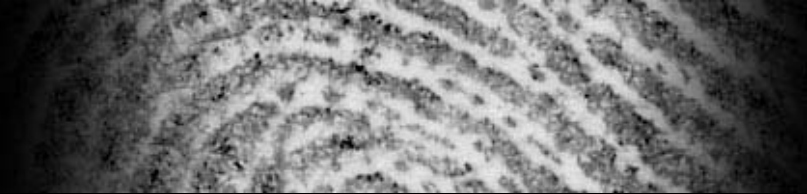




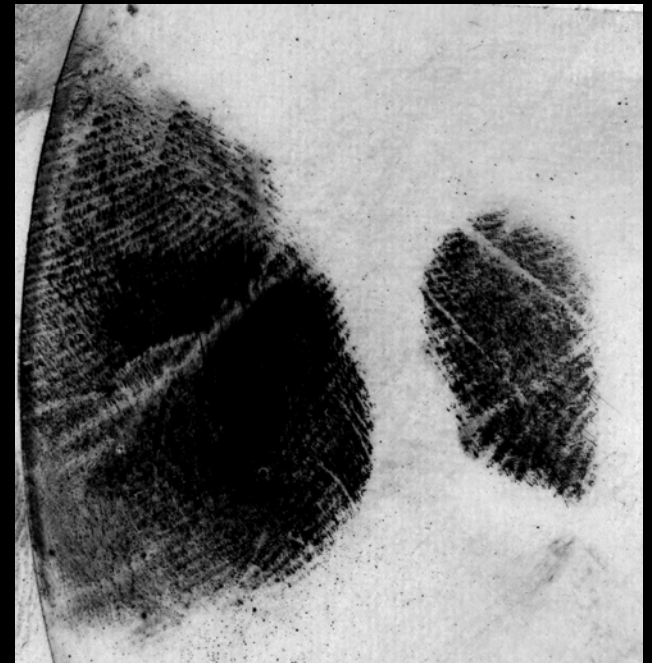
CDEFFS

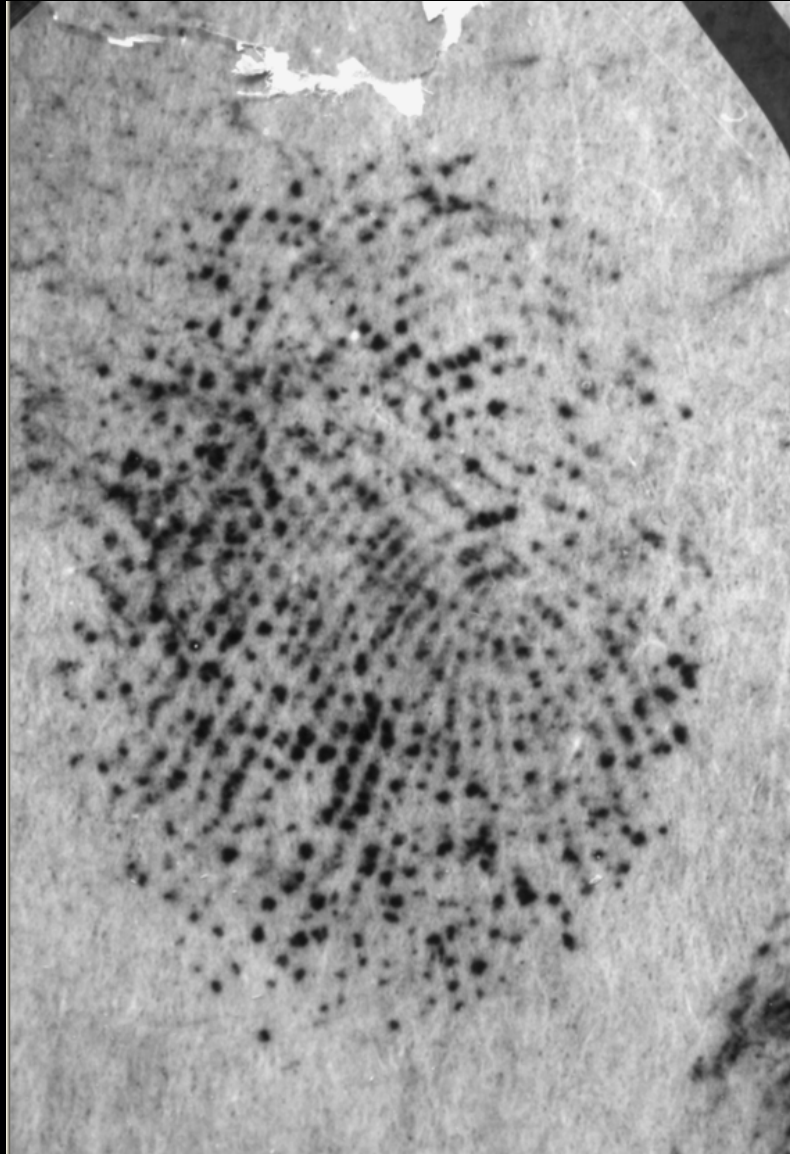
ANSI/NIST Committee to Define an Extended Fingerprint Feature Set

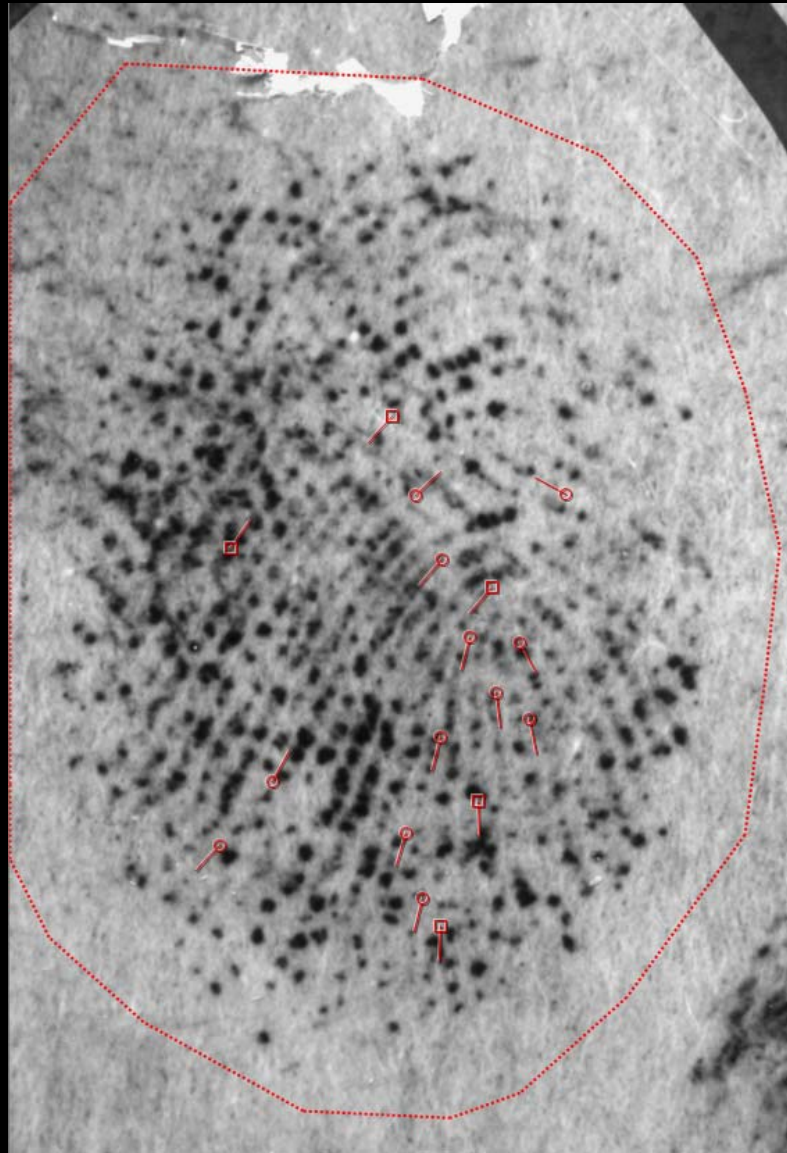


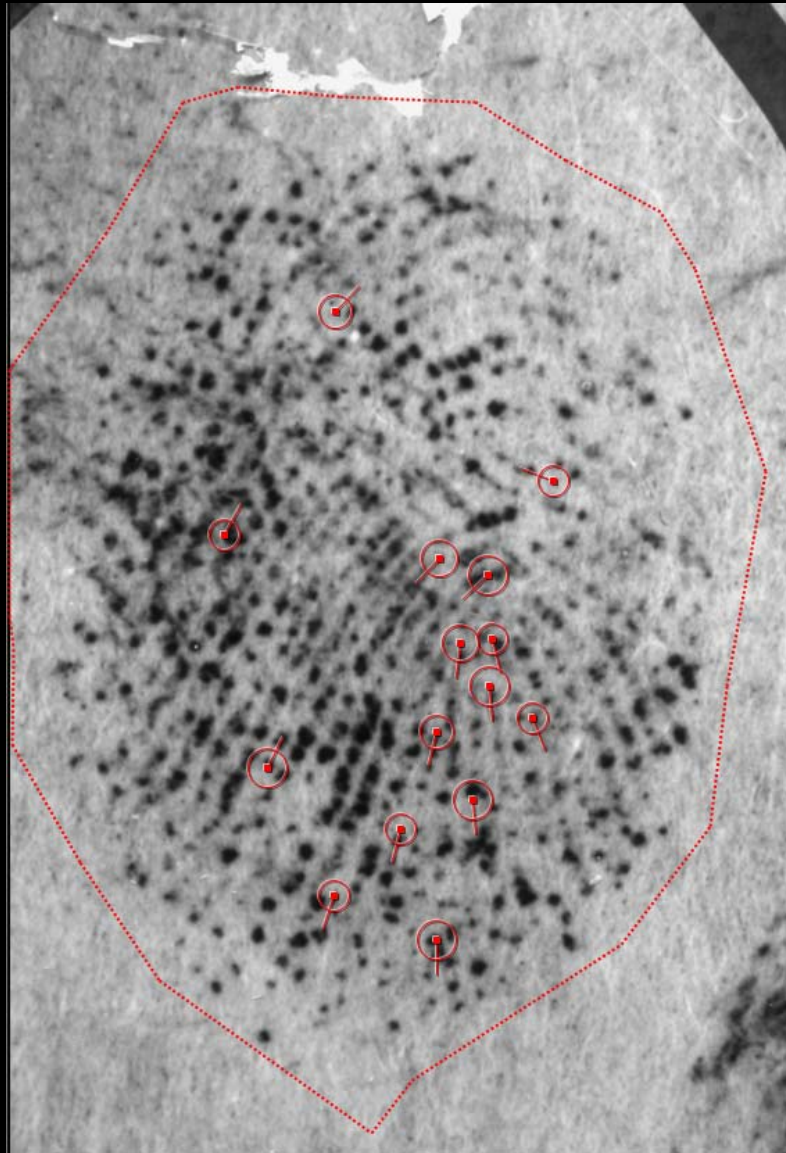
Extended Friction Ridge Feature Sets NIST Latent Workshop

