NIST Fingerprint Data

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Public Datasets

NIST Special Database 4

- 2,000 subjects with two instances
- Rolled/Single finger
- Scanned from inked fingerprint cards
- Lossless compression
- 400 from each fingerprint classification left/right loop, whorl, arch, tented arch

Public Datasets

NIST Special Database 9 and 14

- 2,700 subjects with two instances
- Rolled/Ten finger
- Scanned from inked fingerprint cards – some were printed live-scan cards
- Use same fingerprint images - Lossless (SD9) and WSQ (SD14) compression
- Fingerprint classification distribution not controlled.

Public Datasets

NIST Special Database 10

- 552 subjects with one instance
- Rolled/Ten finger
- Scanned from inked fingerprint cards – some were printed live-scan cards
- Lossless compression
- Concentrated on low frequency fingerprint classifications – arch and low count loops

Public Datasets

NIST Special Database 24

- 20 subjects
- Plain/Single finger
- 10 samples (5 male/female) for all ten finger positions
- Video (MPEG-2) captured off live-scan device
- Rotation and distortion

Public Datasets

NIST Special Database 27 and 27a

- 258 latent cases
- Includes rolled mate
- Included minutiae points validated by latent examiners
- ANSI/NIST formatted records
- 500ppi (SD27) and 1000ppi (SD27a)

Public Datasets

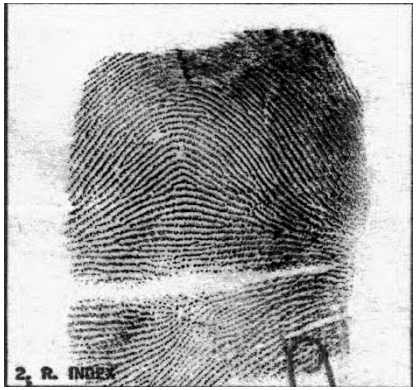
NIST Special Database 29 and 30

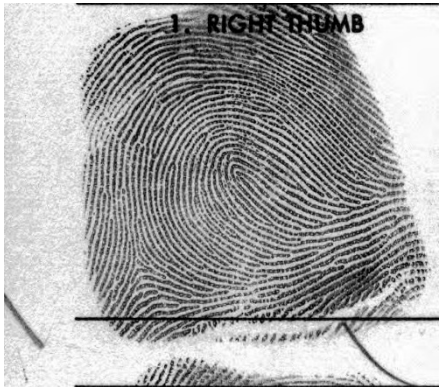
- 216 subjects (SD29) and 36 subjects (SD30) with two instances
- Rolled/Ten finger and plain impression (4-4-1-1)
- Scanned from inked fingerprint cards
- WSQ (SD29) and lossless (SD30) compression
- ANSI/NIST formatted records
- Fingerprint cards can be reconstructed
- 757 (SD29) and 316 (SD30) fingerprint images were used in SD4

Sample Images

SD4

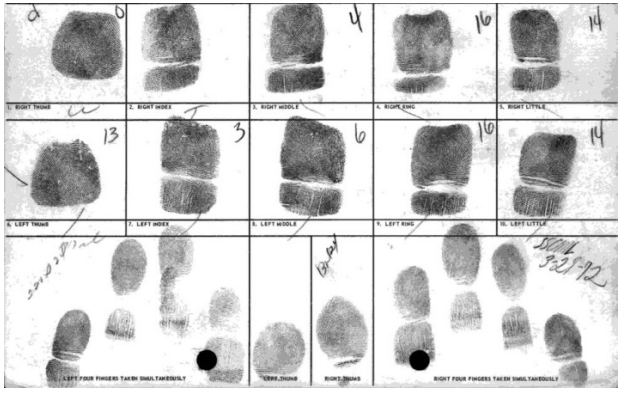
SD[9, 10, 14, 29, 30]





SD[29, 30]

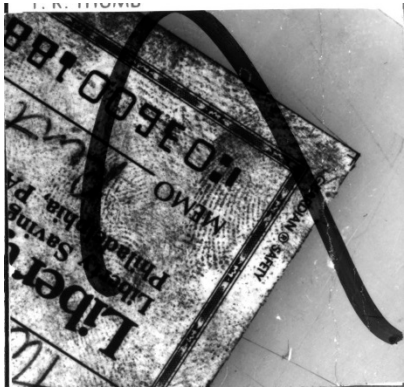
SD[29, 30]

