

# Portal Challenge Problem

## Multiple Biometric Grand Challenge

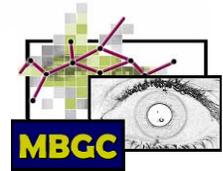
### Preliminary Results of Version 1

05 December 2008

National Institute of  
Standards and Technology

NIST

*...working with industry to foster innovation, trade, security and jobs*



# Portal Challenge Goals

– Develop multi-modal algorithms

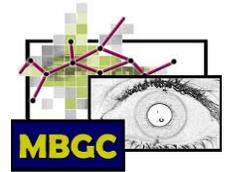
- Iris, face, video

Robust

- Failure to acquire
- Non-ideal biometric samples

– Portal technology

- Stand off screening
- Improving this class of applications

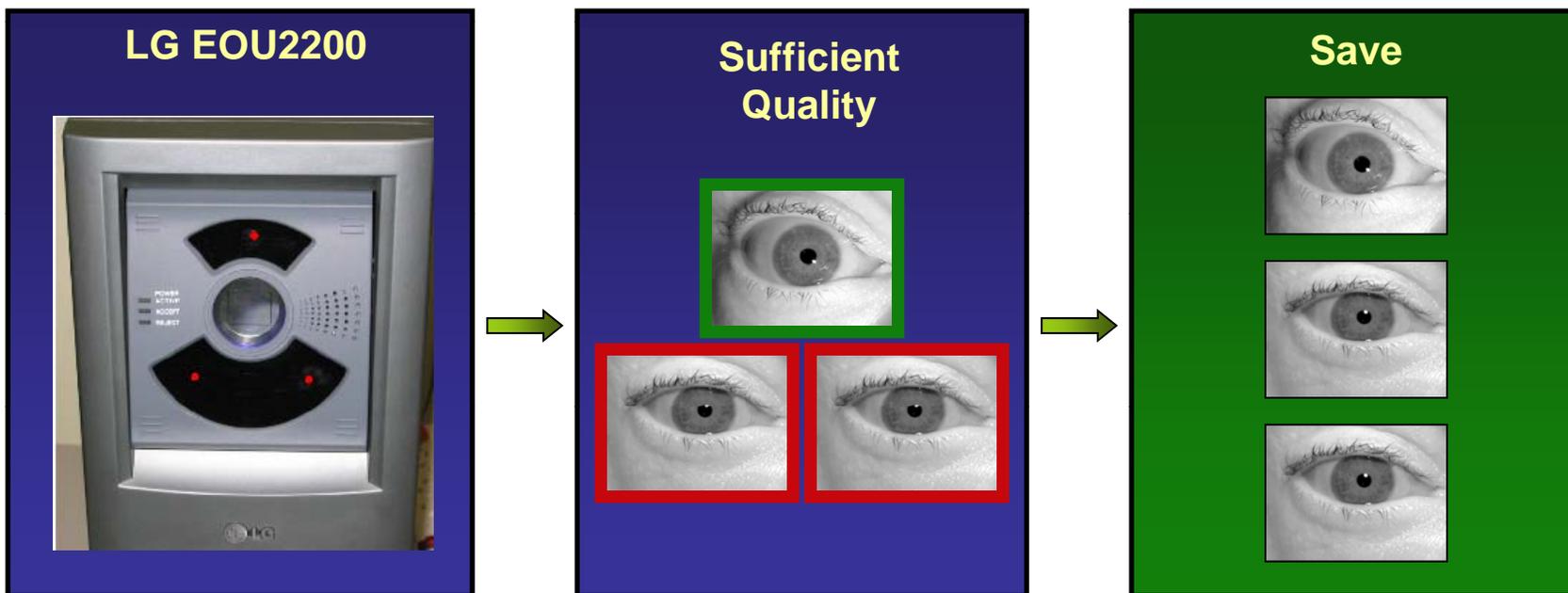


# Meet the Sensors....



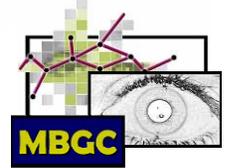
# Meet the LG 2200

## MBGC Iris Acquisition System



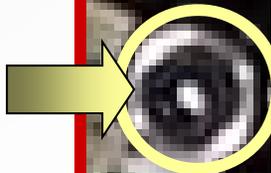
- Take 3 iris images
- One above quality threshold
- Save all three