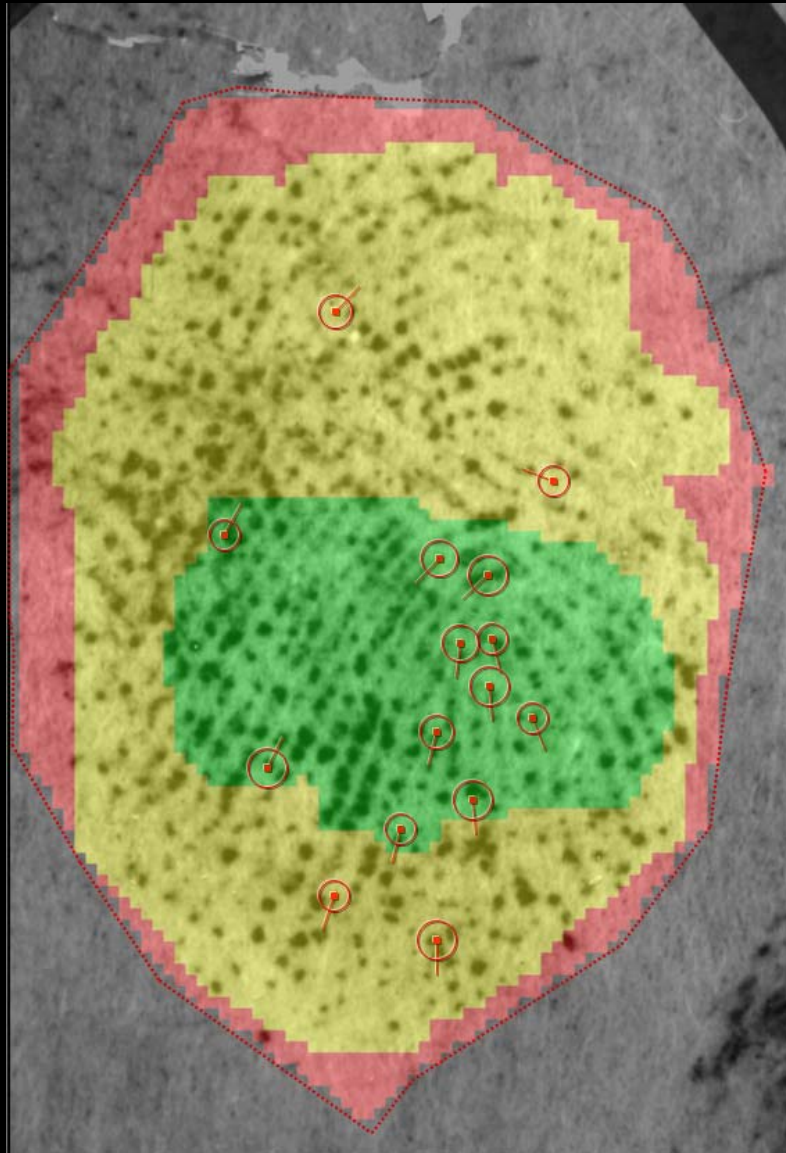
Austin Hicklin
18 March 2009

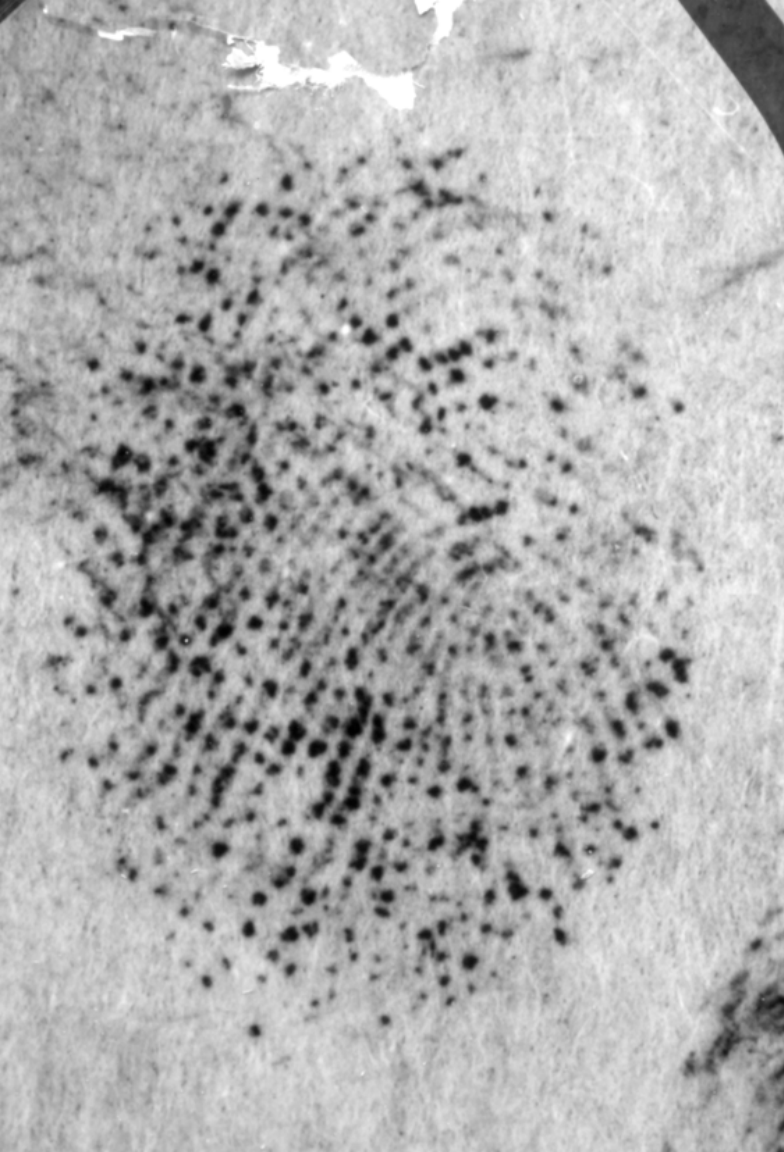


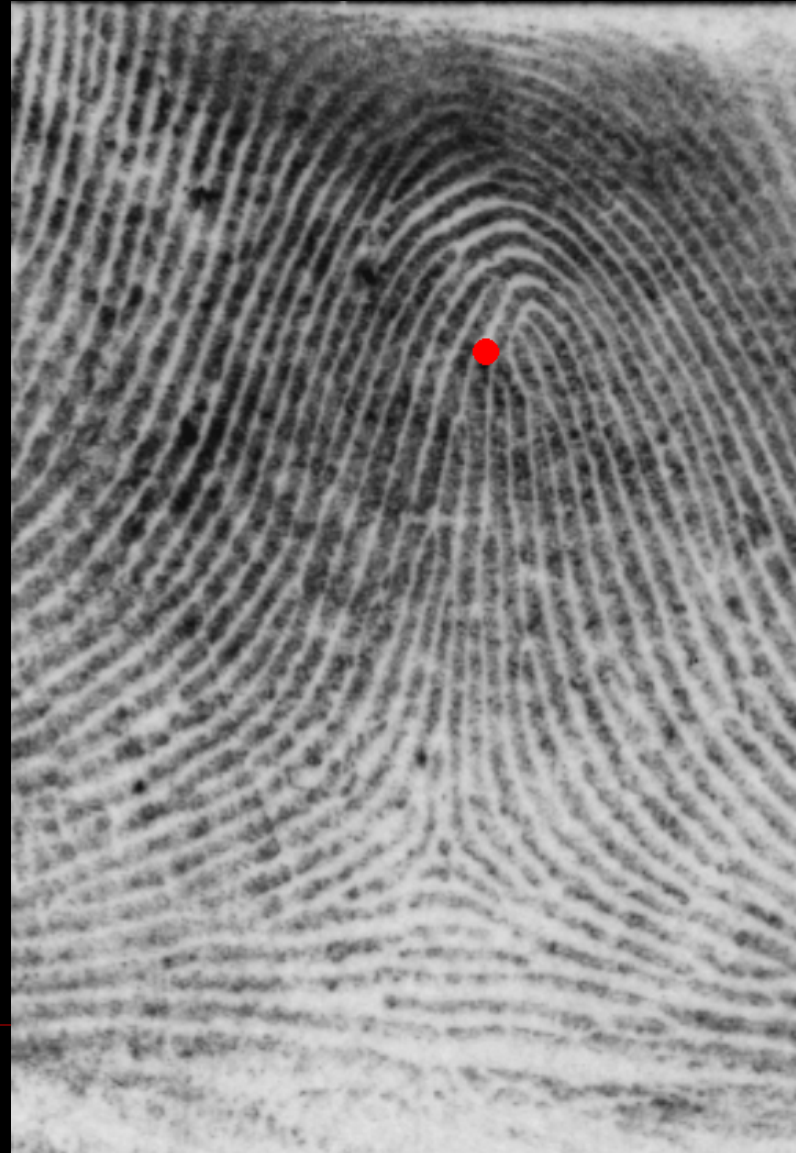
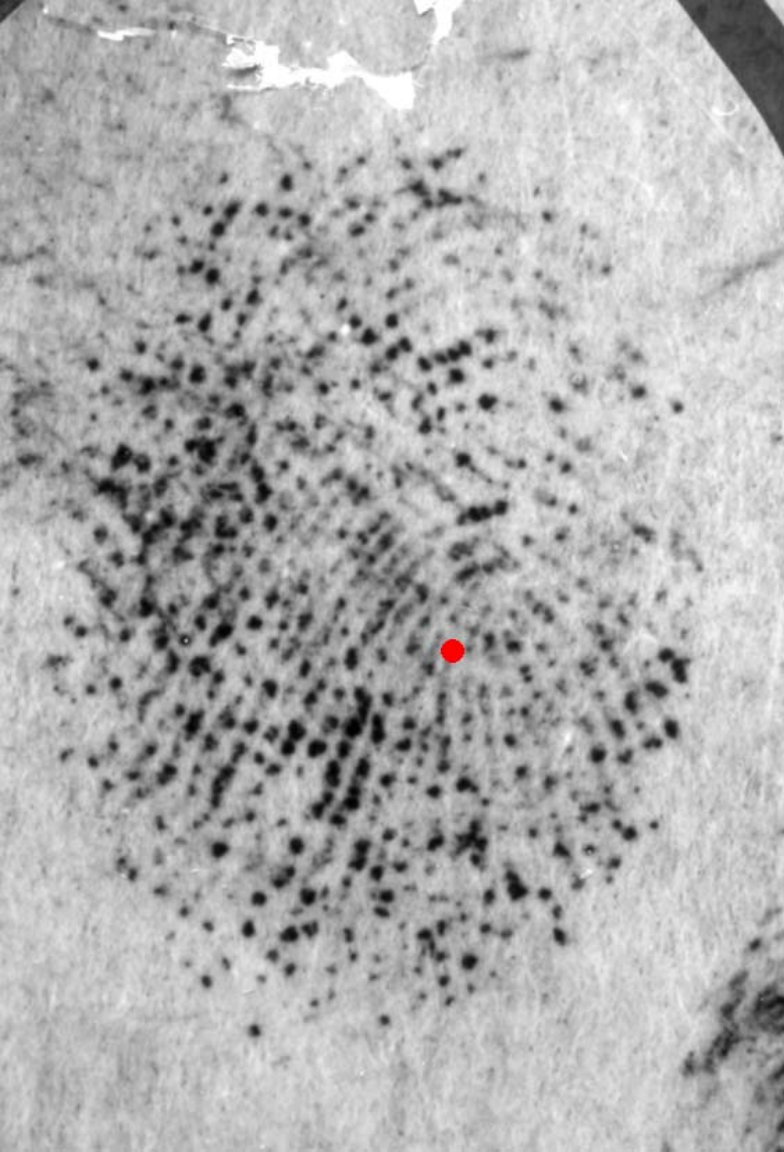


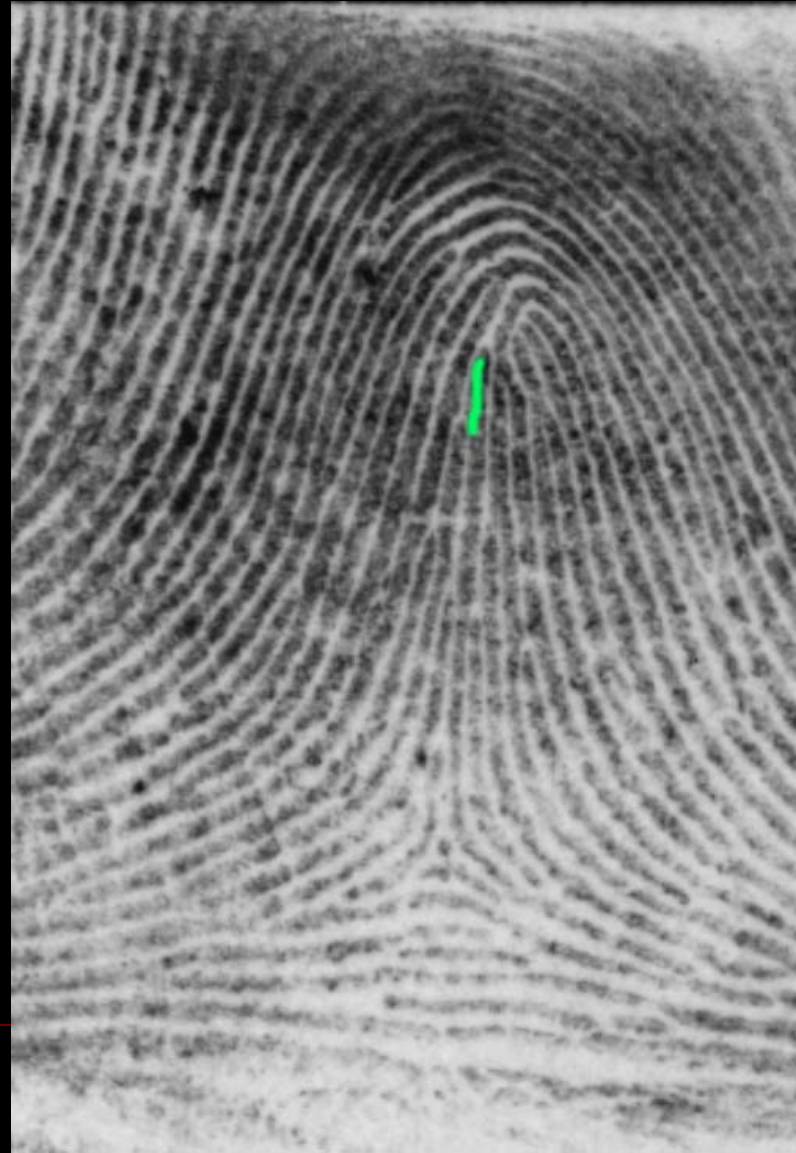
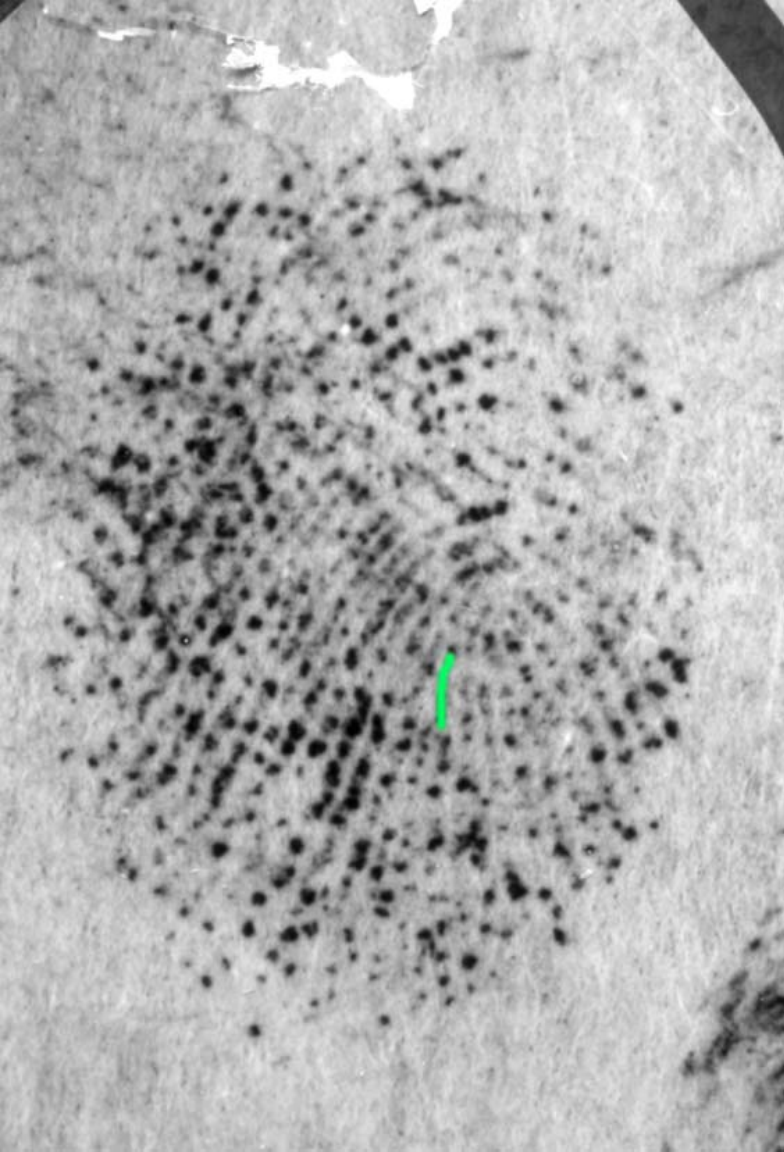


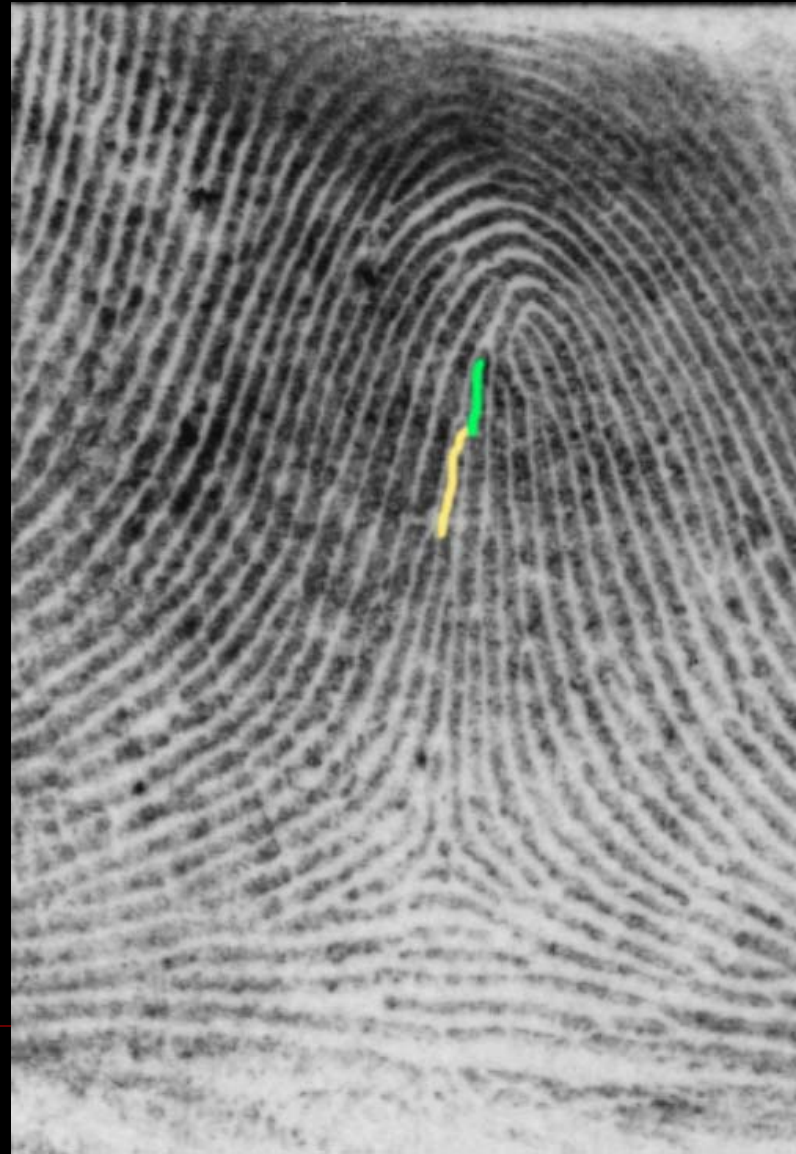
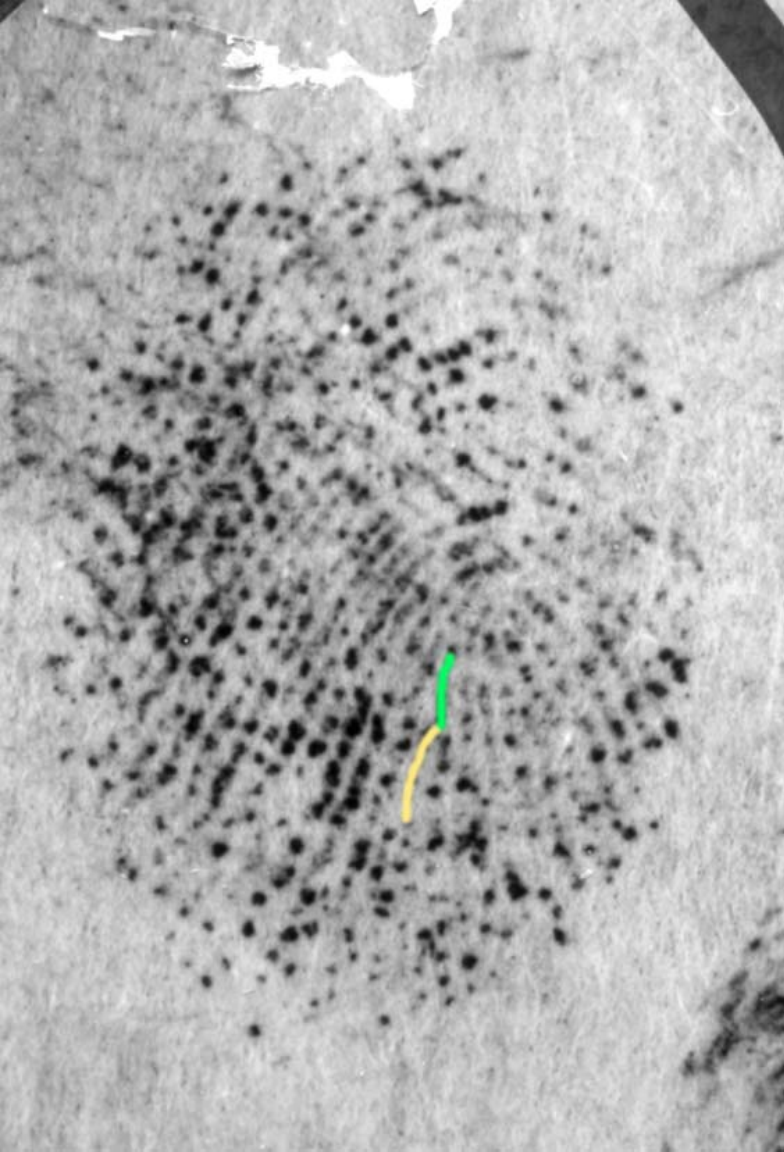


