FRGC and ICE Workshop

Dr. P. Jonathon Phillips - NIST

March 22-23, 2006
NRECA Conference Facility
Arlington, Virginia

FRGC, FRVT 2005 & ICE Sponsors

Executing Agency

- National Institute of Standards and Technology — NIST
  ...working with industry to foster innovation, trade, security and jobs

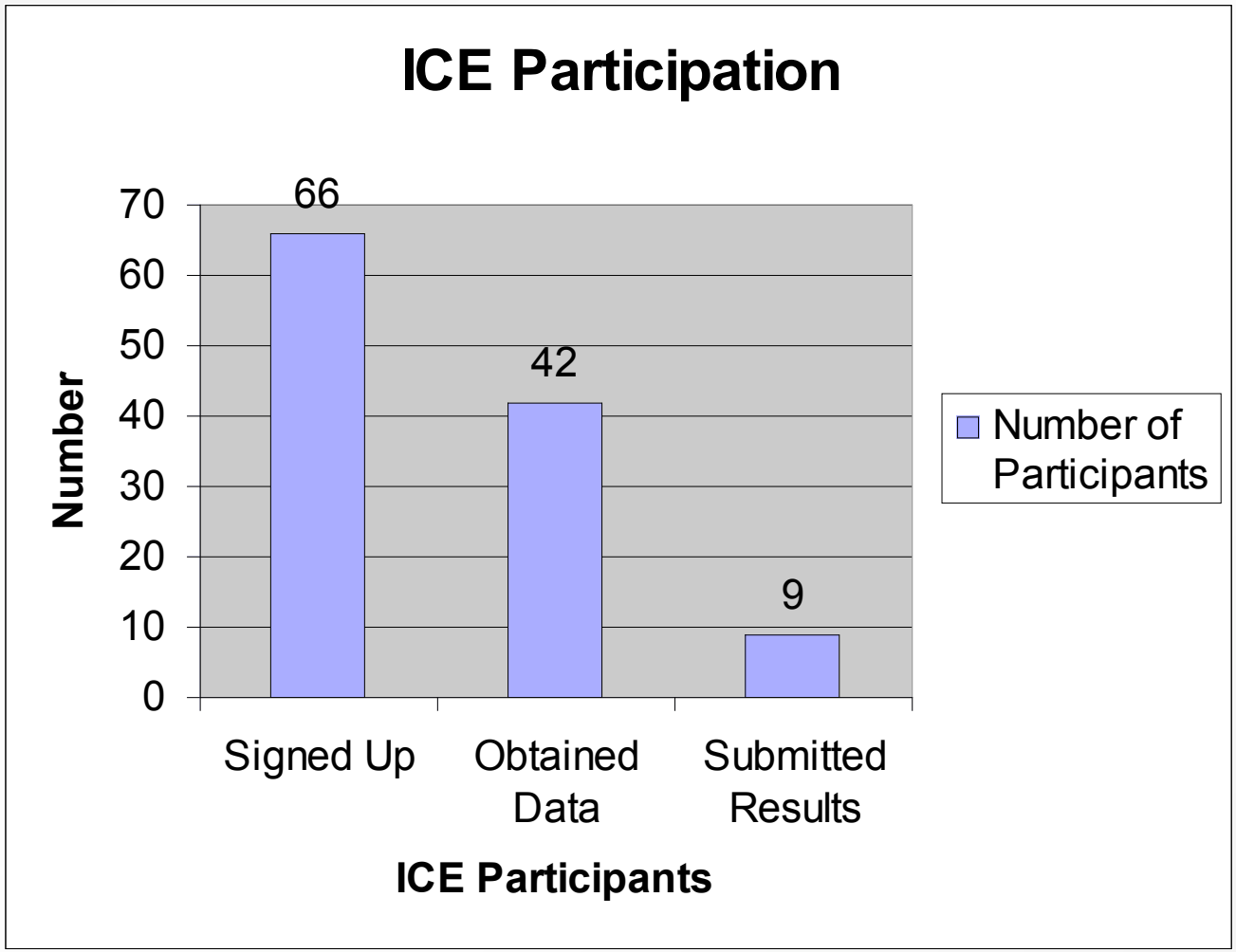
Sponsoring Agencies

- Director of National Intelligence
  Intelligence Technology Innovation Center — ITIC
- Federal Bureau of Investigation
  www.fbi.gov
- Homeland Security
  - Science & Technology Directorate
  - Transportation Security Administration
- National Institute of Justice
  The Research, Development, and Evaluation Agency of the U.S. Department of Justice
- COMBATING TERRORISM
  TSWG
  TECHNICAL SUPPORT WORKING GROUP

FRGC and ICE Team

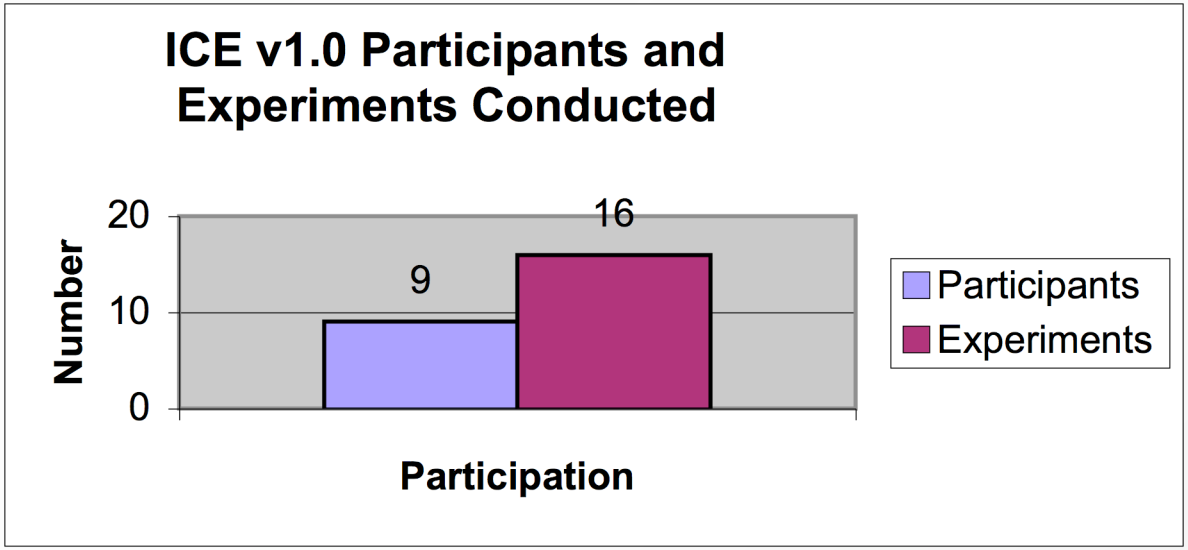
- **Program Manager for FRGC and ICE**
  - P. Jonathon Phillips — *NIST*
- **Evaluation Team**
  - Todd Scruggs — *SAIC*
  - Matt Sharpe — *SAIC*
  - William Worek — *SIAC*
  - Kevin Bowyer — *University of Notre Dame*
  - Patrick Flynn — *University of Notre Dame*
  - Ross Beveridge — *Colorado State University*
  - Alice O'Toole — *University of Texas at Dallas*
- **FRGC and ICE Liaison**
  - Cathy Schott — *Schafer Corp*

ICE Participation



ICE Participation

- Results received on ver1.0 in March 2006



FRVT 2006 Update

- The Face Recognition Vendor Test (FRVT) 2006
  - Began on 30 January 2006
  - Currently underway
    - Testing executables at this time
  - 22 Participants
    - 10 countries
    - 30% of Participants are from Academia

FACE RECOGNITION VENDOR TEST 2006

Iris Challenge Evaluation Overview

NIST

ICE Goals

- Broad Goals
  - Facilitate iris recognition technology development
  - Technology assessment of iris recognition
- Modeled after FRGC/FRVT 2005
  - FRGC (Face Recognition Grand Challenge)
  - FRVT 2006 (Face Recognition Vendor Test 2006)