# Meet the Portal

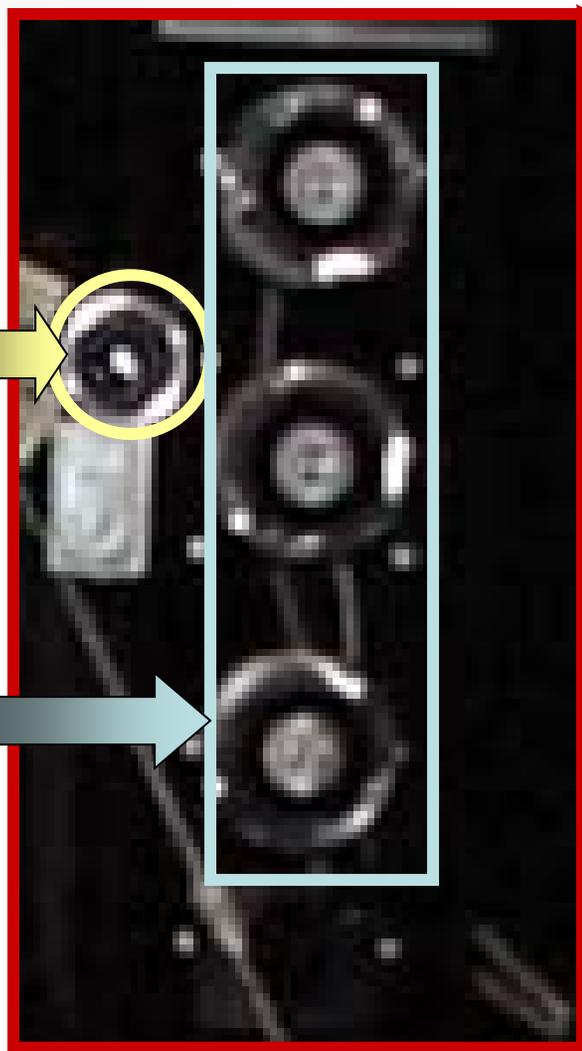


# Meet the Portal

High  
Definition  
(HD) Video  
Camera

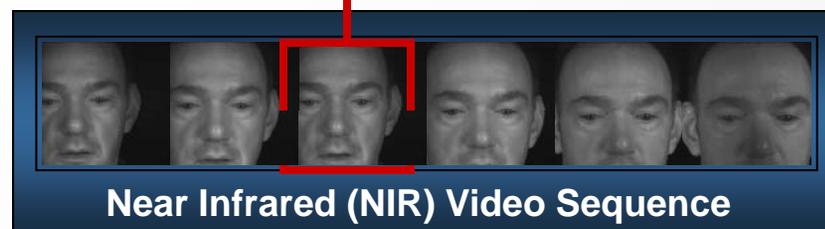


Near Infrared  
(NIR) Video  
Cameras





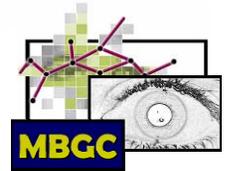
# Meet the Portal



2k

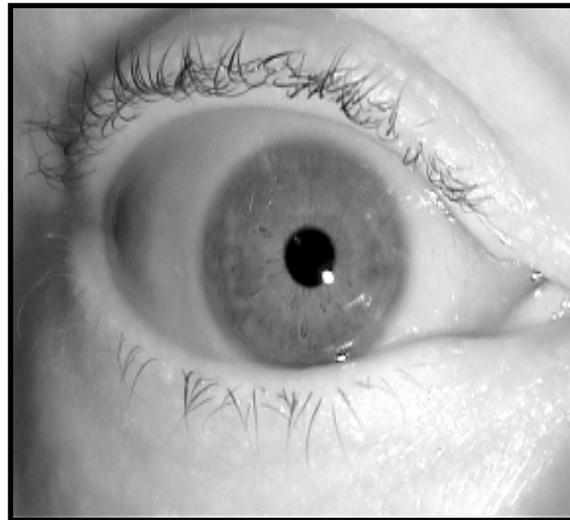
2k

120 pixels  
across iris

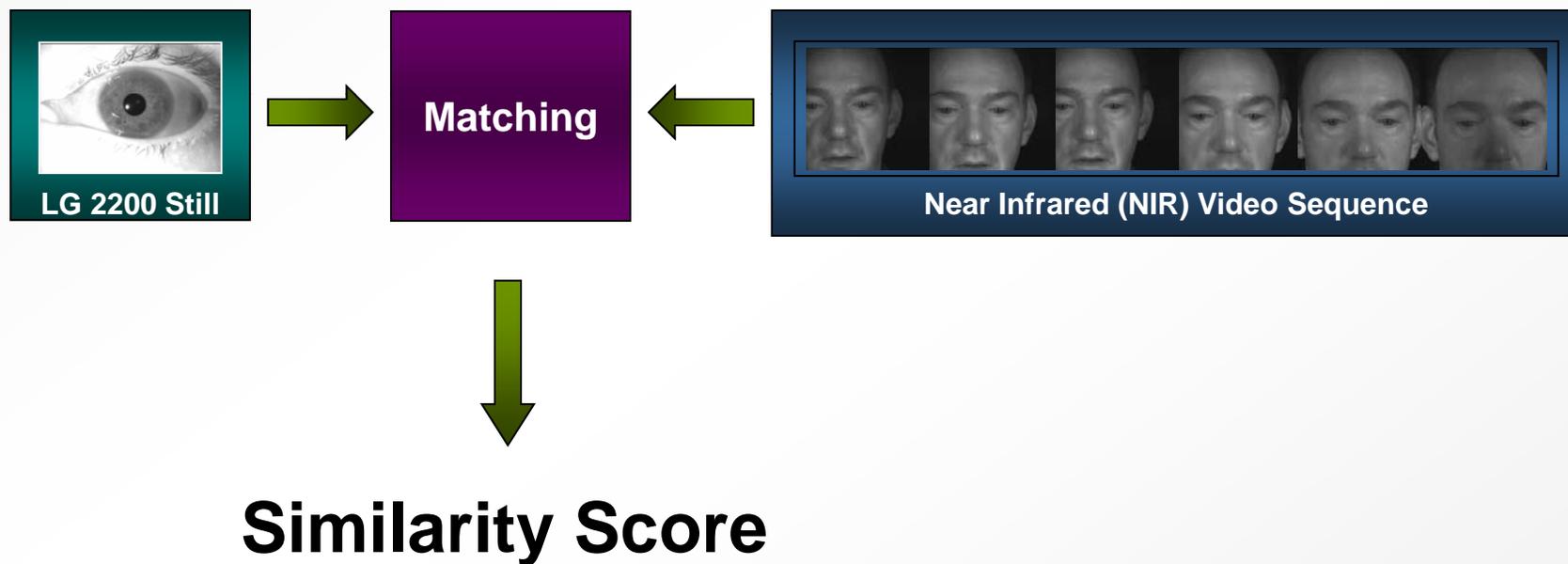


# Iris or Ocular Recognition?

- Called iris recognition.
- But challenge problem not restricted to iris.



# Experiment: Still Iris versus NIR

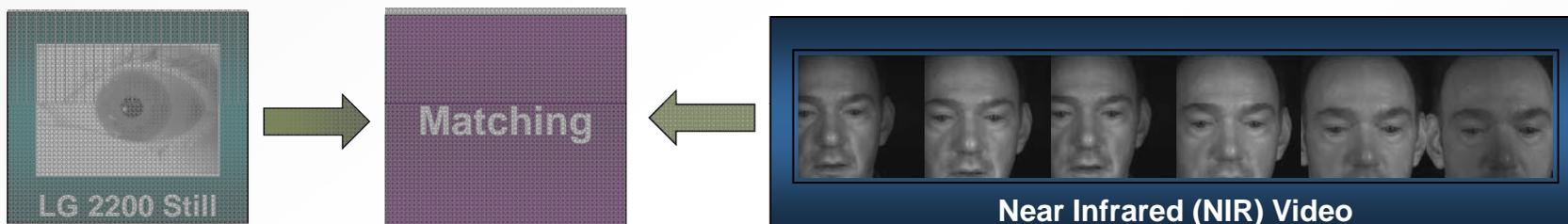


 Target     Query



# Experiment: Still Iris versus NIR

**Note: Input is a full video sequence**



**Similarity Score**

- **Participants needed to:**
  - **Process the video**
  - **Locate the irises**
  - **Segment the irises**
  - **Generate template**

