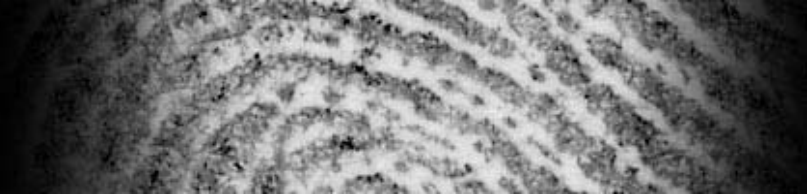


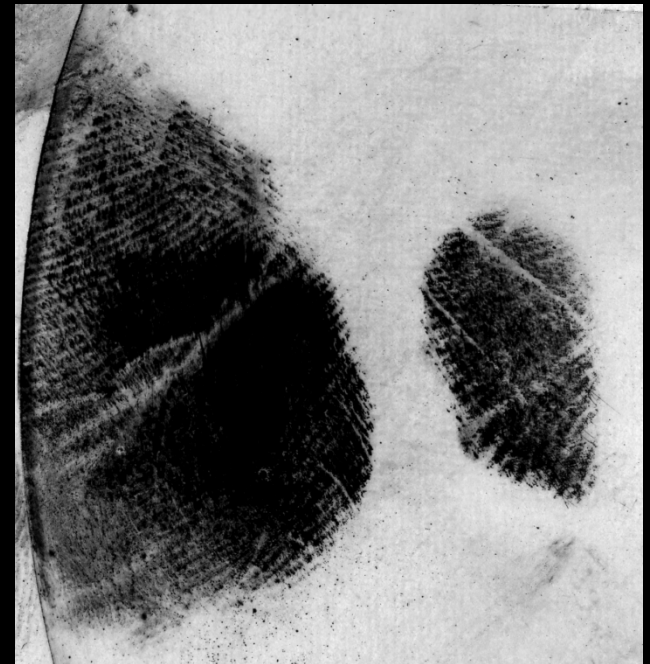
CDEFFS

ANSI/NIST Committee to Define an Extended Fingerprint Feature Set



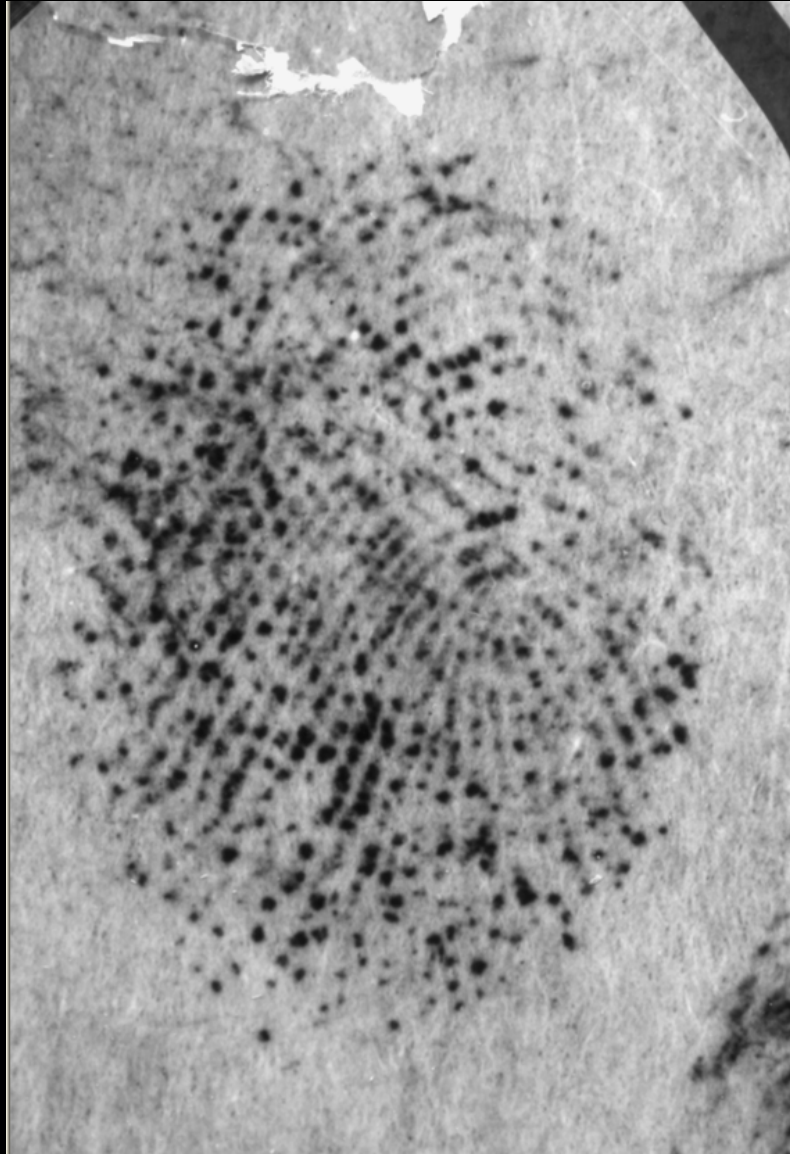
Extended Friction Ridge Feature Sets ANSI/NIST ITL Standard Workshop