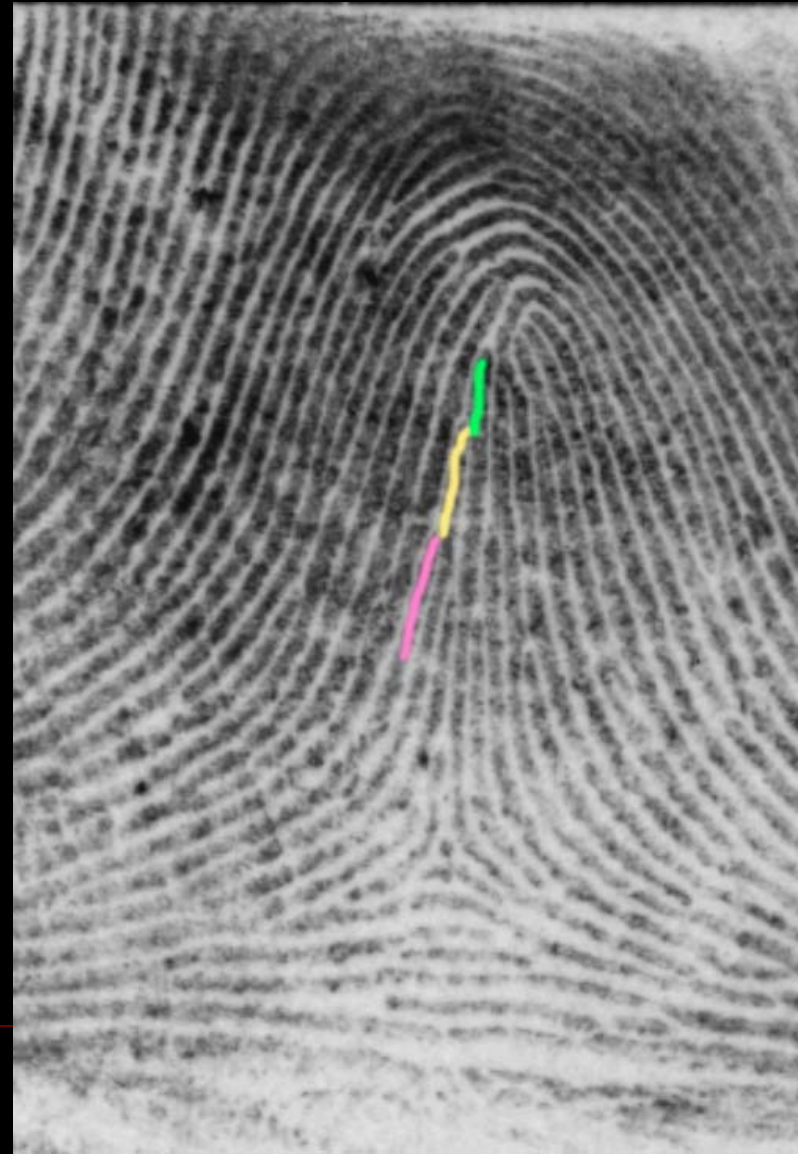
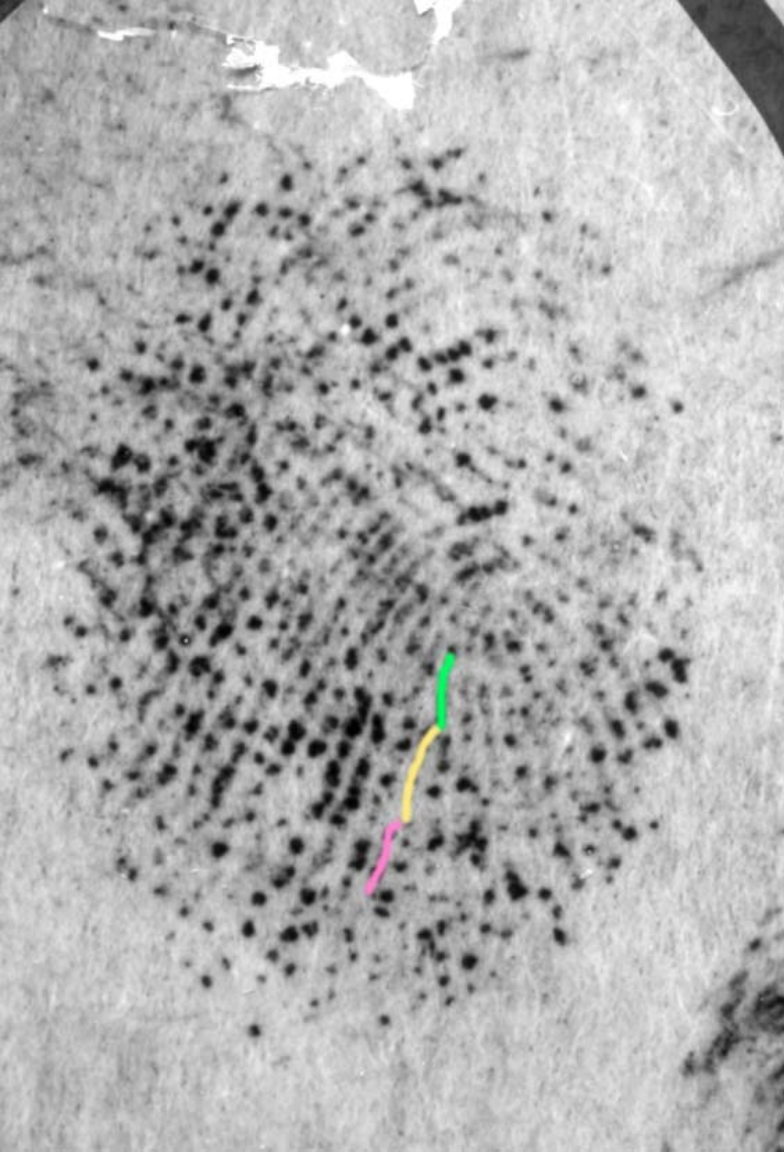


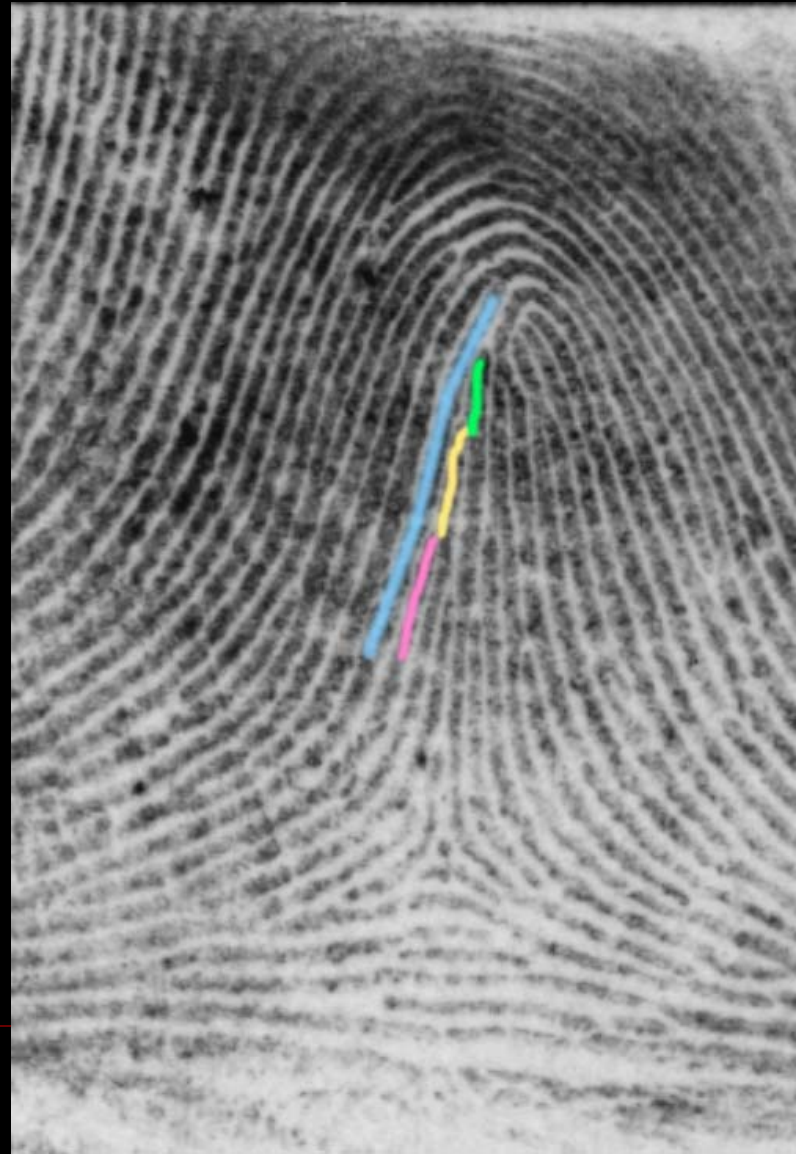
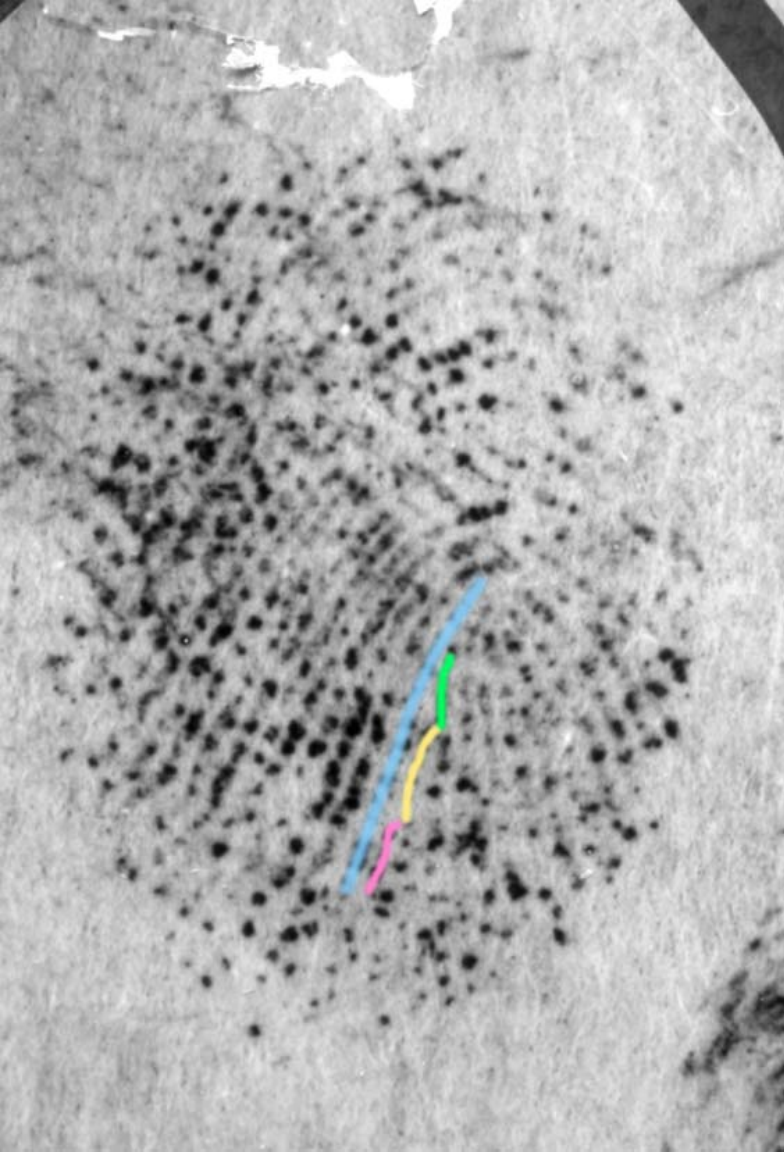


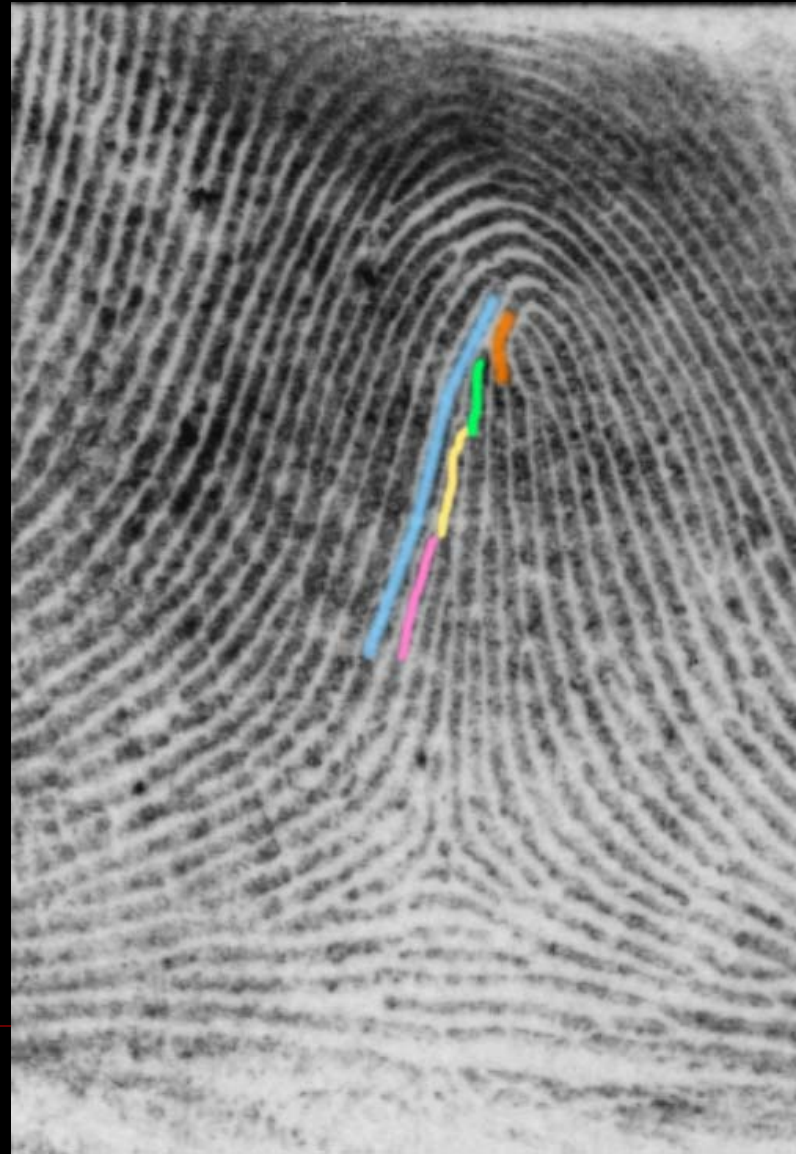
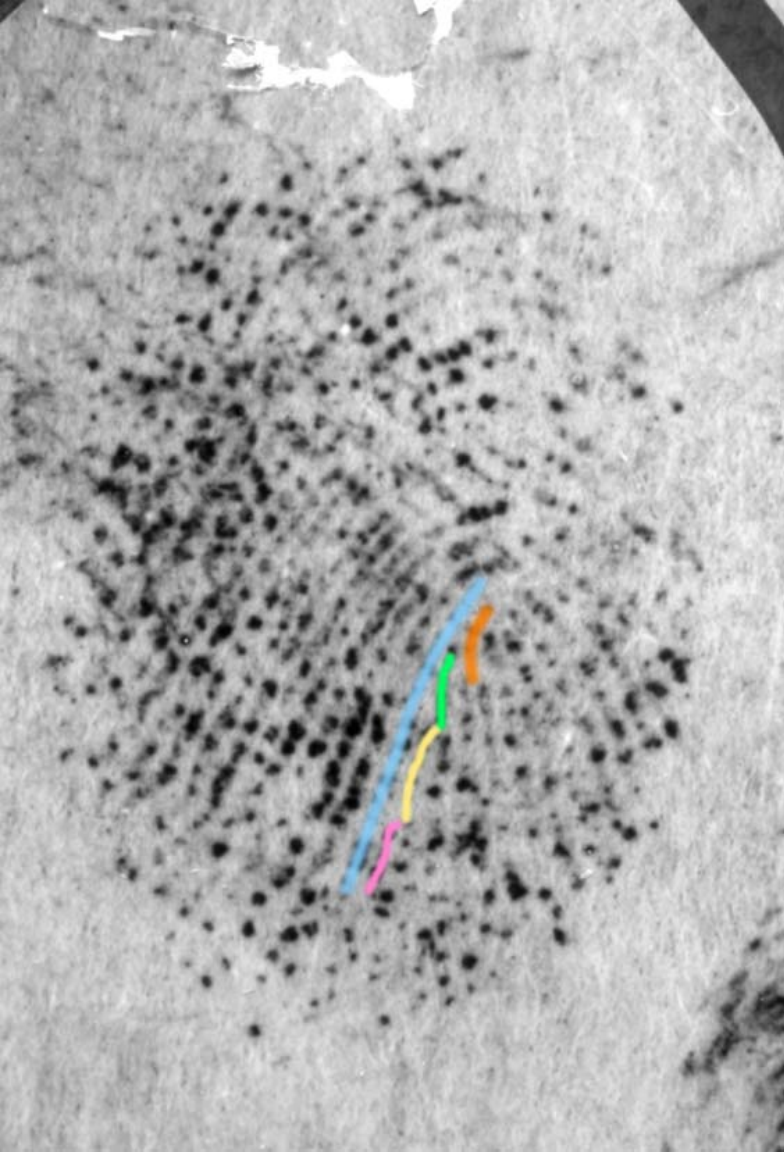