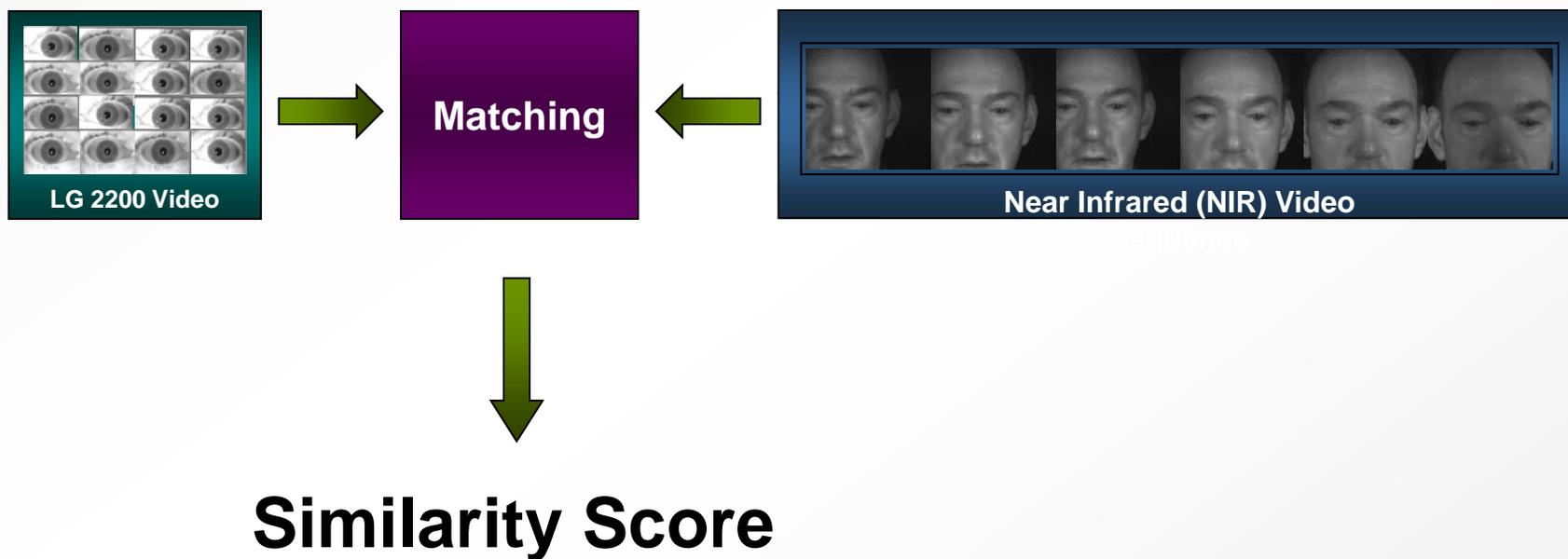
 Target     Query

# Meet the LG 2200 again....



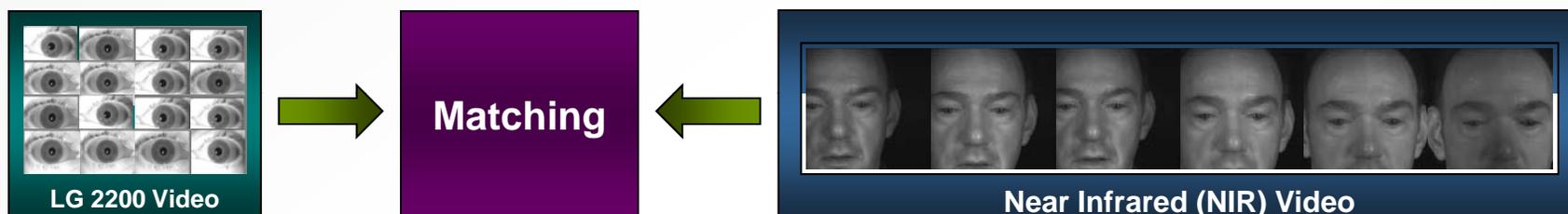
Iris video sequence

# Experiment: Video Iris versus NIR



# Experiment: Video Iris versus NIR

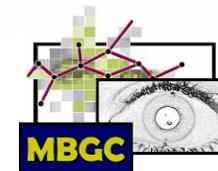
**Both inputs are full video sequences**



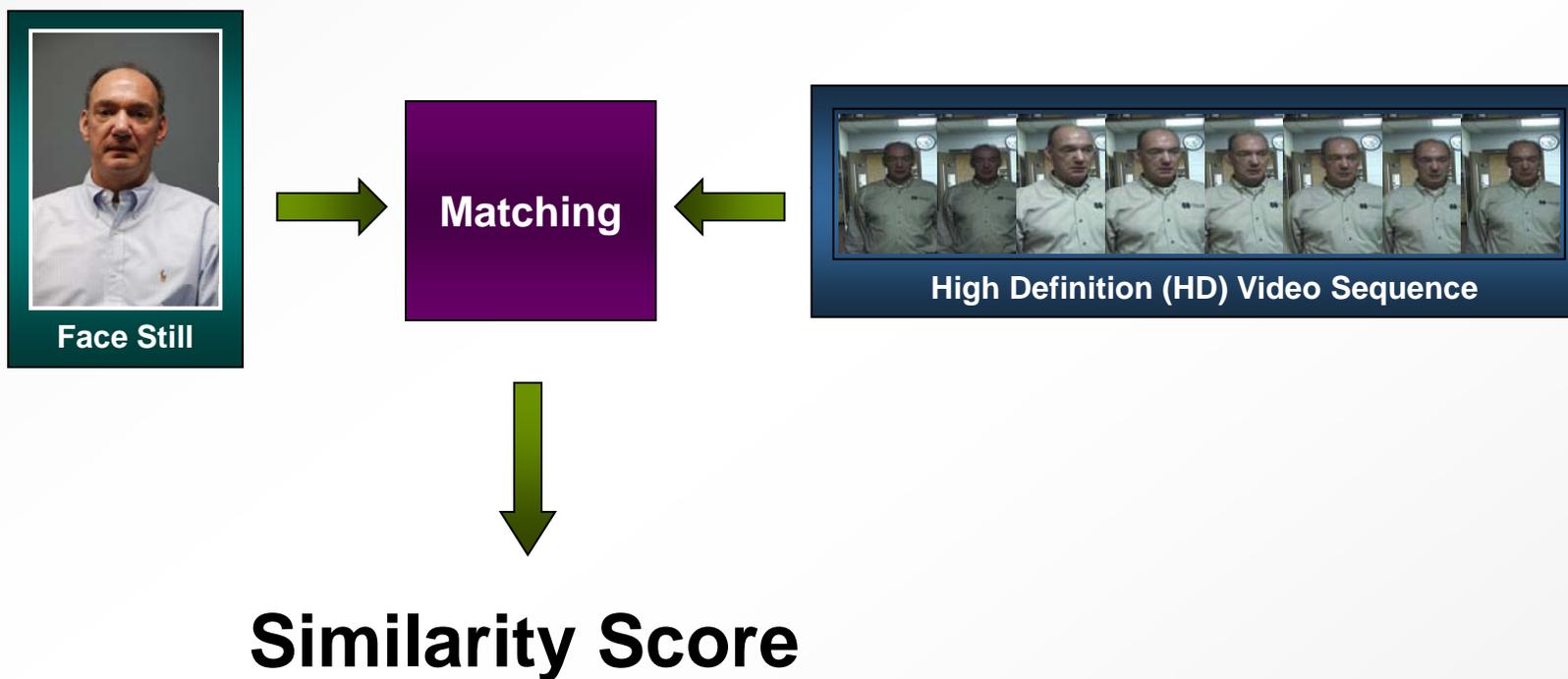
- **Participants needed to:**
  - **Process the video**
  - **Locate the irises**
  - **Segment the irises**
  - **Generate template**