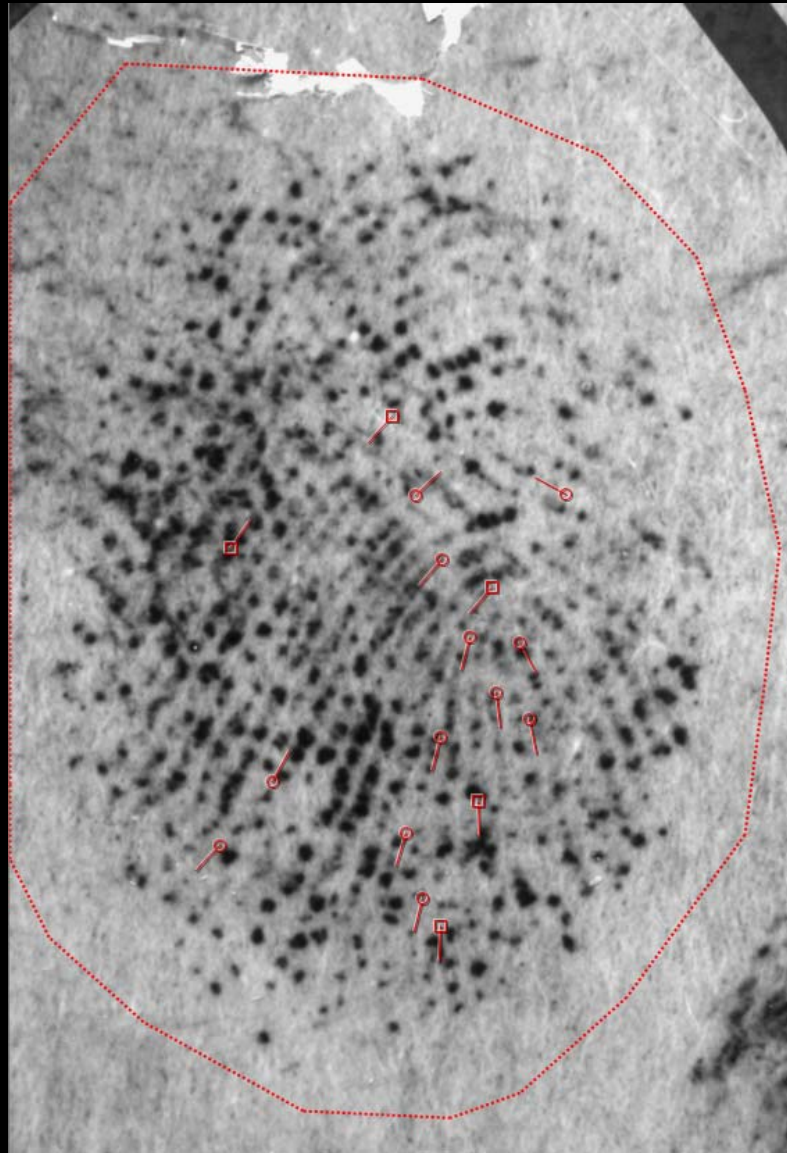
Austin Hicklin
27 July 2010

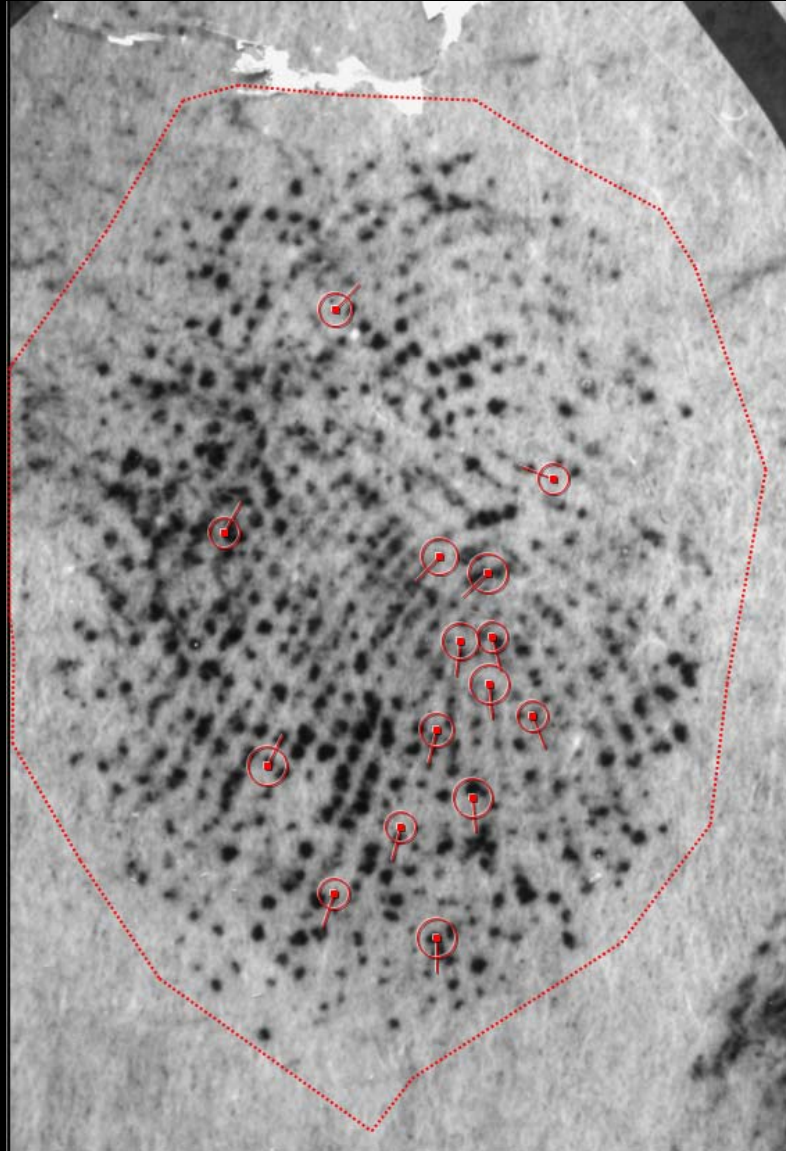


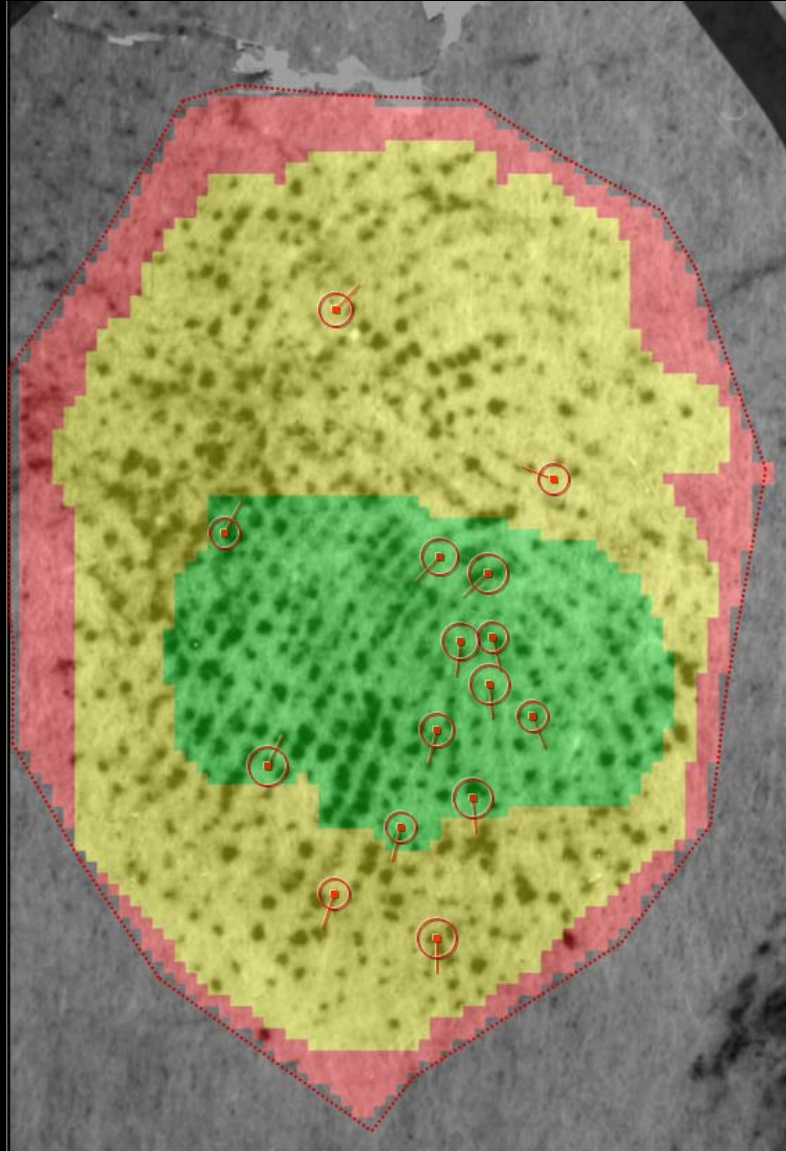
Background

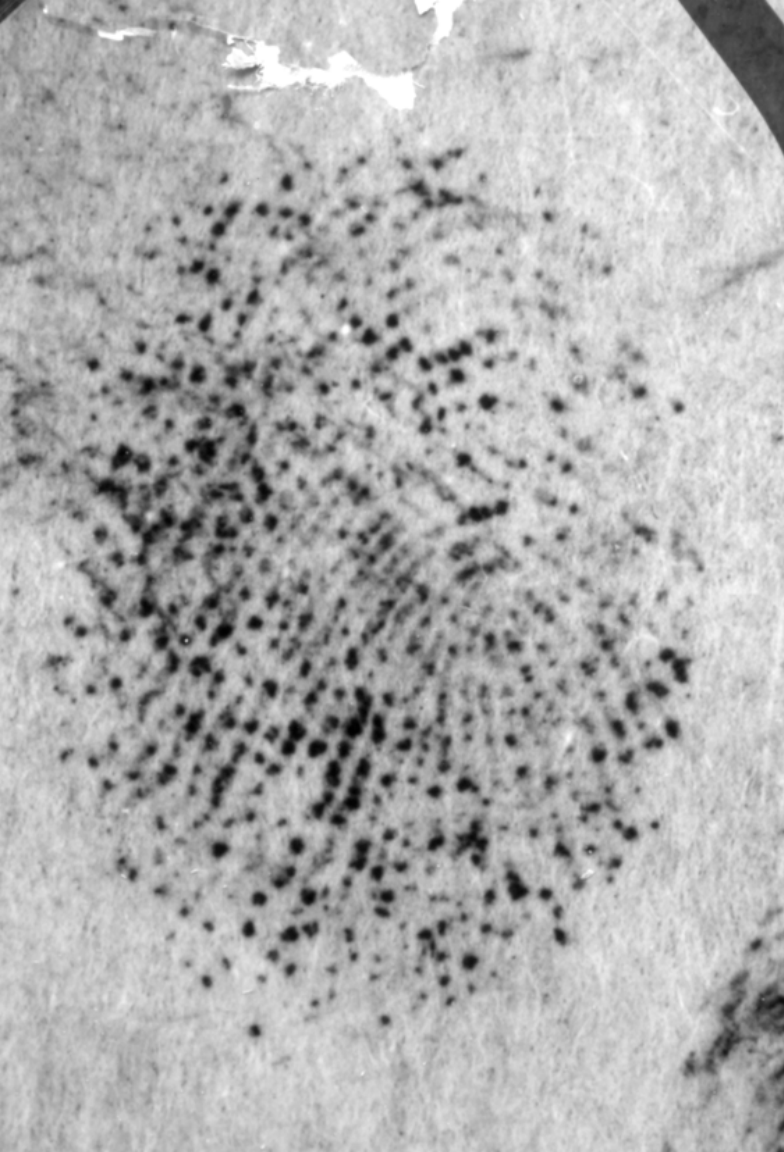
- April 2005 (ANSI/NIST ITL 1-2000 Standard Workshop I)
 - Request that SWGFAST identify, define and provide guidance on additional fingerprint features beyond the traditional ending ridges and bifurcations currently defined in ANSI/NIST ITL-1 2000
- Fall 2005 (SWGFAST)
 - SWGFAST responded to NIST, enumerating the features used by human latent examiners not currently addressed in fingerprint feature standards
- December 2005 (ANSI/NIST ITL 1-2000 Standard Workshop II)
 - Steve Meagher and Austin Hicklin gave a presentation entitled “Extended Fingerprint Feature Set”, and proposed these next steps:
 - Convene a committee to define an Extended Fingerprint Feature Set
 - Plan for an Addendum to the ANSI/NIST ITL-2007
 - FBI will be providing data sets with marked up examples
 - Committee to Define an Extended Fingerprint Feature Set chartered
 - CDEFFS includes representatives from a broad spectrum of federal, state, and local law enforcement and forensic agencies, SWGFAST and the latent fingerprint community, US and international academics, and senior engineers from each of the major AFIS vendors

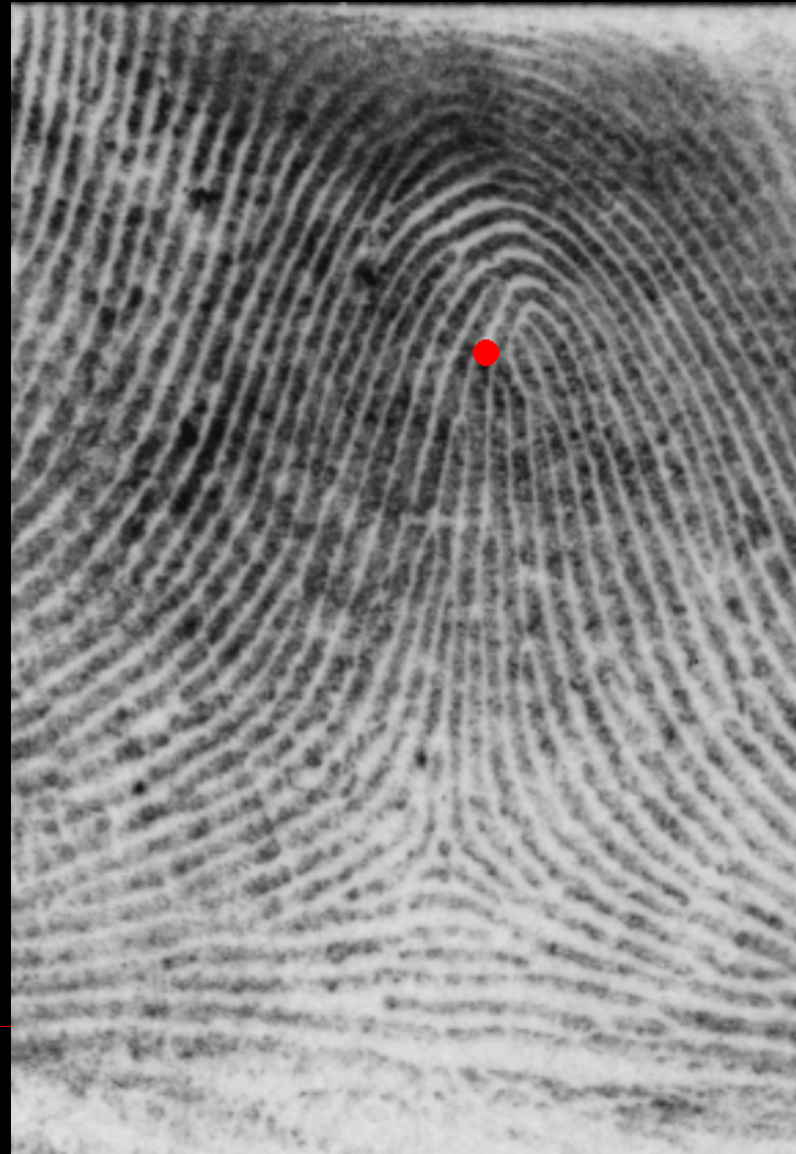
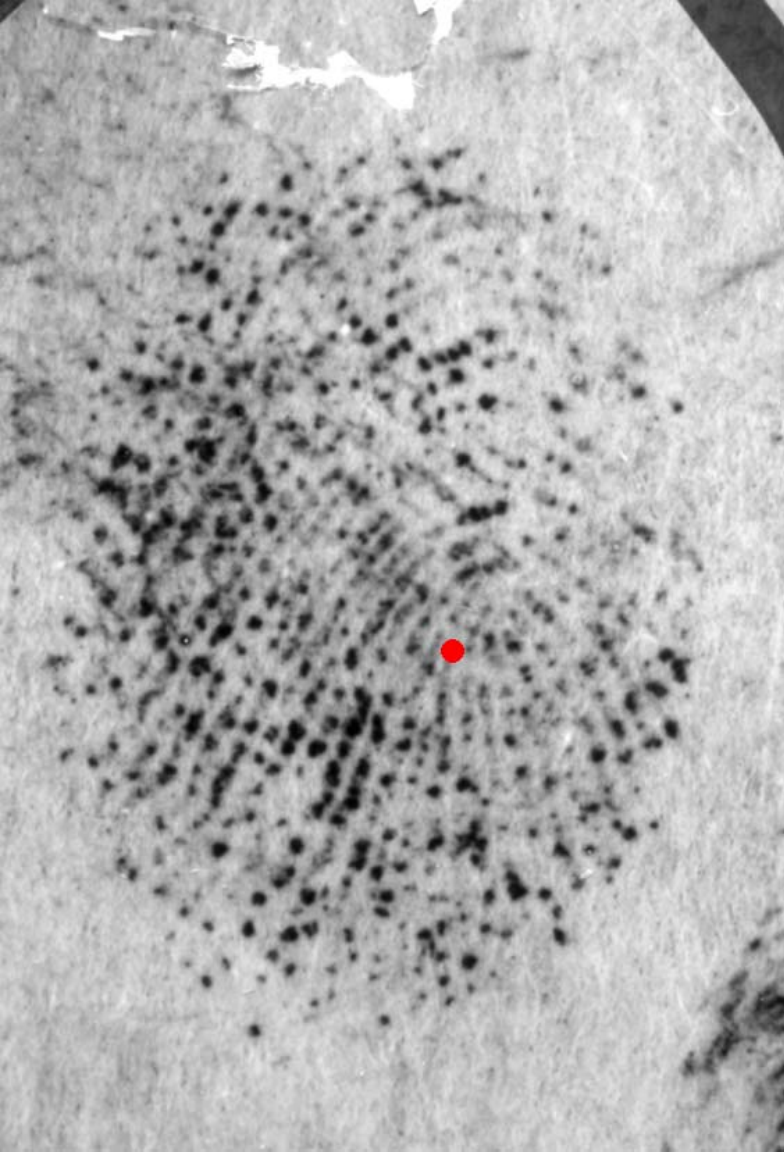


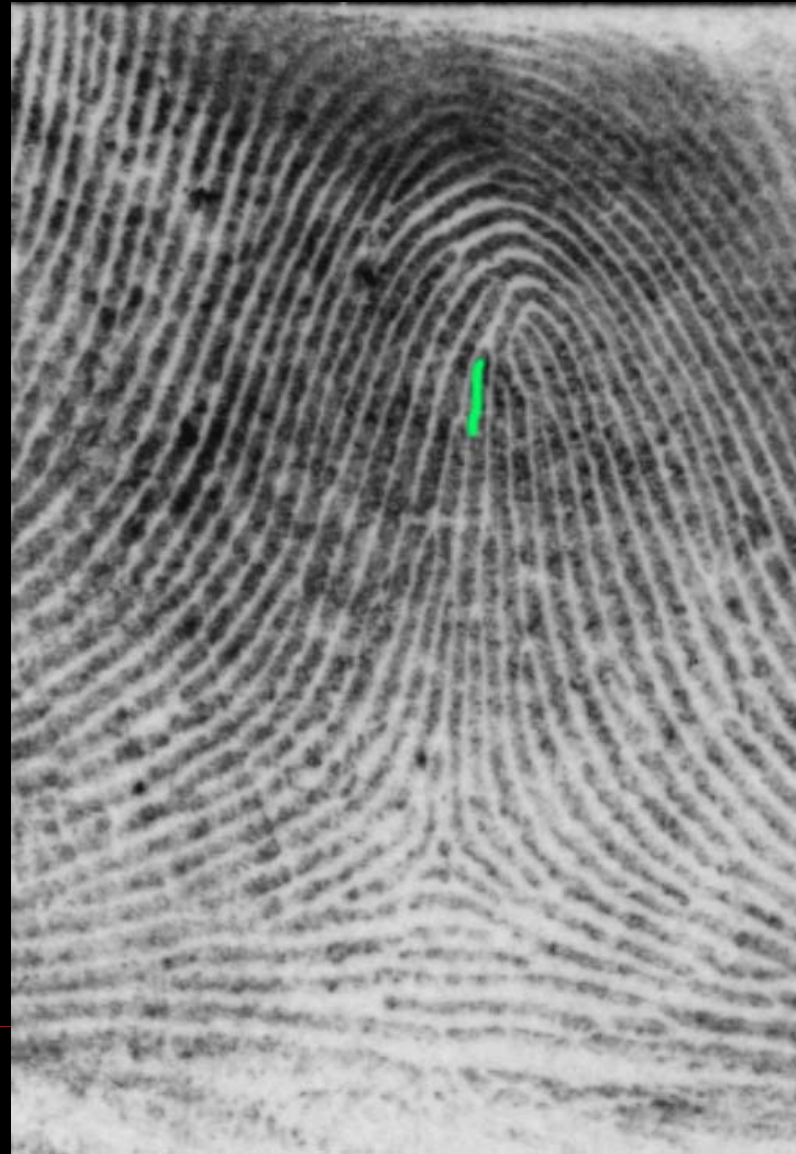
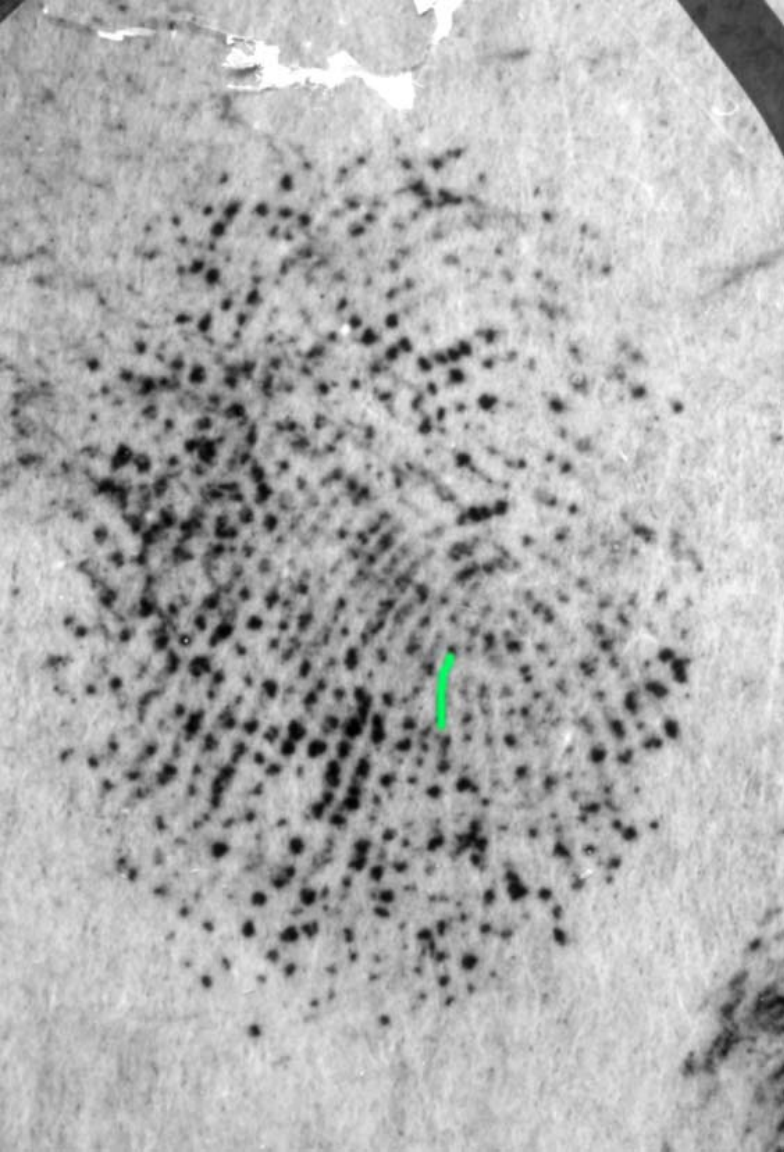