Questions Examined

Recognition

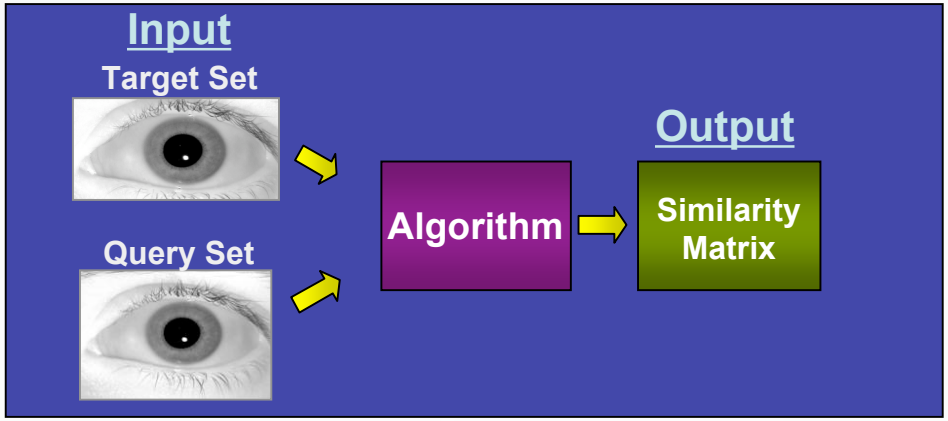
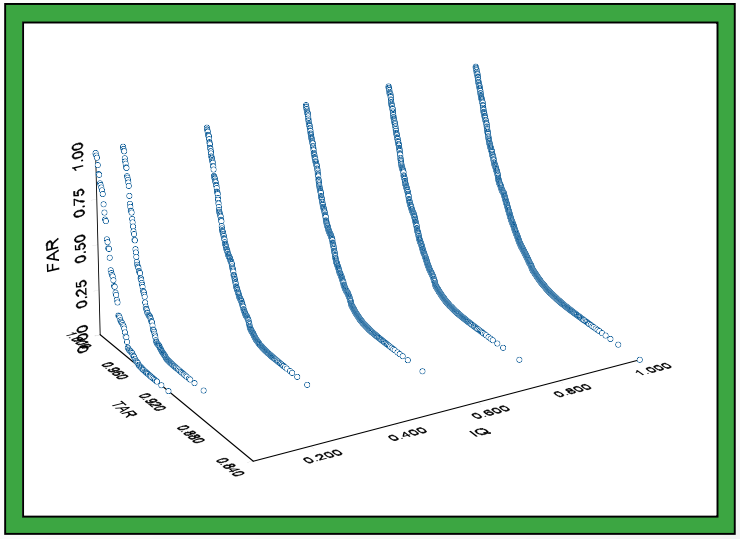


Image Quality



ICE 2005 and 2006

- What is the difference between ICE ~~Phase I~~ 2005 and ICE ~~Phase II~~ 2006?
  - ICE 2005 – Technology Development
    - Iris recognition challenge problems
    - Iris data set
  - ICE 2006 - Evaluation
    - Independent government technology evaluation
    - Sequestered data

ICE 2005 Challenge Problems

NIST

Define Experiments

Exp 1

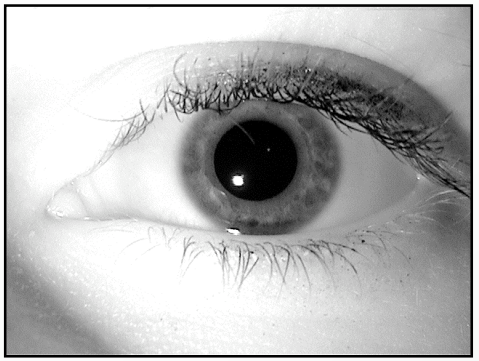
Right Eye

1425 Iris Images

124 Individuals

Exp 2

Left Eye



1528 Iris Images

120 Individuals

112 Overlapping Individuals

132 Total Individuals

Define Experiments

- Exp 3 and 4
  - Right iris verses left iris
  - Left iris verses right iris
- Purpose
  - Examine right-left iris independence
  - Analysis not included in today's presentation

Iris Challenge Evaluation

- Fully Automatic
- Quality Metric

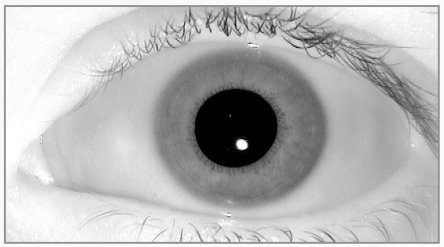
NIST

Fully Automatic

Input

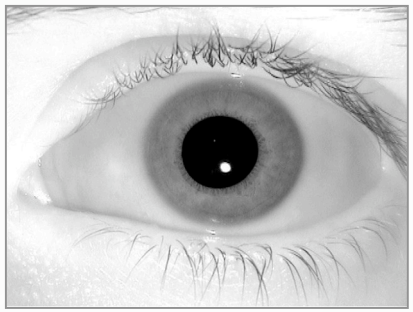
Target Set

Image



Query Set

Image

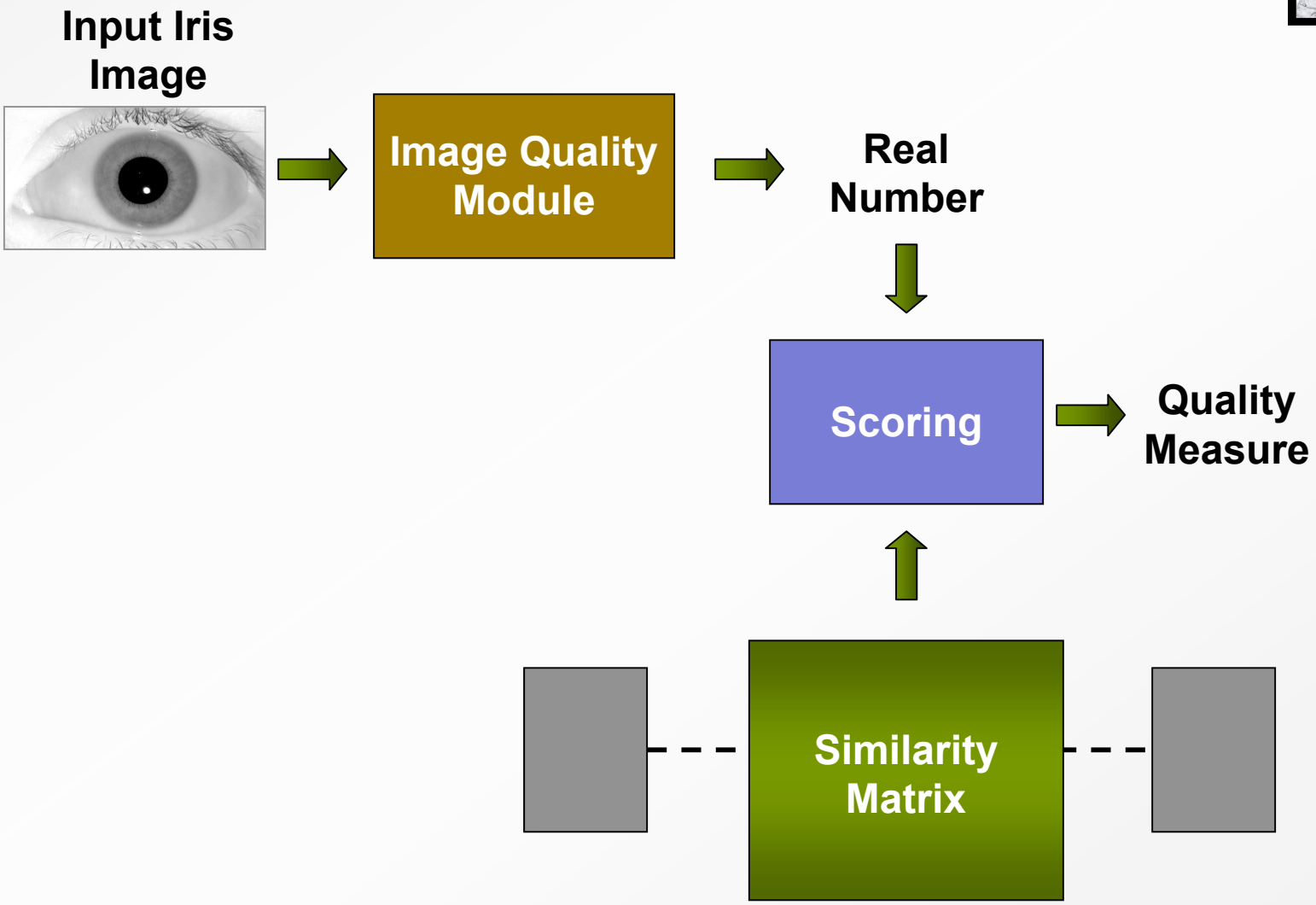


Output

Algorithm

Similarity Matrix

Image Quality



ICE 2005 Results

ICE 2005

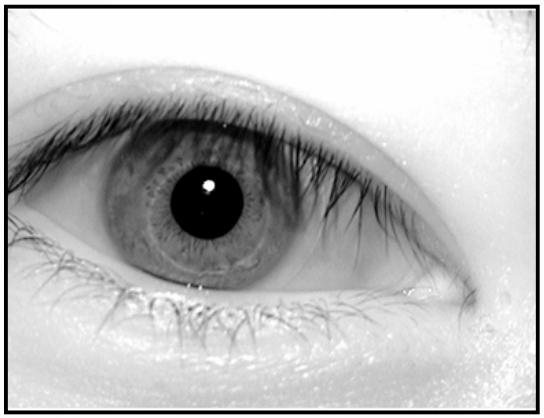
- Challenge Problem
  - Open book
- Data Released September 2005
  - Iris images
  - Experiments
  - Ground truth
- Similarity Matrices Submitted March 2006
  - Generated by participants
  - Scored by NIST
- NOT an independent Evaluation
  - NO sequestered data