 Target     Query

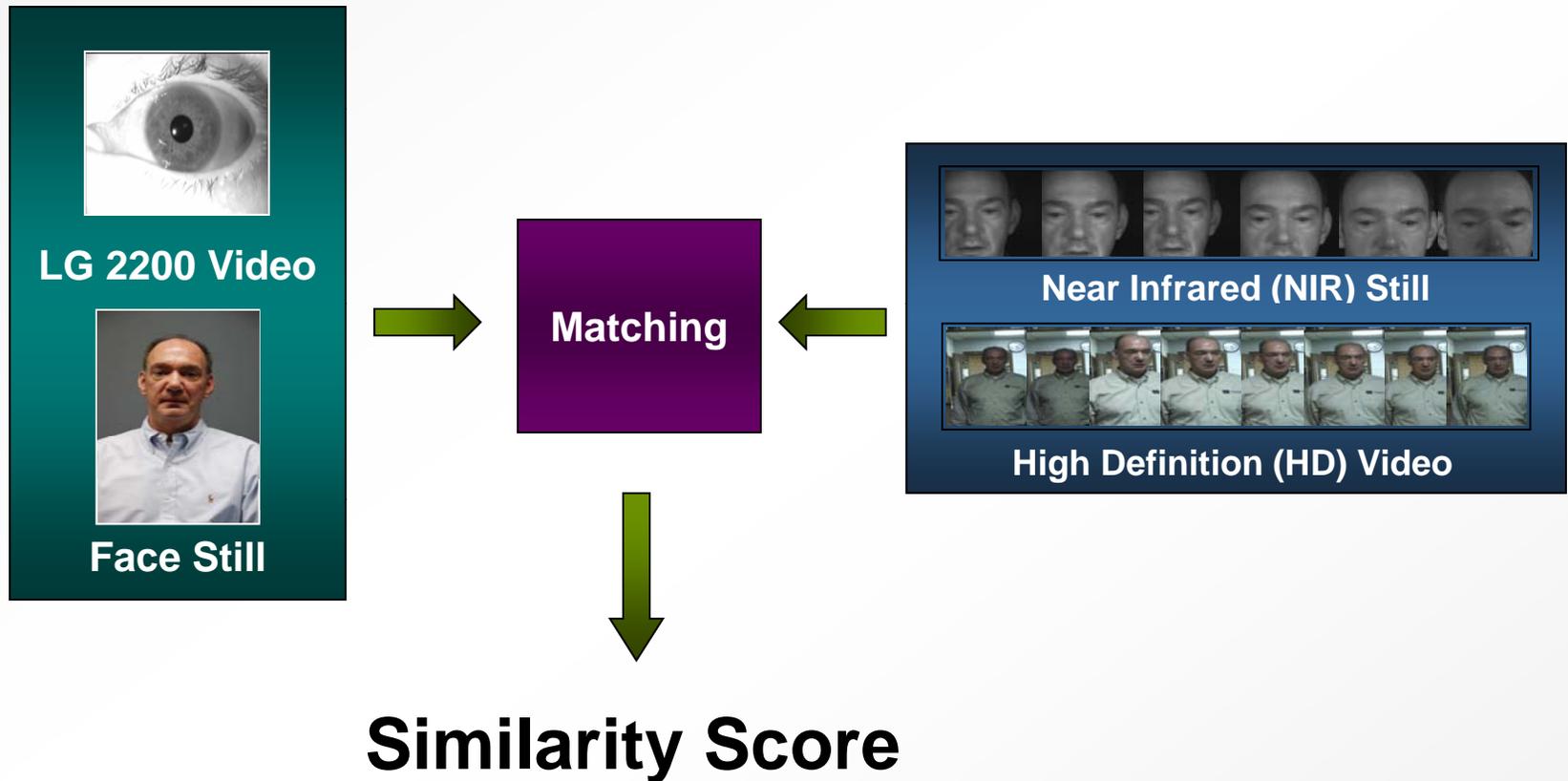
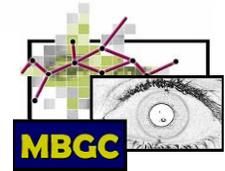
# Meet the Portal again....



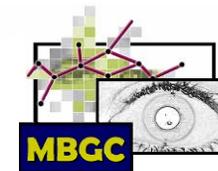
# Experiment: Still Face versus HD Video



# Experiment: Multiple Biometrics



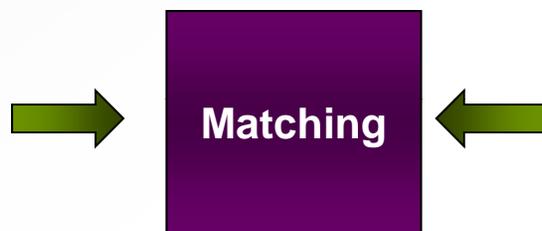
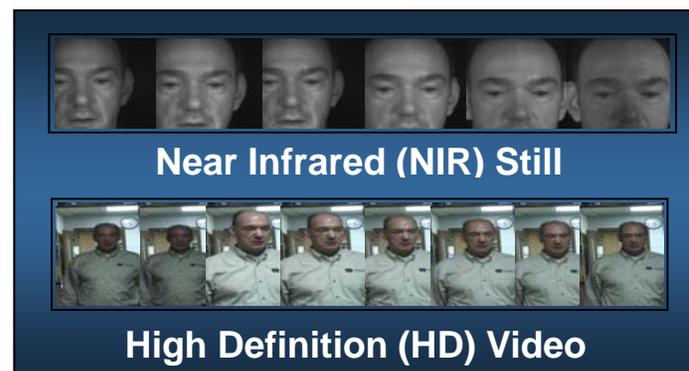
# Experiment: Multiple Biometrics



**Input is iris video  
sequence and face still**



**Inputs are both video sequences**

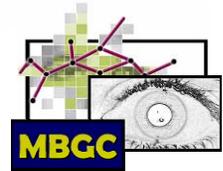


• **Participants needed to:**

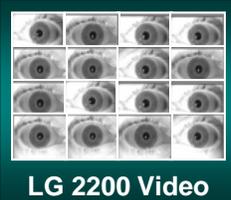
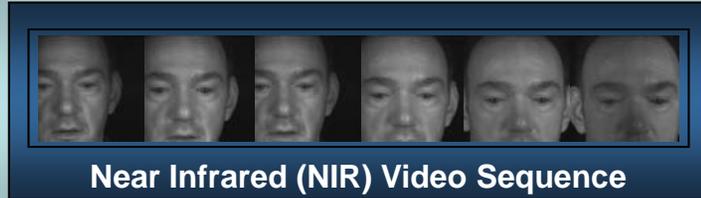
- **Process all the video sequences**
- **Generate template**
- **Decide on fusion strategy**

 Target     Query

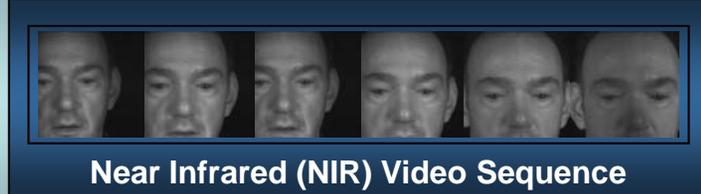
# Quick Summary



Still Iris versus NIR



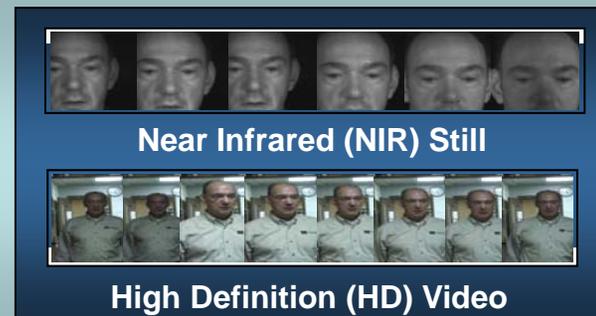
Video Iris versus NIR



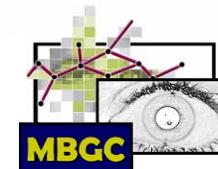
Still Face versus HD Video



Multiple Biometrics:  
Still Iris / Still Face vs. NIR & HD  
Video Iris / Still Face vs. NIR & HD



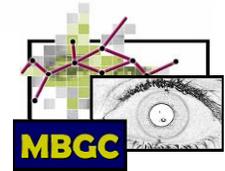
Target      Query



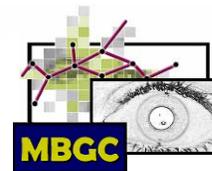
# Portal Challenge Version 1

- Number of subject sessions= 140
- Each subject session consists of
  - 1 NIR (from Iris On the Move)
  - 1 High definition video
  - 1 Still face (controlled illumination)
  - 1 Left iris video
  - 1 Right iris video
  - 1 Left iris still sample (6 iris images, LG2200)
  - 1 Right iris still sample (6 iris images, LG2200)