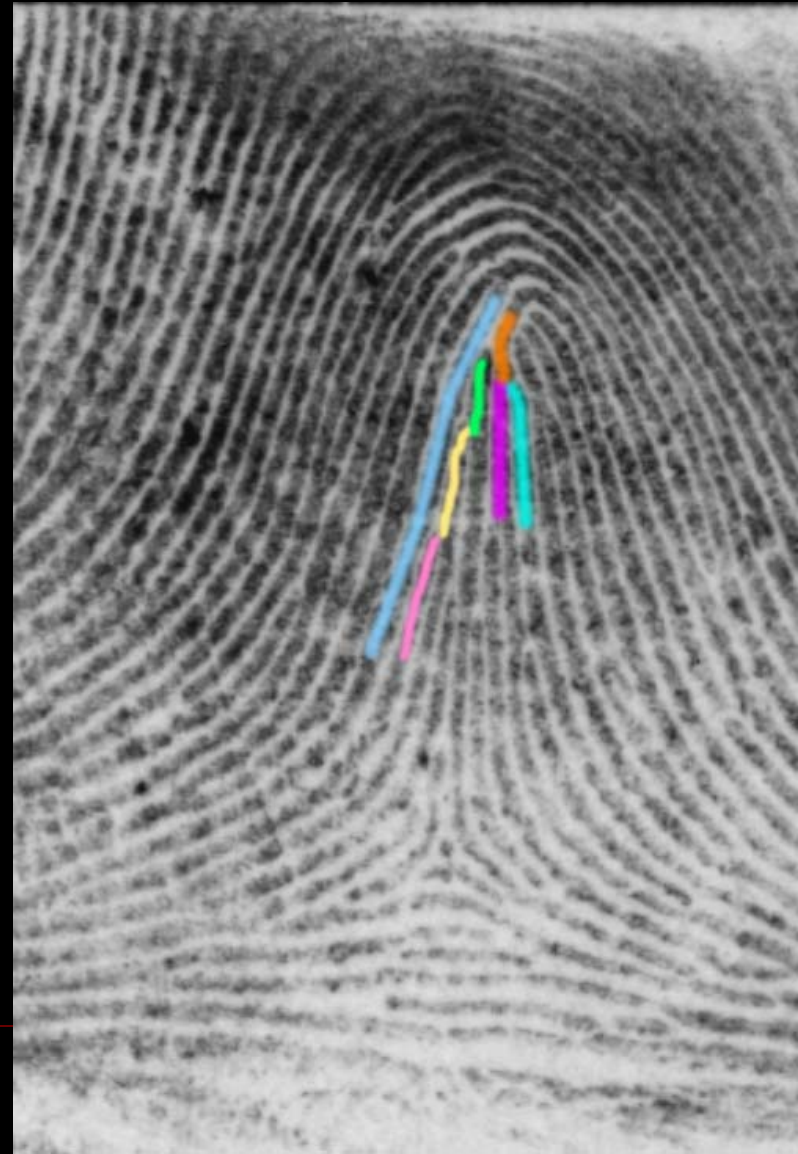
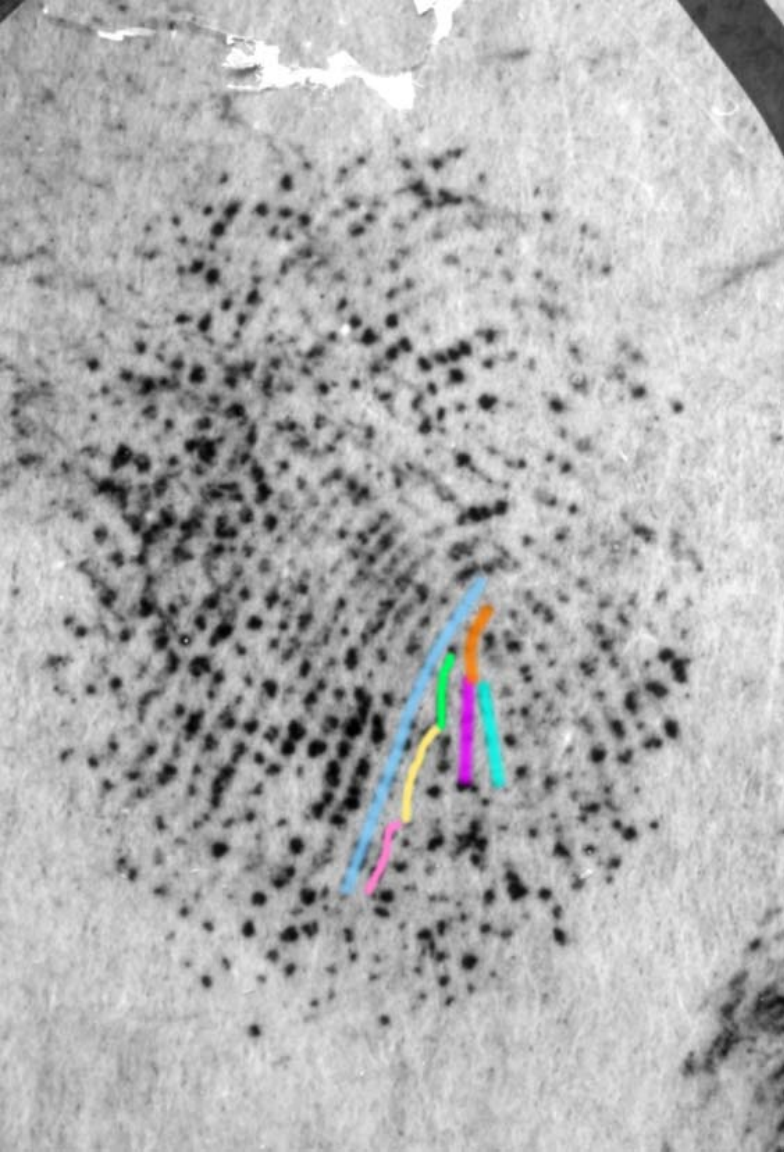


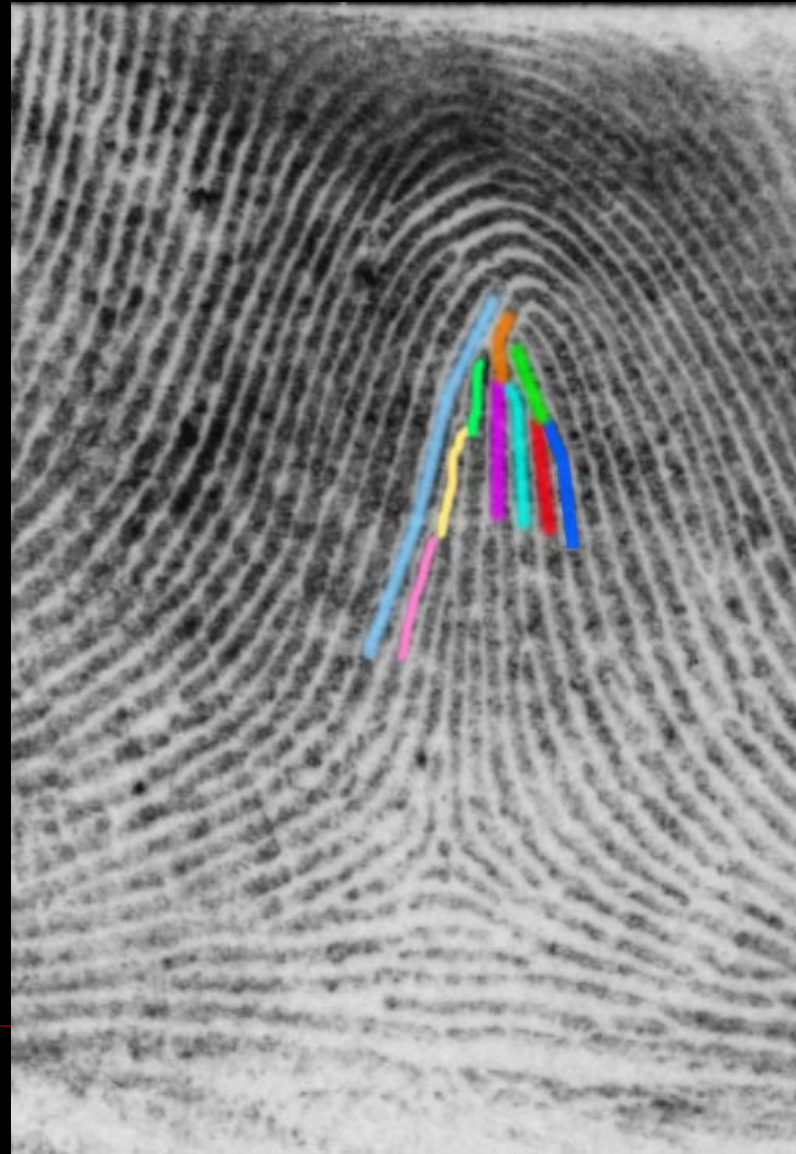
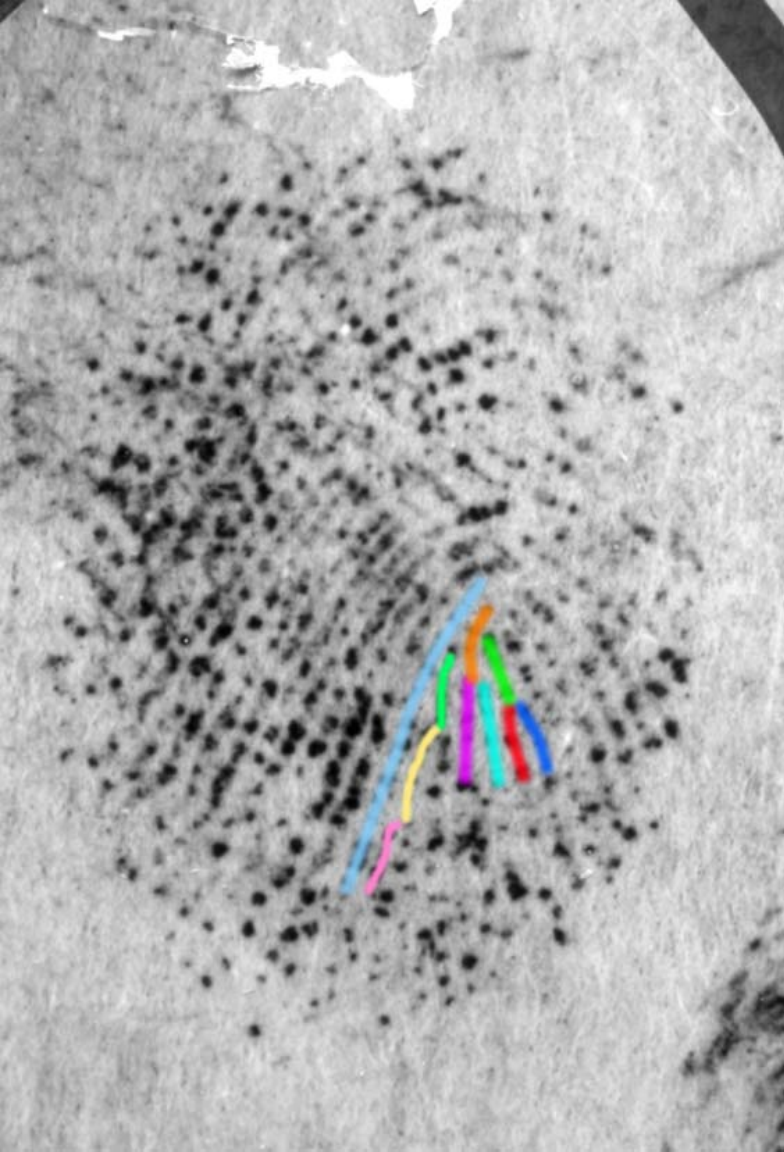


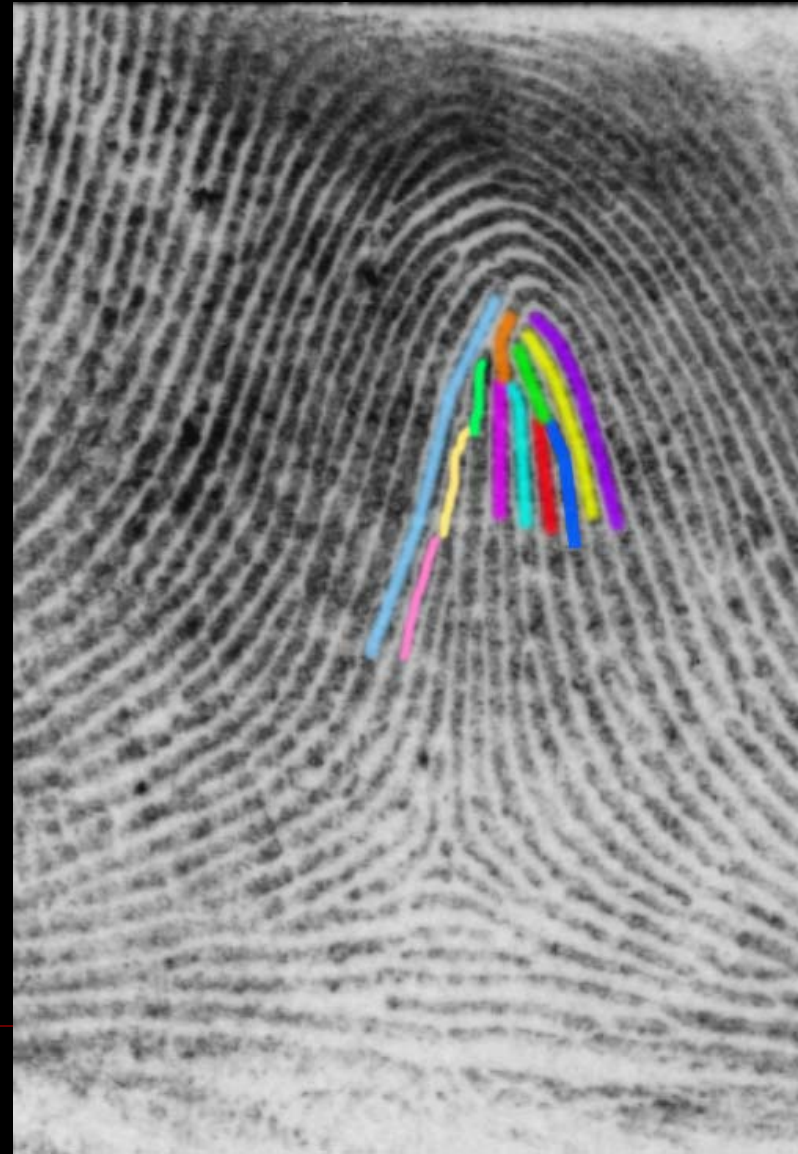
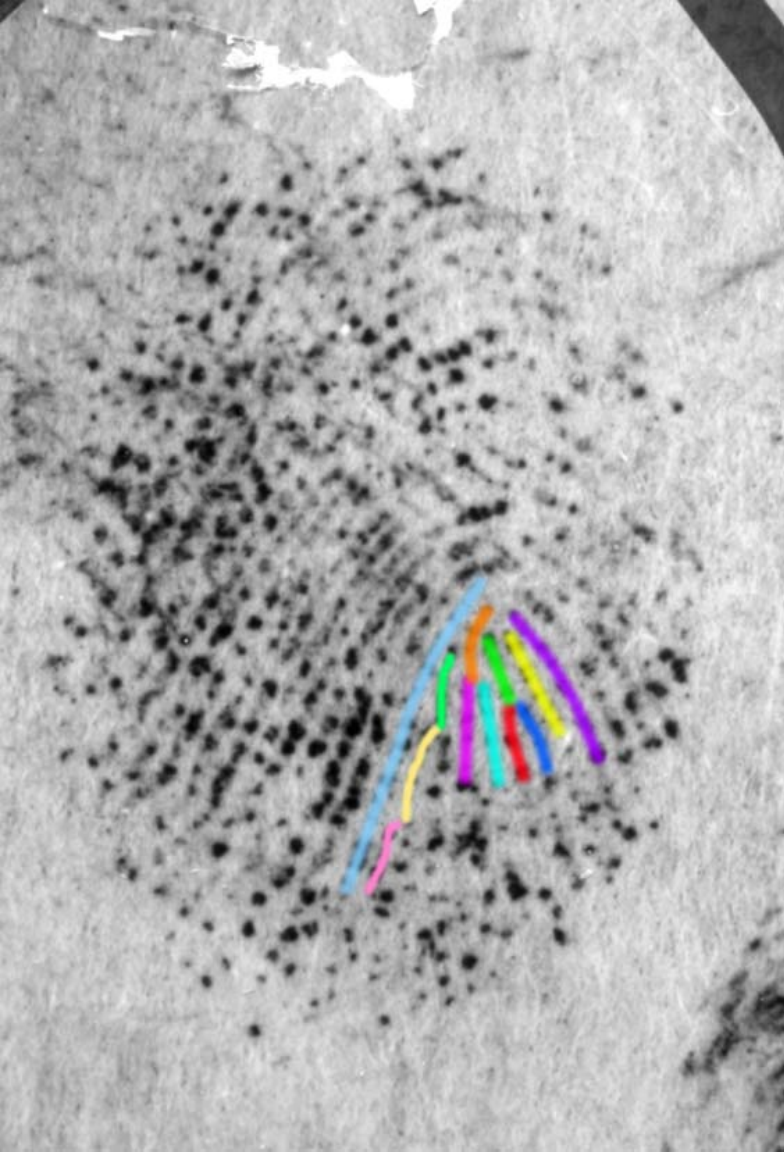


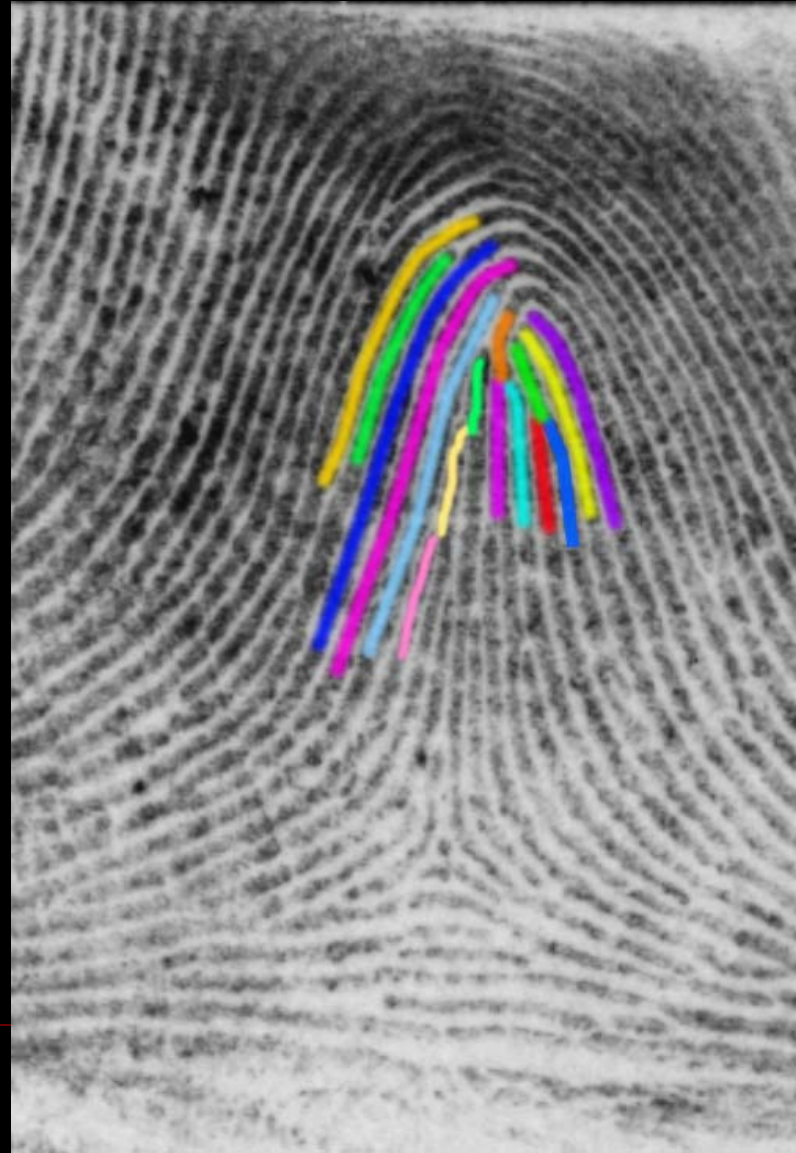
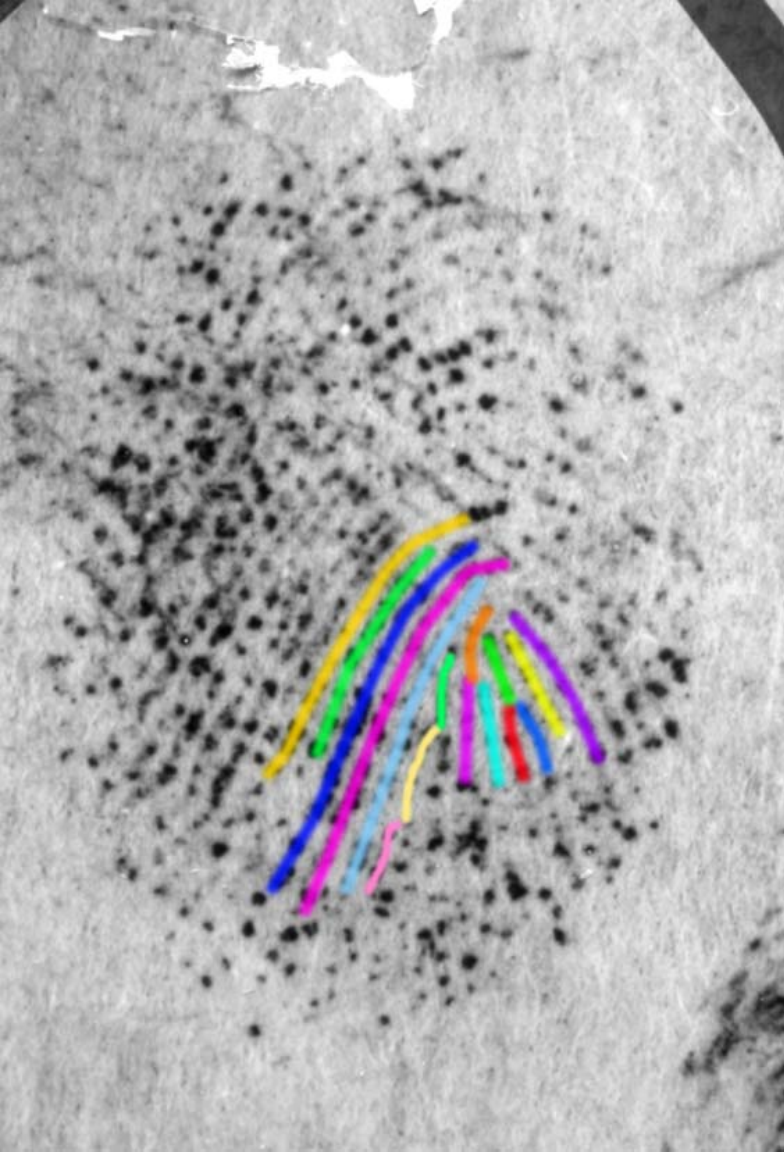