Result Submissions

- Results submitted:
  - 9 Groups
  - 15 Algorithms + 1 irisBEE Baseline
  - 6 Countries
- ICE Phase I Participants:
  - Cambridge University *(Cam 1, Cam 2)*
  - Carnegie Mellon University *(CMU)*
  - Chinese Academy of Sciences, Center for Information Science *(CAS 1, CAS 2, CAS 3)*
  - Indiana University, Purdue University, Indianapolis *(IUPUI)*
  - Iritech *(IritchA, IritchB, IrtchC, IritchD)*
  - PELCO *(Pelco)*
  - SAGEM - Iridian *(SAGEM)*
  - West Virginia University *(WVU)*
  - Yamataki Corp / Tohoku University *(Tohoku)*

Hidden Test

- Find all mislabeled irises



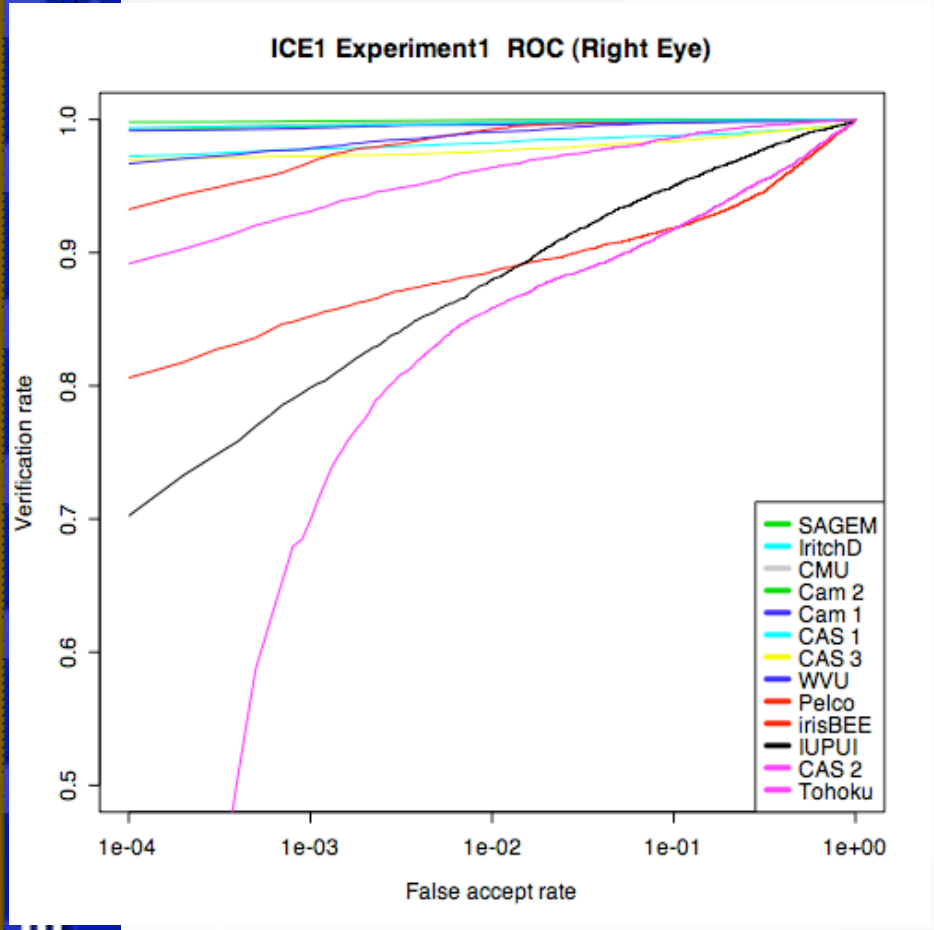
246240.tiff

- Accidentally included in Exp 2
- Error corrected in Exp 2 mask matrix

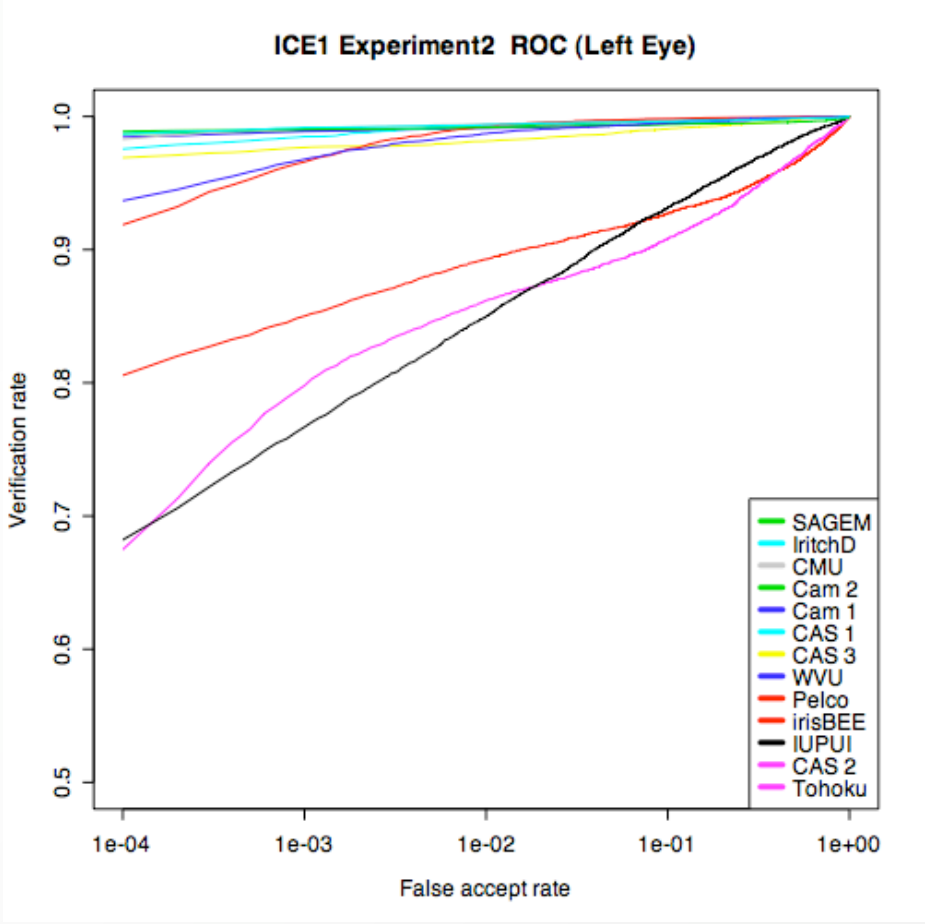
1 Error in 2953 image!!