# List of participants



Name	Legend	Iris	Face	Fusion
Carnegie Mellon	HH		X	
Cognitec	AA		X	
CU_WVU_etc.	KK	X	X	X
Dalian	BB		X	
L-1	GG		X	
Lockheed	FF	X	X	X
Pittsburgh Pattern	II		X	
IUPUI	MM	X		
SAGEM	DD	X	X	X
SudParis	CC		X	
Surrey	EE		X	
Toshiba	LL		X	



# Coming up: Multiple Biometrics ROC



Face Still



LG 2200 Still

**Multiple Biometrics:**  
Still Iris / Still Face vs. NIR & HD  
Video Iris / Still Face vs. NIR & HD

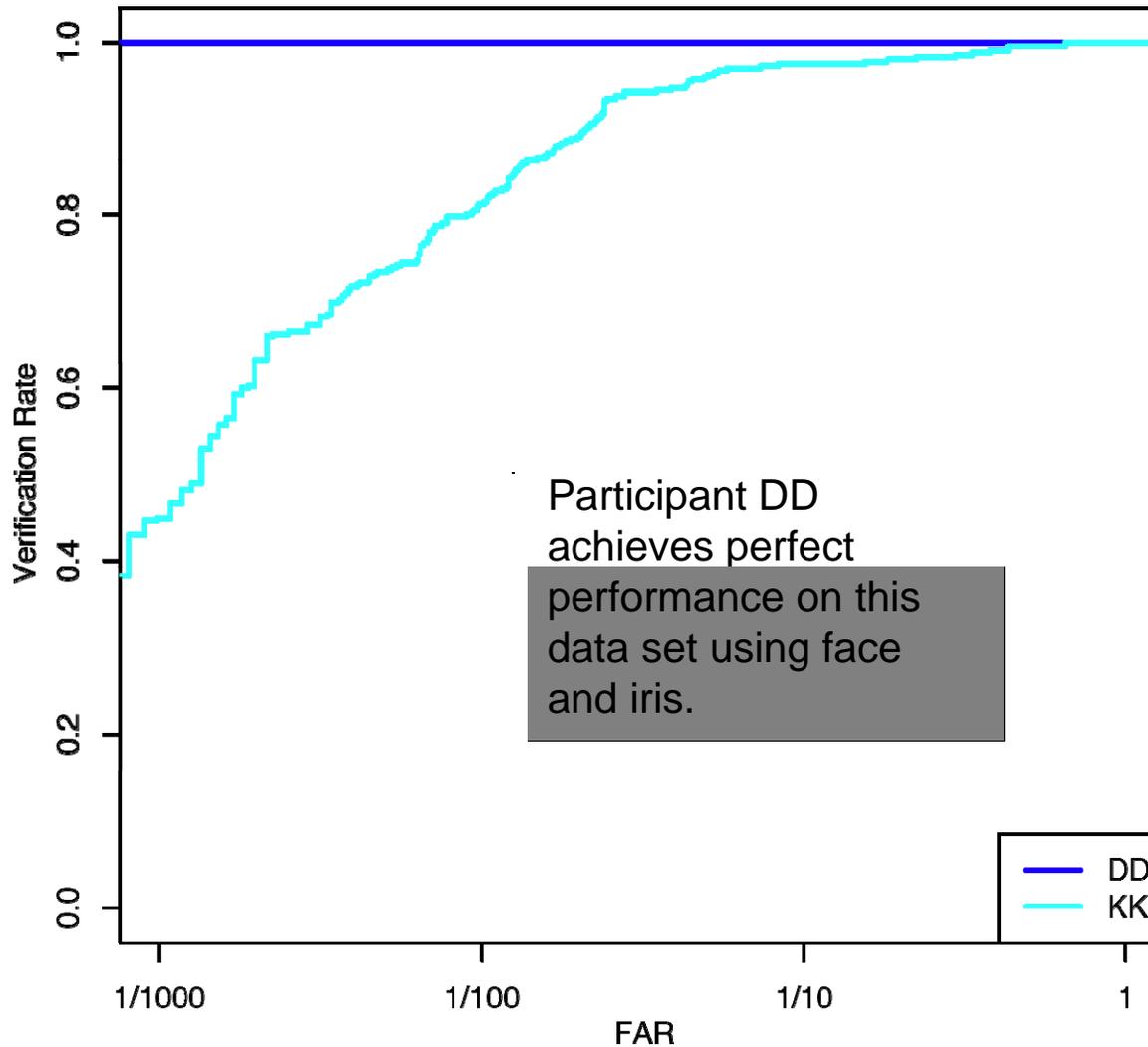
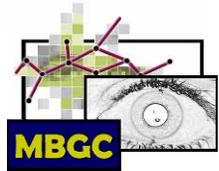


Near Infrared (NIR) Still



High Definition (HD) Video

# Multiple Biometrics: Still Iris / Still Face vs. NIR / HD Face



Results from an Open Book Challenge Problem, NOT an Independent Evaluation



# Coming up: Still Iris versus NIR ROC



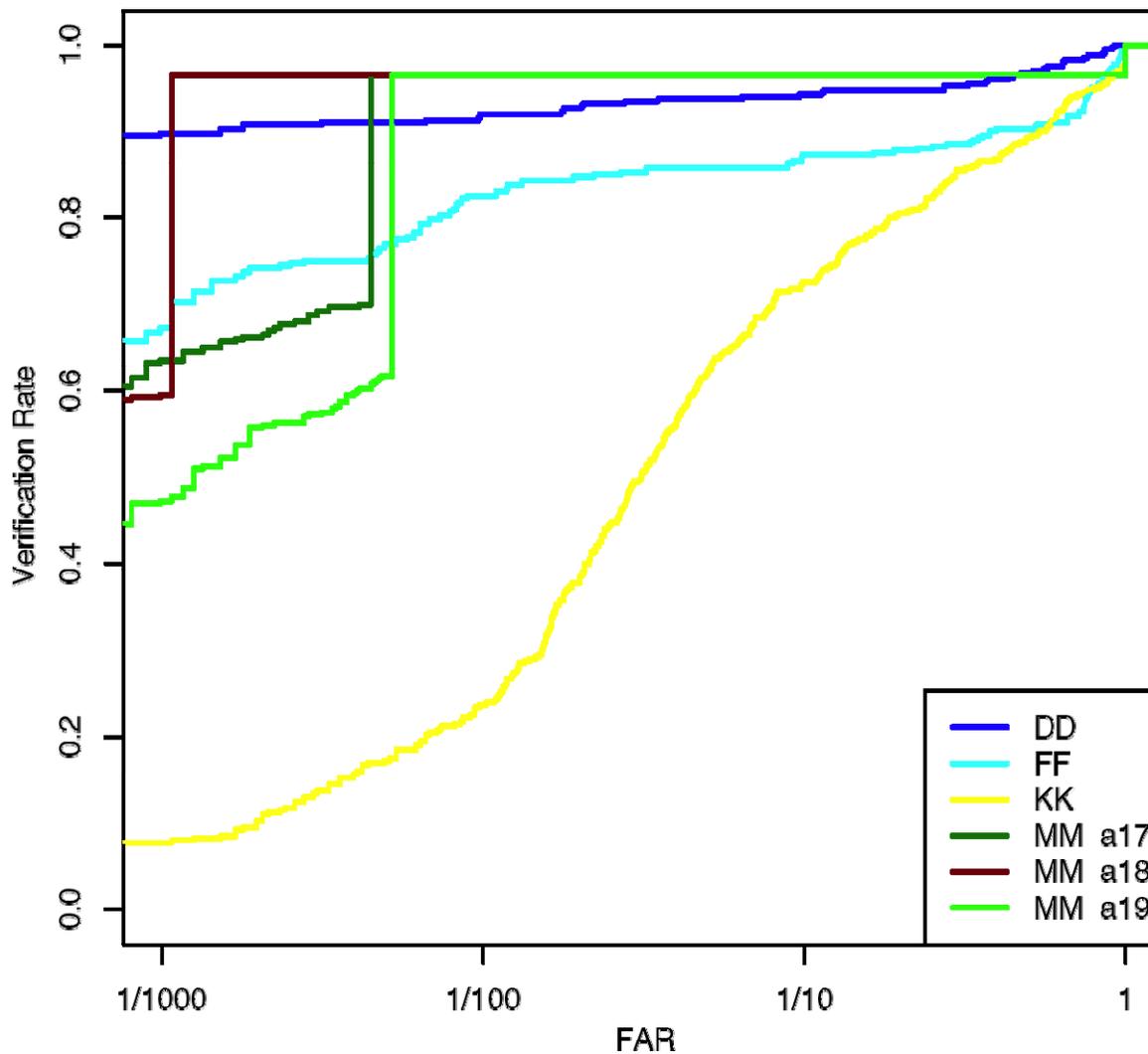
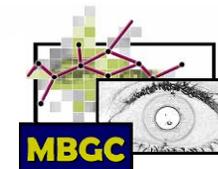
LG 2200 Still