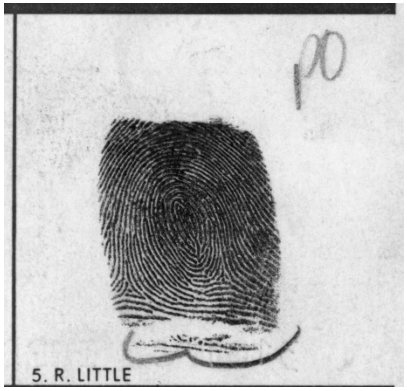


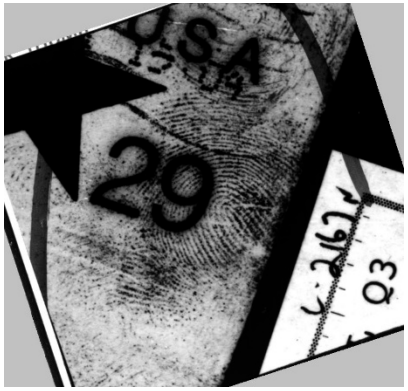
Sample Images

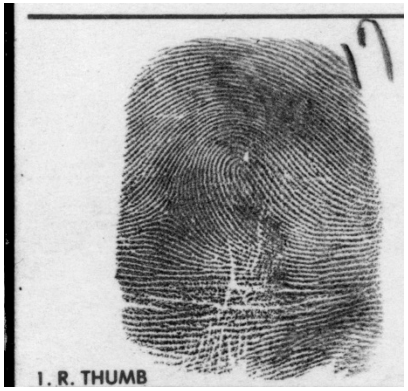
SD24

SD27









Dataset Quality

- Mostly scanned fingerprint cards
- Markings on the cards and images
- No true live-scan
- SD4 is digital video

Dataset Distribution

- Deceased Subject
- CDROM (Small Fee ~$90) / Online Samples
- Compression - Lossless and Wavelet Scalar Quantization (WSQ)
- Image Format Issues – IHEAD - PNG

NISTIG: Public vs. Sequestered

- Public
  - Can distribute
  - Smaller sample sizes (hundreds/thousands)
  - Less storage capacity required
  - Older data (deceased subject)

- Sequestered
  - Can’t distribute
  - Larger sample sizes (millions)
  - Increased storage capacity required
  - Operational data

Dataset Consolidation

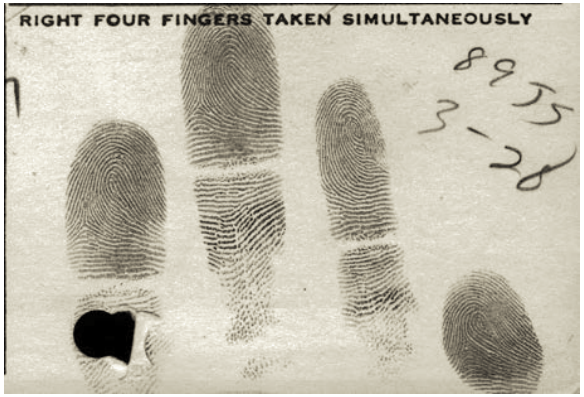
- Ground truth errors
- Controlled capture vs. operational
- Small vs. Large sample size
- Hashed/Anonymous identification impacts cross dataset consolidations

Fingerprint “Flipping”

Finger Positions Swapped	
1	6
2	7
3	8
4	9
5	10
11	12
13	14

Fingerprint “Flipping”

Right Slap



Left Slap

NISTIG Evaluation Model

- Public Data
  - Development - Participant hardware
  - Validation – Participant and NIST hardware