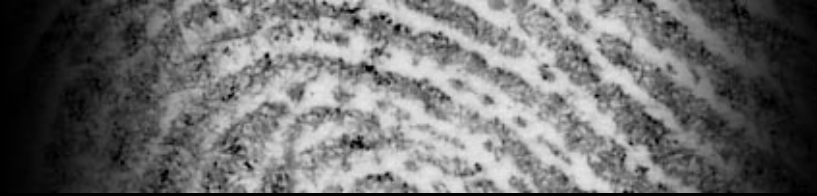






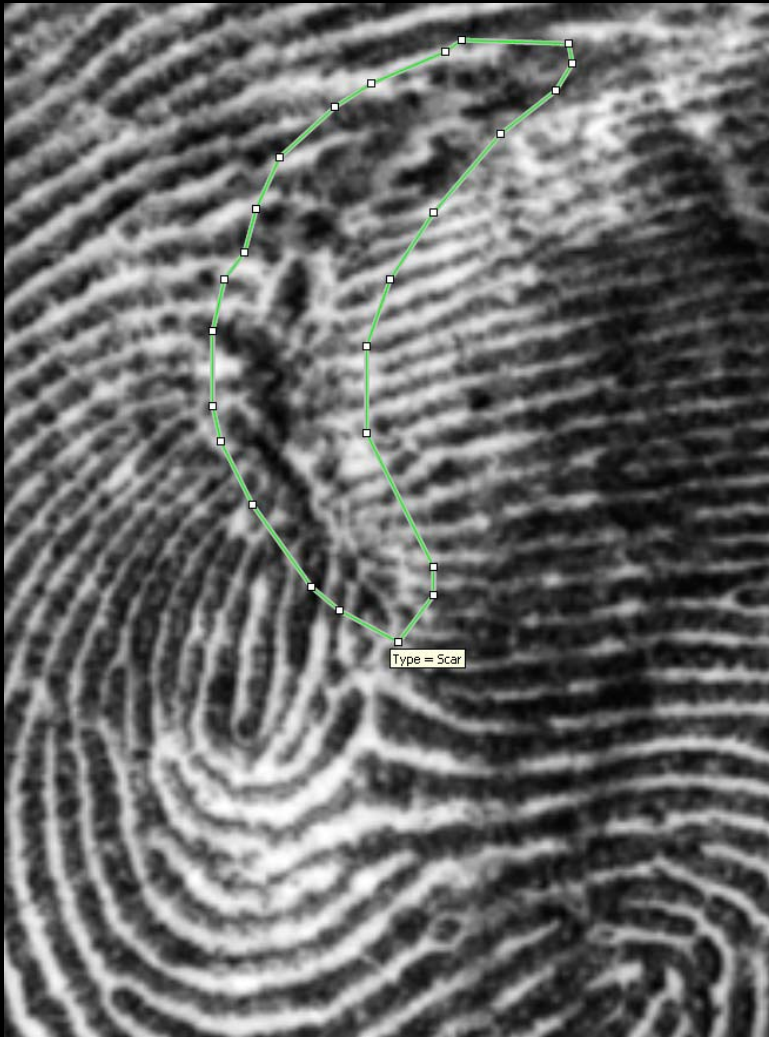
CDEFFS

ANSI/NIST Committee to Define an Extended Fingerprint Feature Set



What are extended feature sets?

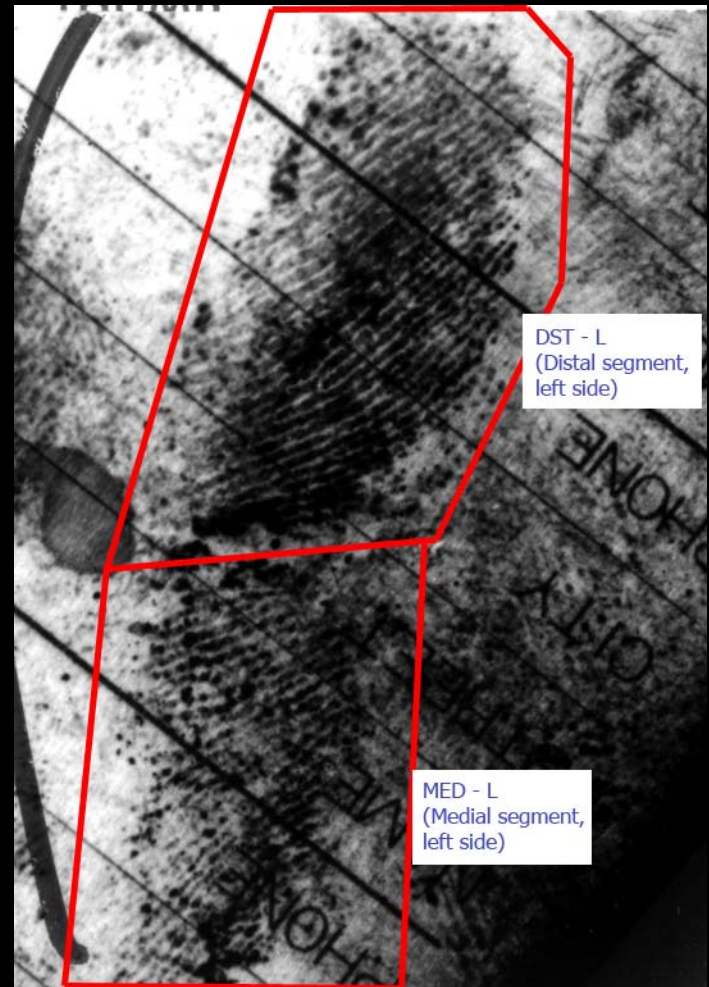
Extended Friction Ridge Feature Specification (EFS)



- "Data Format for the Interchange of Extended Friction Ridge Features"
- *Draft Addendum to ANSI/NIST-ITL 1-2007*
 - Working Draft Version 0.3; 18 March 2009

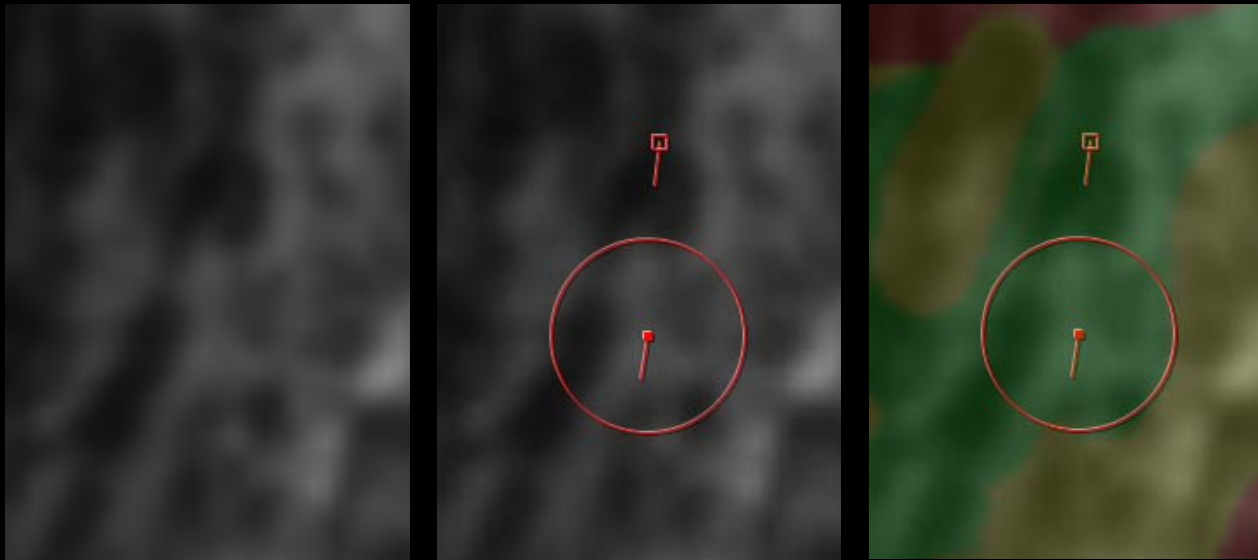
Purpose

- 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.



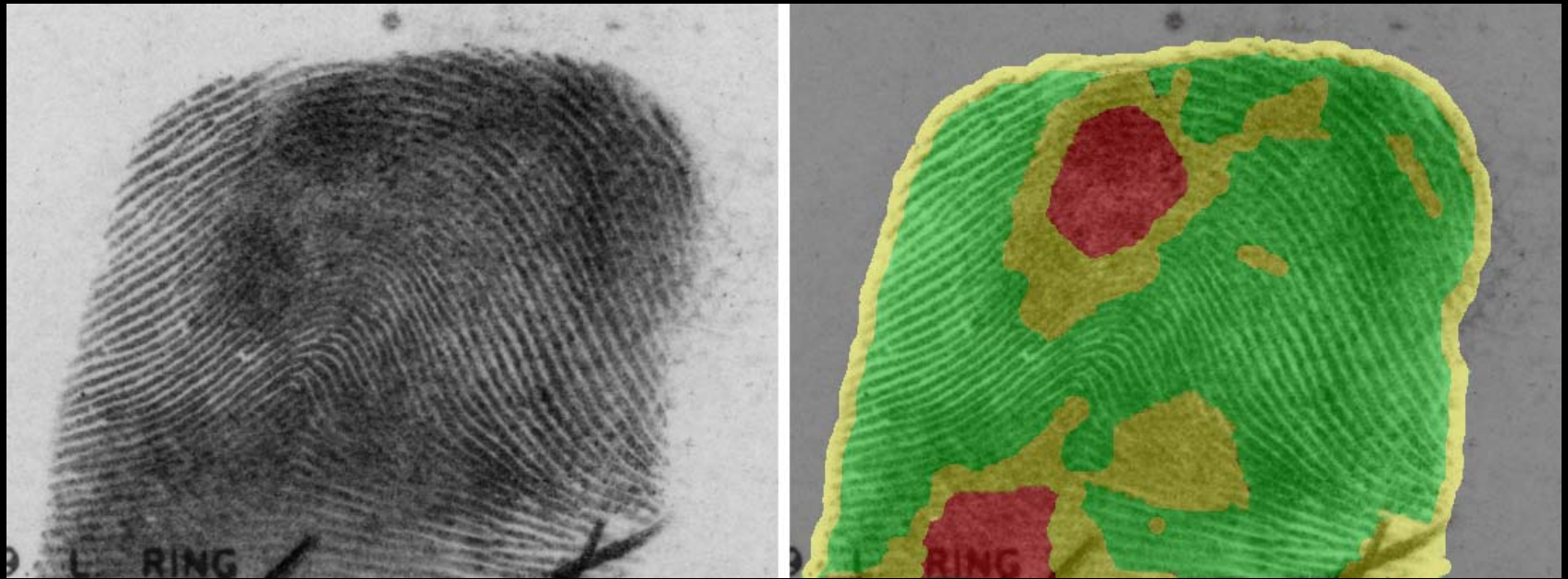
Extended Features

- More sophisticated representation of minutiae



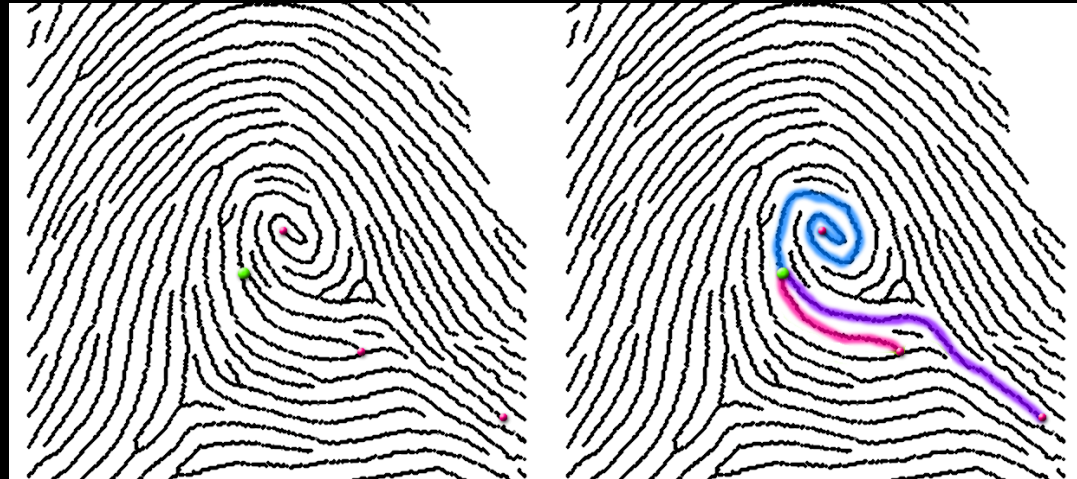
Extended Features

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



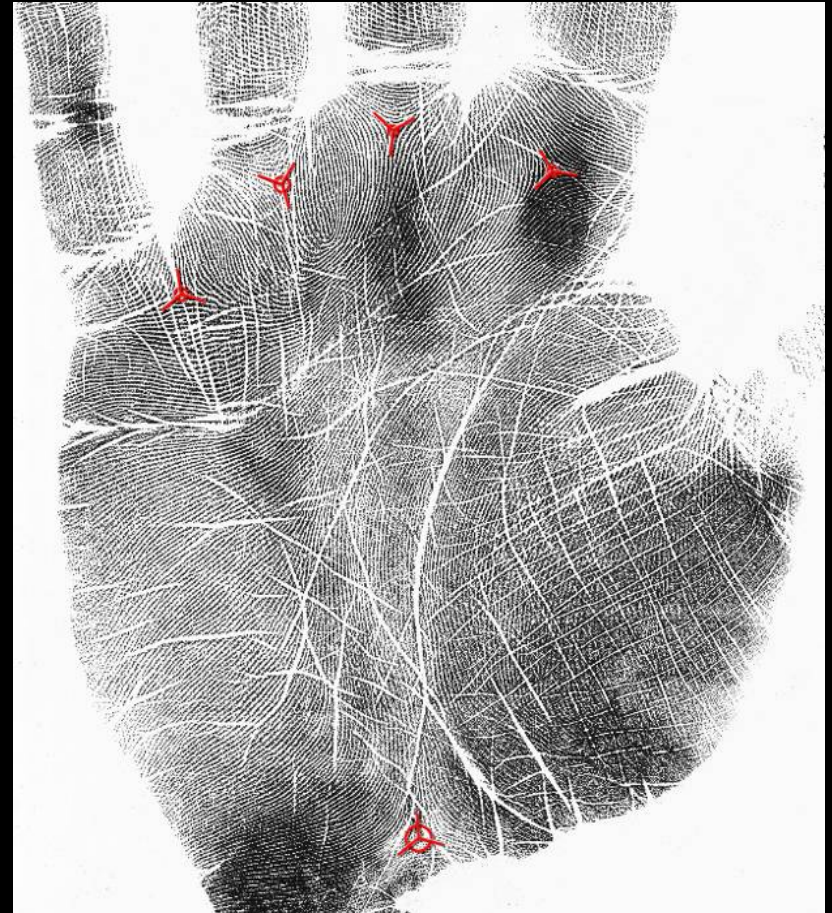
Extended Features

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



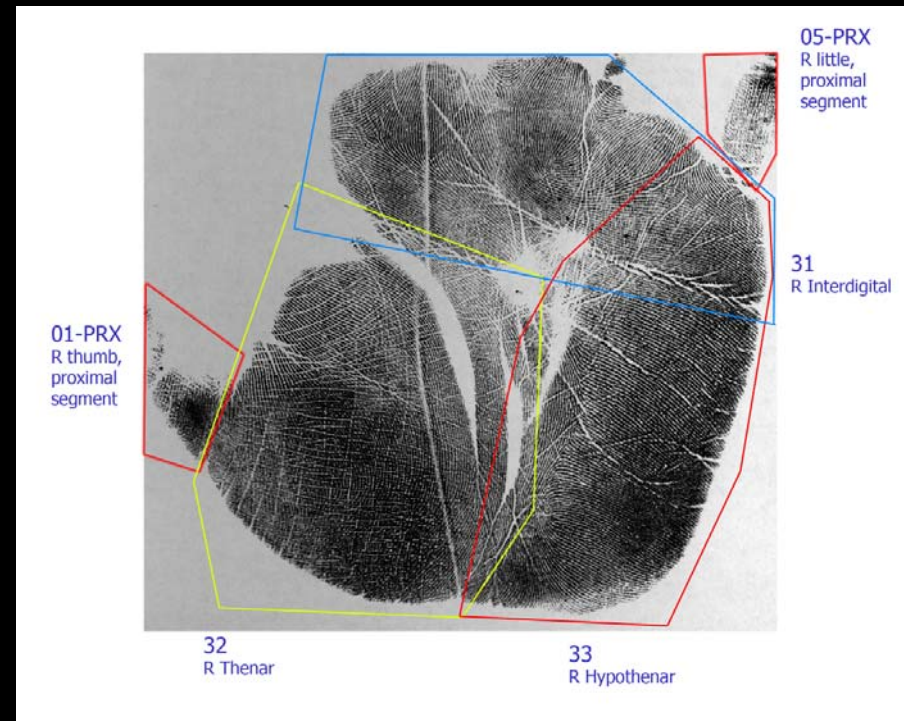
Extended Features

- More sophisticated representation of minutiae
- Interoperable definitions of feature confidence
- 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)