Still Iris versus NIR



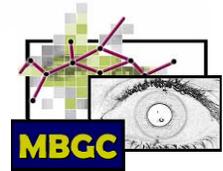
Near Infrared (NIR) Video Sequence

# Iris Only: Still Iris vs. NIR



Results from an Open Book Challenge Problem, NOT an Independent Evaluation

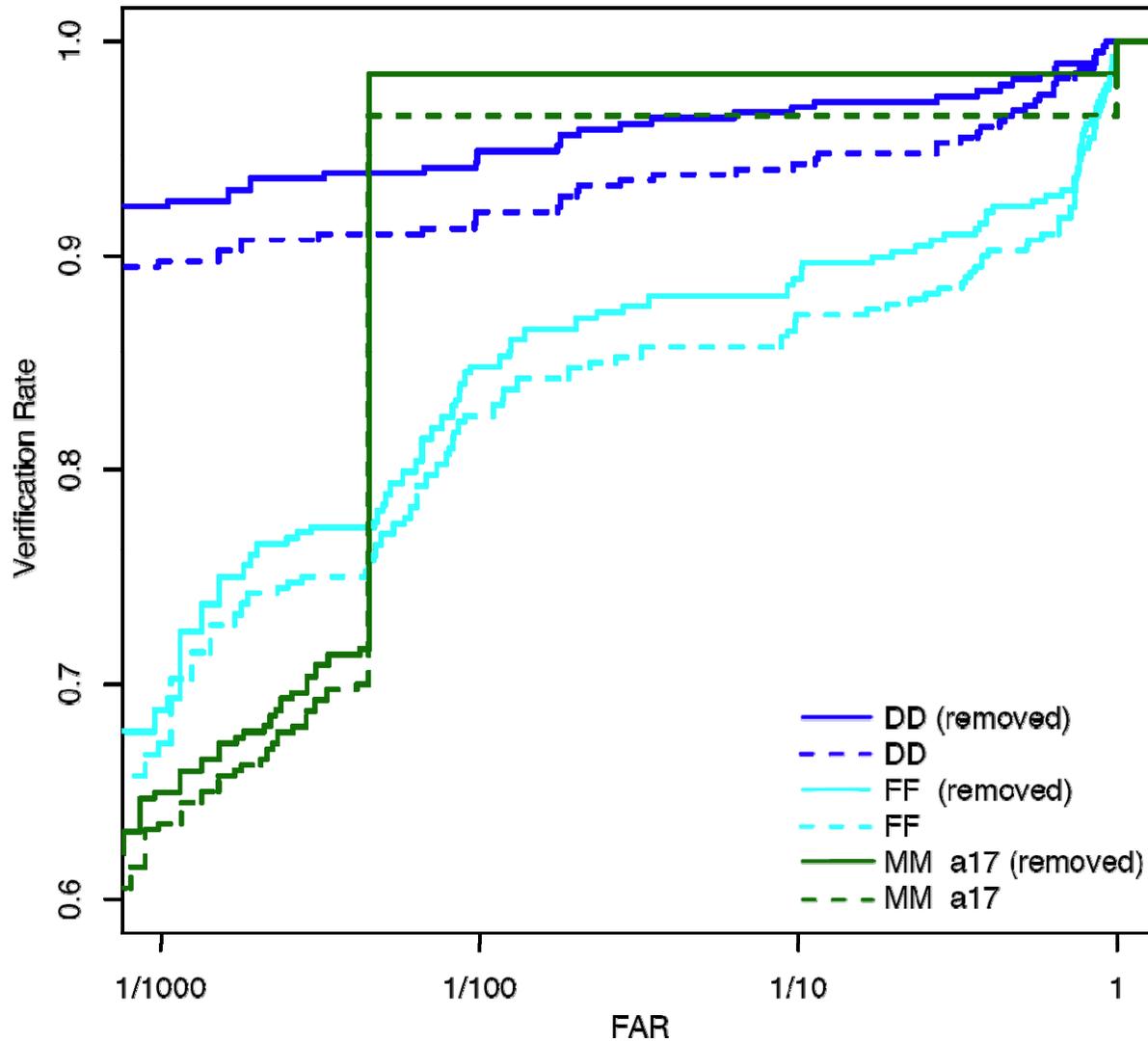
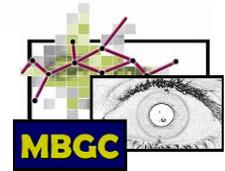
# Missing and Partial Irises in NIR



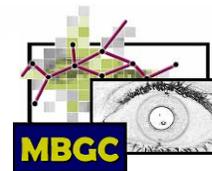
- 1) 04233v1466.avi (Right iris)
- 2) 05187v278.avi (Right iris)
- 3) 05313v5.avi (Partial right iris)
- 4) 05324v10.avi (Right iris)
- 5) 05367v5.avi (Right iris)
- 6) 05370v5.avi (Right iris)
- 7) 05372v10.avi (Partial right iris)
- 8) 04851v1175.avi (Right iris)
- 9) 05233v290.avi (Right iris)
- 10) 05390v5.avi (Right iris)
- 11) 05201v315.avi (Right iris)