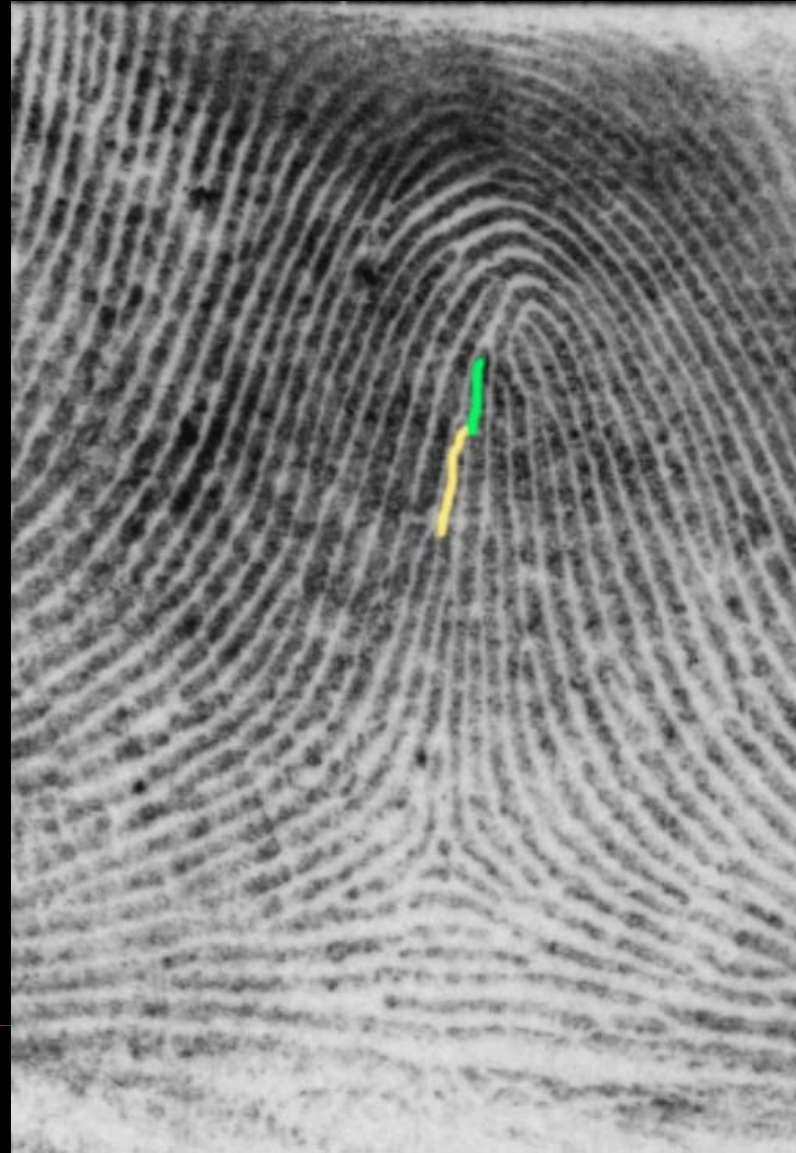
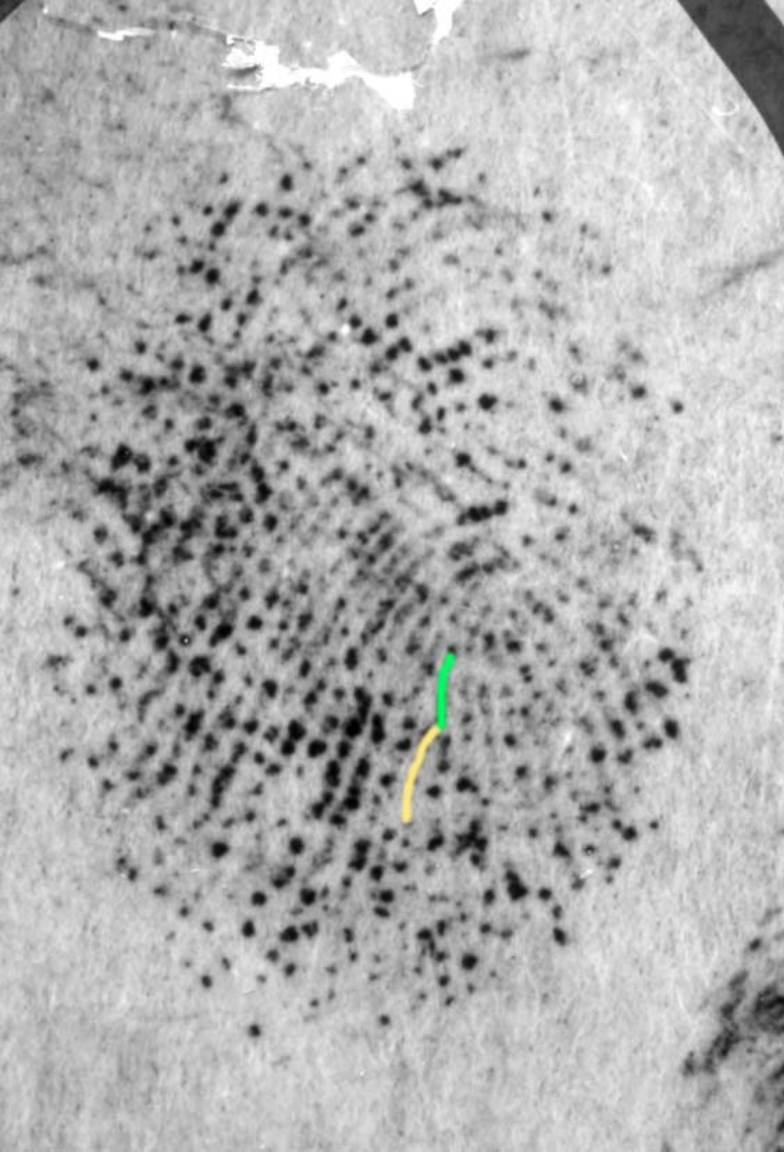


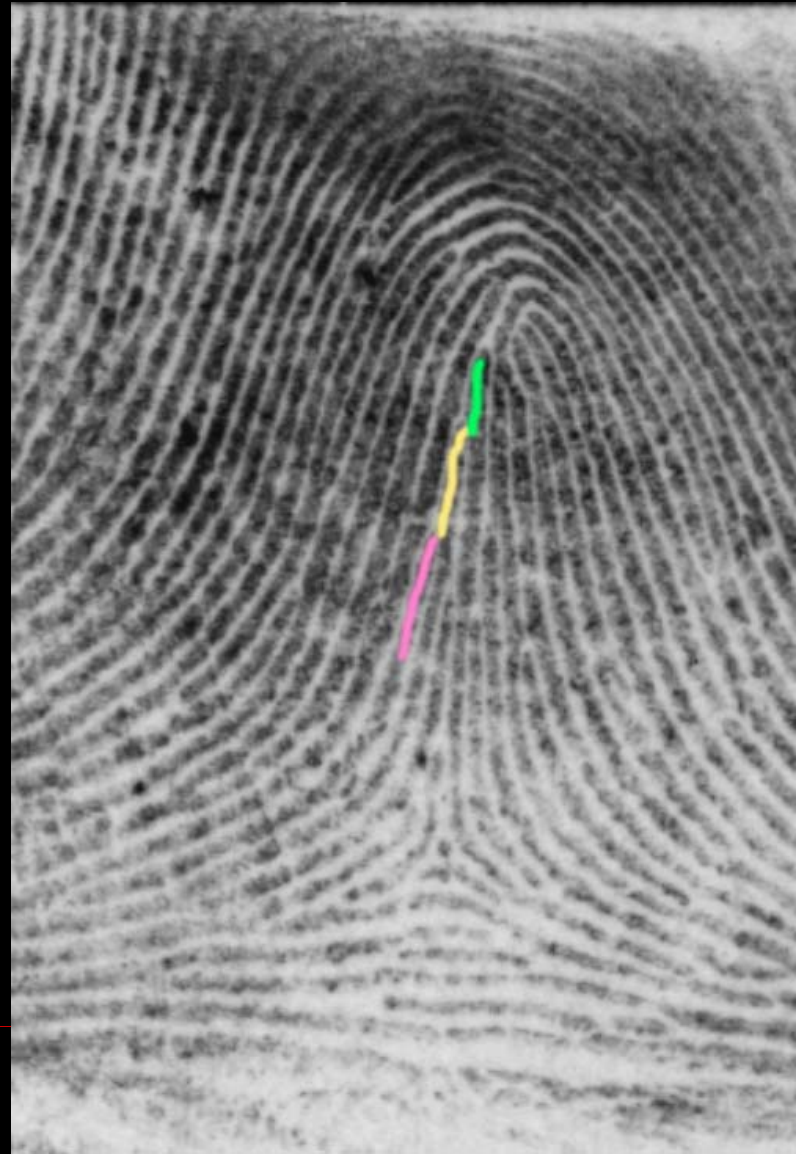
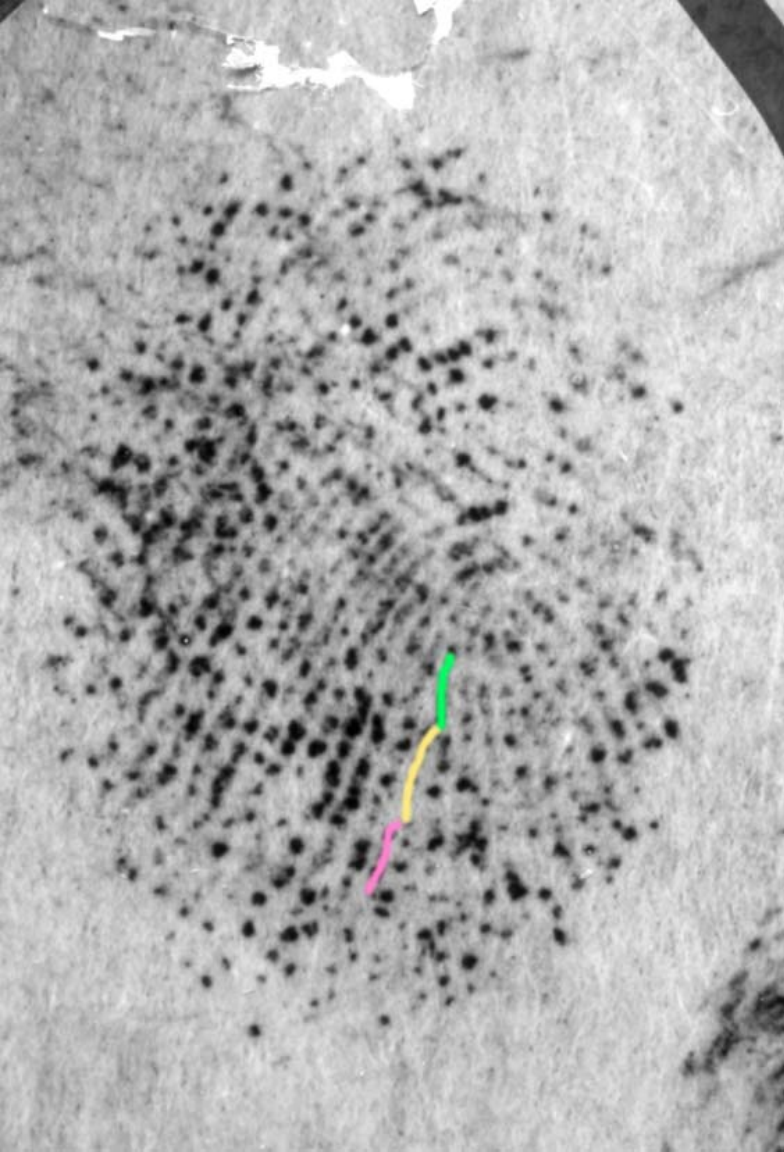