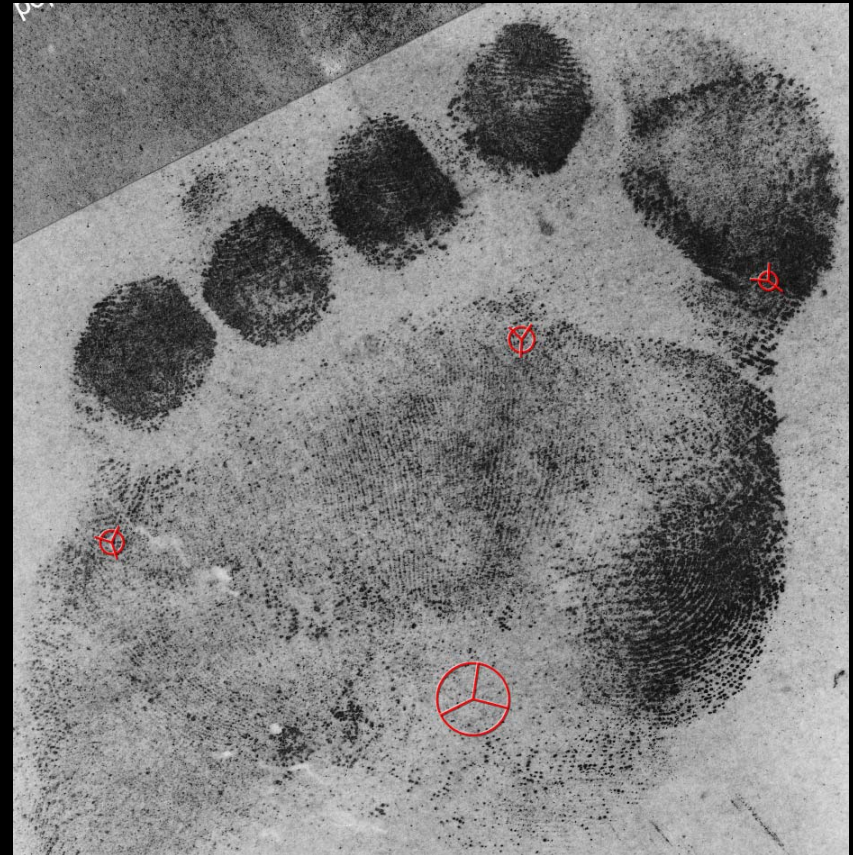
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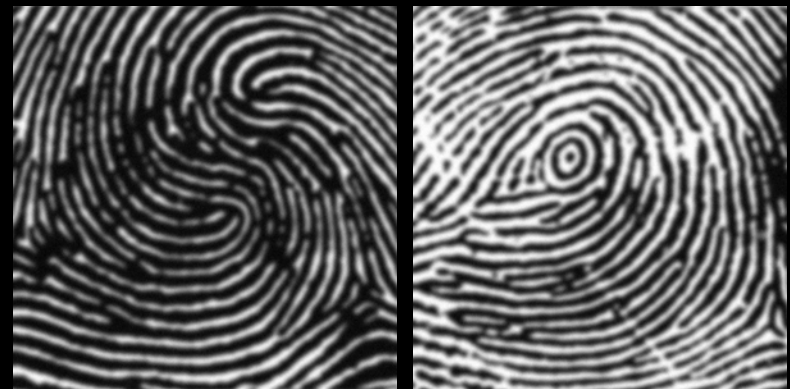
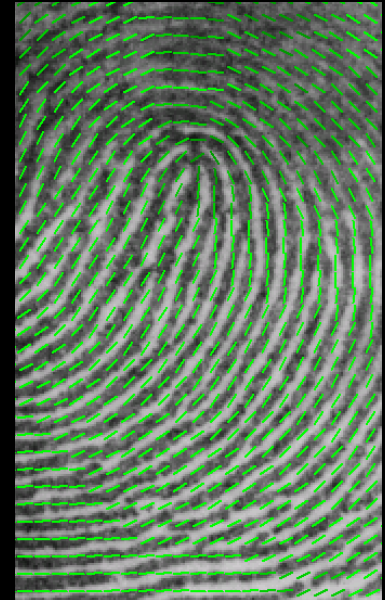
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- Interoperable definitions of feature confidence
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Extended Features

- More sophisticated representation of minutiae
- Interoperable definitions of feature confidence
- 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)
- Complete definition of level 1/pattern class

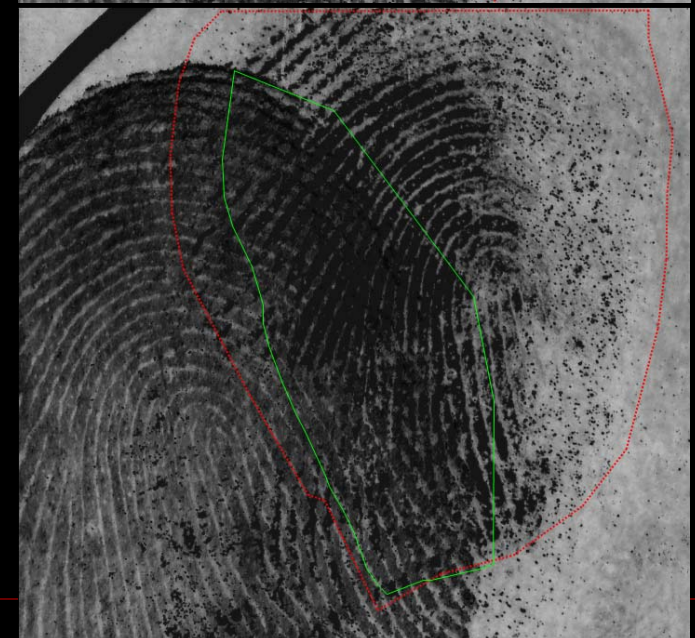
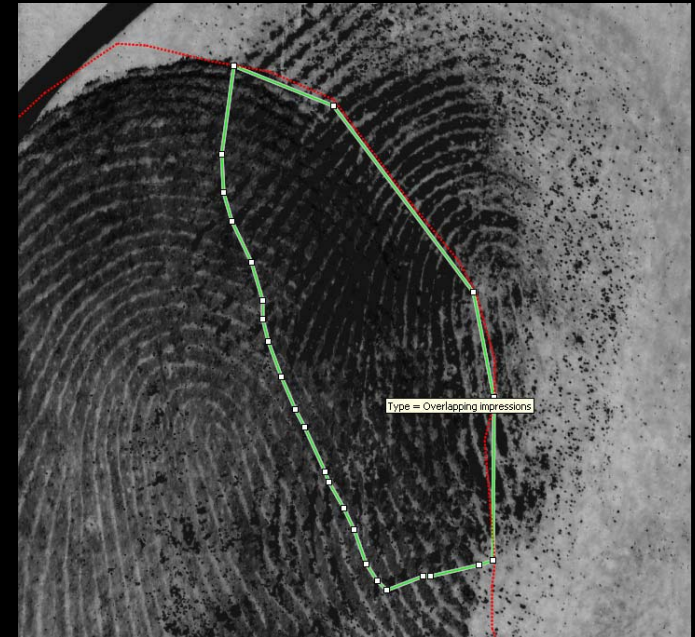


Extended Features

- More sophisticated representation of minutiae
- Interoperable definitions of feature confidence
- 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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- Detailed casework documentation / annotation

Extended Features

- More sophisticated representation of minutiae
- Interoperable definitions of feature confidence
- 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)
- Complete definition of level 1/pattern class
- Detailed casework documentation / annotation
- Markup of multiple impressions/image



Extended Features

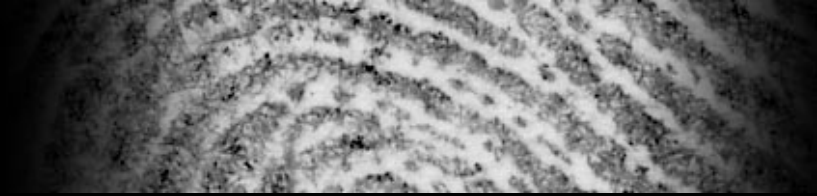
- More sophisticated representation of minutiae
- Interoperable definitions of feature confidence
- Practical definitions of ridge path segments as features
- Designed from the start to include all friction ridge data (including palms, lower finger joints, and plantar (foot/toe) data)
- Complete definition of level 1/pattern class
- Detailed casework documentation / annotation
- Markup of multiple impressions/image
- Scars

Extended Features

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

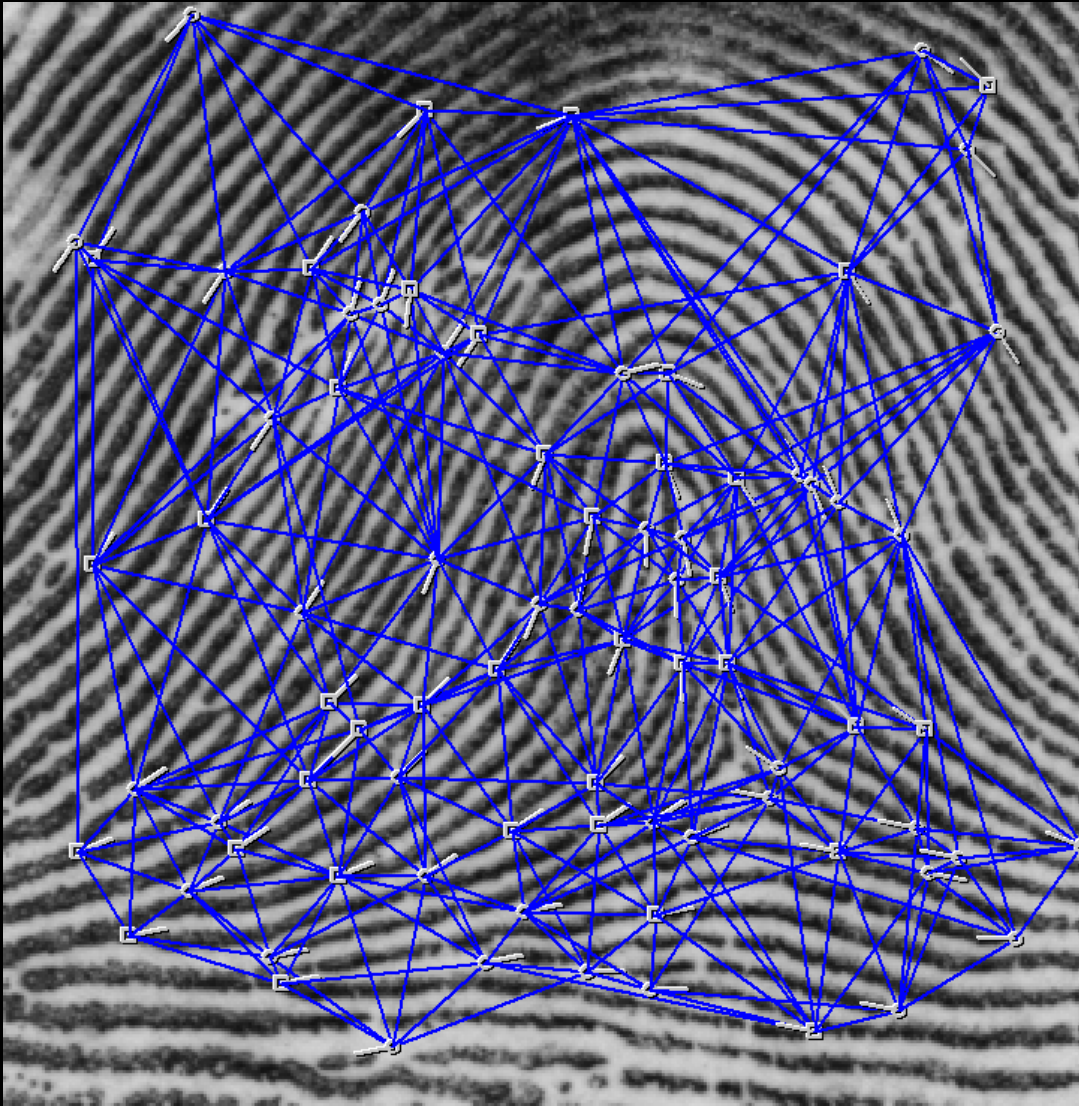
CDEFFS

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

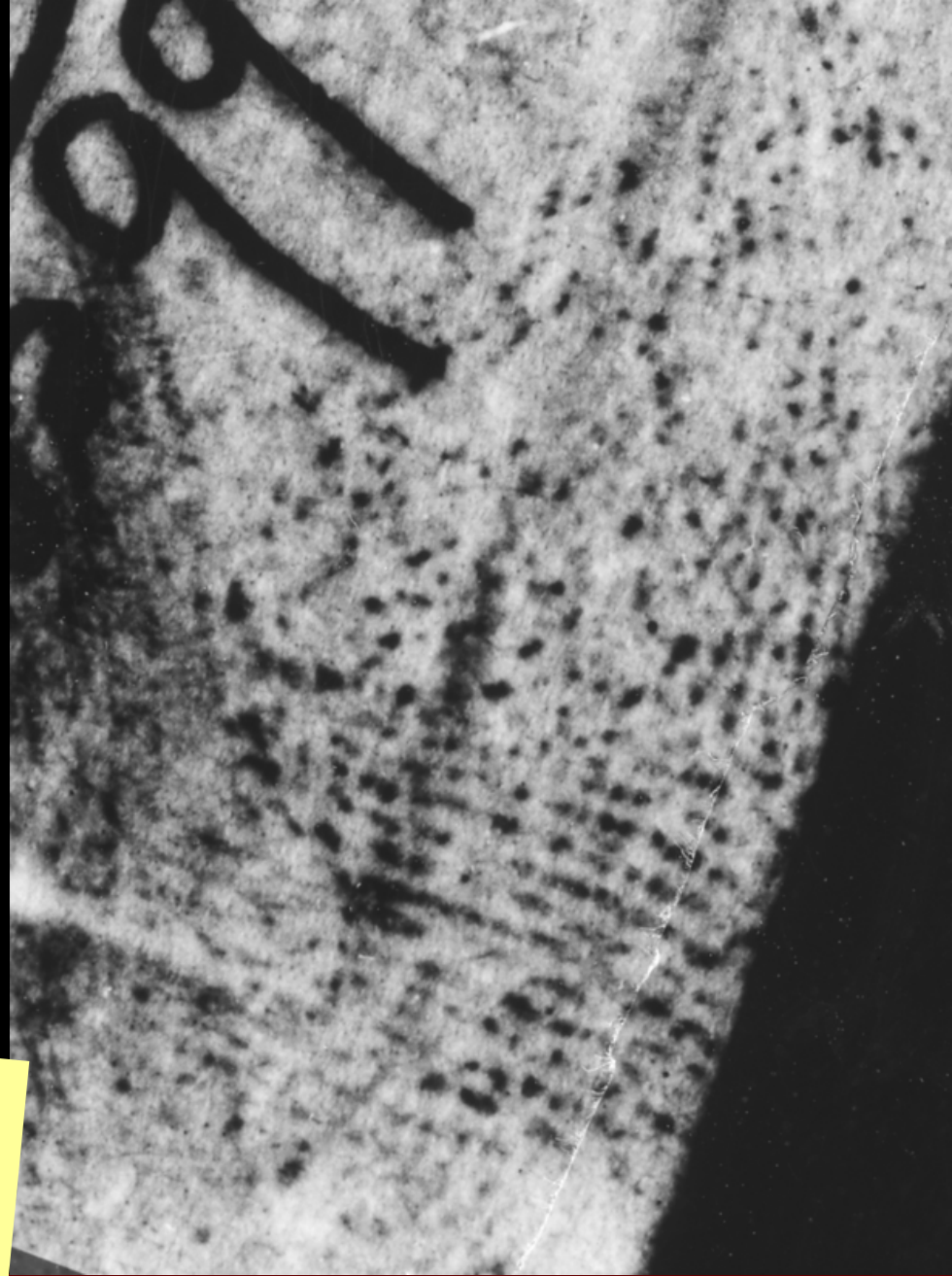


Why EFS?

