# The Need for Large-Scale Biometric Testing

Patrick Grother

Information Access Division

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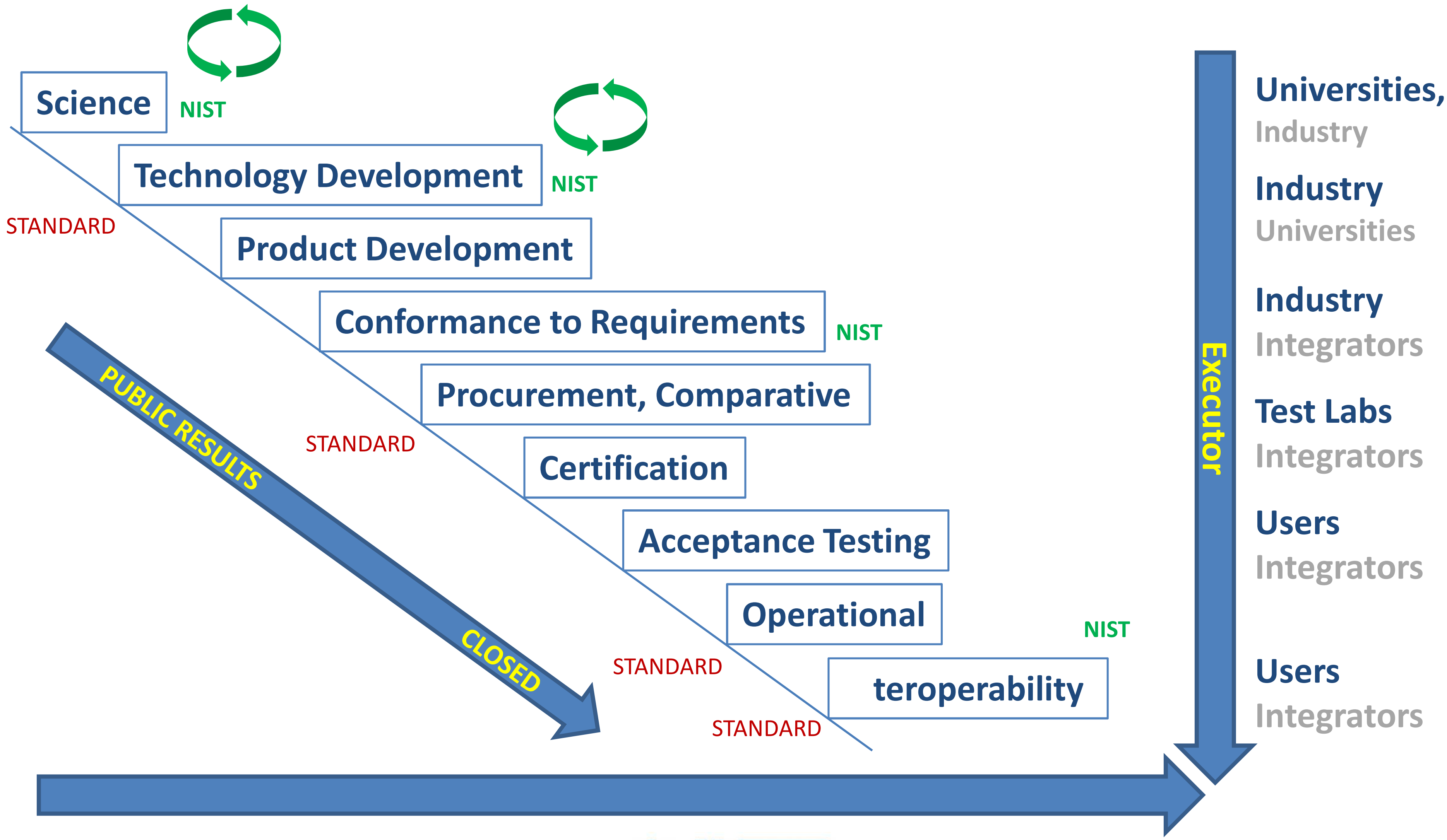
# The purposes of biometric testing

- Scientific discovery
  - Basic research, sensors, algorithms,
- Research and development
  - Is the method better than before?
  - Internal commercial, or gov-industry cooperation
- Capability testing
  - Is the technology viable?
    - Benchmarking
    - Core capability
  - Establishing criteria
- Testing to know what's possible
  - Could requirements be met
  - Is the technology viable?
- Comparative testing
  - Which technology?
  - Which implementation?
- Conformance
  - To requirements
  - To standards
- Interoperability testing
  - Can we upgrade, replace, while keeping our data?
  - Jurisdictional interoperability
- Certification
  - Can we leverage others' tests?
- Regression
  - Has the update helped?

