

IREX III

Performance of 1:N Iris Recognition Algorithms

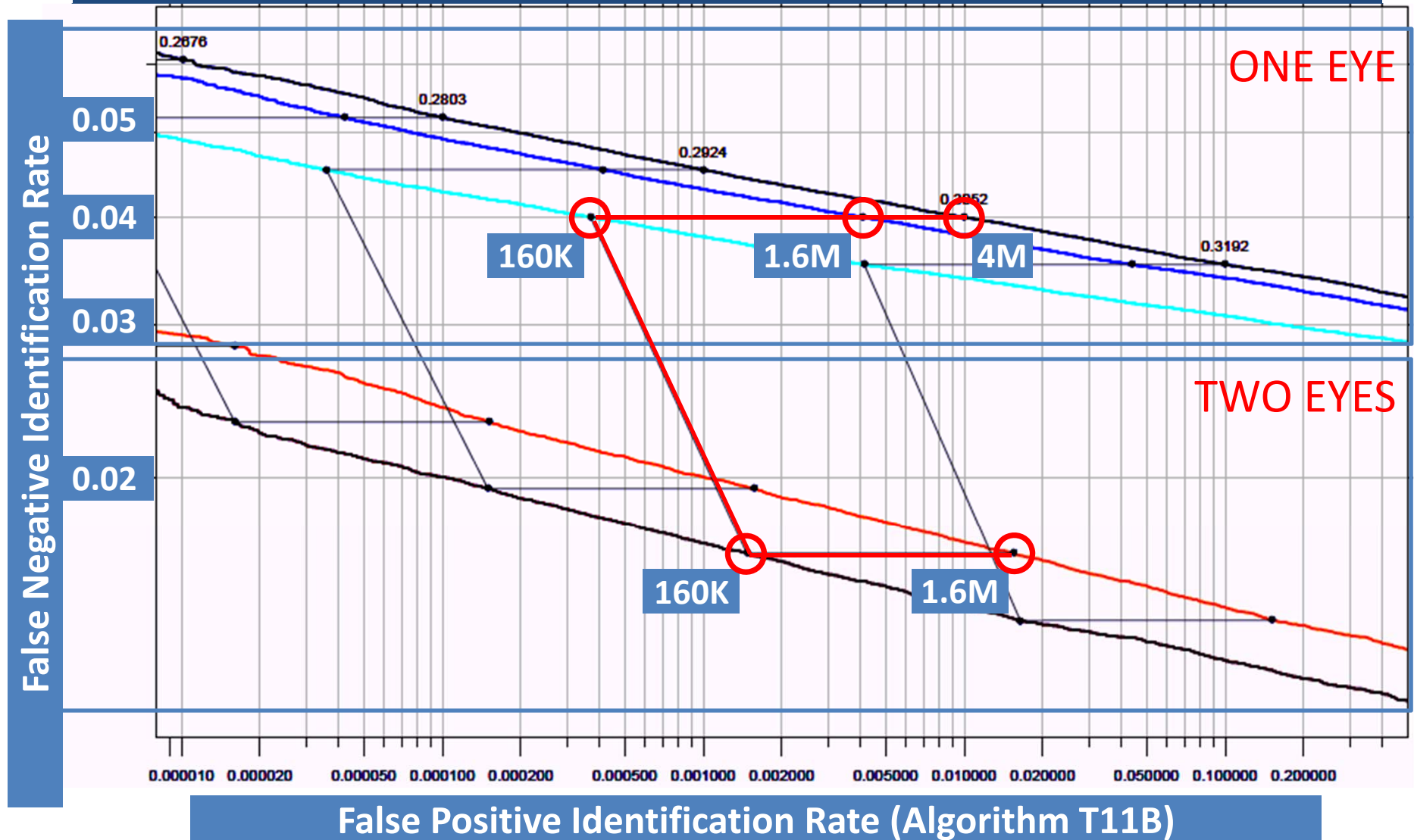
Patrick Grother