ROC Results - Fully Automatic

Exp 1



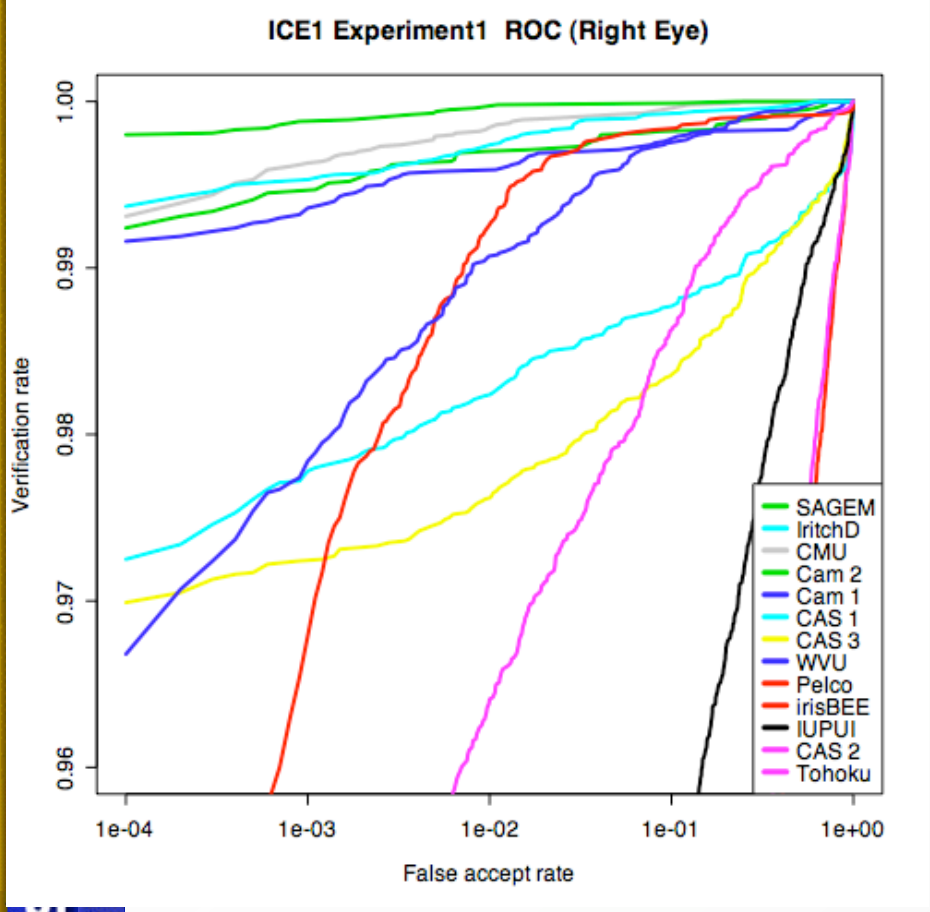
Exp 2



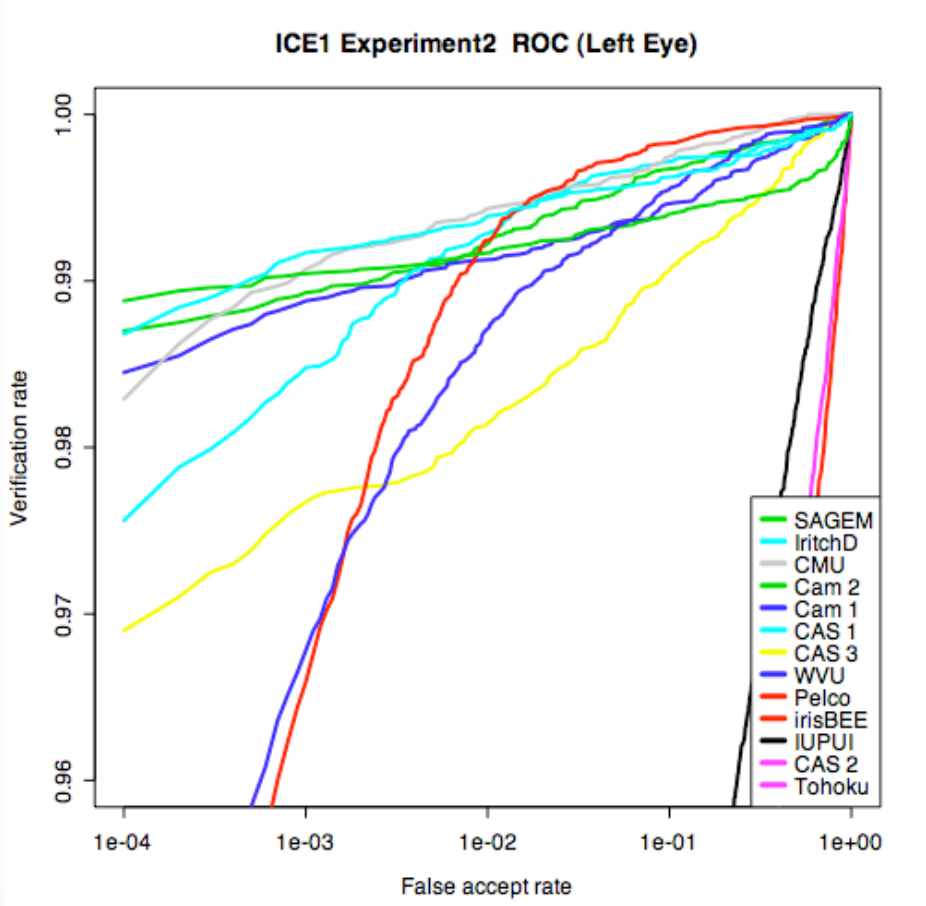
Results from Open Book Challenge Problem
NOT Independent Evaluation