# Stages of Testing



# Why test at all?

- » It's about money
  - » Biometric errors cause additional cost
    - Failure to enroll $\longrightarrow$ additional time, procedures, modalities, processes, time
    - In 1:N false non-match $\longrightarrow$ benefits fraud, immigration fraud
    - In 1:N false match $\longrightarrow$ identity resolution processes
  - » Can the application requirements be met?
  - » Can the technical requirements be met?
  - » Risk mitigation
    - Characterizing performance allows procedures to mitigate risk e.g. a finding that FTE > 0.03 prompts environmental redesign to regulate humidity, or ambient light.
  - » Conformance, Interoperability
    - Entire system needs to be upgraded / junked if it doesn't interoperate with others

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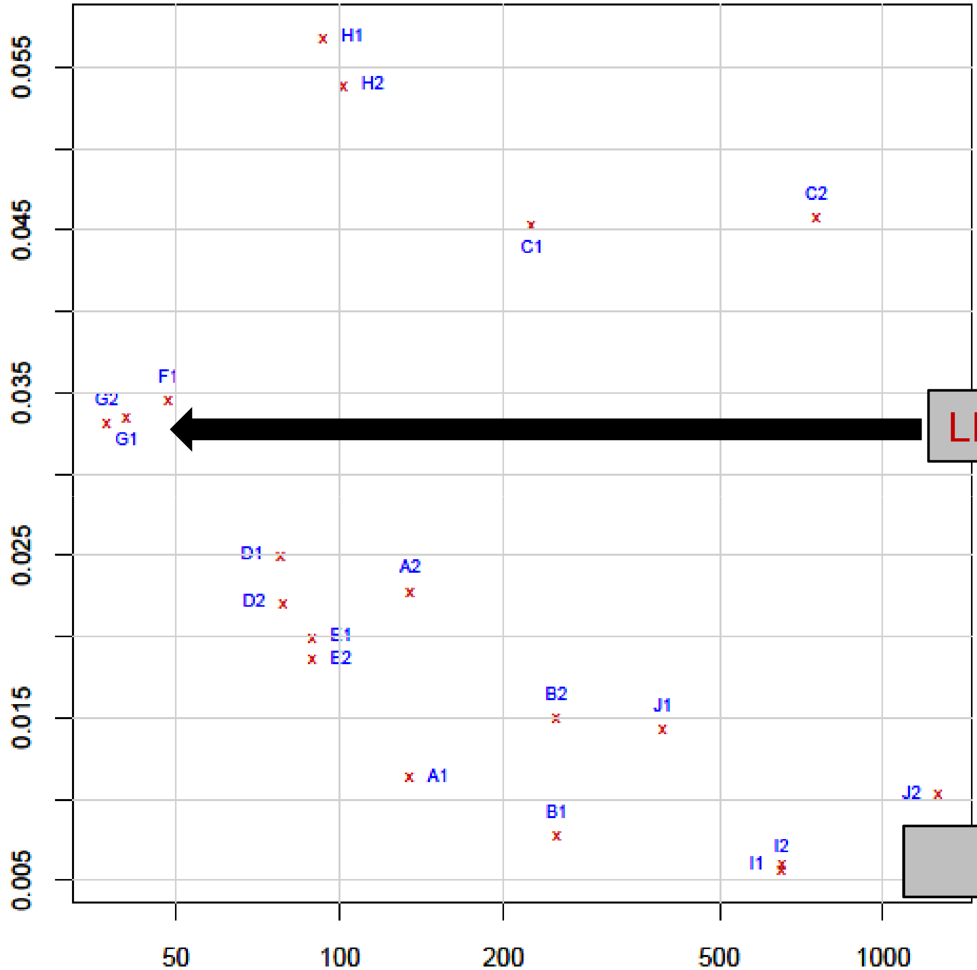
# Trading Time for Accuracy




(milliseconds, mean kinds 3 and 7)

An industry-wide trade space.

