

Evaluating the Performance of Biometric Algorithms

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Biometric Consortium 2009

23 September 2009



Outline

- *Why NIST?*
- *Impact and Issues with Evaluations*
- *NIST Evaluation Process*
- *Datasets*
- *NIST Evaluations*
- *Future Plans*

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Why NIST Performs Biometric Evaluations

- *Mandates:*
 - *Patriot Act (PL 107-56)*
 - *Enhanced Border Security and VISA Entry Reform Act (PL 107-173)*
 - *Homeland Security Presidential Directive 12 (HSPD-12)*
 - *10-Print Transition: mandated by Homeland Security Council Deputies Committee*
- *Develop testing methods for evaluating biometrics performance*
- *Advance biometric matching technologies*
- *Other Government Agencies*

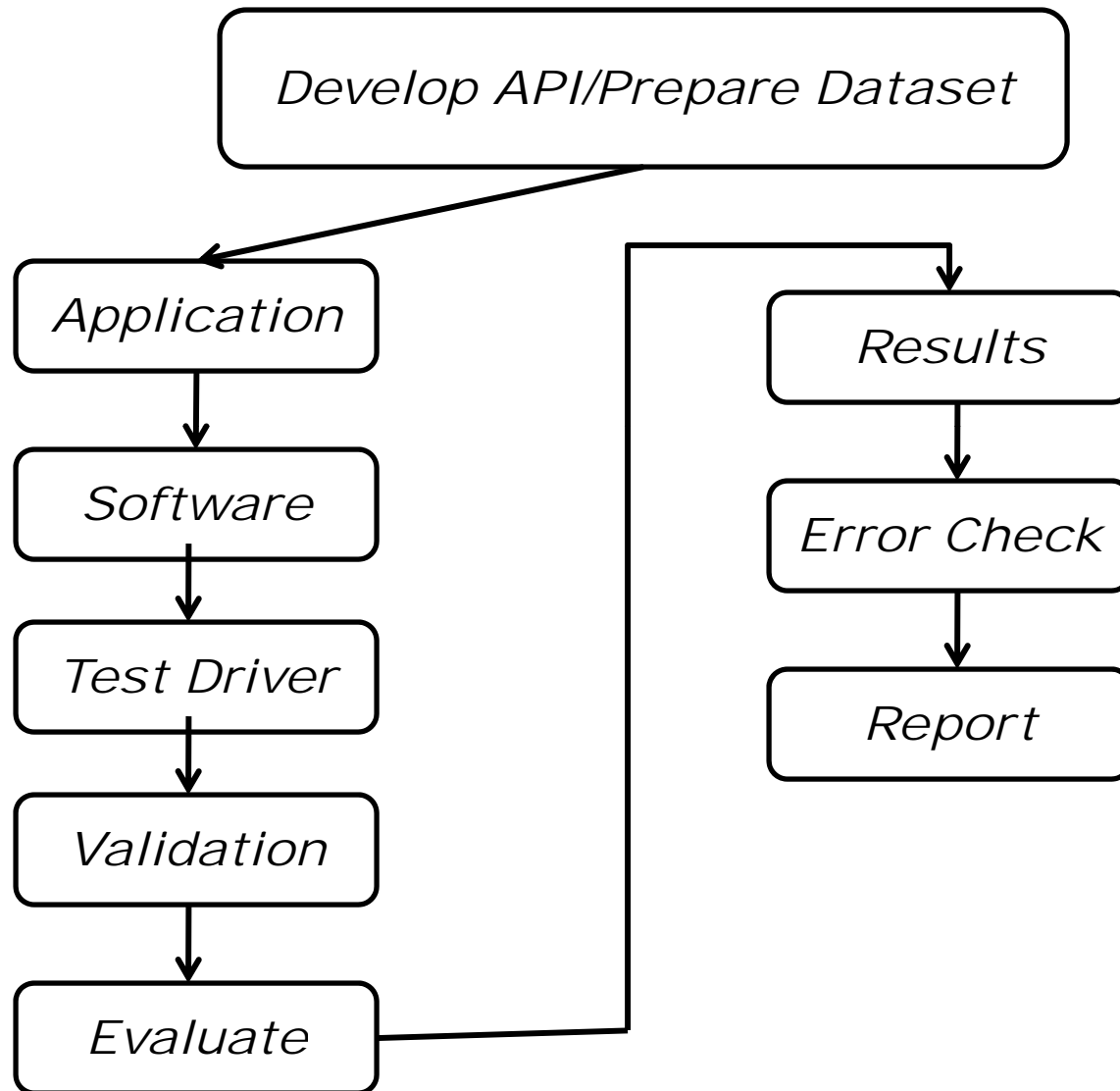
Impact of Evaluations

- *Current measure of biometric technology performance on operational data.*
- *Algorithm developers can evaluate performance with operational datasets.*
- *Advance biometric matching technologies.*
- *Improve implementation's adherence to standards and protocols*

Issues with Performing Evaluations

- *Baseline algorithms (bozorth) give ability to develop evaluation methods*