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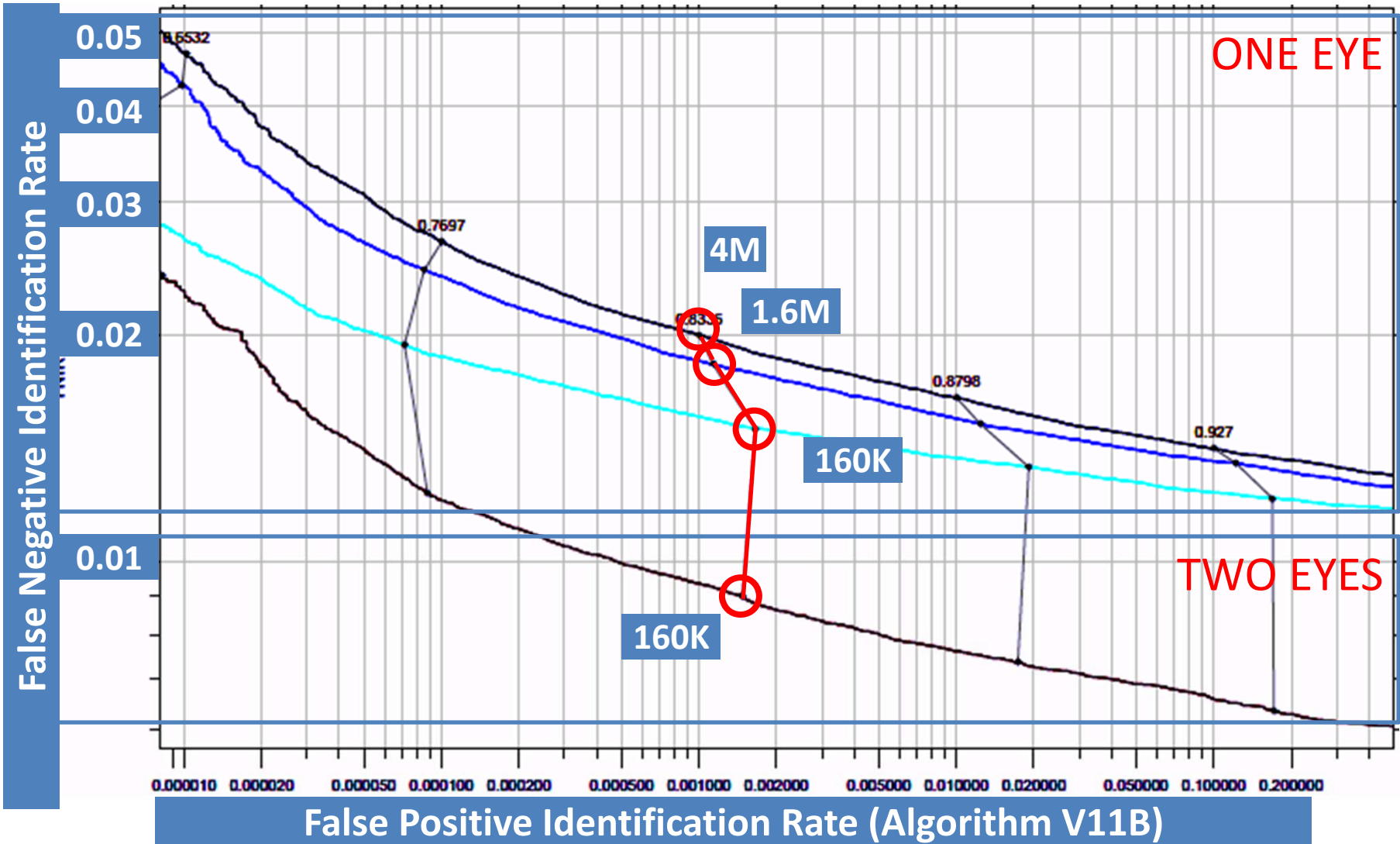
NIST Session, BCC, Tampa, Florida
Wednesday, September 28, 2011