LESS ACCURATE TAKE < 20ms

ST ACCURATE TAKE > 600ms

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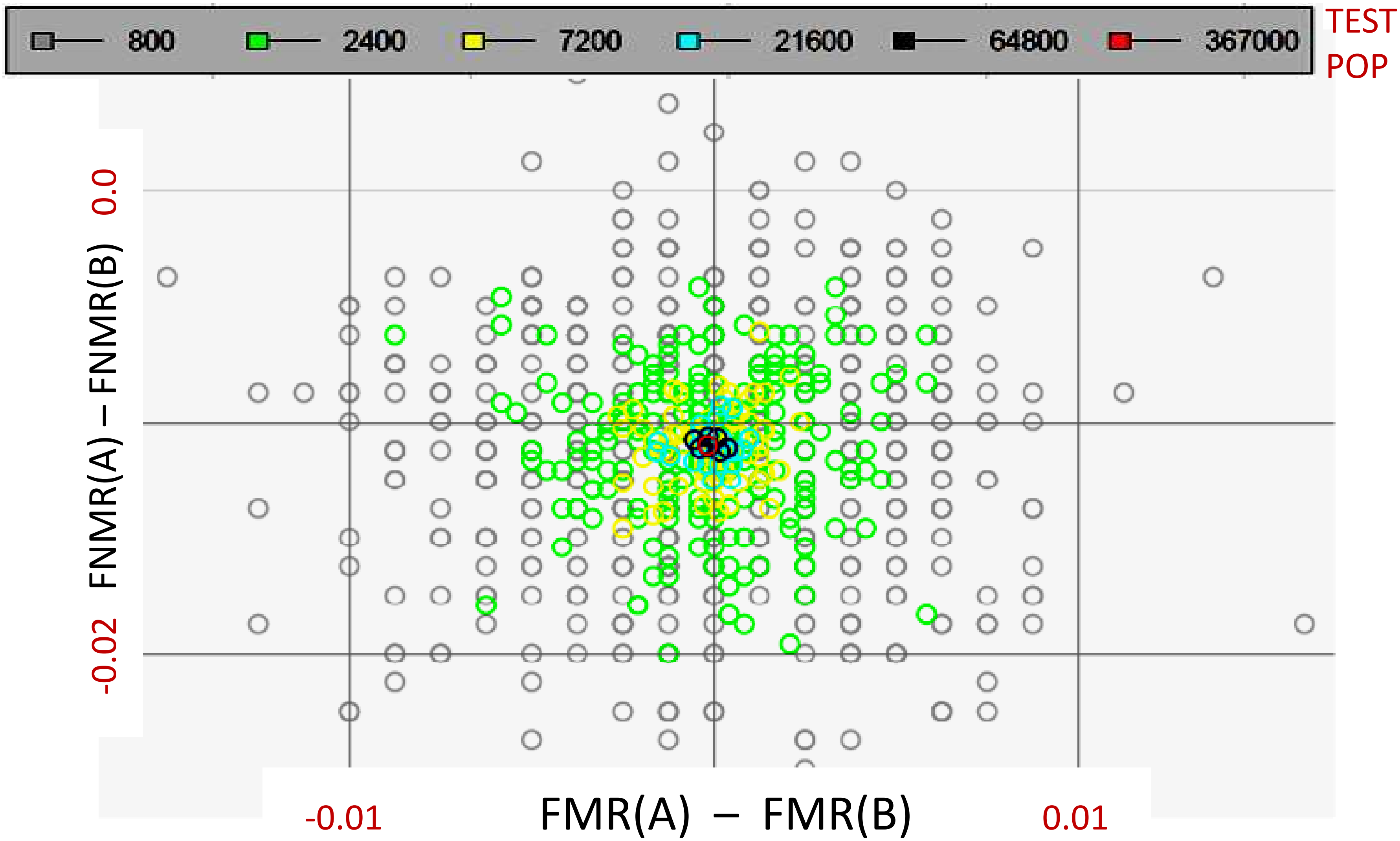
# Large scale testing, eh? What's large?

- Statistical definition of large
  - Depends on purpose
    - e.g. show, with 99% confidence, that a match-on-card comparison algorithm has FAR < 10-4
    - e.g. existence proof that a gummy finger can be enrolled in a biometric system
    - e.g. given a choice of instructional modes for use of a biometric sensor, determine via live test, which is best
    - e.g. testing whether a e-Passport conformance testing suite correctly rejects defective records or JPEG 2000 streams
  - Technology dependent
    - e.g. comparing AFIS systems vs. comparing 1:1 ePassport gates
- Practically…
  - Systematic effects are larger than random effects and these can be identified efficiently
    - Irises with radius greater than 150 pixels always fail to enroll
  - Cost constraints limit population size, test duration
    - Corners are cut (e.g. full-cross comparison of N samples)
  - Test crews get tired

# Test Size :: Vendor A vs. B

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# IBPC 2010

- International Biometric Performance Conference
  - Novel test methods, metrics
  - Specification, requirements, certification
  - Accuracy, security, operational
  - Emphasis on **how** systems are tested, vs. latest results
- Co-chairs
  - Patrick Grother, Elham Tabassi, NIST
  - Christoph Busch, Fraunhofer
  - Tony Mansfield, NPL
- Logistics
  - March 2-4, 2010
  - Gaithersburg, Maryland
  - Call for papers: http://biometrics.nist.gov/ibpc2010

# In 119 pages IREX covers

- **http://iris.nist.gov/irex**
- Compare algorithmic accuracy
  - ROCs
  - Fixed threshold – effect on FMR and FNMR
- Speed-accuracy trade-space
- False Match Rate Calibration
  - How to set the threshold
- Effect of dataset
  - On FNMR, on FMR
- Algorithm interoperability
  - Enroll on A – Identify on B
  - Segmentation performance
- Image quality assessments
- Biometric zoo
- Compare lossy compression algs
  - JPEG vs. JPEG 2000
- Limits of lossless compression
- Bounds on iris size
- How closely to crop an iris
- Comparison of specialized formats
  - Masked vs. Polar
  - Which is fit for purpose
- Effect of pupil dilation
  - And change in dilation
- Effect of eyelid occlusion
- Effect of iris-pupil displacement

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# Thanks
# patrick.grother@nist.gov

301 975 4157

Minutia interoperability: http://fingerprint.nist.gov/minex
Iris interoperability: http://iris.nist.gov/irex
Biometric Performance Conference: http://biometrics.nist.gov/ibpc2010

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