# Still Iris vs. NIR, Missing and Partial Irises Removed.



Results from an Open Book Challenge Problem, NOT an Independent Evaluation



# Coming up: Still Face versus HD Video ROC



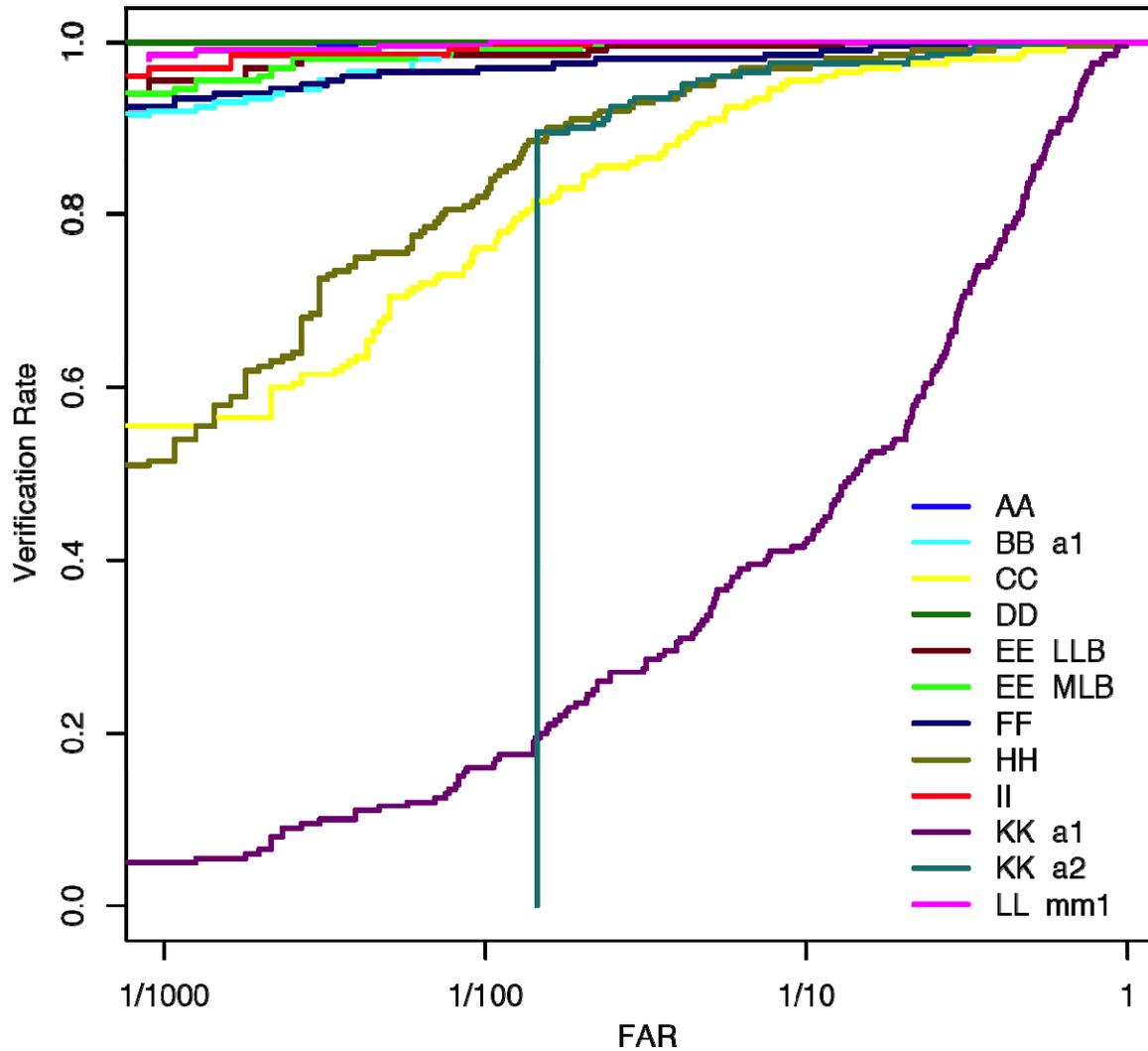
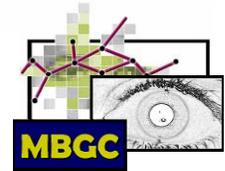
Face Still

Still Face versus  
HD Video



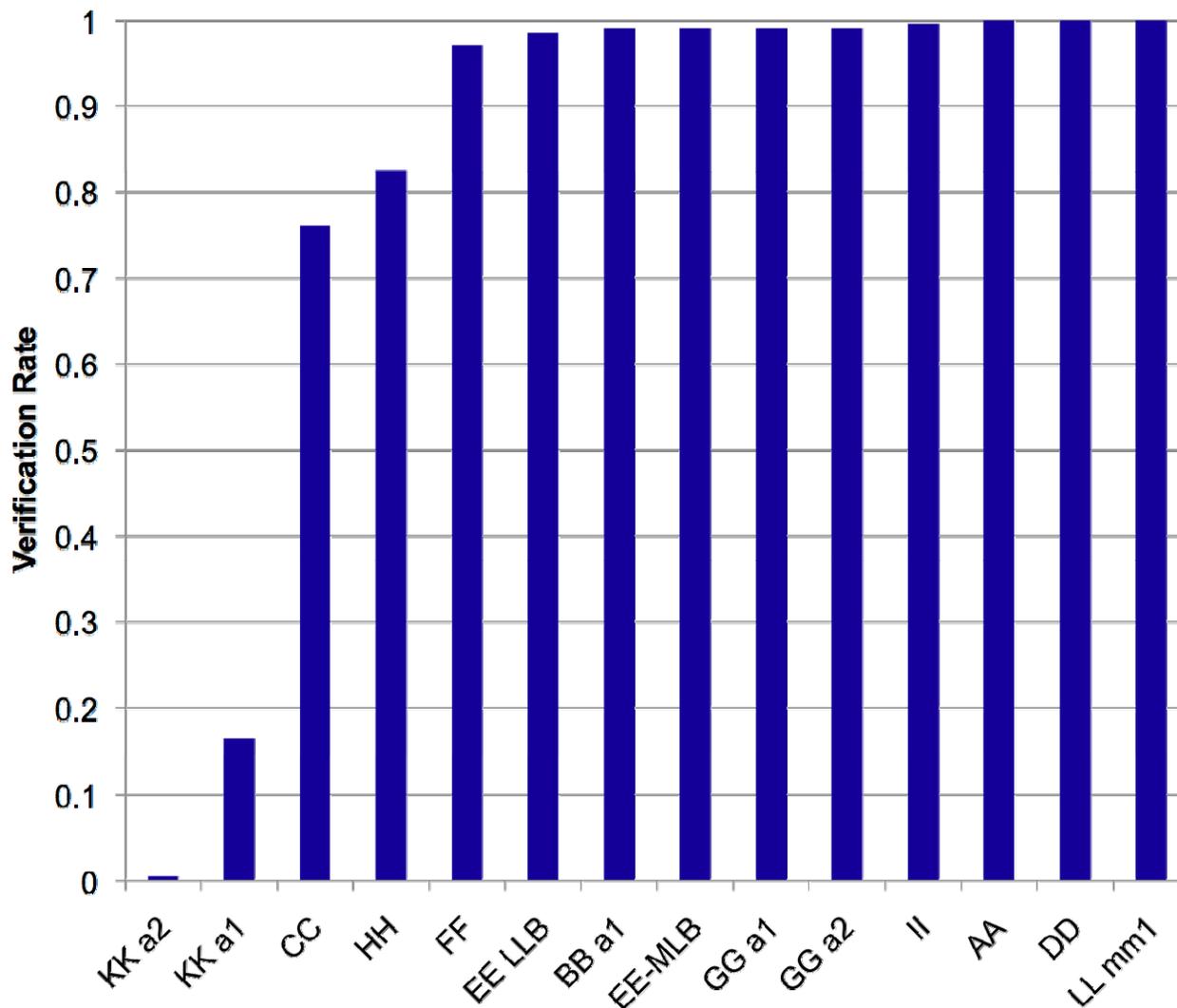
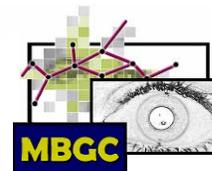
High Definition (HD) Video Sequence