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

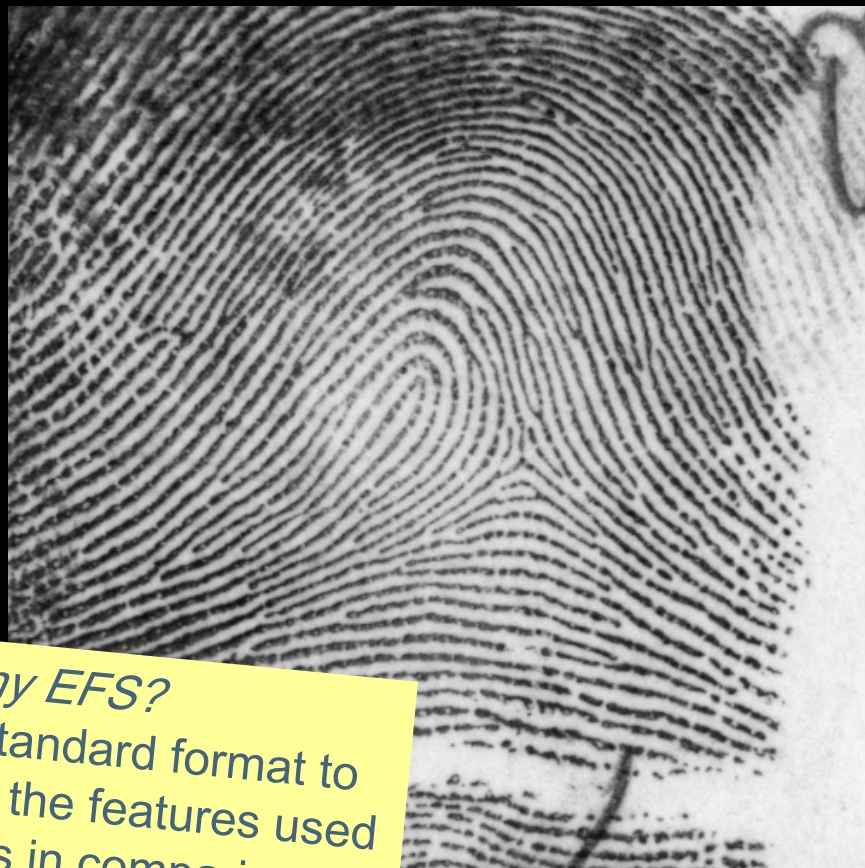
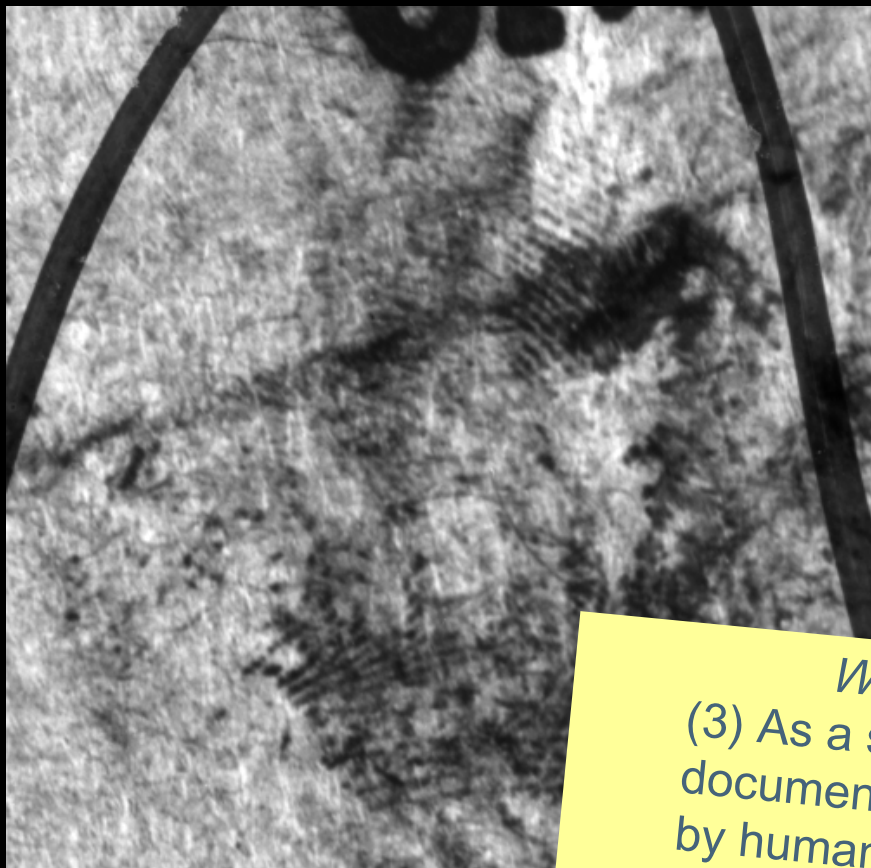
Latent Triage (C)

- 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.

Non-AFIS Comparisons

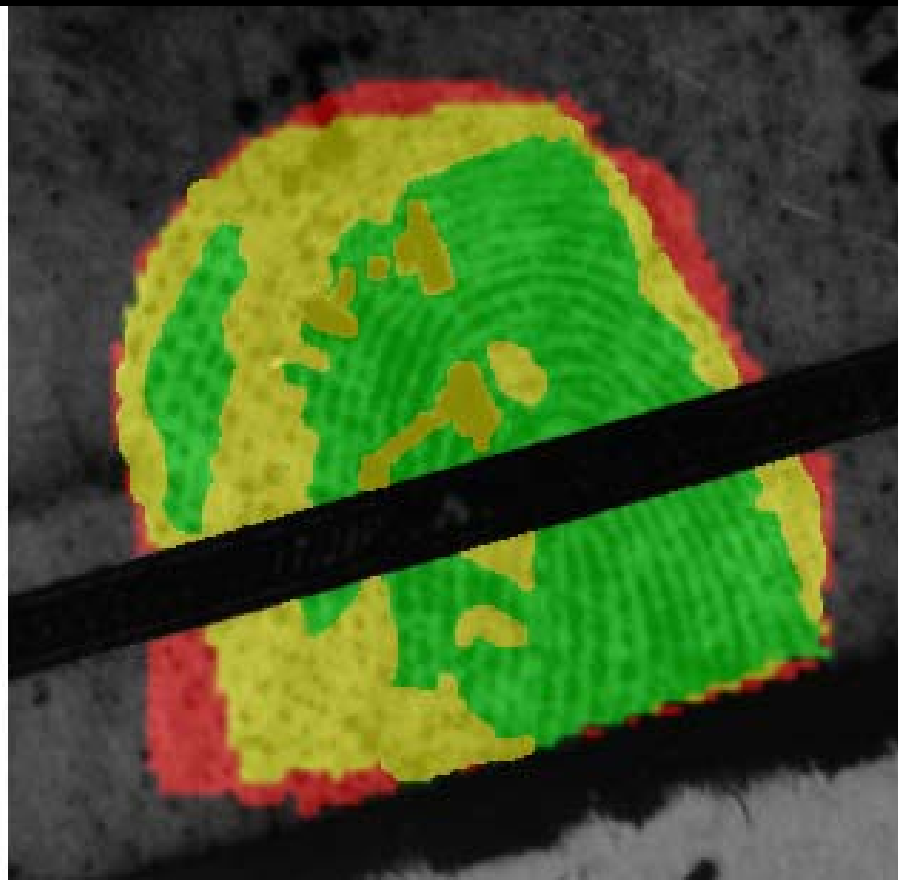
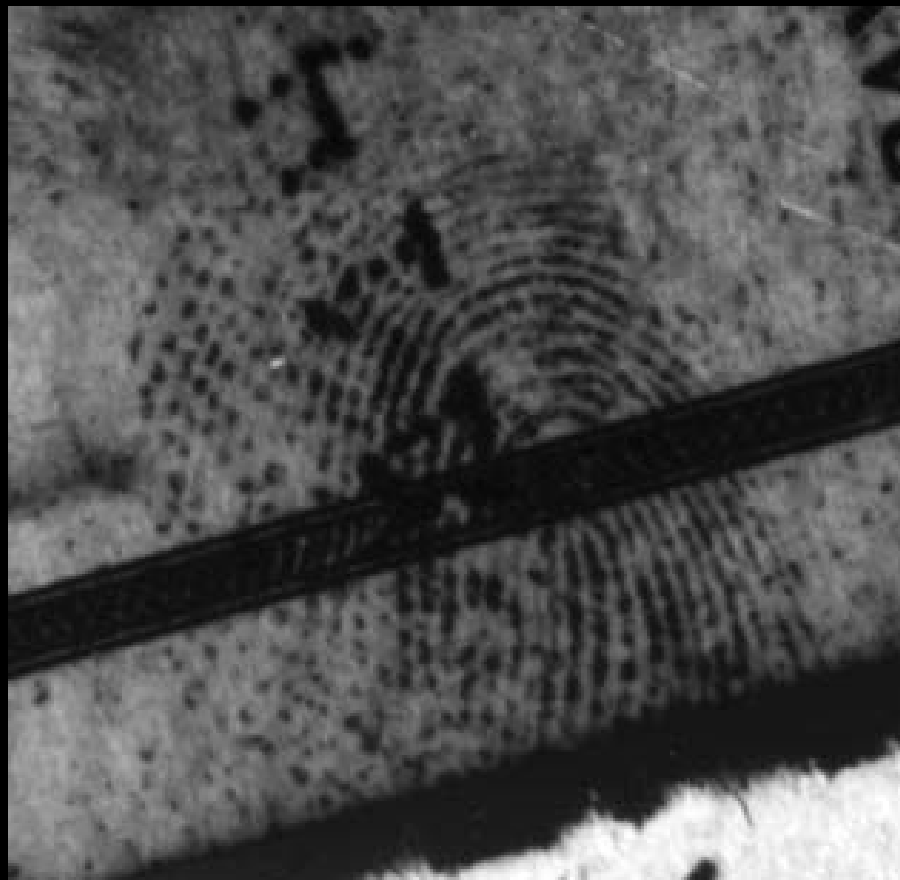


Why EFS?

(3) As a standard format to document the features used by humans in comparison decisions, for future reference or interchange with other examiners, or for courtroom/Daubert use.

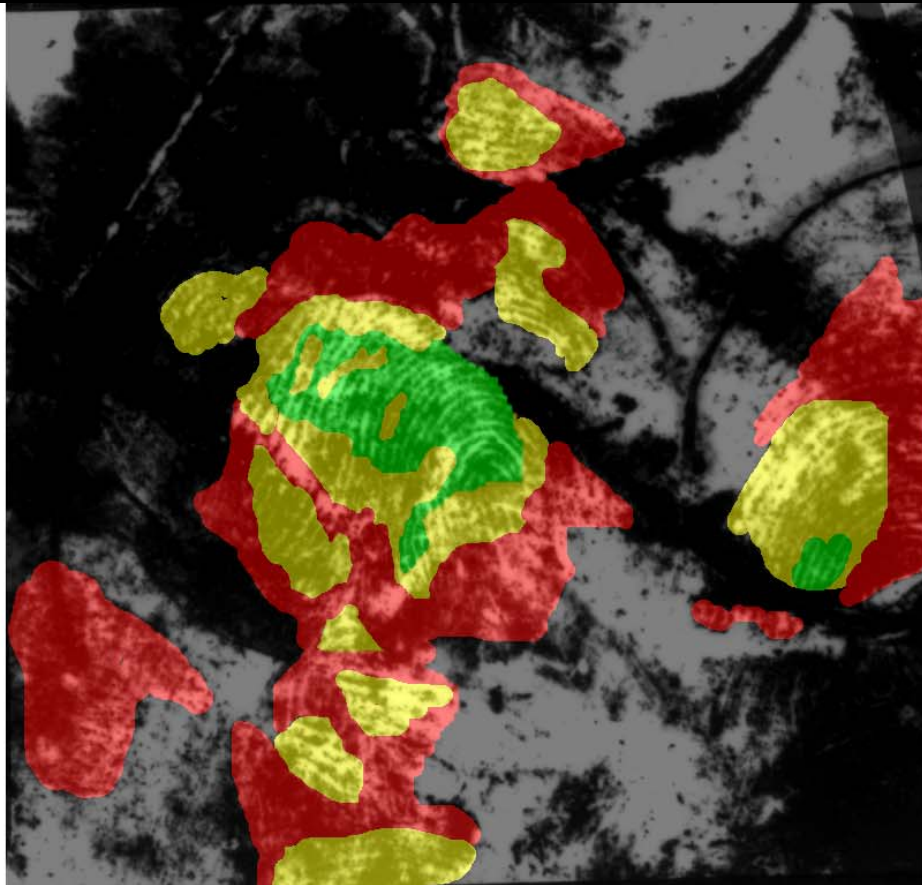
Example: Local Quality

Red=Low confidence
Yellow=Confidence in Level 1 (ridge flow only)
Green=Confidence in Level 2 (minutiae)
Blue=Confidence in Level 3 details

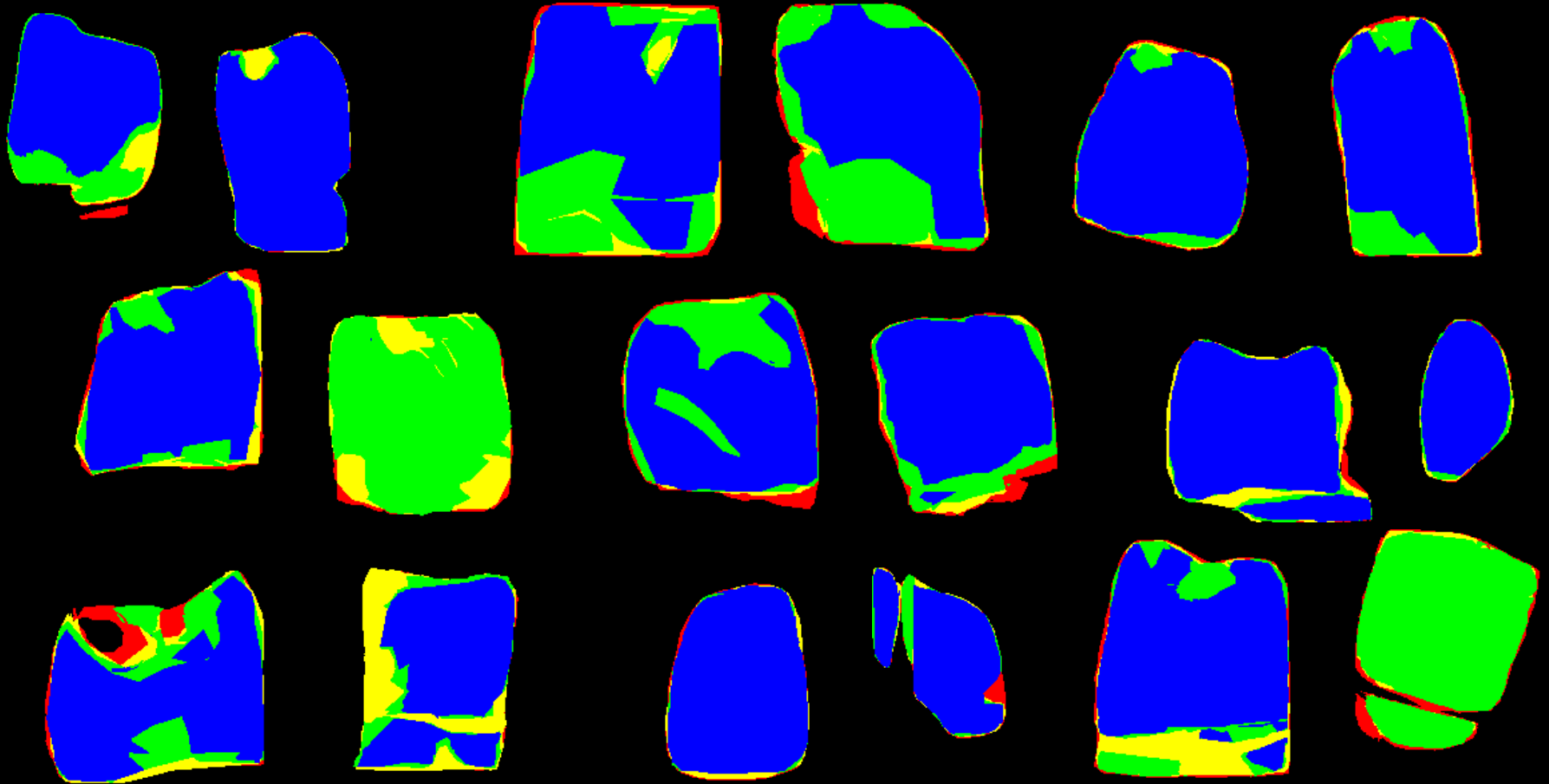


Example: Local Quality

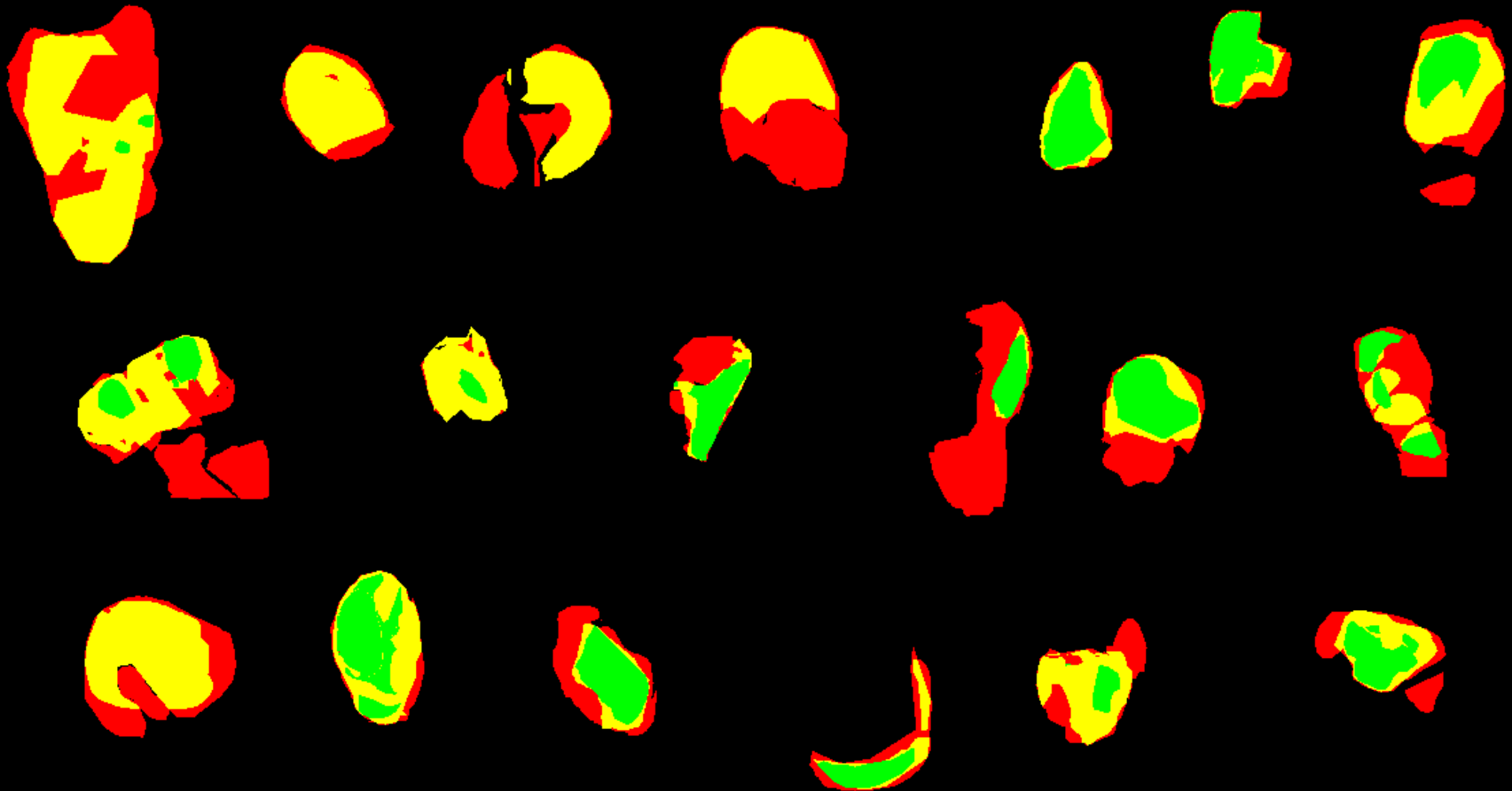
Red=Low confidence
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Blue=Confidence in Level 3 details



