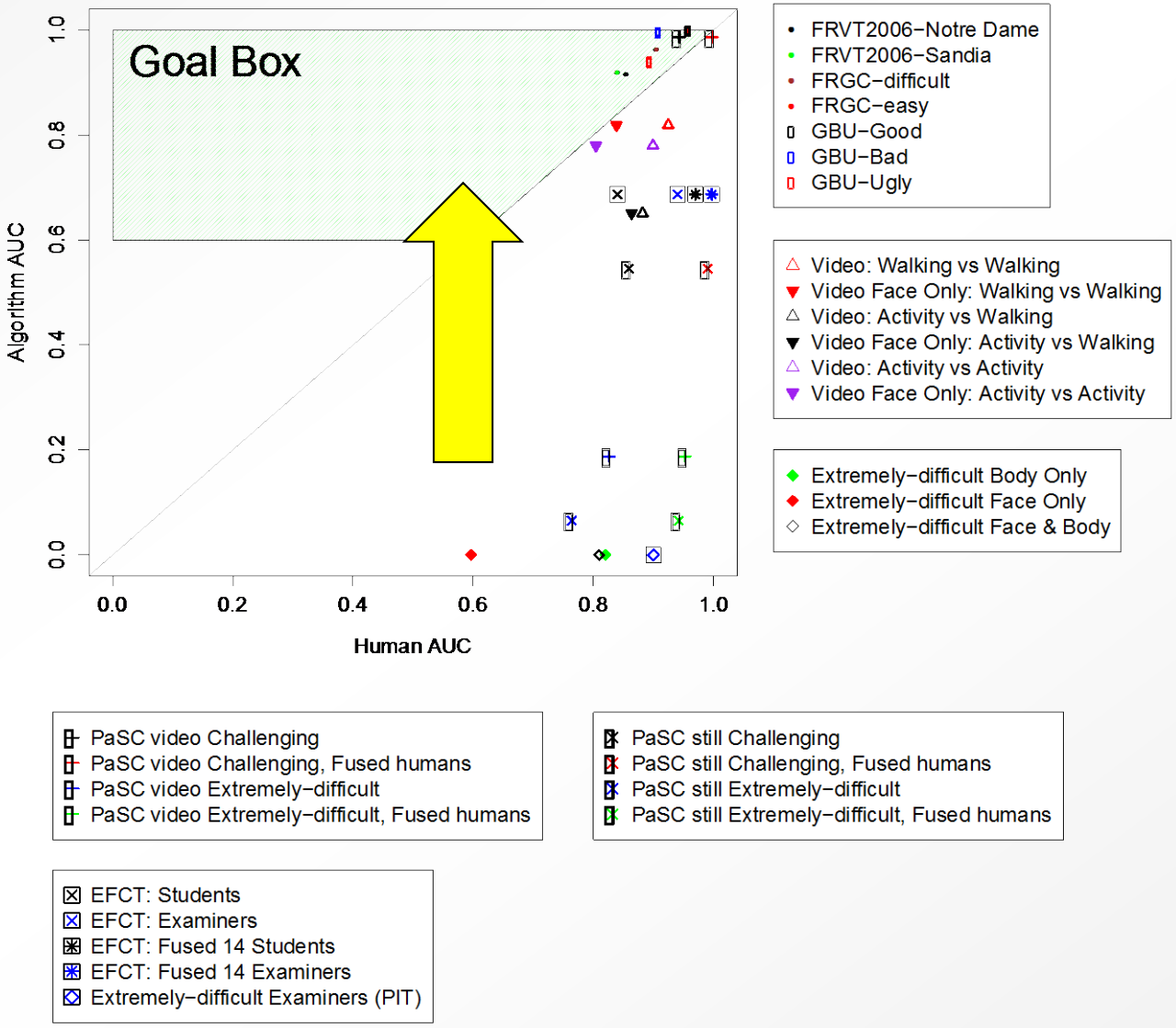
Difficult Cases

- In hard cases (poor viewing conditions), humans take advantage of face, body, still, & video
- Evidence: algorithms do NOT take advantage of face, body, still, & video
- Learn from the human visual system.
  - Functional
  - Perceptual
- Incorporate into algorithm design.

Across Experiments

Hurdle: Measuring Success




Goal Box
Algorithm AUC
Human AUC
0.0
0.2
0.4
0.6
0.8
1.0
FRVT2006−Notre Dame
FRVT2006−Sandia
FRGC−difficult
FRGC−easy
GBU−Good
GBU−Bad
GBU−Ugly
Video: Walking vs Walking
Video Face Only: Walking vs Walking
Video: Activity vs Walking
Video Face Only: Activity vs Walking
Video: Activity vs Activity
Video Face Only: Activity vs Activity
Extremely−difficult Body Only
Extremely−difficult Face Only
Extremely−difficult Face & Body
PaSC video Challenging
PaSC video Challenging, Fused humans
PaSC video Extremely−difficult
PaSC video Extremely−difficult, Fused humans
PaSC still Challenging
PaSC still Challenging, Fused humans
PaSC still Extremely−difficult
PaSC still Extremely−difficult, Fused humans
EFCT: Students
EFCT: Examiners
EFCT: Fused 14 Students
EFCT: Fused 14 Examiners
Extremely−difficult Examiners (PIT)

Human and Machine Performance

- Algorithms Better (Untrained Humans)
  - Mugshots & Mobile Studio environments
  - Digital Single Lens Reflex
    - Mobile Studio and Ambient Lighting
- Humans Better
  - Non-face identity cues
  - Cross-pose
  - Point and Shot Cameras (in general)

The Challenge

- Problem: Robust Recognition of Unfamiliar Faces
- Goal: Human Level Performance
  - Untrained Humans
  - Trained Professionals
  - Forensic Examiners
- Compare Machine & Human on a Face Performance Index
- Objective: Move Machine Performance into the Goal Box

Questions?