- *Developing API to meet evaluation needs*
- *Dataset sample size*
- *Dataset preparation and security*
- *Repeatable results*
- *Validation/Security of submitted SDK*
- *Interpretation of results*

Evaluation Process



Evaluation Process

- *API*
 - *Inputs/Outputs to interface with SDK*
 - *Consider “gaming” issues*
 - *Use existing standards when possible*
 - *Length of time to run evaluation*
- *Dataset Preparation*
 - *Consolidations*
 - *Sample selection – random, sample size, diversity of data*
 - *“True” imposter data*
 - *Data format*
 - *Length of time to run evaluation*

Evaluation Process

- *Software Validation*
 - *Repeatable – why not?*
 - *Resolve issues of non compliance*
 - *Estimate length of time to run evaluation*
- *Evaluation*
 - *Managing across multiple systems – enrollment and matching stages*
 - *Unexpected exits*
 - *System maintenance shutdowns*
 - *Length of time to run evaluation*
- *Confidence in results*
 - *What to report*
 - *Statistical significance*
 - *Error check “outliers”*

Public Datasets

Algorithm Development & SDK Validation
biometrics.nist.gov/databases

- *Fingerprint*
 - *NIST Special Databases - 4, 9, 10, 14, 24, 29, 30*
- *Face*
 - *NIST Special Database 18*
 - *ColorFERET*
- *Iris*
 - *ICE dataset*