ROC Results

Exp 1

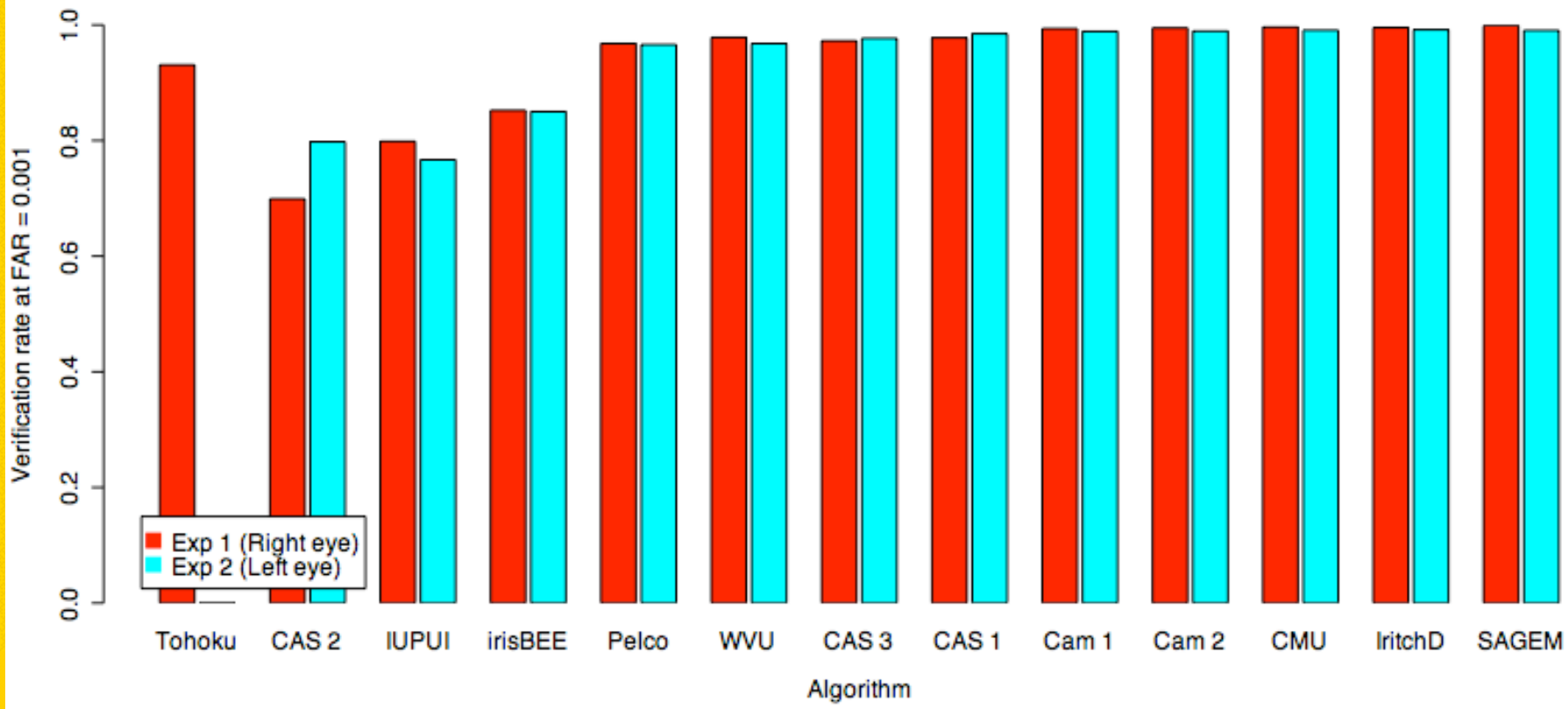


Exp 2



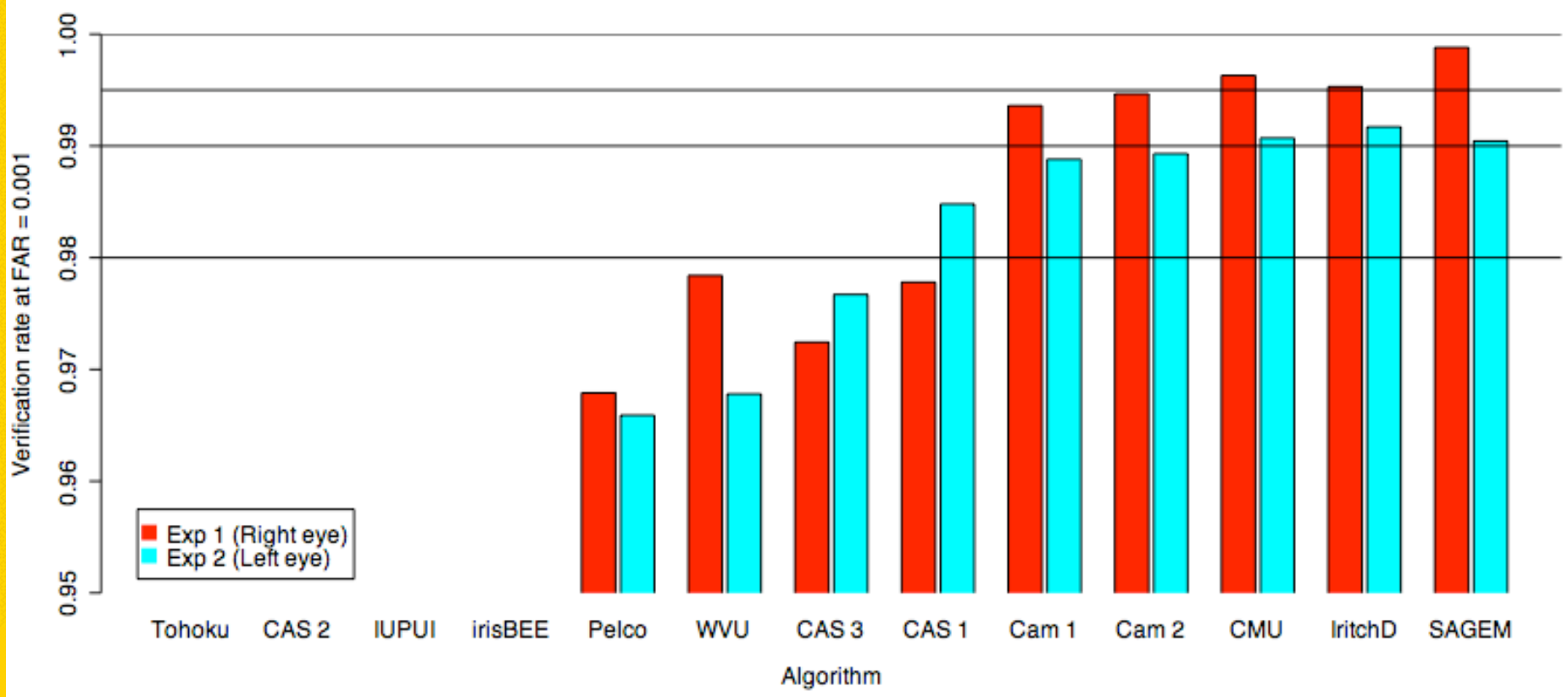
Results from Open Book Challenge Problem
NOT Independent Evaluation

Bar Plot Performance Results Fully Automatic, FAR=0.001



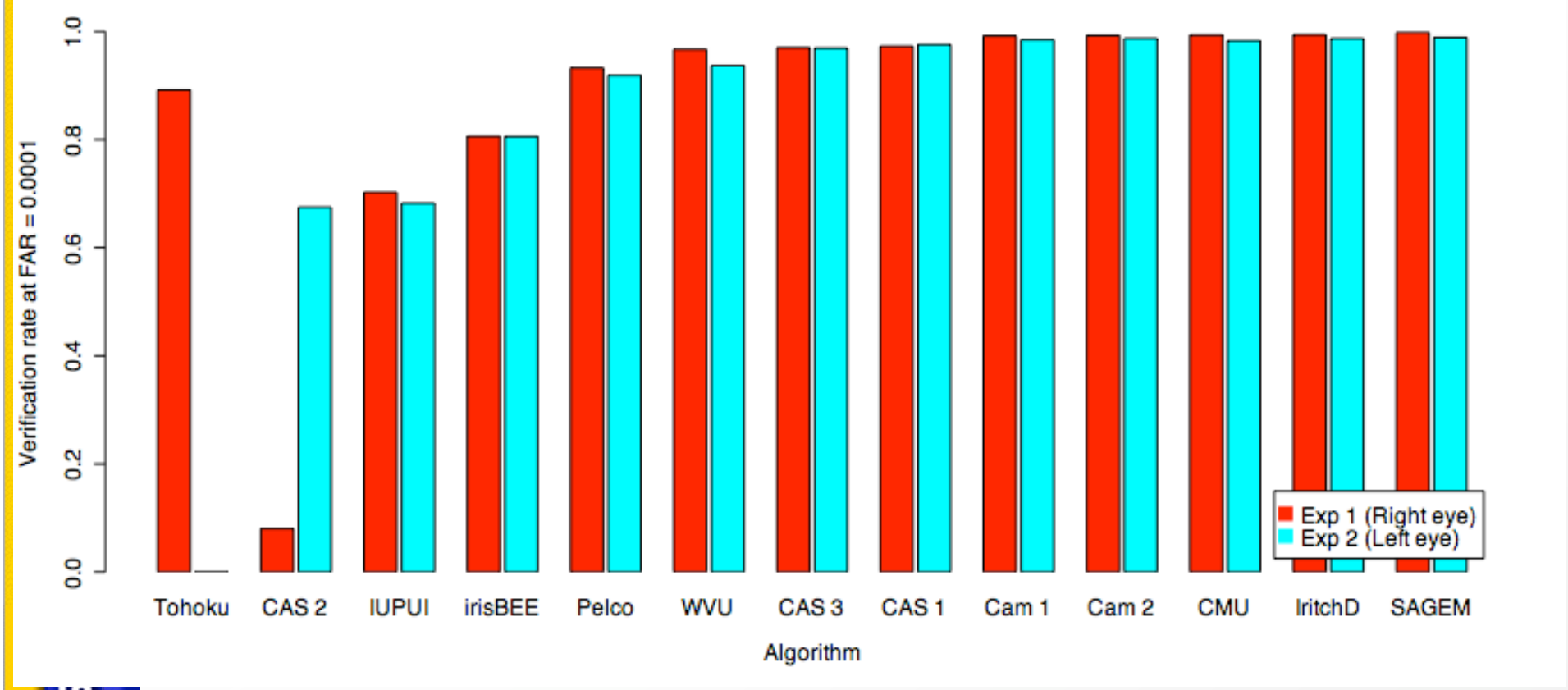
Results from Open Book Challenge Problem
NOT Independent Evaluation