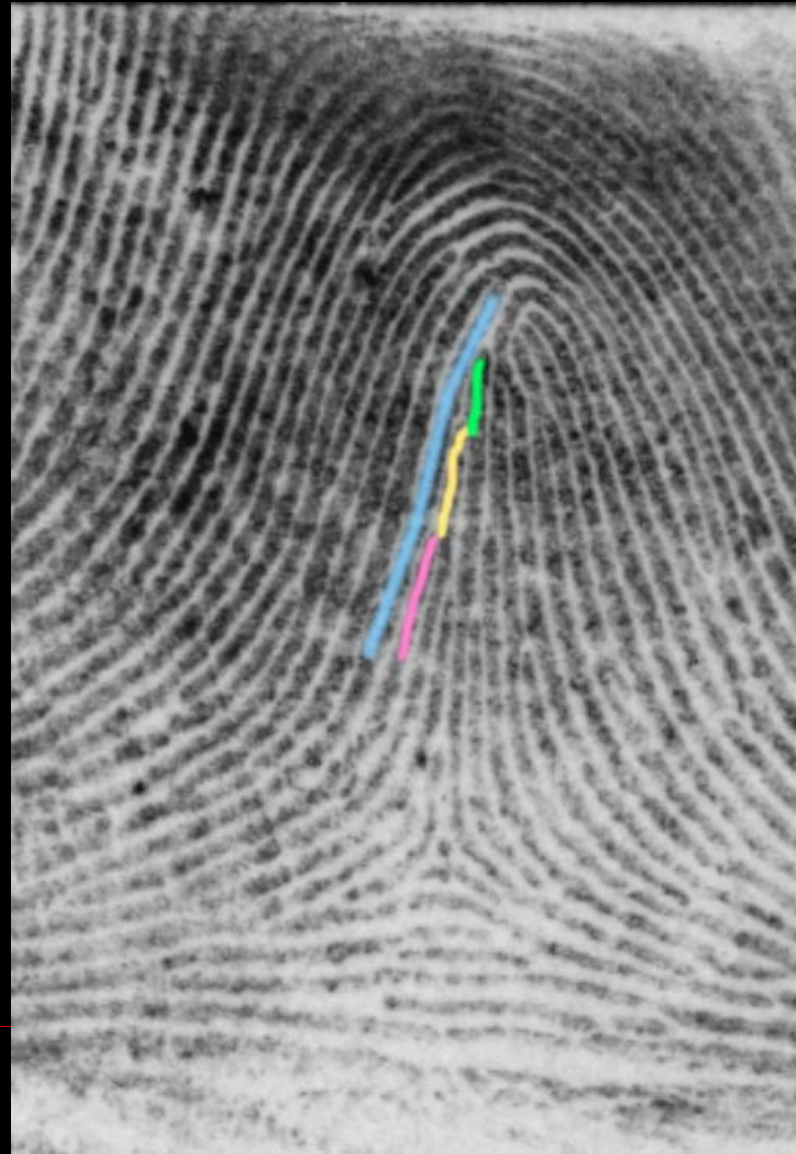
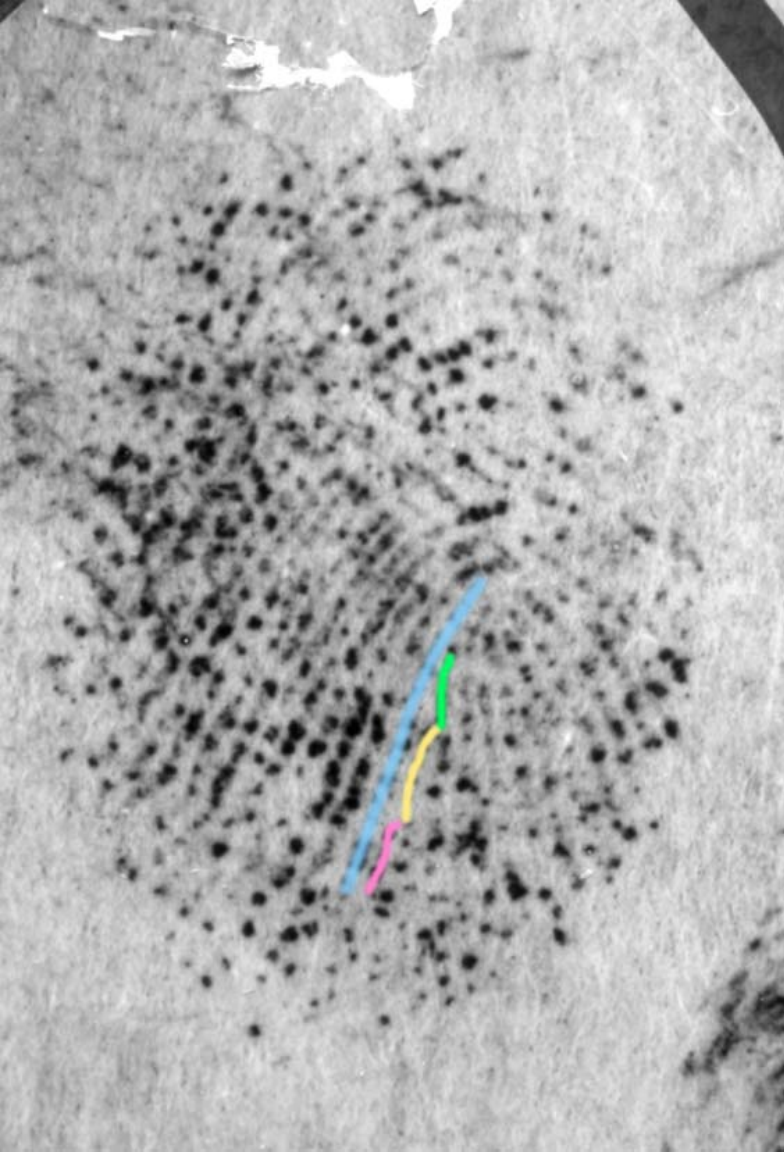


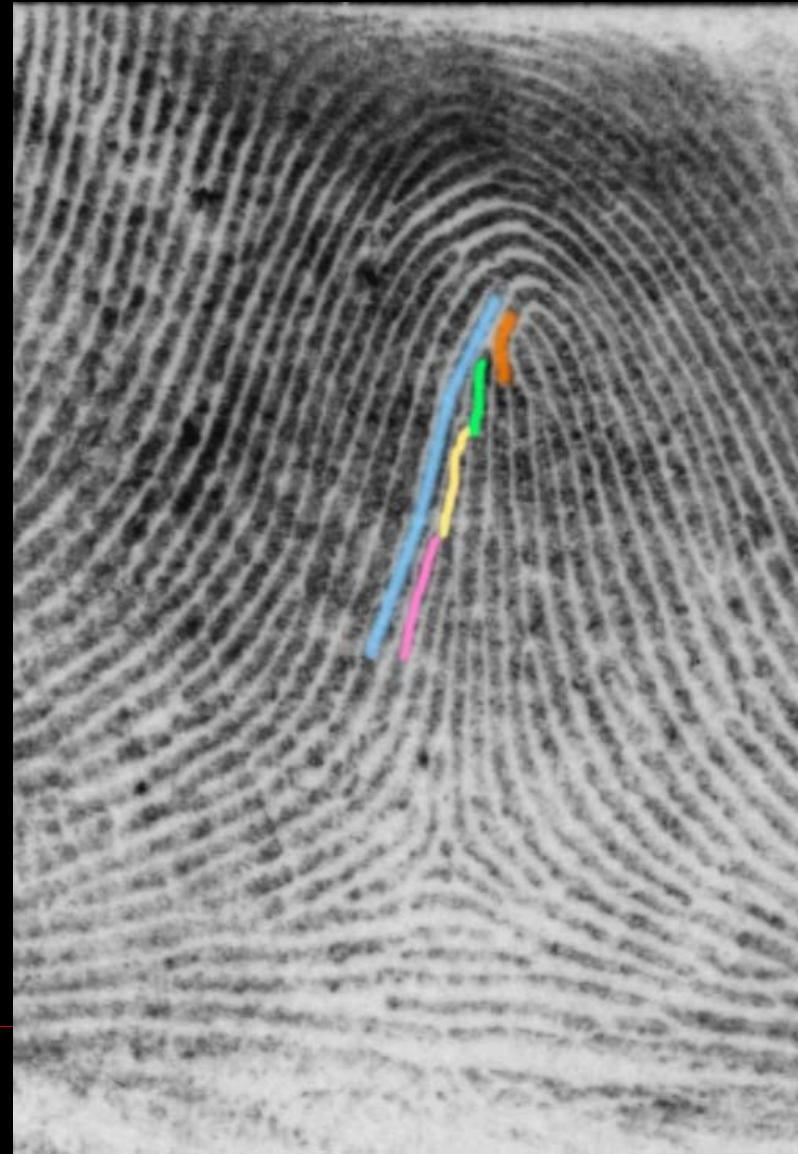
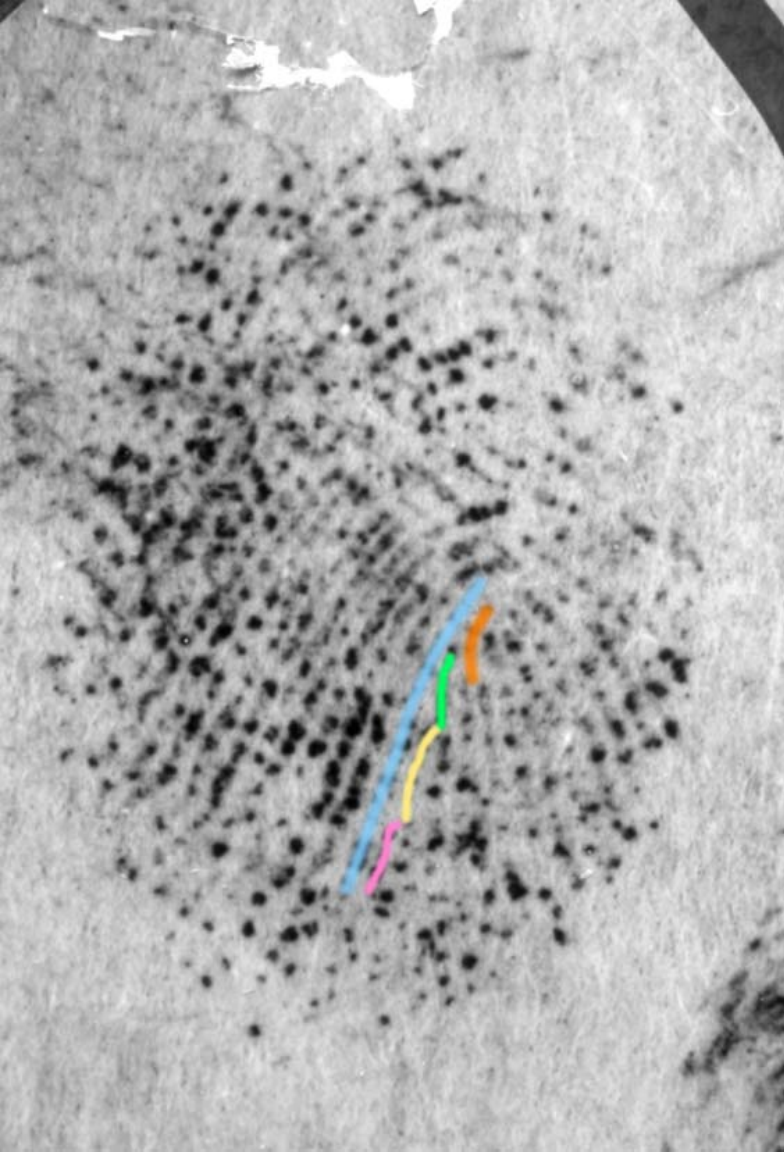


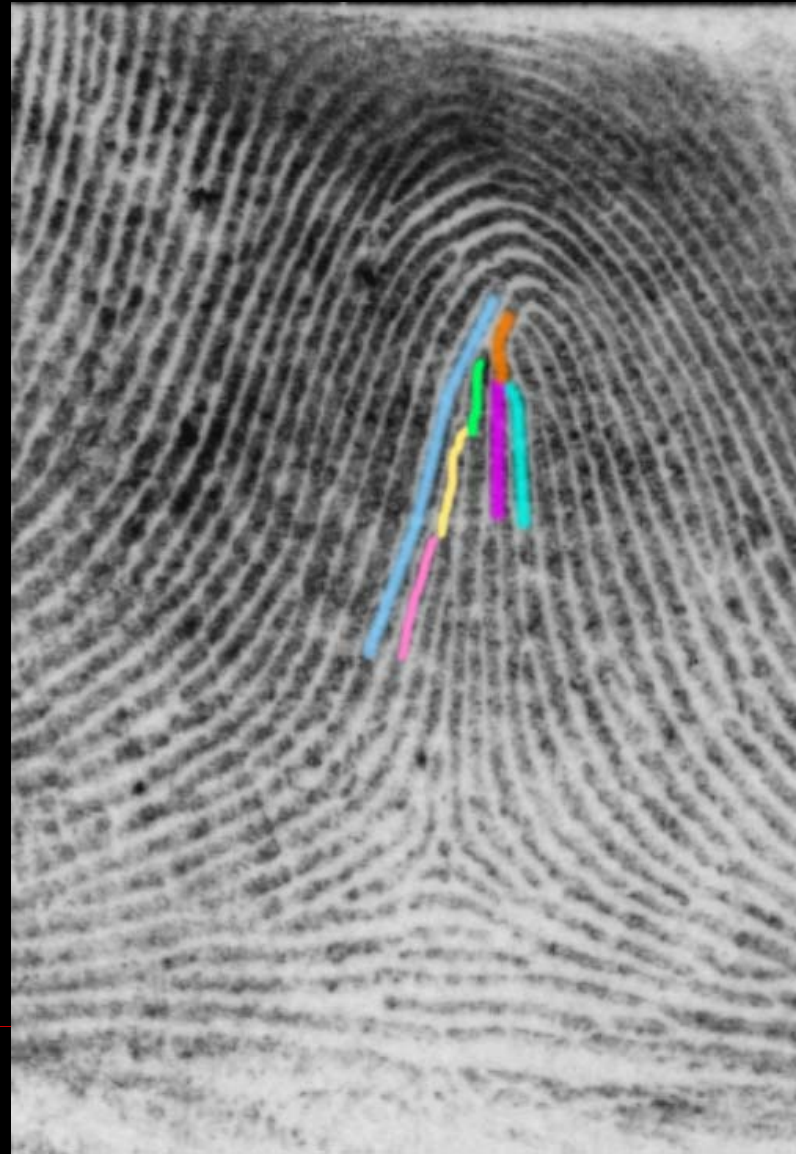
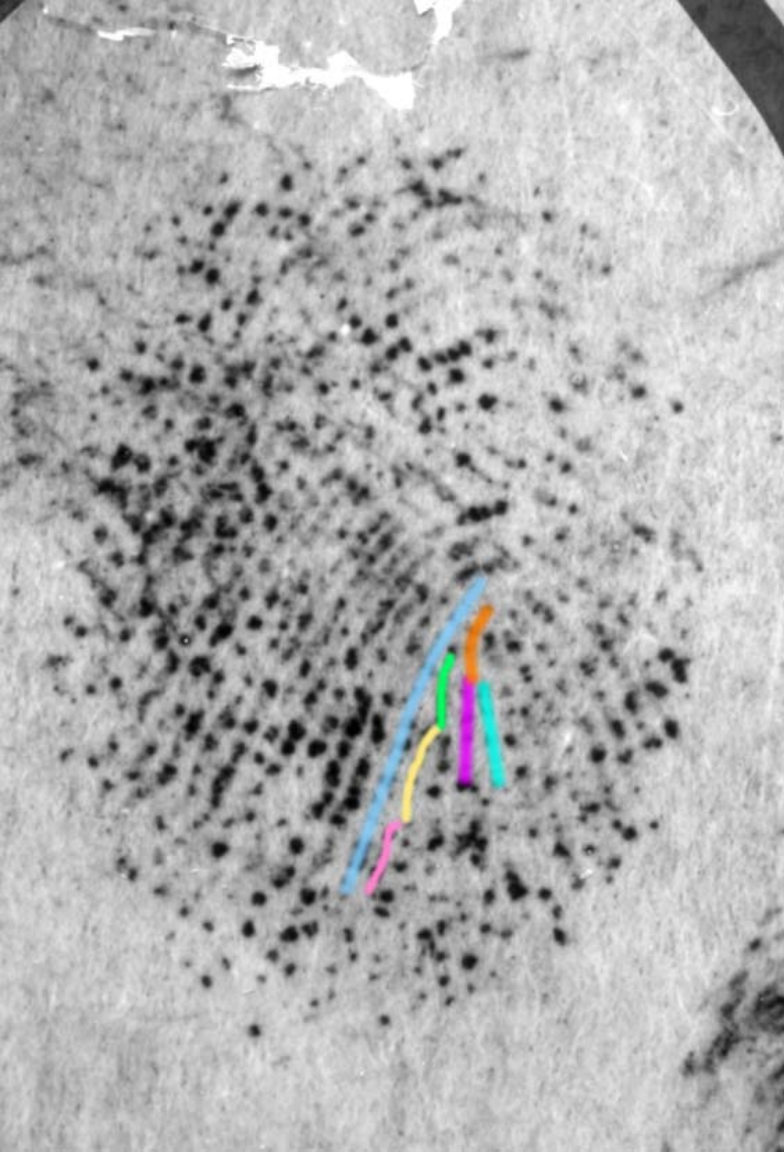