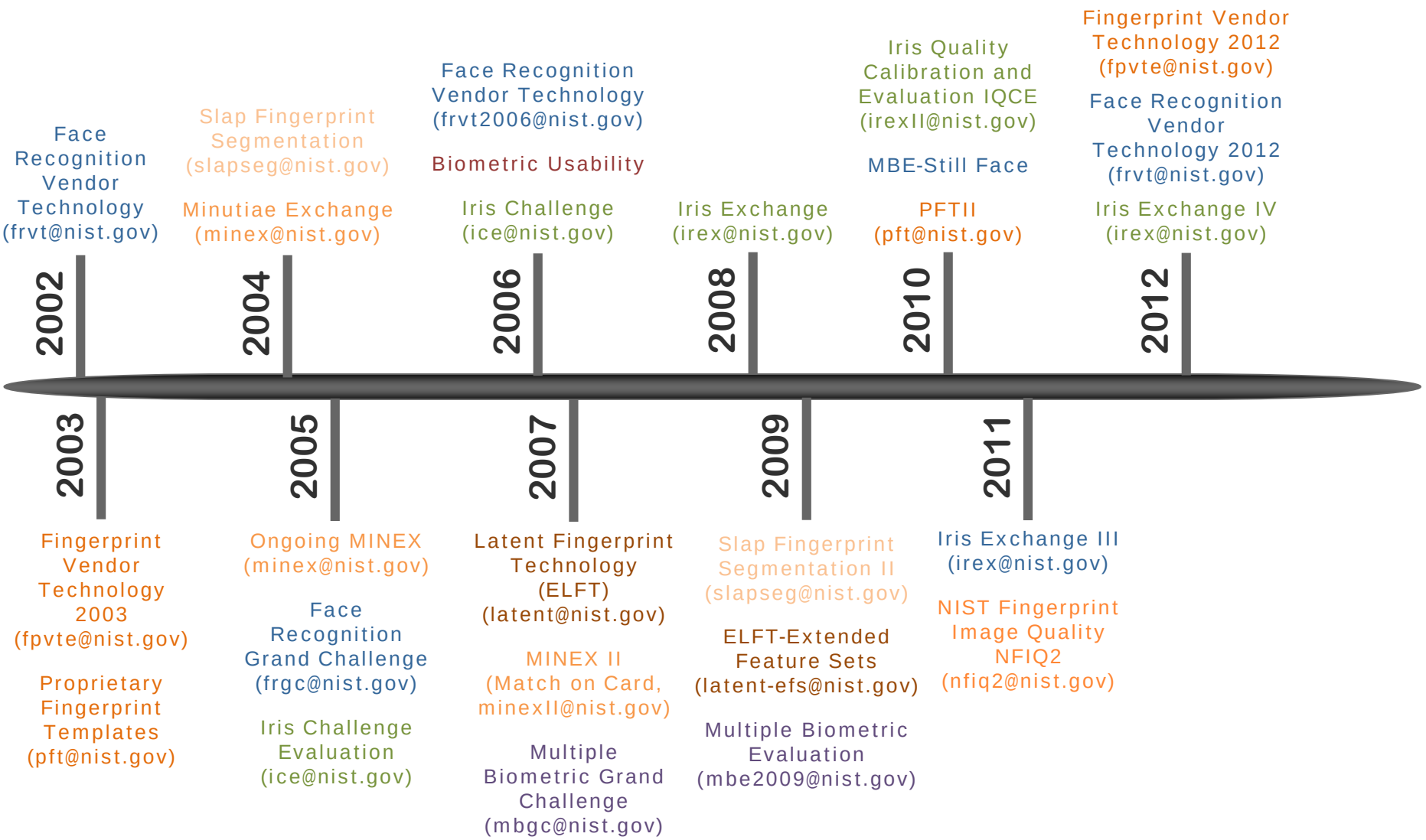
- Sequestered Data
  - Large Scale Evaluation - NIST owned hardware
  - Results – Published in report cards and public reports.

Large Scale Evaluations

- Proprietary Fingerprint Templates
  - One-to-One
  - Fingers – Left/Right Thumb, Index, Middle
  - Impression – Plain and Rolled
  - #Subjects - ~120K each for mates/nonmates
- MINEX – Interoperable Template
  - One-to-One
  - Fingers – Left/Right Index
  - Impression – Plain
  - #Subjects - ~125K each for mates/nonmates
- Fingerprint Vendor Technology Evaluation
  - One-to-Many
  - Fingers – All Ten
  - Impression – Rolled and Plain/Slap
  - #Subjects – 1.6M, 3M, and 5M

Biometrics Evaluations at NIST

biometrics.nist.gov/evaluations



Impact of Evaluations

PFT – Proprietary Fingerprint Templates
MINEX – Minutiae Exchange (Interoperable Templates)
ELFT – Latent Fingerprint
SlapSeg – Slap Fingerprint Segmentation
MBE – Still Image Face Recognition
IREX – Iris Exchange
FpVTE – Fingerprint Vendor Technology Evaluation
FRVT – Facial Recognition Vendor Test

- Current measure of biometric technology performance on operational/sequestered data
  - Valuable to sponsors:
    - Developing system procurement requirements
    - Provides guidance in “who’s real”
- Competition among developers
  - Evaluate performance with operational data
  - Innovation – speed vs. accuracy
- Advance biometric matching technologies
- Improve implementation’s adherence to standards and protocols

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