Bar Plot Performance Results
Fully Automatic, FAR=0.001



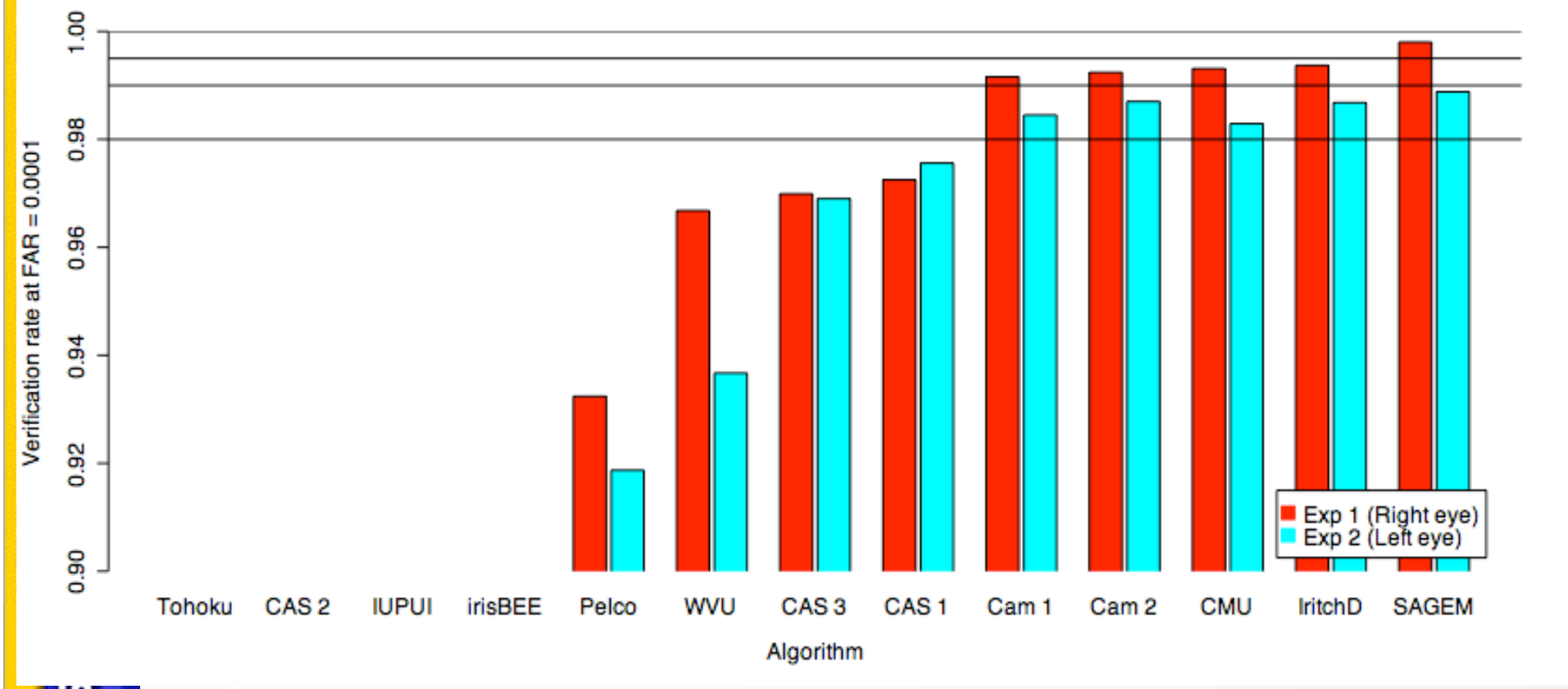
Results from Open Book Challenge Problem
NOT Independent Evaluation

Bar Plot Performance Results Fully Automatic, FAR=0.0001



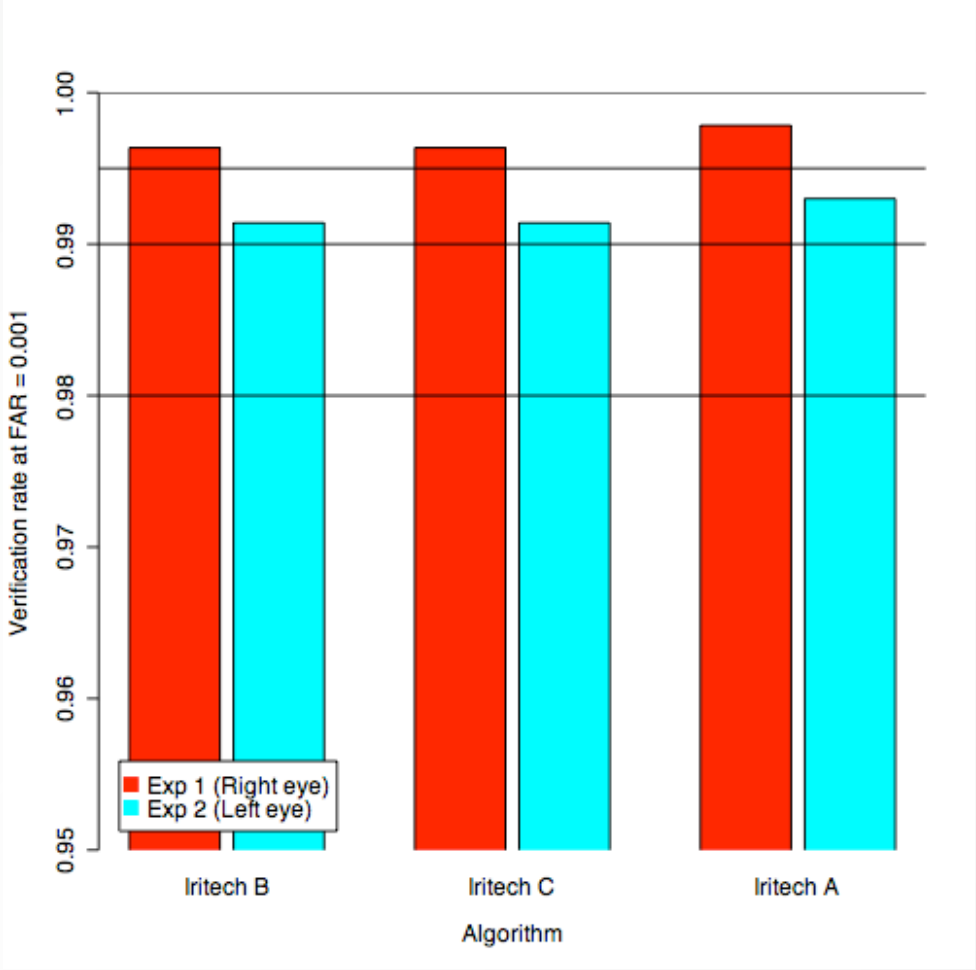
Results from Open Book Challenge Problem
NOT Independent Evaluation