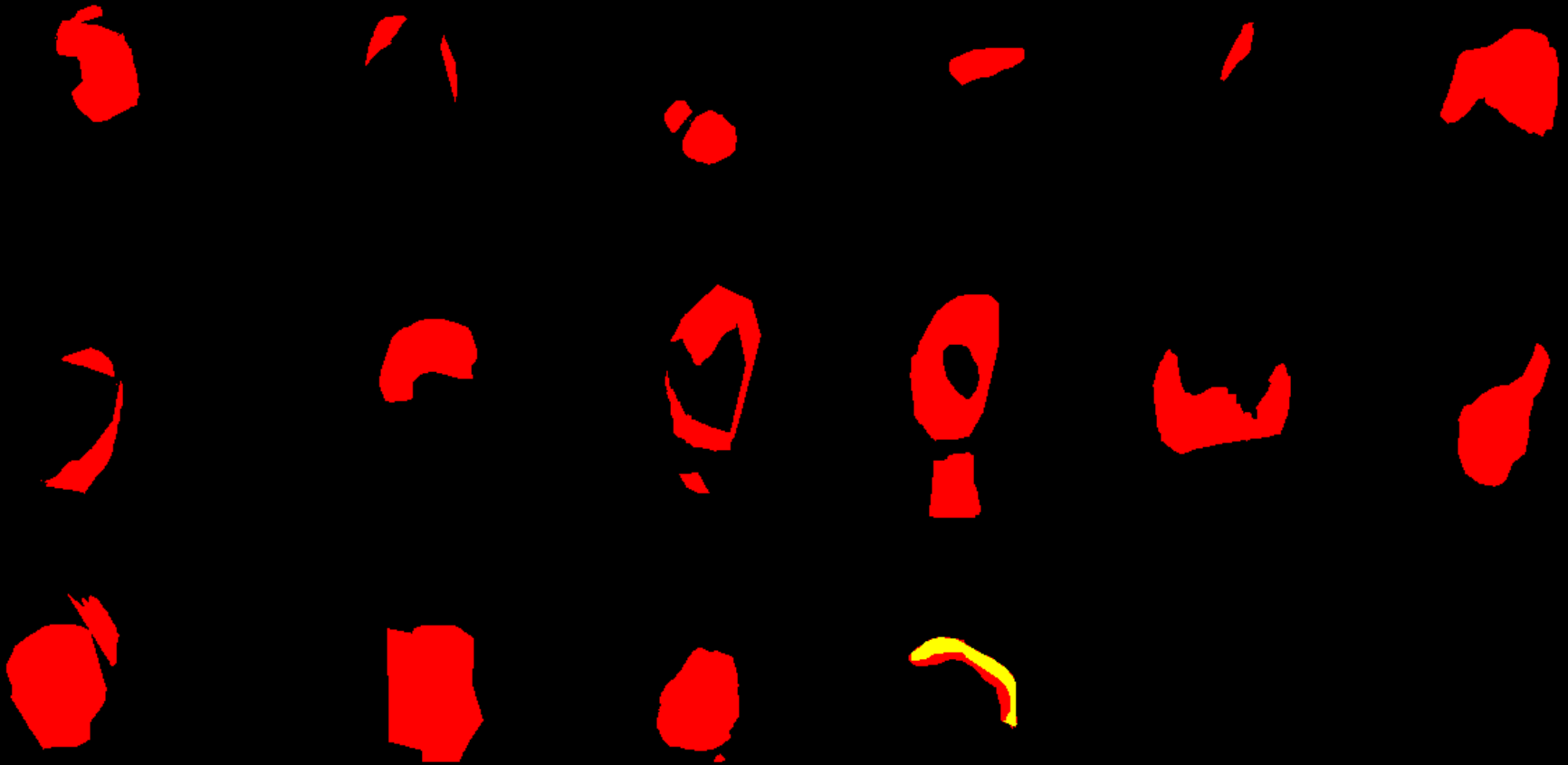
Examples of exemplars rated “Very easy”



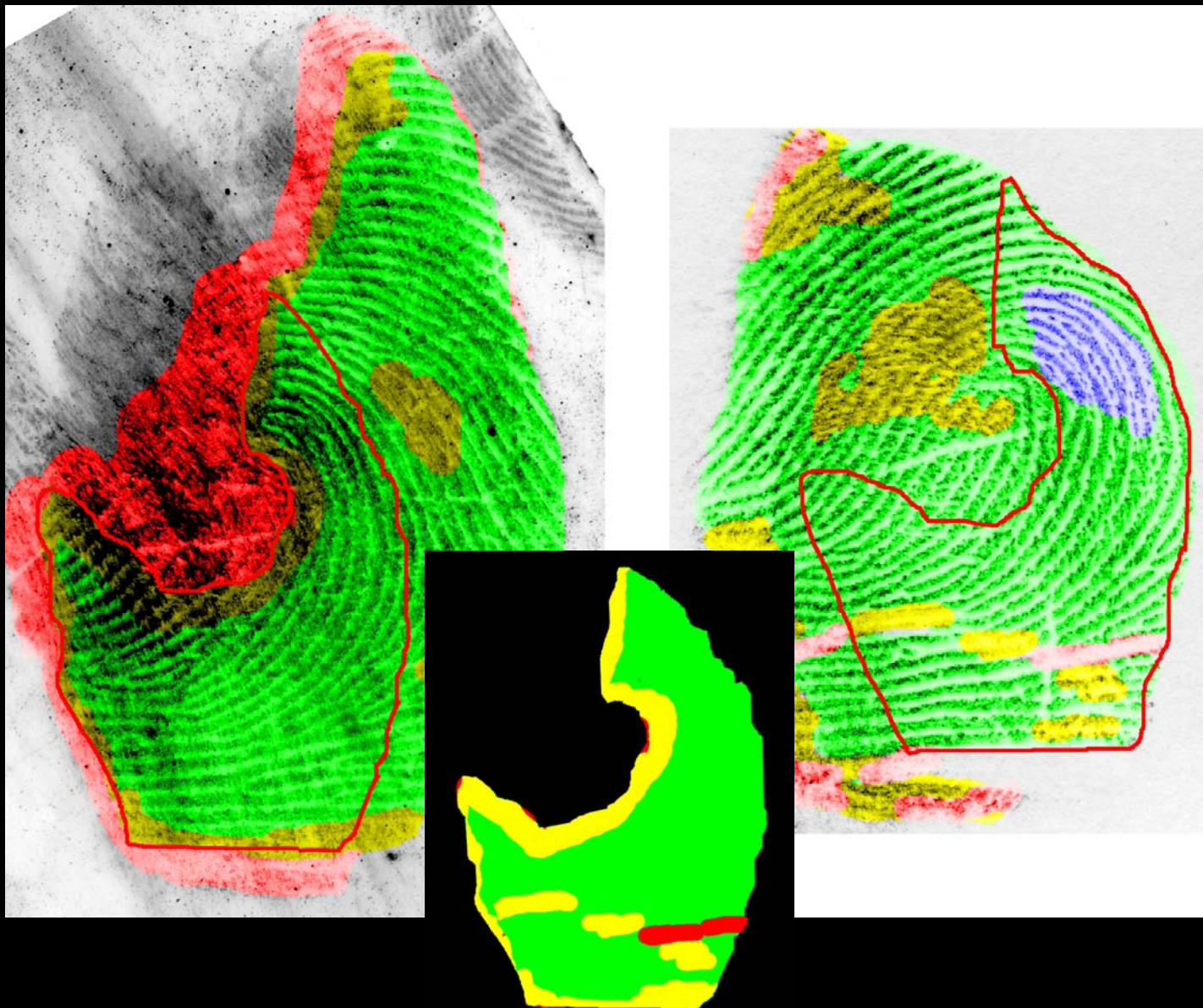
Examples of latents rated “Very difficult”



Examples of latents rated “Unusable”

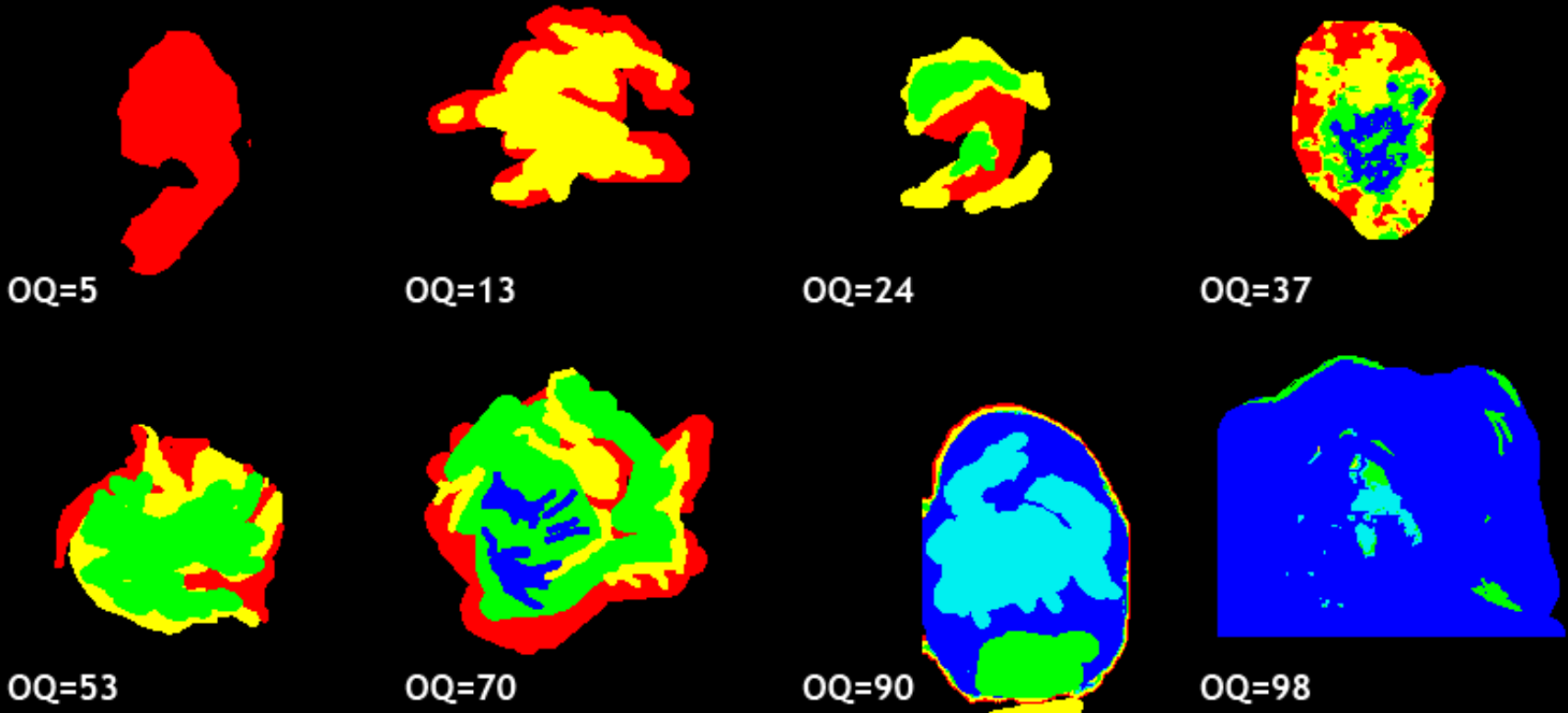


Comparison Quality



Overall Quality/Confidence Assessment

- Based on the size, regularity, and continuity of local quality areas
- *(developed, being assessed/tuned)*

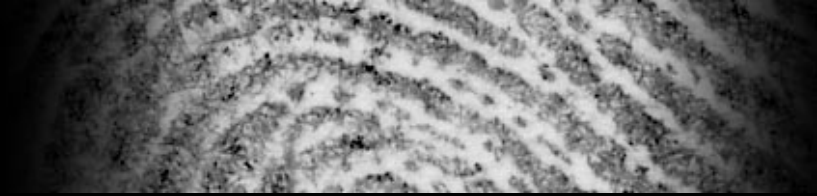


Summarizing Data Content

- For a single image OR a comparison
- Summary Data Content metric for (distal) fingerprints combines
 - OQ (Overall Quality/Confidence)
 - Number of marked features (by confidence)
 - Classifiability
 - Centering
- *(under development)*

CDEFFS

ANSI/NIST Committee to Define an Extended Fingerprint Feature Set

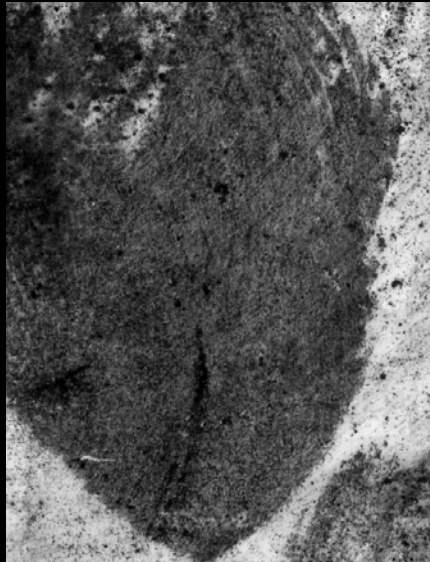


Uses for EFS

Uses (1 of 3)

Analysis Casework

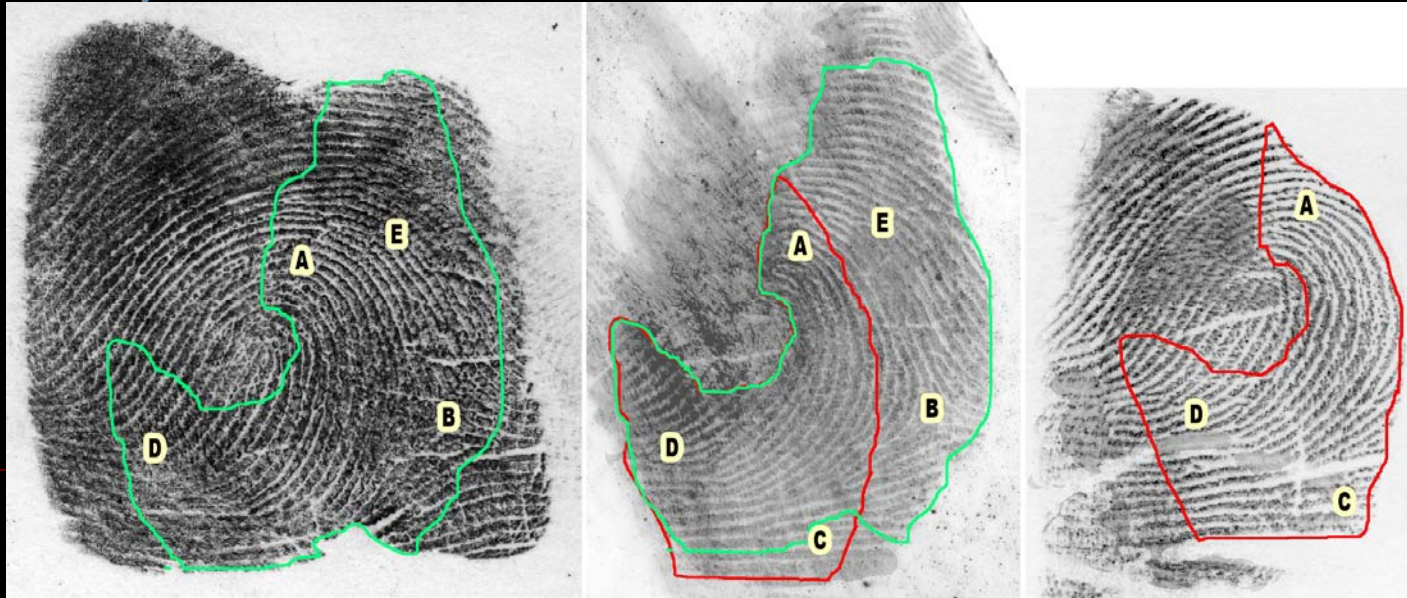
- Definition of the information content of a single friction ridge impression as discerned by an examiner during analysis,
 - for archiving,
 - interchanges with other examiners,
 - validation and quality assurance processing, and
 - quantitative analysis.



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

Next Steps

- Standard guidelines for markup
 - Juried reference data
 - ULW 5.6
 - NIST ELFT-EFS
-
- Use of EFS for research

Austin Hicklin
hicklin@noblis.org

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