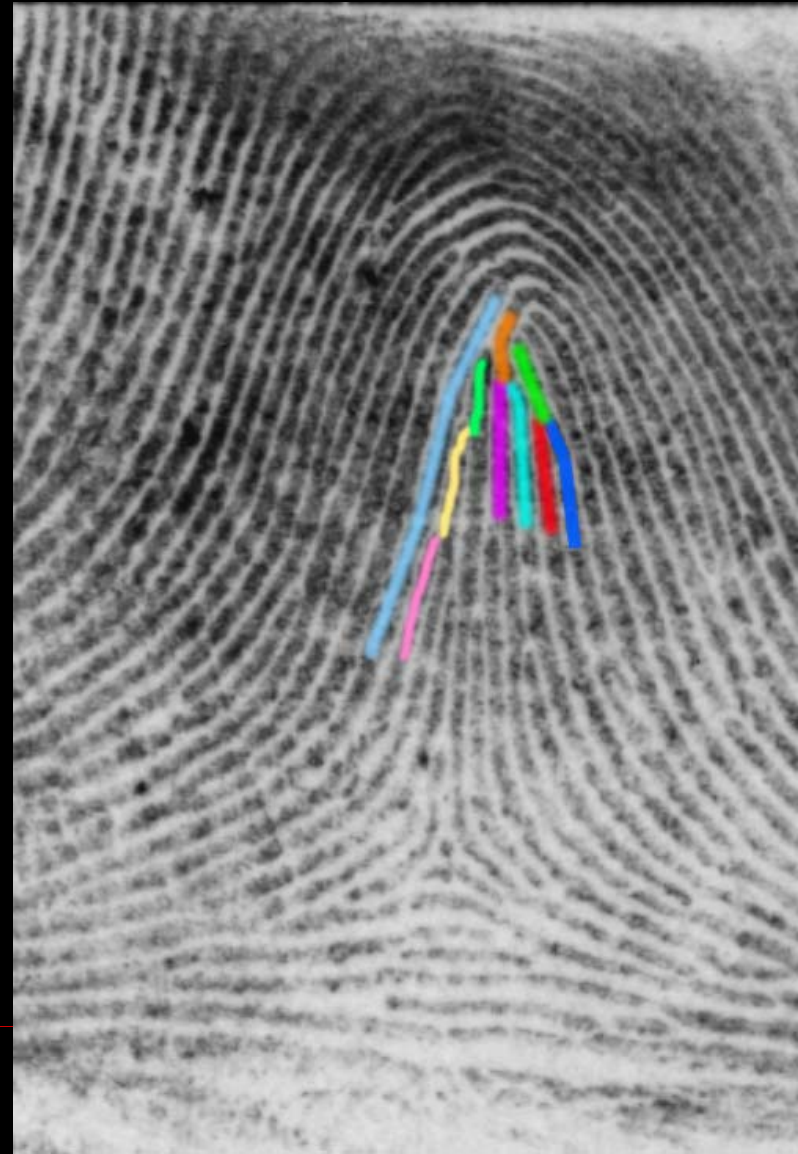
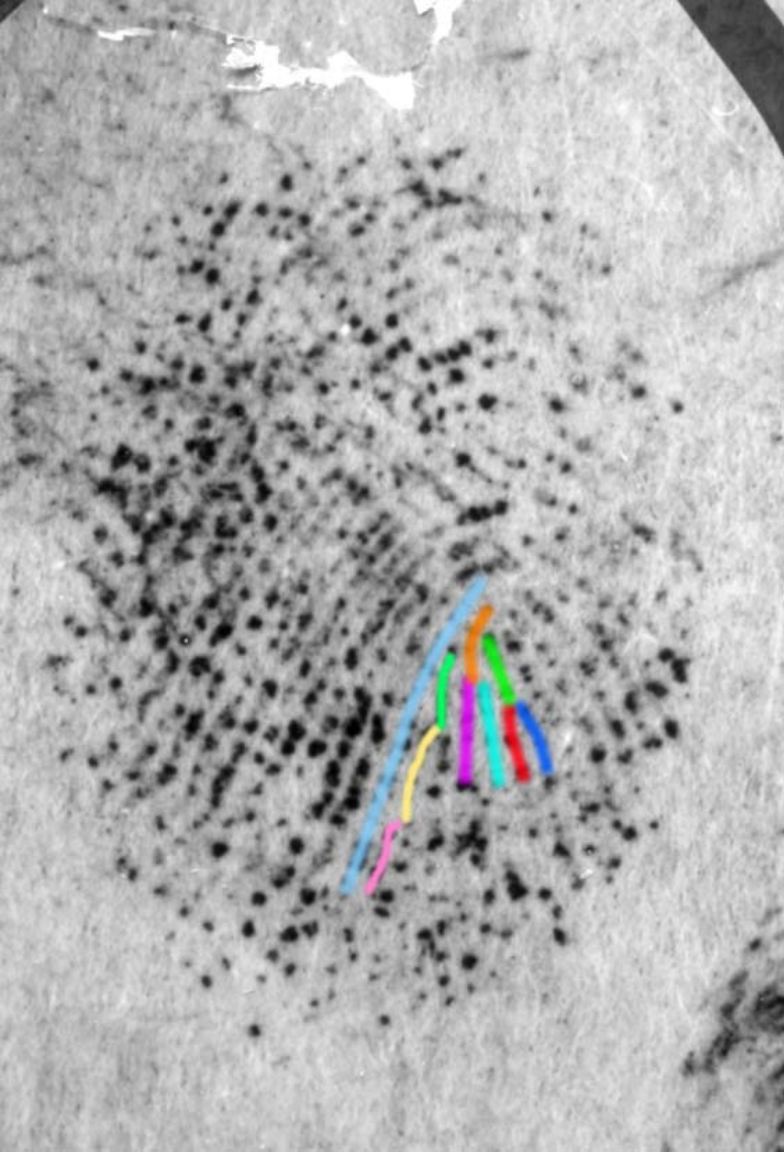


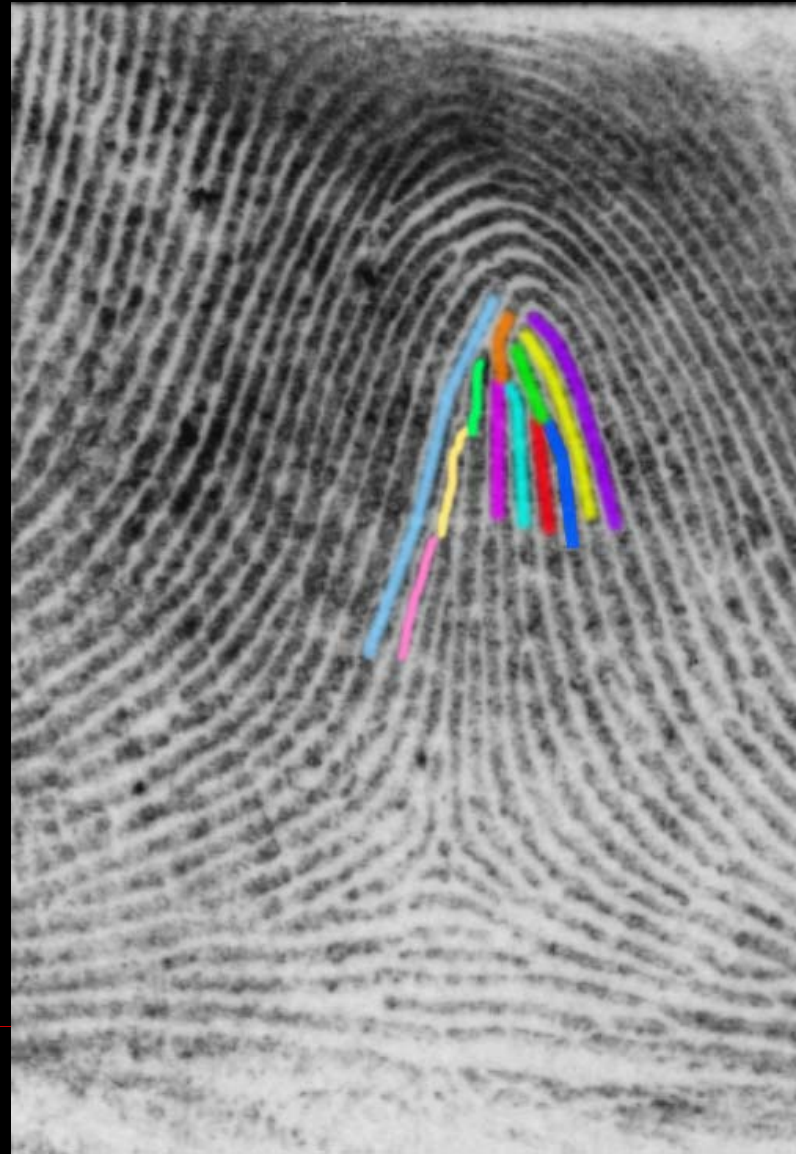
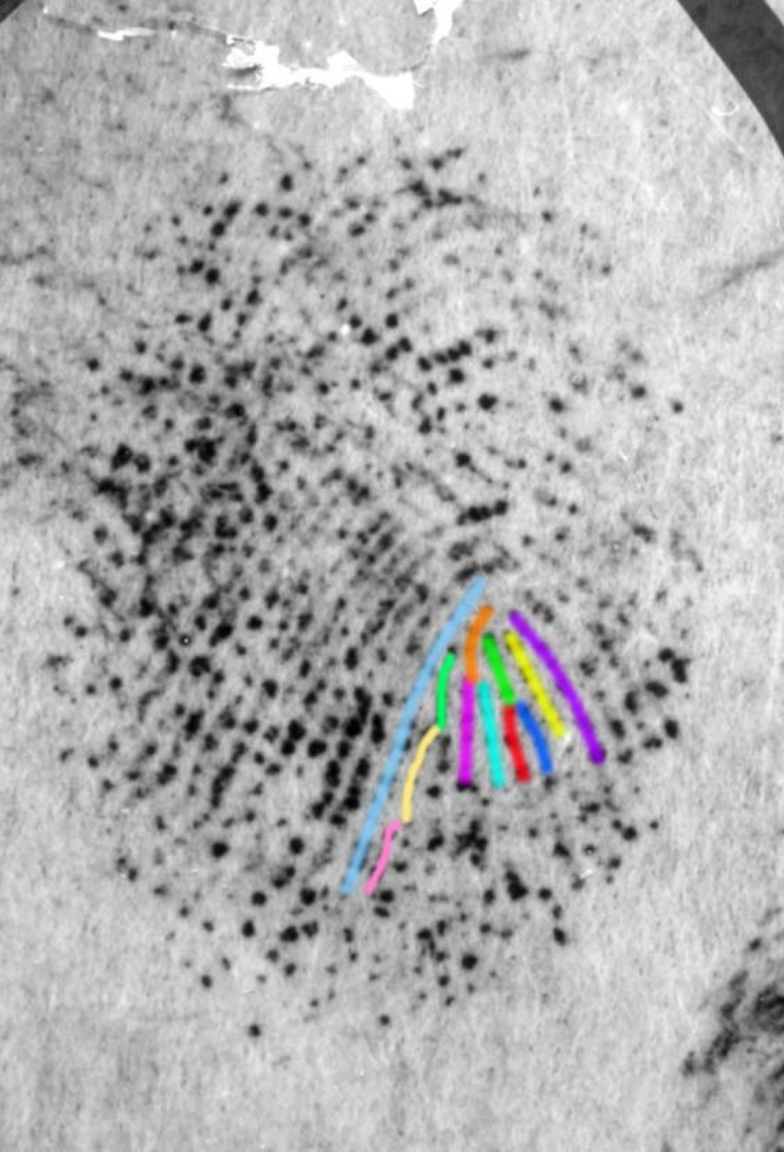