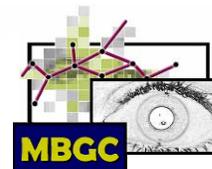
# Face Only: Still Face vs. HD Video



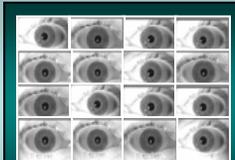
Results from an Open Book Challenge Problem, NOT an Independent Evaluation

# Still Face vs. HD Face, Verification Rates at FAR=1/100





# Coming up: Video Iris versus NIR ROC

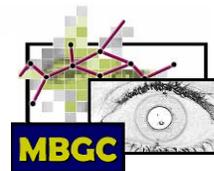


LG 2200 Video

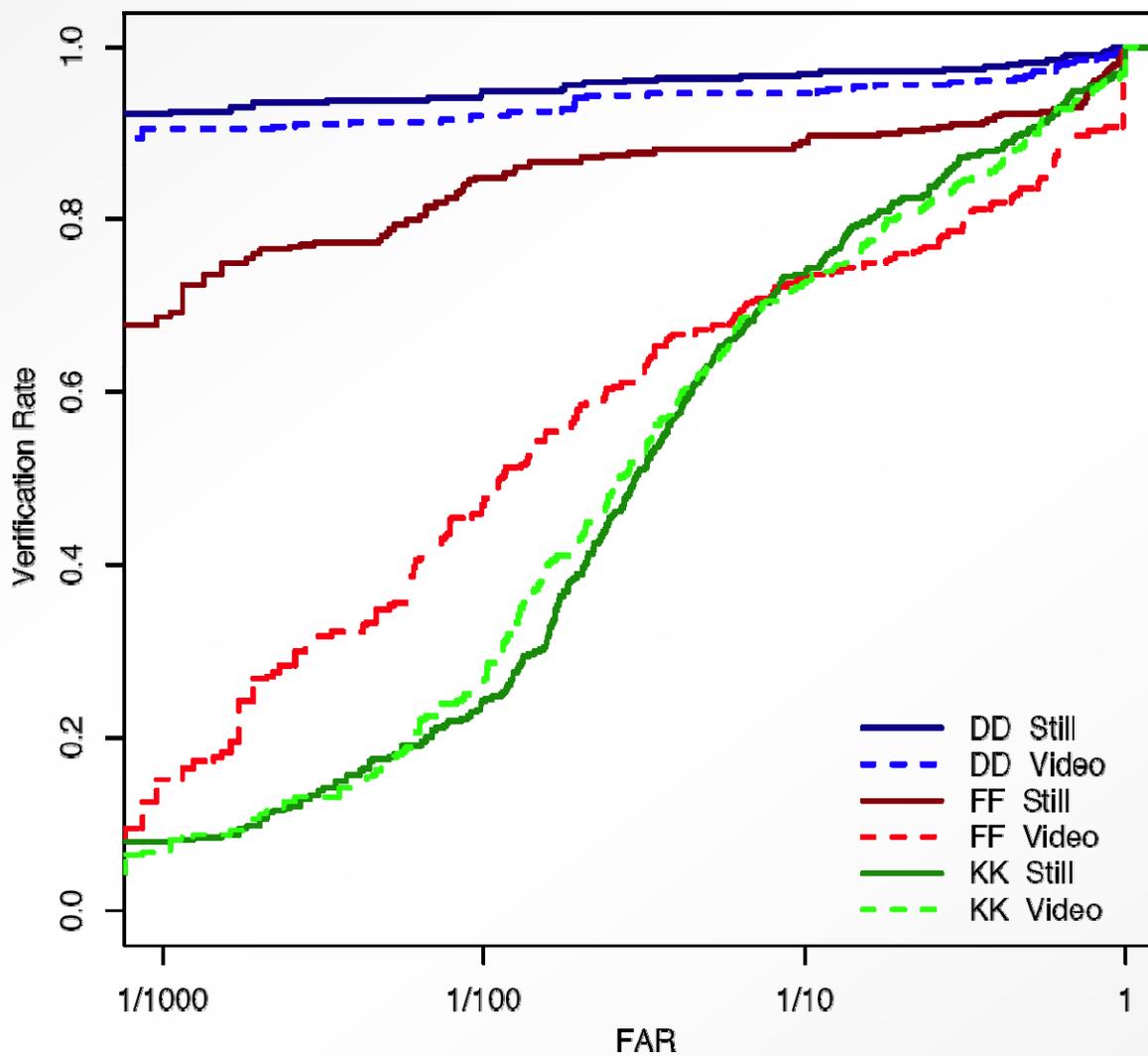
Video Iris versus NIR



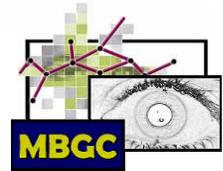
Near Infrared (NIR) Video Sequence



# Video Iris vs. NIR

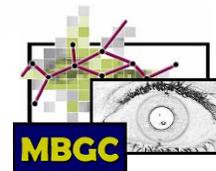


Results from an Open Book Challenge Problem, NOT an Independent Evaluation



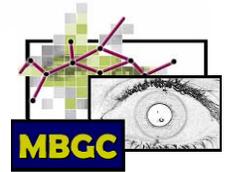
# Conclusions

- Established community
- Cautiously optimistic about performance
- Score distributions differ qualitatively among algorithms
- Performance on portal iris
  - First generation algorithms promising
- Performance on portal face
  - Can be near perfect on limited data set
- Need larger data set
  - Better understanding of face performance
  - Allows meaningful fusion experiments

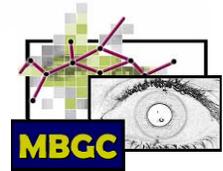


# Meta-conclusions

- Full range of problems and performance
  - Perfect on multiple biometric fusion
  - Random on activity sequences
  - A lot in between
- First characterization of iris performance on stand-off sensor data
- Unconstrained video is a significant challenge
- Potential resolution/compression insensitivity
- Cautiously optimistic about portal
- Human recognition from video

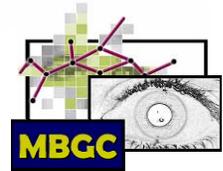


# MBGC ver2 and MBE 2009



## MBGC version2

- Scheduled release January 2009
- Portal Challenge
  - Increased number of subject sessions
- Video Challenge
  - Increased number of subject sessions
- Still Face
  - Additional resolution and compression rates
  - Cross comparisons



# MBE 2009

- Three tracks
  - Portal
  - Still Face
  - Video
- Run at NIST
- Sequester data
- Portal and Video
  - Executable
  - Based on FRVT 2006, ICE 2006, and MBGC
- Still face track
  - Operational data
  - Submission of SDKs will be an option
- Summer 2009
  - Staggered start of three tracks