Bar Plot Performance Results Fully Automatic, FAR=0.0001



Results from Open Book Challenge Problem
NOT Independent Evaluation

Bar Plot Performance Results Manual Intervention, FAR=0.001

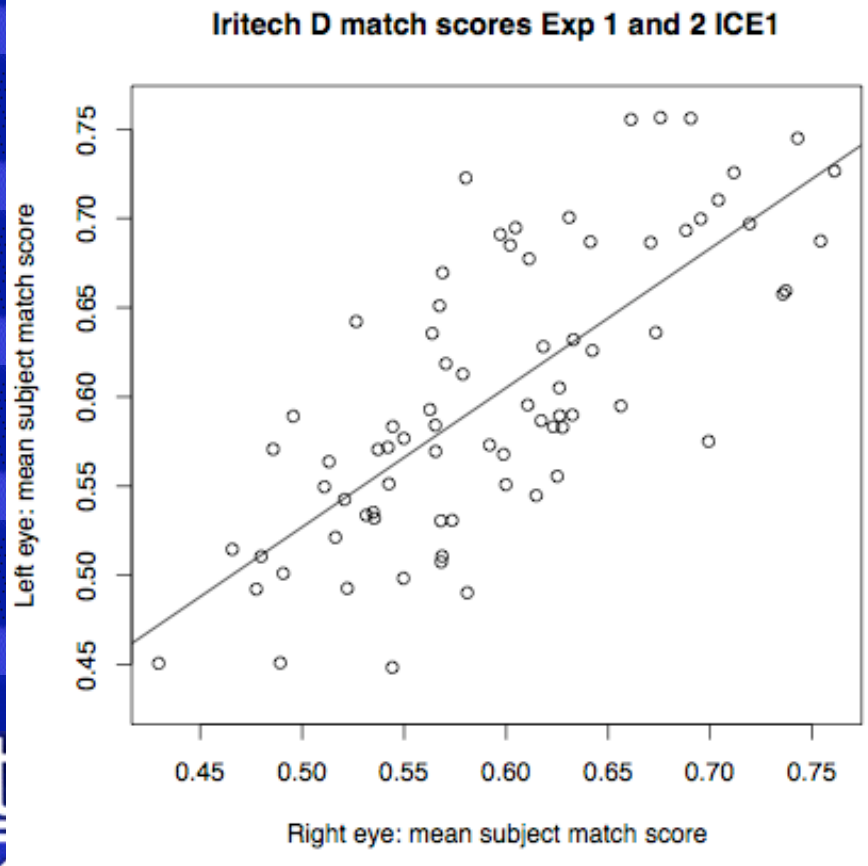


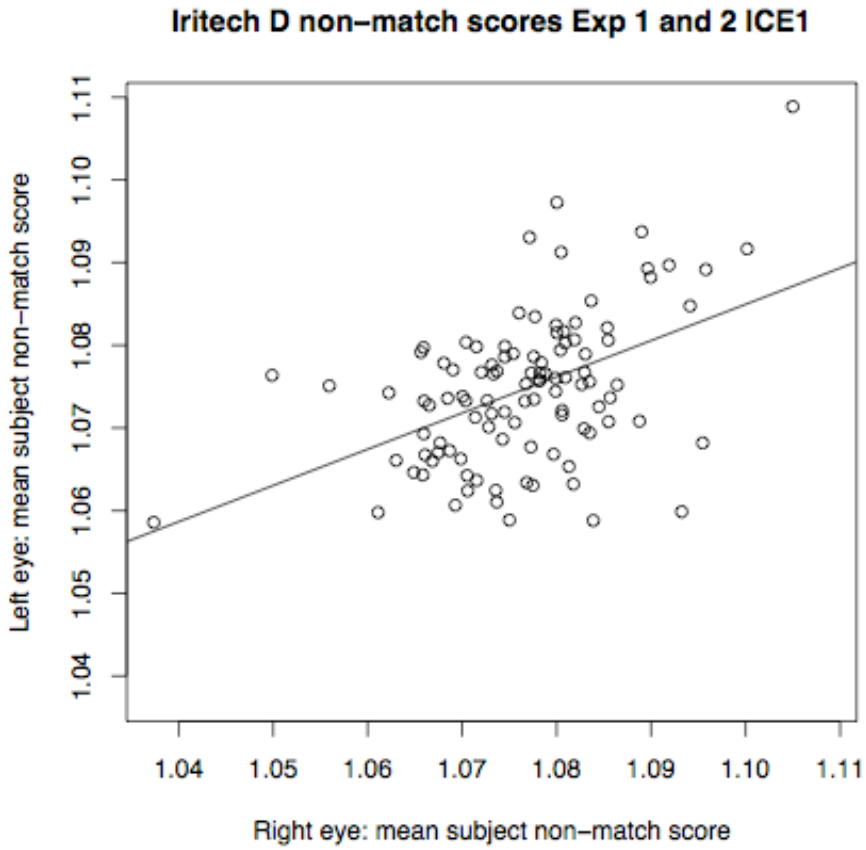
Results from Open Book Challenge Problem
NOT Independent Evaluation

Eye Independence

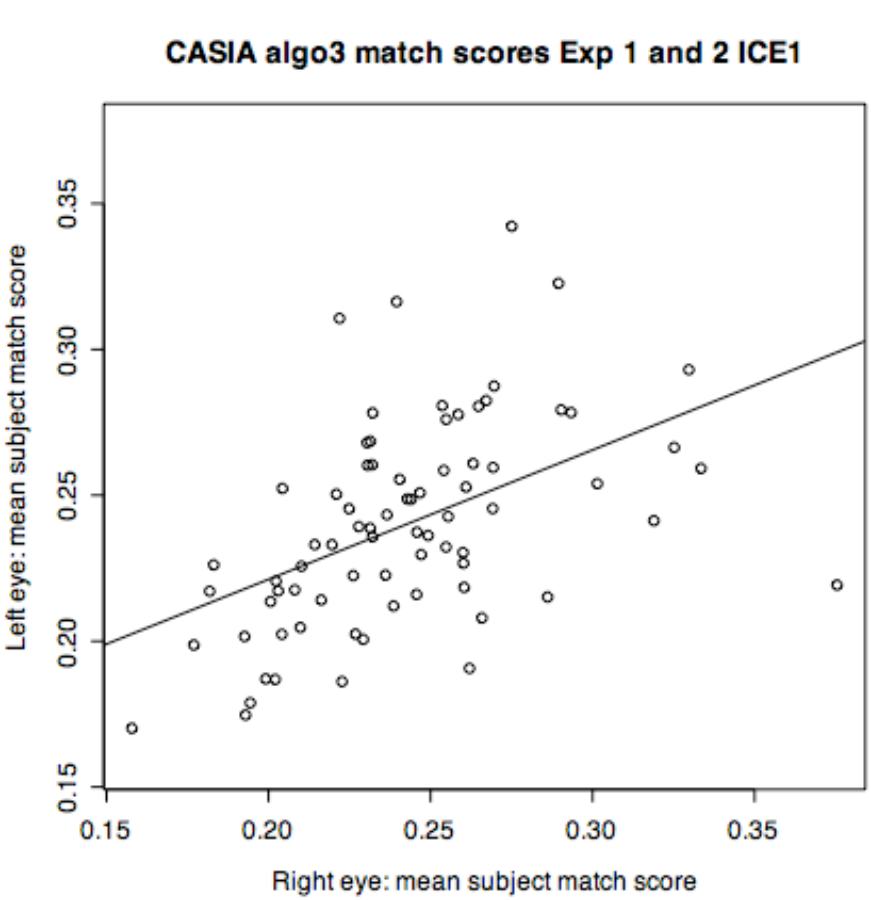
- Purpose:
  - Examine relationship between left & right iris
- Method:
  - For each subject, compute mean match score
    - Right and left iris
  - For each subject, compute mean non-match score
    - Right and left iris
  - Scatter plot of right verses left iris
    - Mean match score
    - Mean non-match score