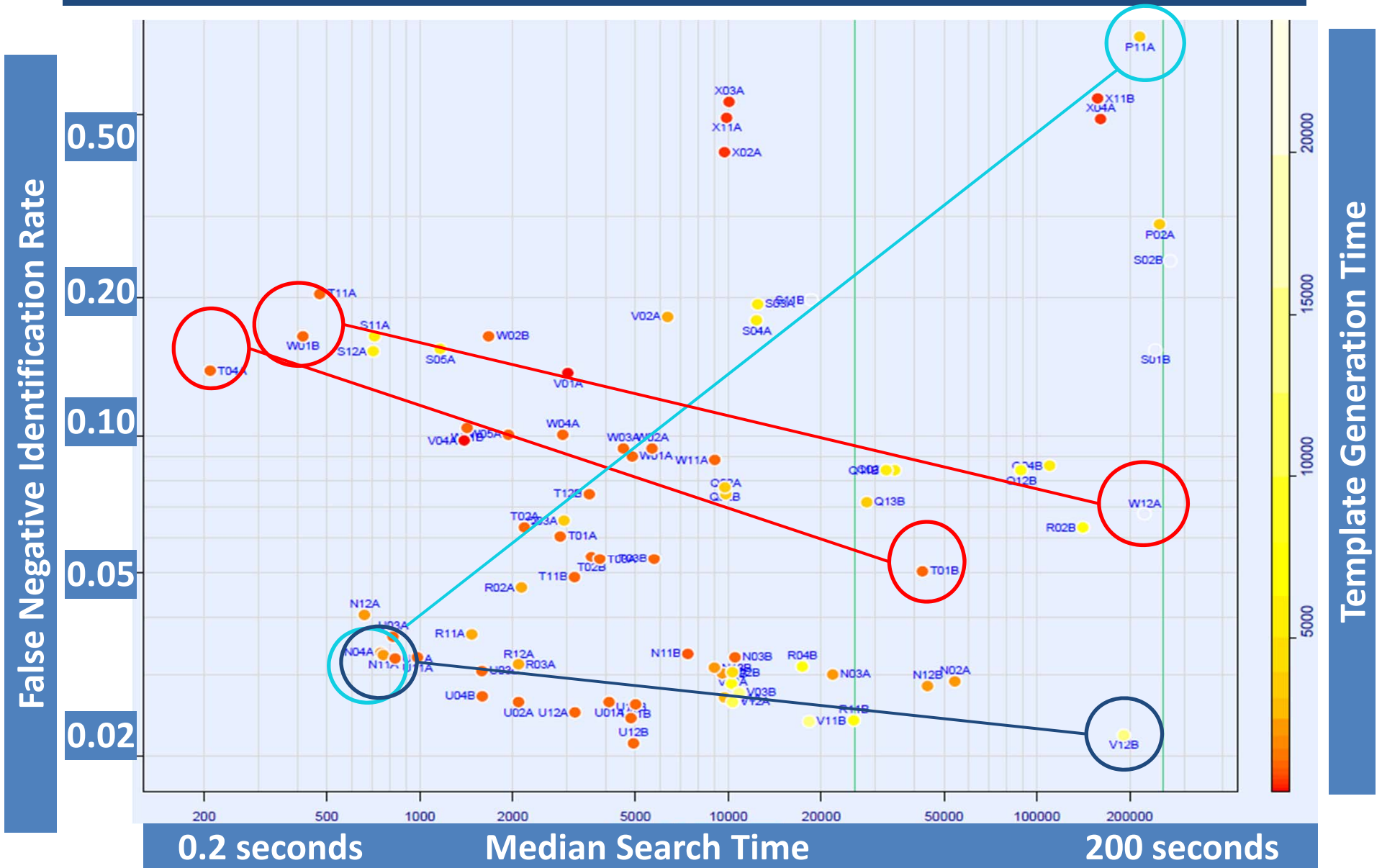
Scalability :: Accuracy dependence on N



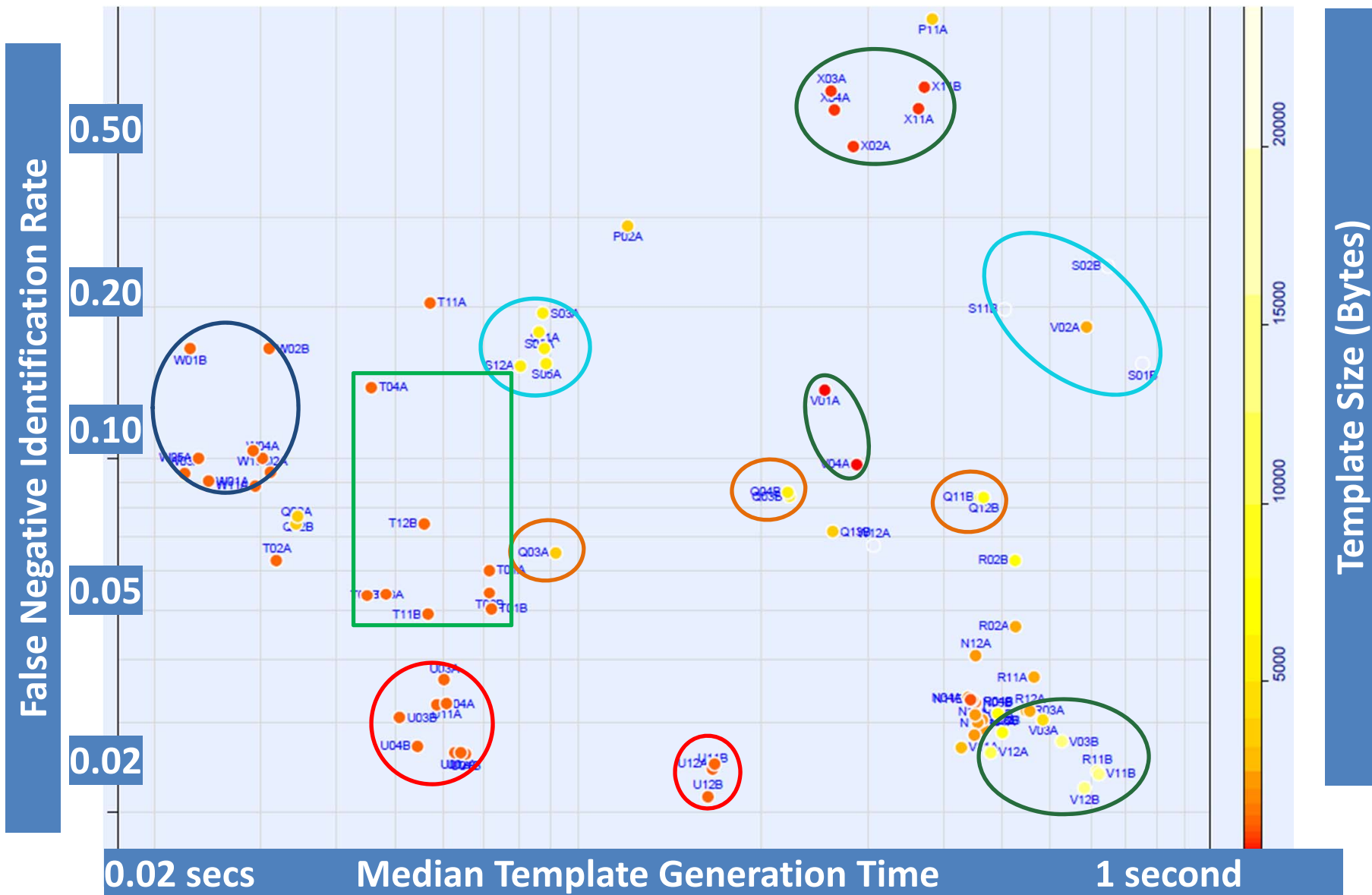
But ... control of FPIR



Tradespaces :: Intra + Inter Supplier



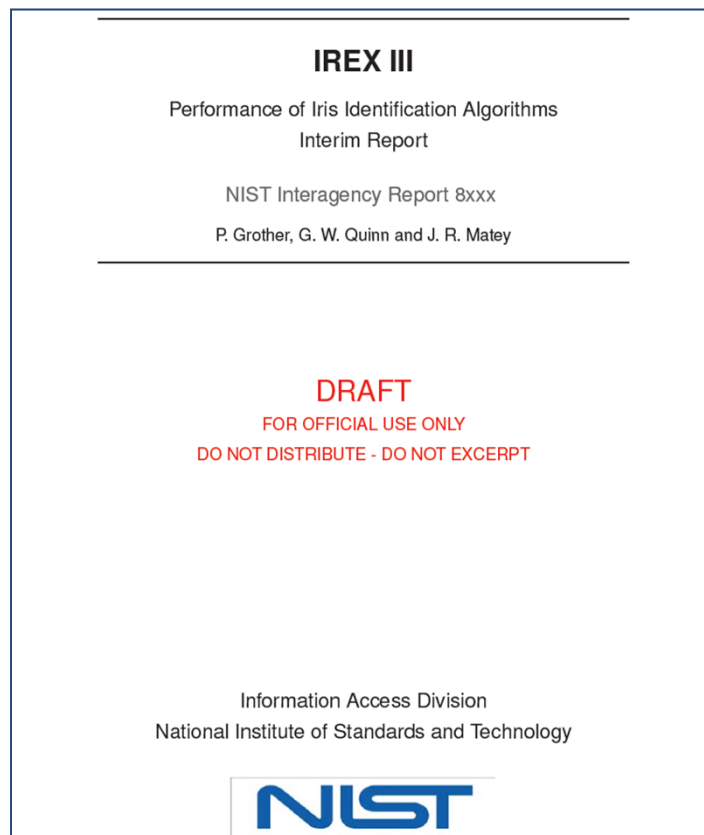
Tradespaces :: Intra + Inter Supplier



IREX III – Two Documents under Preparation

Evaluation Report :: Oct 2011

- » NIST Interagency Report 8XXX



Improving Iris Recognition

- » NIST Interagency Report 8YYY
- » Vignettes from empirical IREX III observations
- » Guidance to planners, trainers, operators, deployers for real time quality control
 - Potential content for ISO standard amendment.