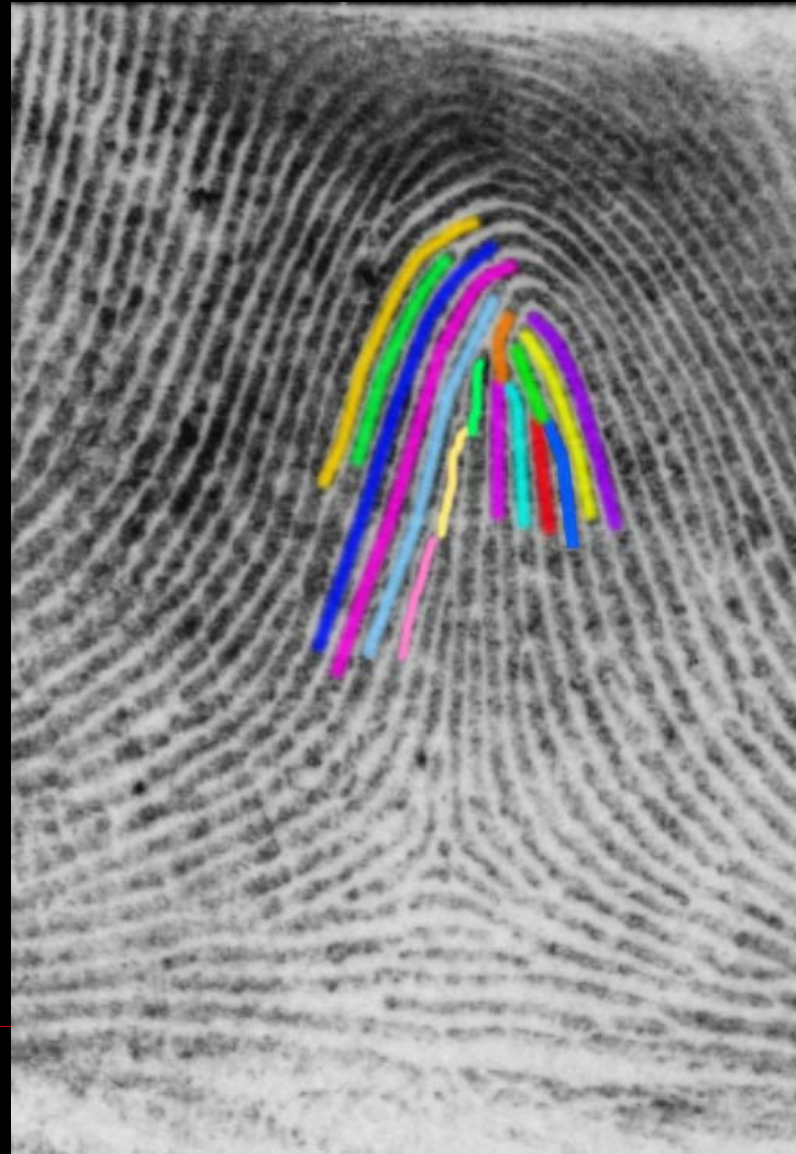
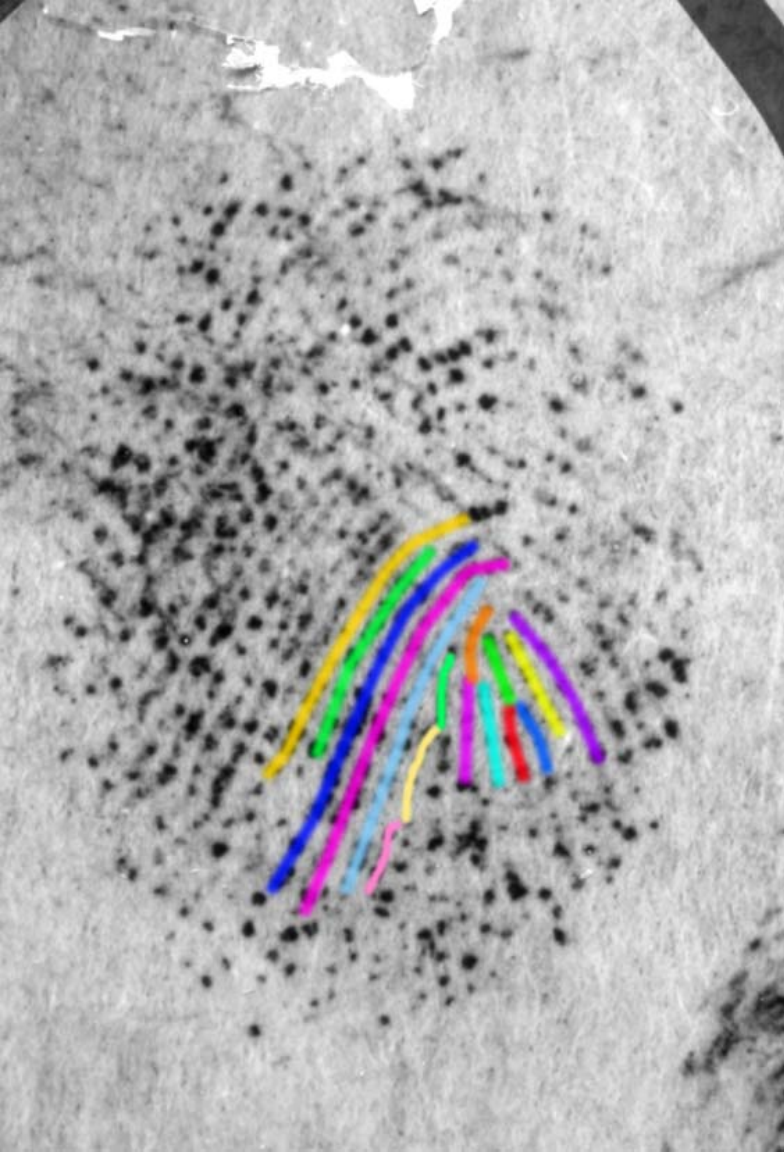






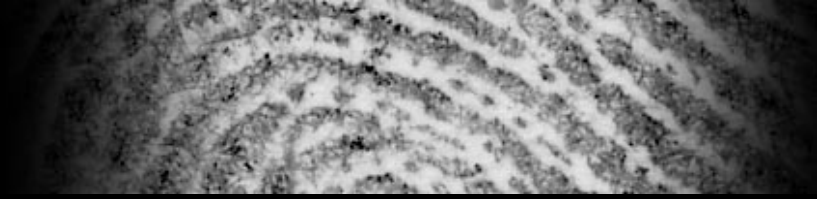






CDEFFS

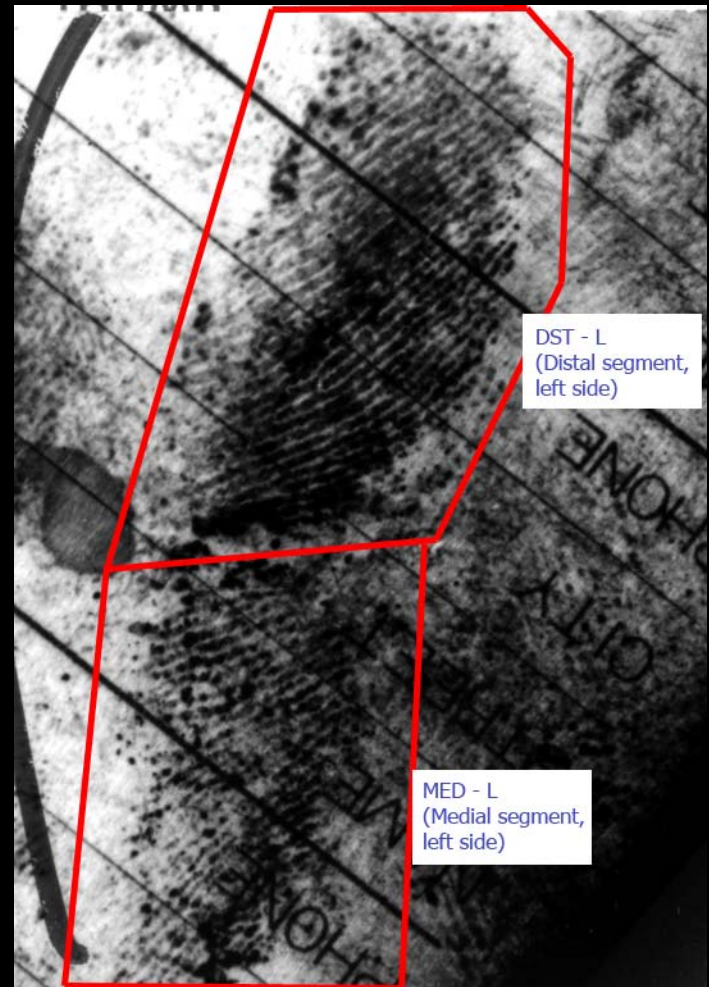
ANSI/NIST Committee to Define an Extended Fingerprint Feature Set



What are extended feature sets?

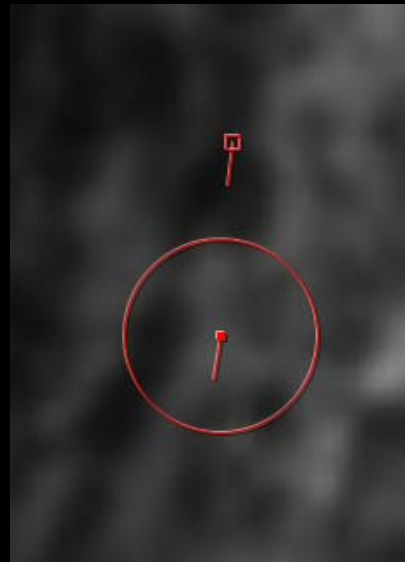
Purpose

- To define a quantifiable, standard method of characterizing the information content of a fingerprint or other friction ridge image.
- To provide a means to capture and save all substantive content an examiner sees in an image or comparison.



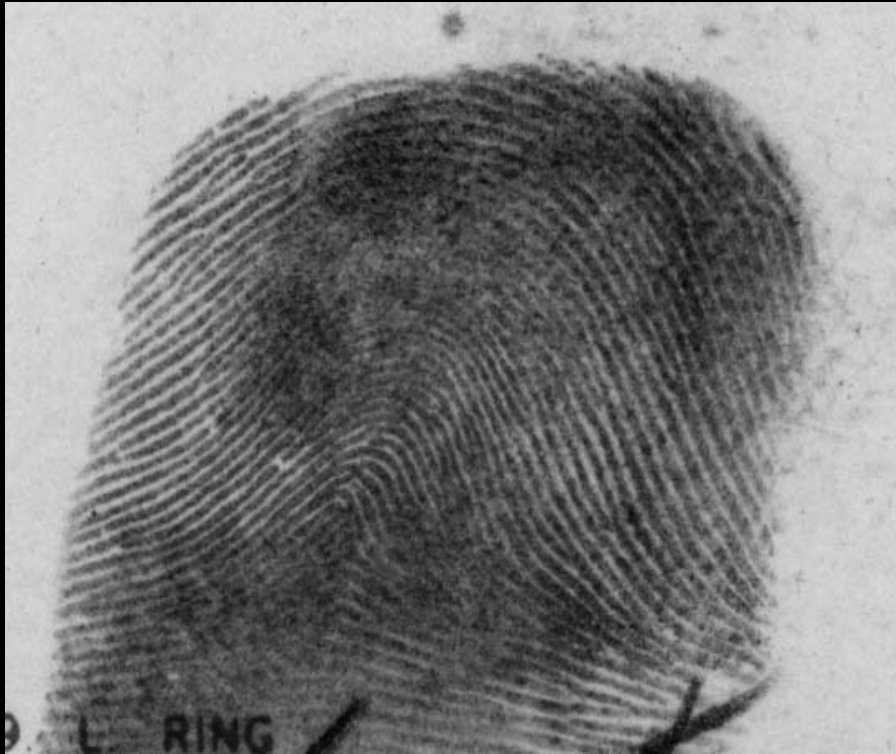
Extended Features

- More sophisticated representation of minutiae



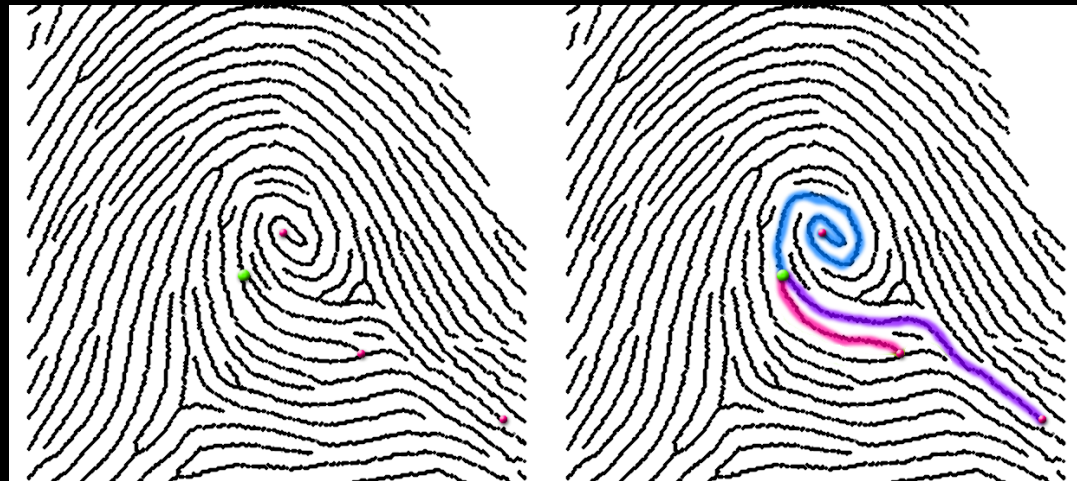
Extended Features

- More sophisticated representation of minutiae
- Interoperable definitions of feature confidence / quality



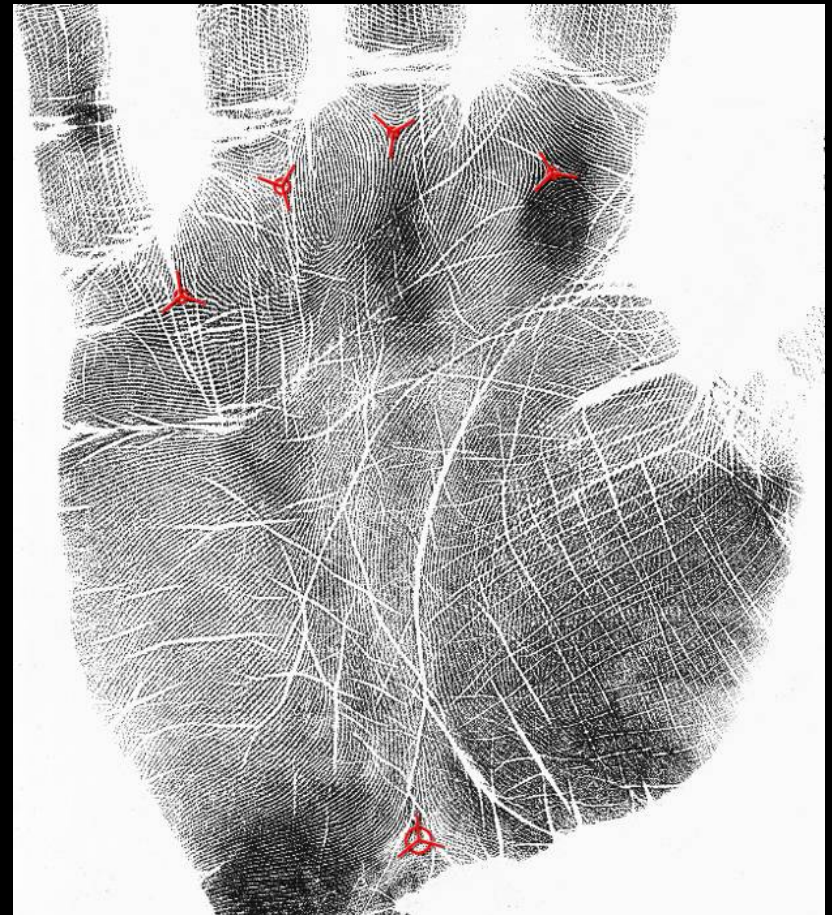
Extended Features

- More sophisticated representation of minutiae
- Interoperable definitions of feature confidence / quality
- Practical definitions of ridge path segments as features