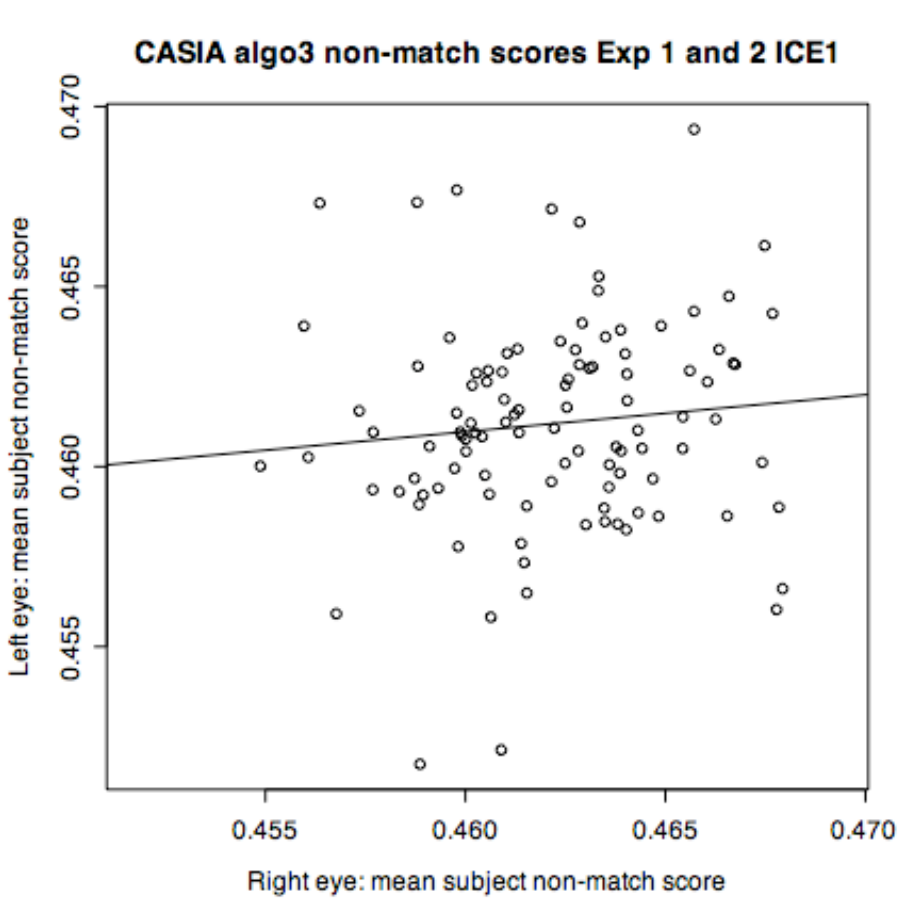
Eye Independence - Iritech



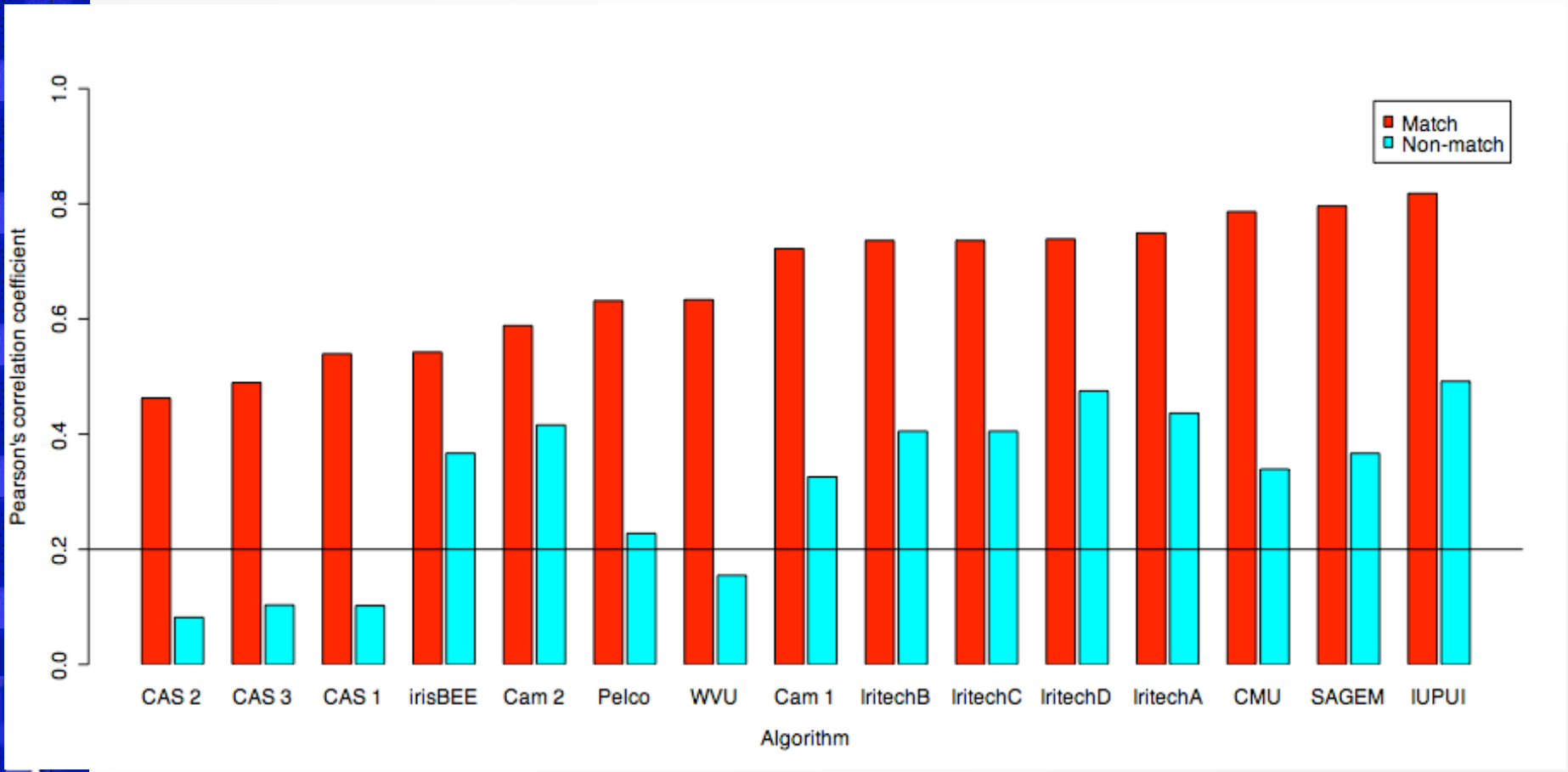


Eye Independence-CASIA

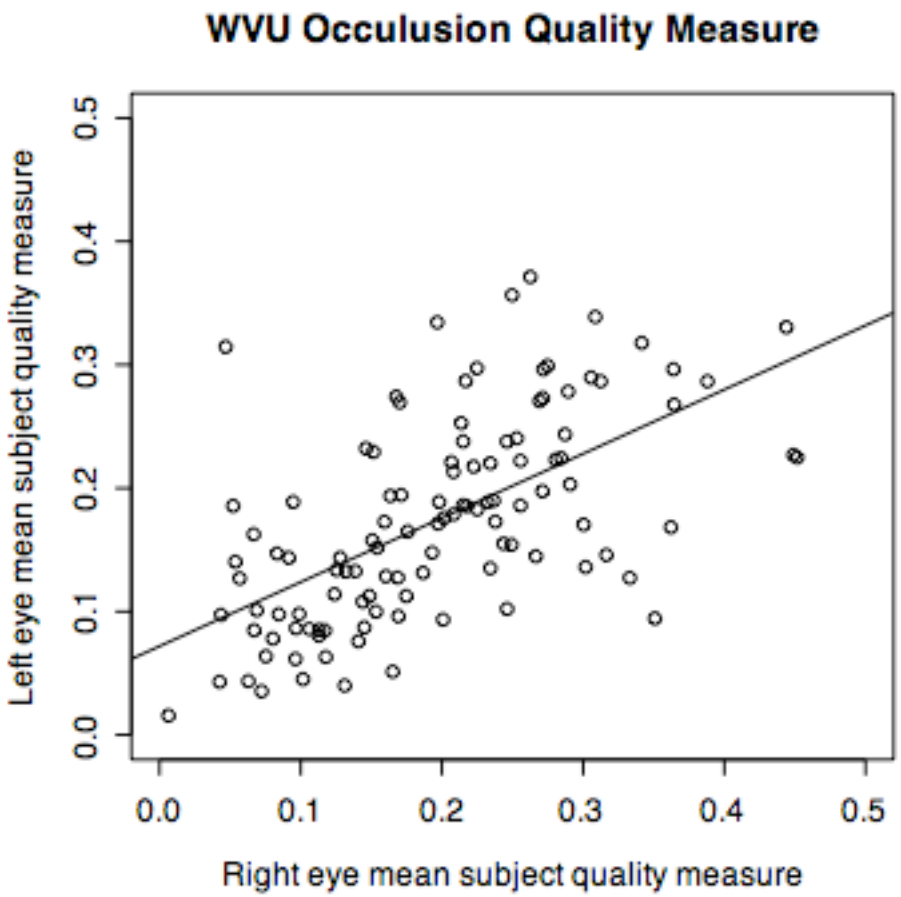


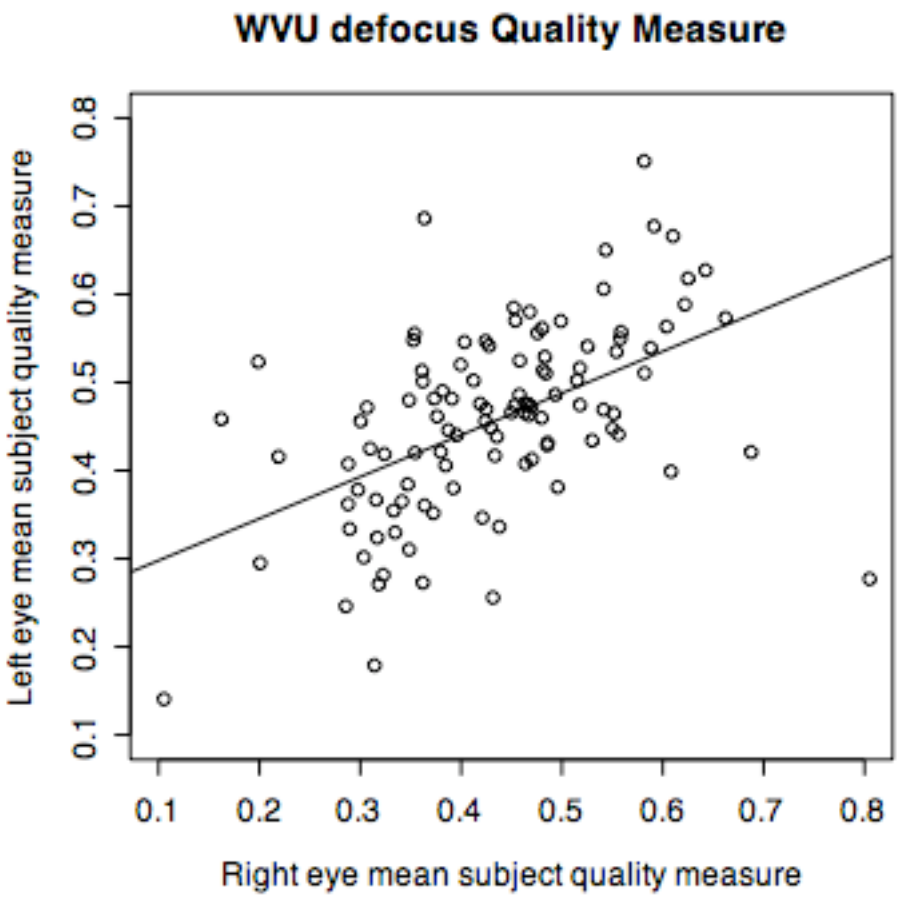


Eye Independence-Summary



Quality Measures





ICE 2006 Schedule

- Today
  - Key points in afternoon talk
- 1 April 2006
  - ICE 2006 Protocol released
- 15 June 2006
  - Executables submission deadline
  - ICE 2006 evaluation begins
- December 2006
  - ICE 2006 Final Report released

Conclusion

- ICE - Technology Development
- ICE 2006 – Independent Government Evaluation
  - Modeled after FRVT 2006
- Goals
  - Facilitate technology development
  - Technology assessment of iris recognition