- » Guidance to developers for consideration in algorithm design

Conclusions

- » The industry has at least eleven algorithm providers
- » Algorithms matter
 - Large variations in accuracy
- » Iris can be fast, 10^7 mps
 - And slow, 10^4 mps
 - Speed can be traded for accuracy
 - Accuracy statements without speed measurements are limited
- » The Daugman *iriscode* template is not the only one
 - Template sizes vary ~250B to 10KB, and up to 20K for search.
- » $FPIR = N \text{ FMR}$ usually
 - But for others, $FPIR = \text{constant}$.
 - Threshold calibration curves
- » Failure modes are algorithm dependent
 - Valuable to review high mates
 - Valuable to review low nonmates

IBPC 2012



INTERNATIONAL BIOMETRIC
PERFORMANCE CONFERENCE

IBPC 2012

Evaluation and Specification of Biometric Technologies
NIST, Gaithersburg, MD
March 5-9, 2012

US-VISIT
Keeping America's Doors Open and Our Nation Secure

 **Homeland Security**
Science and Technology

March 5-9, Gaithersburg, MD

- » How to define, get, design for, measure, assure, performance in biometric systems.
- » <http://biometrics.nist.gov/ibpc2010>
- » 2012 website coming soon
- » Contact ibpc2012@nist.gov

- » See slides “*The Gulf Between Biometric Research and Biometric Deployments*”, Terry Boulton, 9/27/11