Extended Features

- More sophisticated representation of minutiae
- Interoperable definitions of feature confidence / quality
- Practical definitions of ridge path segments as features
- Designed from the start to include all friction ridge data (including palms, lower finger joints, and plantar (foot/toe) data)



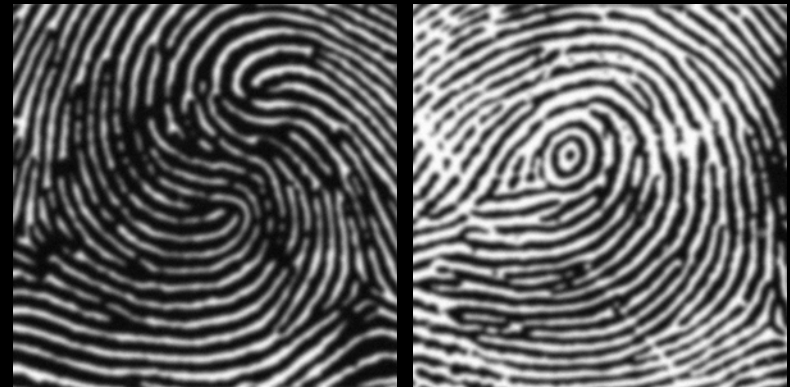
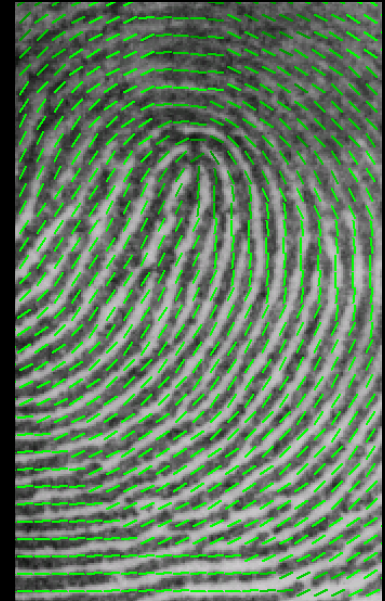
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- Complete definition of level 1/pattern class



Extended Features

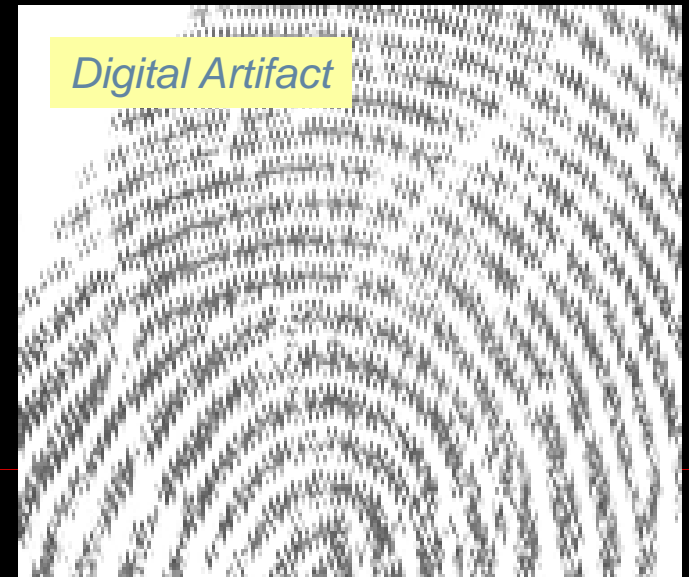
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- Complete definition of level 1/pattern class
- Detailed casework documentation / annotation

Processing Method
Cyanoacrylate fluorescent dye

Matrix
Natural perspiration

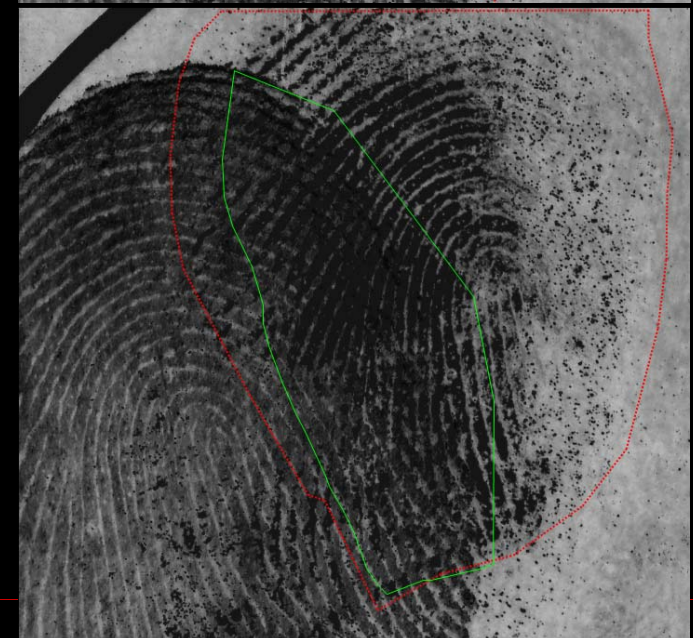
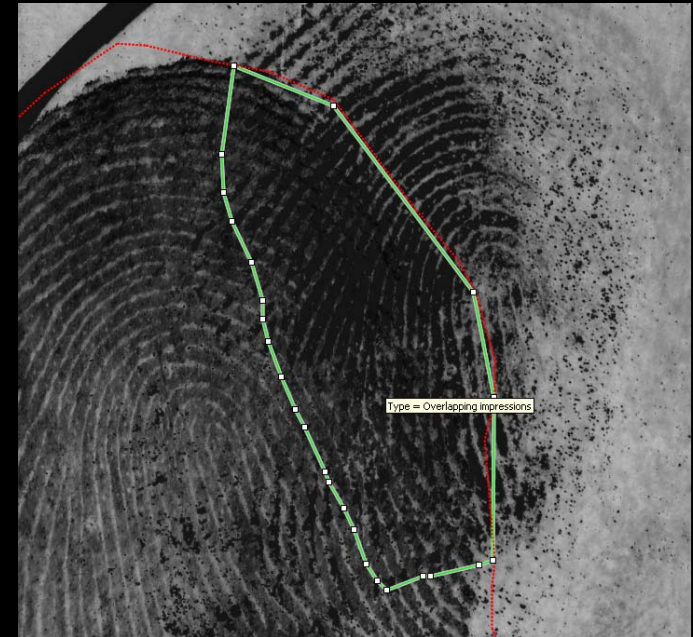
Substrate
Metal, painted

Digital Artifact



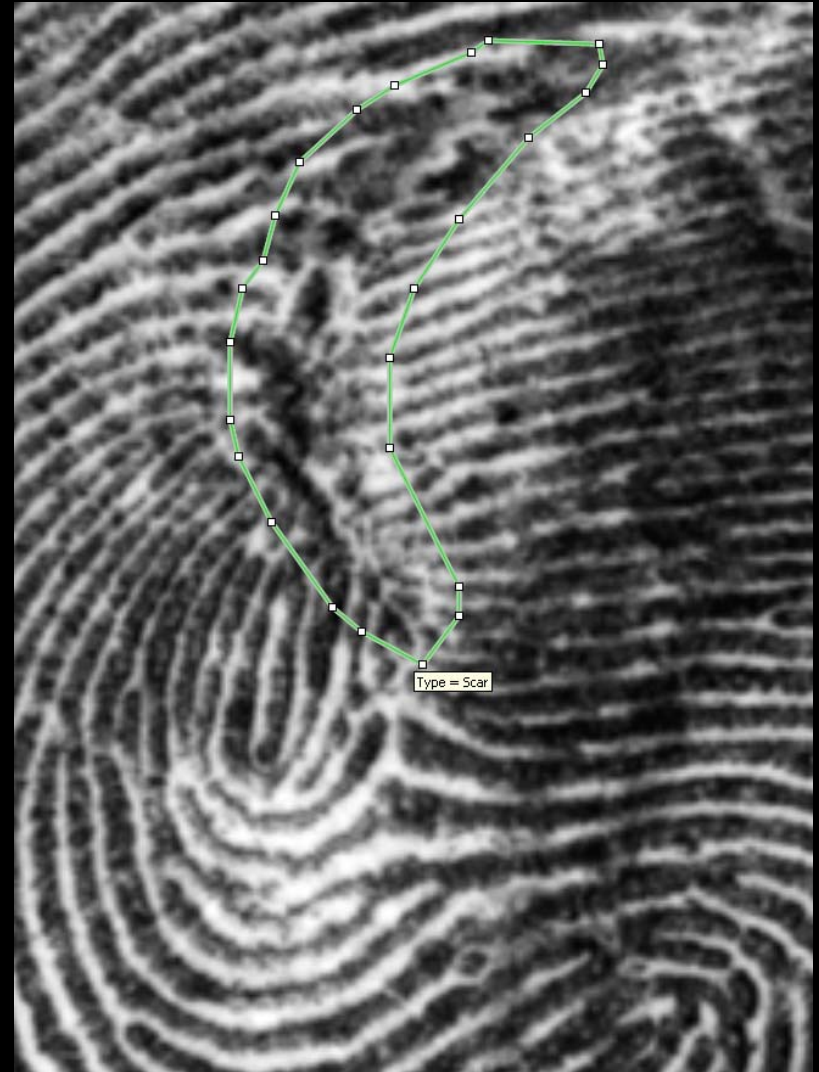
Extended Features

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- Markup of multiple impressions/image



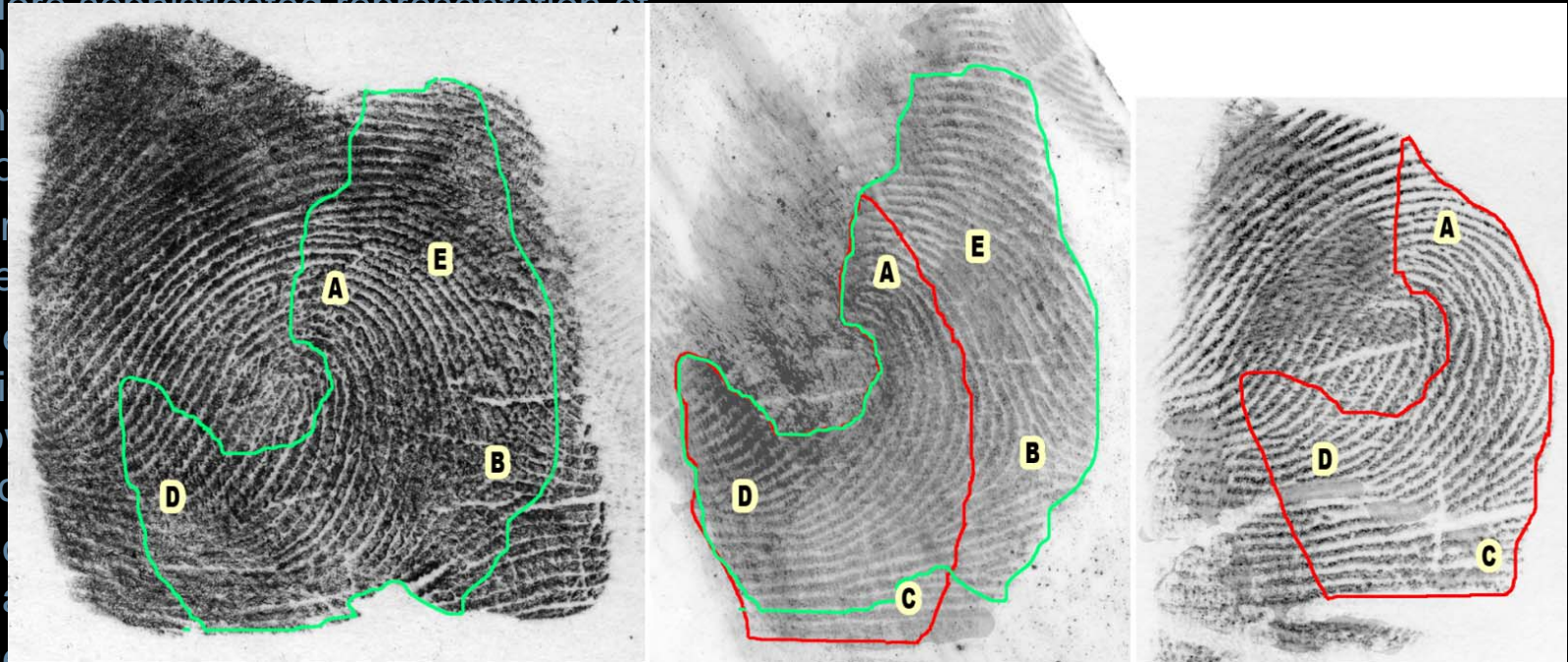
Extended Features

- More sophisticated representation of minutiae
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- Complete definition of level 1/pattern class
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- Markup of multiple impressions/image
- Scars



Extended Features

- More sophisticated representation of



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- Detailed casework documentation / annotation
- Markup of multiple impressions/image
- Scars
- Comparison features

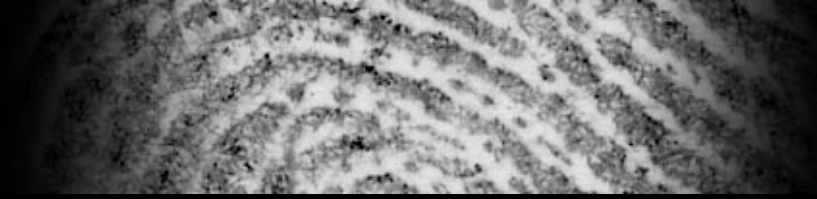
Extended Features

- No single monolithic type of transaction
- Broadly inclusive set of features, not all of which are appropriate for a specific purpose