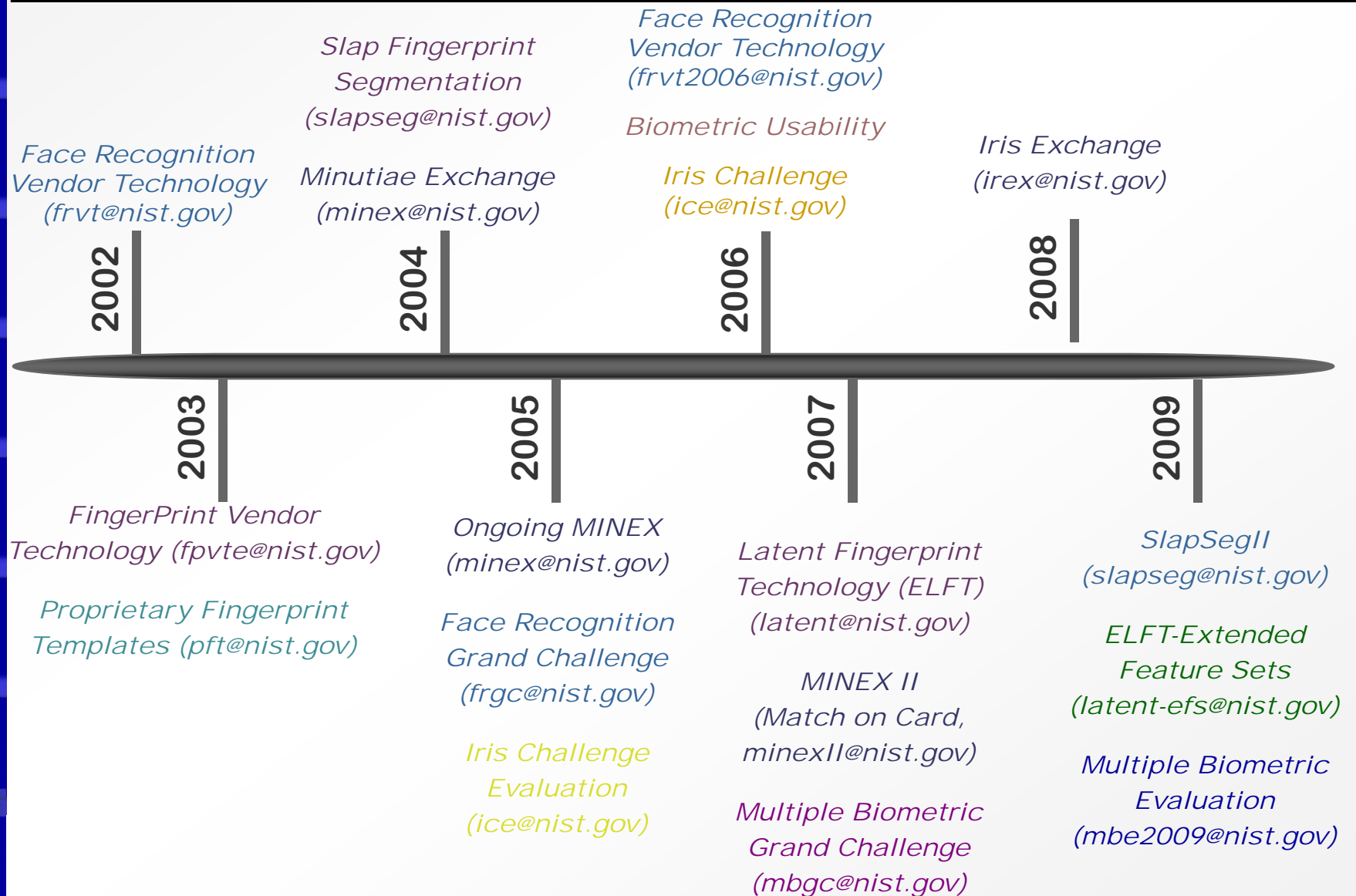
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Sequestered Datasets Used for Evaluations

- *Fingerprint , Face, and Iris*
 - *Operational Datasets from sponsoring agency*
 - *Large number of subjects (100,000 – 6,000,000)*
 - *Multiple Instances*
 - *Meta-data for results analysis*

Biometrics Evaluations at NIST

biometrics.nist.gov/evaluations



Large Scale Evaluations

- *SAN Storage for large datasets (240TB)*
- *High end computing*
 - *32 blades (4x4) with 192GB memory*
 - *24 blades (2x4) with 48GB memory*
 - *80 blades (2x2) with 16GB memory*
- *136 blades -> 336 CPU -> 1024 cores*



Evaluation of Latent Fingerprint Technologies-Extended Feature Set (ELFT-EFS)

- *Gallery feature space 8-12GB*
- *Current: 80 blades (2x2) 4GB memory, 70 GB local storage workspace*
- *Upgraded: 16GB memory to allow searching backgrounds 10K subjects with 10 rolled prints or slaps each.*
- *300GB local storage workspace*
- *OS upgrades to 64-bit Linux and windows.*

Large Scale Evaluations

- *Use larger sample sizes in existing 1-to-1 evaluations (PFT, MINEX, ...)*
- *Large scale biometric identification evaluations (1-to-many)*
- *Government needs for evaluations on large datasets*
- *Testing methods and APIs for large-scale evaluations*

Thank You

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