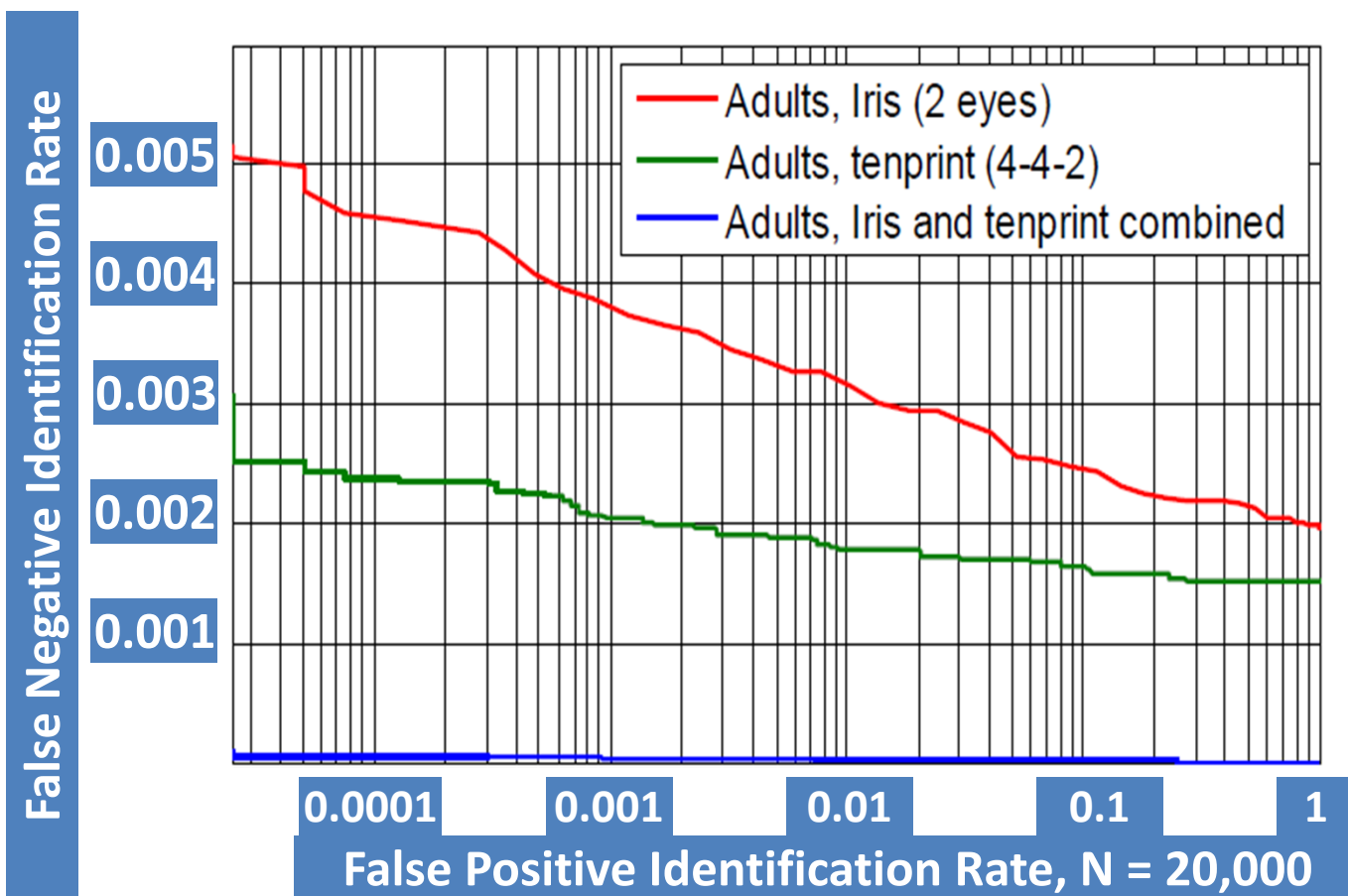
NIST

Thank You

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NIST

Published UID Accuracy, N = 20K



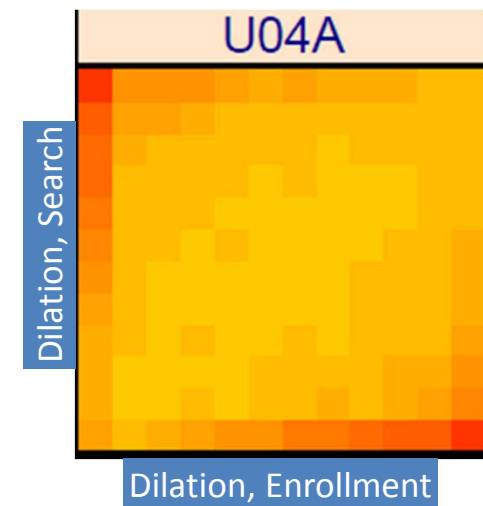
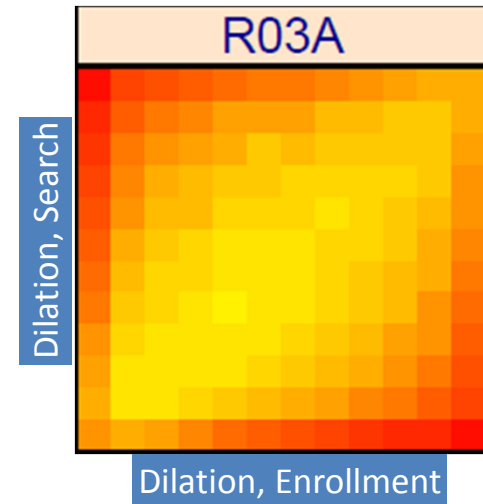
IRES III :: Two Eyes,
1.6M, JPEG

UID :: JPEG 2000

Under reasonable assumptions, UID and DoD are less than factor of two apart on FNIR at a common FPIR and N

Source: Annexure 3, UID Enrolment Proof-of-Concept Report, December 3, 2010.

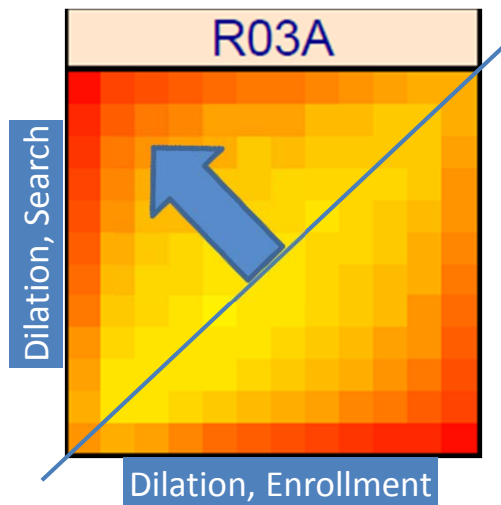
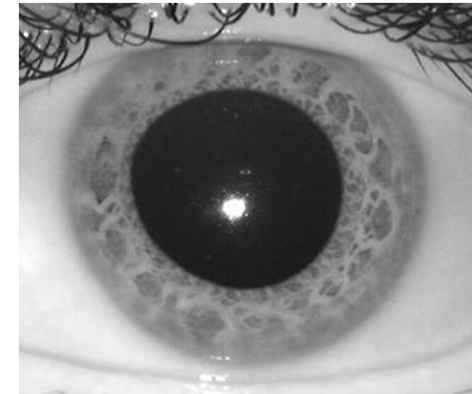
Dilation :: Outdoor operation implications



$$\text{Dilation} = R_p / R_i$$

» False rejection via

- High dilation
- Low dilation (i.e. constriction)
- **Cross condition**



$$\Delta D = 1 - \left(\frac{R_i^{(2)}}{R_i^{(1)}} \right) \left(\frac{R_i^{(1)} - R_p^{(1)}}{R_i^{(2)} - R_p^{(2)}} \right) = 1 - \frac{1 - D^{(1)}}{1 - D^{(2)}}$$

False Positives

- » Vanilla binomial
- » $FPIR(\tau, N) = 1 - (1 - FMR(\tau))^N$
- » Which, for small $FMR(\tau)$, gives
- » $FPIR(\tau, N) \sim N FMR(\tau)$

False negatives

- » For one enrolled mate
- » $FNIR(\tau, N) = FNMR(\tau, 1)$
- » To add a rank requirement in the FNIR definition, e.g. “**HD = 0.2 and rank 5 or better**”, see
- » Guide to Biometrics, Bolle et al. Springer 2003, or
- » Grother + Phillips, *Models of large population recognition performance*, CVPR 2004