- 9.300 – Region of Interest
- 9.301 – Orientation
- 9.302 – Finger/Palm Positions(s)
- 9.307 – Pattern Classification
- 9.308 – Ridge Quality Map
- 9.309 – Ridge Quality Map Format
- 9.310 – Ridge Flow Map
- 9.311 – Ridge Flow Map Format
- 9.312 – Ridge Wavelength Map
- 9.313 – Ridge Wavelength Map Format
- 9.314 – Tonal Reversal
- 9.315 – Possible Lateral Reversal
- 9.316 – Friction Ridge Quality Metric
- 9.320 – Cores
- 9.321 – Deltas
- 9.322 – Core-Delta Ridge Counts
- 9.323 – Center Point of Reference (Lateral Center Only)
- 9.324 – Distinctive Characteristics
- 9.325 – No Cores Present (Auto)
- 9.326 – No Deltas Present (Auto)
- 9.327 – No Distinctive Areas Present (Auto)
- 9.331 – Minutiae
- 9.332 – Minutiae Ridge Count Algorithm
- 9.333 – Minutiae Ridge Counts
- 9.334 – No Minutiae Present (Auto)
- 9.340 – Dots
- 9.341 – Incipient Ridges
- 9.342 – Creases and Linear Discontinuities
- 9.343 – Ridge Edge Features
- 9.345 – Pores
- 9.346 – No Dots Present (Auto)
- 9.347 – No Creases Present (Auto)
- 9.347 – No Incipient Ridges Present (Auto)
- 9.349 – No Ridge Edges Present (Auto)
- 9.350 – Method of Feature Detection
- 9.351 – Comments
- 9.352 – Latent Processing Method
- 9.353 – Examiner Analysis Assessment
- 9.354 – Evidence of Fraud
- 9.355 – Latent Substrate
- 9.356 – Latent Matrix
- 9.357 – Local Quality Issues
- 9.360 – Area of Correspondence
- 9.361 – Points of Correspondence
- 9.362 – Examiner Comparison Determination
- 9.372 – Skeletonized Image
- 9.373 – Ridge Path Segments

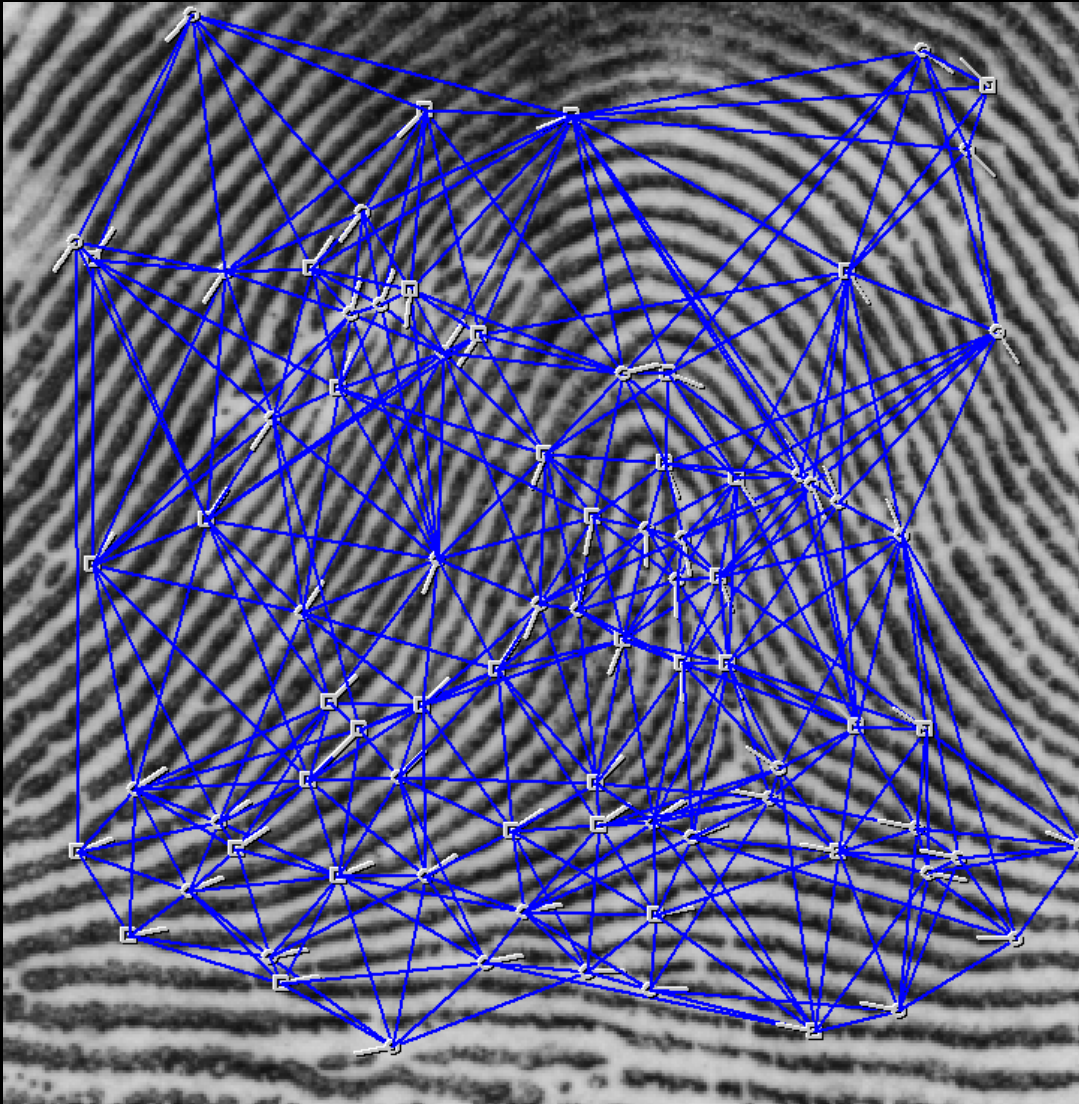
CDEFFS

ANSI/NIST Committee to Define an Extended Fingerprint Feature Set



Why EFS?

Context - Why EFS?



- Examiners already hate marking up ridge counts
- Why are we asking for even more from them?

Latent Triage (A)

- Some latents are appropriate for increased automation:
 - Automatic feature extraction
 - Automatic prioritization or candidate list filtering



Latent Triage (B)

- Many latents are well-served by the current standard AFIS methods
 - Human markup of limited feature sets (minutiae)
 - Human decisions and candidate list filtering

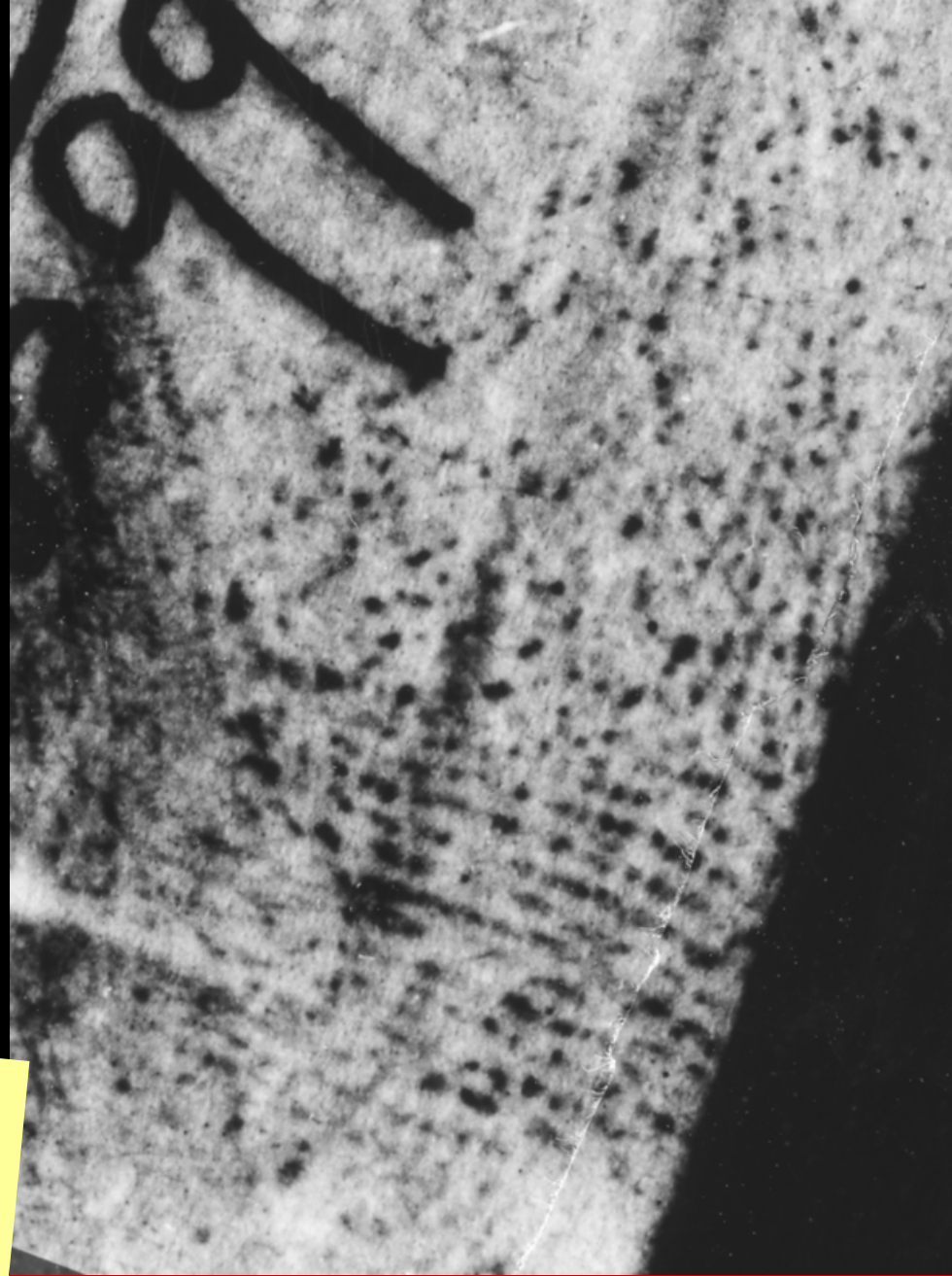


Why EFS?

(1) To identify the minimal subset of features that are most effective in ordinary AFIS searches without imposing an undue burden on the examiner.

Latent Triage (C)

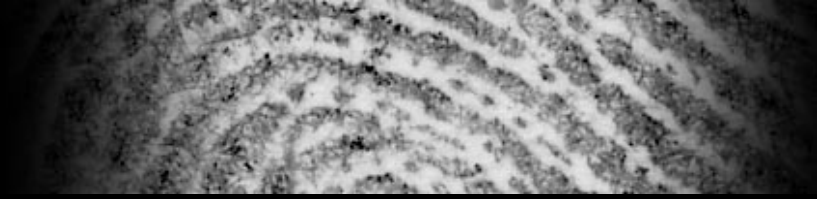
- But some latents are not well-served by the oversimplified feature sets used in most AFIS searches



Why EFS?
(2) To extend the limits of the kinds of images that are AFIS searchable.

CDEFFS

ANSI/NIST Committee to Define an Extended Fingerprint Feature Set

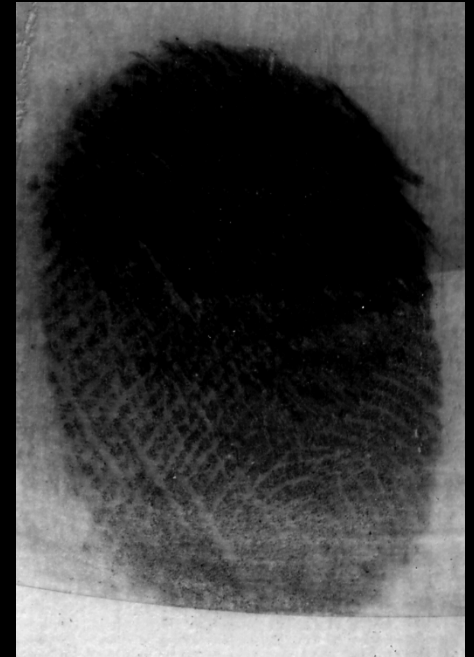


Uses for EFS

Uses (1 of 3)

Analysis Casework

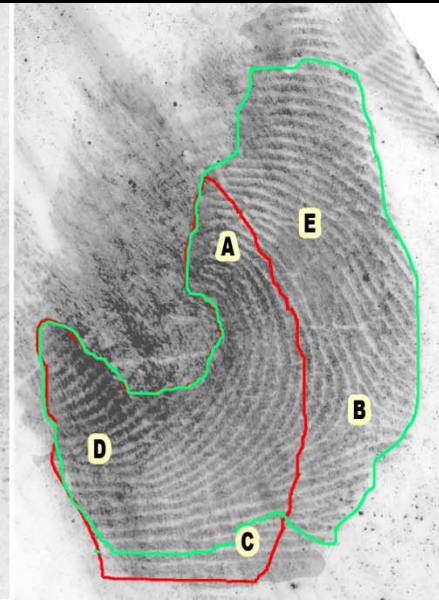
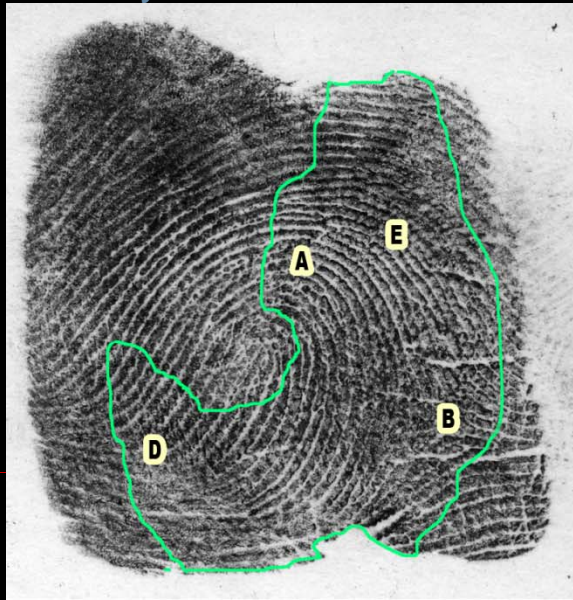
- Definition of the information content of a single friction ridge impression as discerned by an examiner during analysis,
 - for archiving,
 - interchanges with other examiners,
 - validation and quality assurance processing, and
 - quantitative analysis.



Uses (2 of 3)

Comparison Casework

- Definition of the information content and determination of a comparison of two friction ridge impressions as discerned by an examiner during comparison and evaluation,
 - for archiving,
 - interchanges with other examiners,
 - validation and quality assurance processing,
 - documentation for challenged comparisons, and
 - quantitative analysis.



Uses (3 of 3)

- interoperable interchange format for automated fingerprint or palmprint systems, for
 - human-initiated searches
 - data interchange between automated systems
 - feedback to examiners from automated processing

CDEFFS

ANSI/NIST Committee to Define an Extended Fingerprint Feature Set



Related Work

Related Work

- Standard guidelines for markup (Draft)
- Juried reference data
 - ELFT-EFS Public Challenge Dataset
 - Available on request
- ULW (Universal Latent Workstation)
 - Reference Implementation
- NIST ELFT-EFS
 - Preliminary results on CDEFFS website
 - NIST IR in progress
- Use of EFS for research

Austin Hicklin
hicklin@noblis.org

*<http://fingerprint.nist.gov/standard/cdeffs>
(or just Google "CDEFFS")*