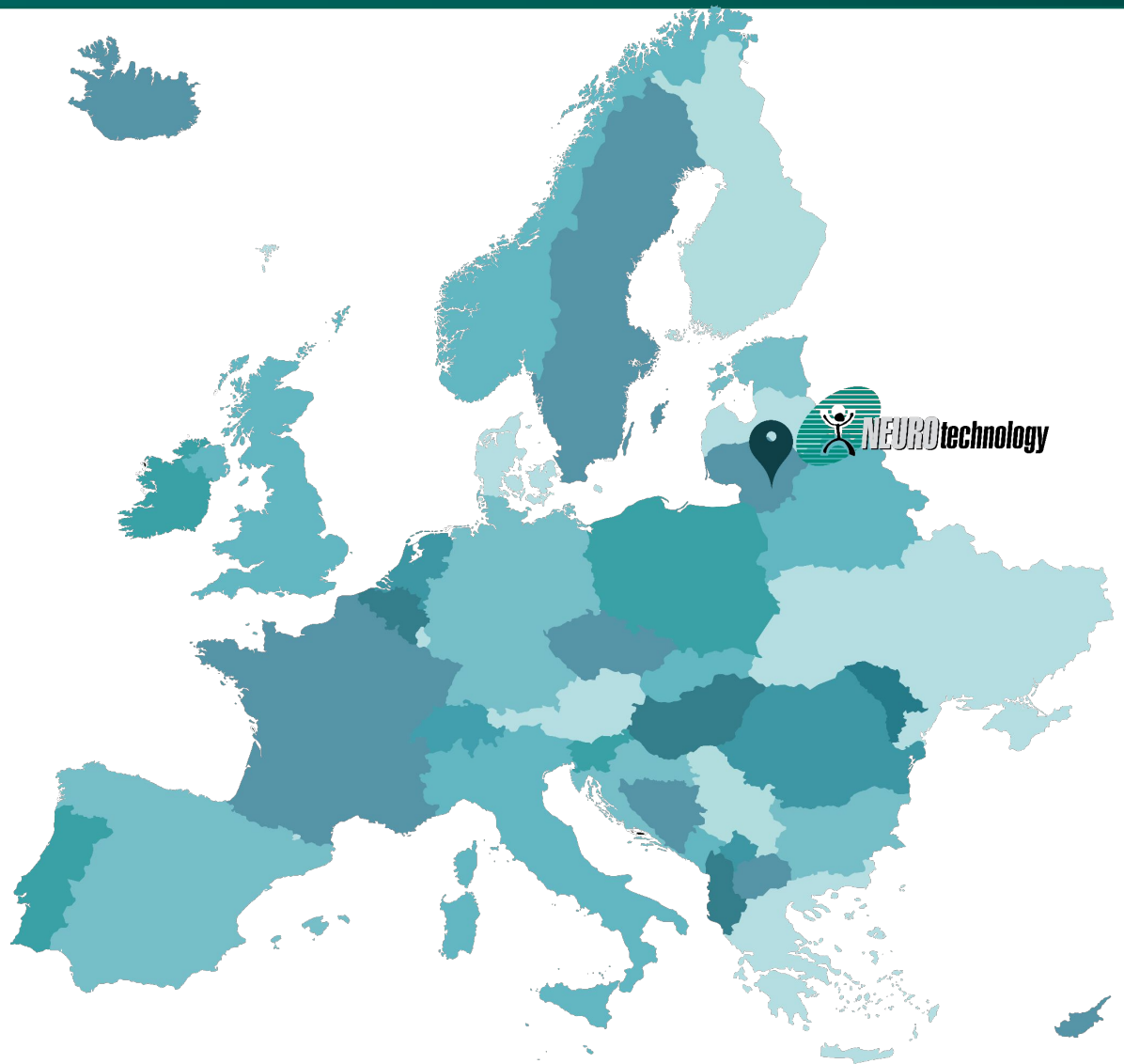
The Role of AI in Fingerprint Recognition: From Image Enhancement to Feature Extraction Different Features for Different Domains (Civil & Criminal)

International Face and Fingerprint Performance Conference (IFPC) 2025

Evaldas Borcovas, Head of Biometrics Research, Neurotechnology April 2025

Neurotechnology

Neurotechnology is established in Lithuania



www.neurotechnology.com

The company's headquarters are located in Vilnius

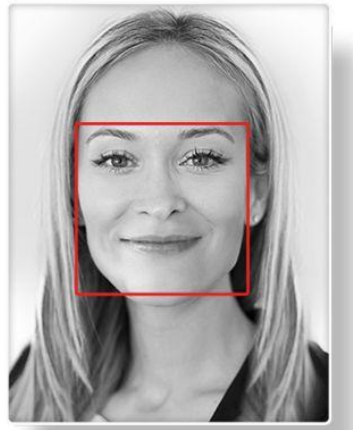
Biometrics

Voice

Palmprint

Fingerprint

Iris



Face

Neurotechnology is like a small private university for researchers who want to push technology forward

Compliant and evaluated in most of the evaluations

NEUROtechnology

MOSIP COMPLIANT

NIST

iBeta QUALITY ASSURANCE
LEVEL 1
ISO 30107-3
Presentation Attack Detection
TESTED
COMPLIANT

OSIA

FVC ongoing

ISO

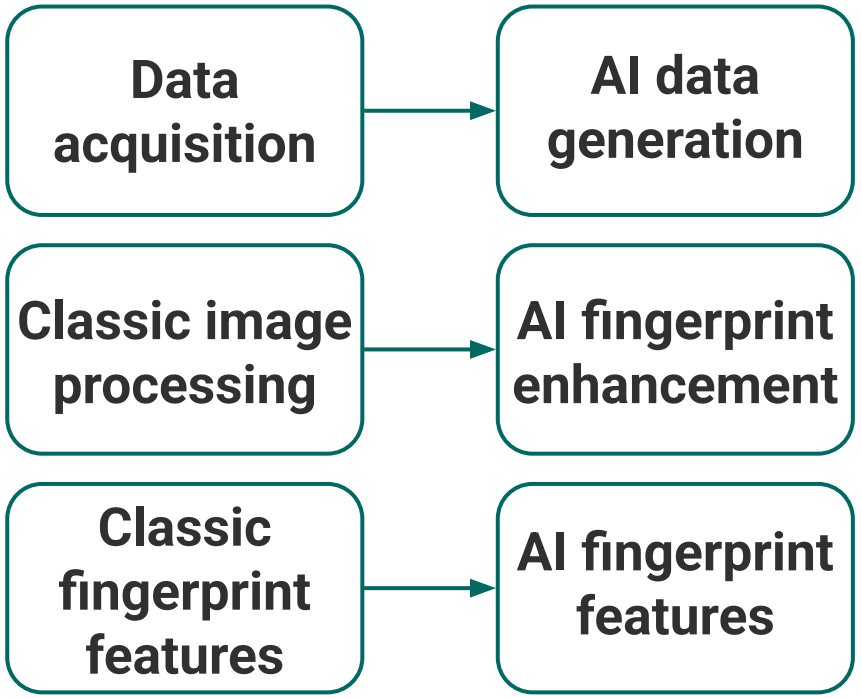
ANSI

Fingerprint recognition pipeline

NEUROtechnology

Data acquisition → Quality assurance → Enrolment → Verification/ Identification → Result analysis

AI is transforming traditional fingerprint recognition



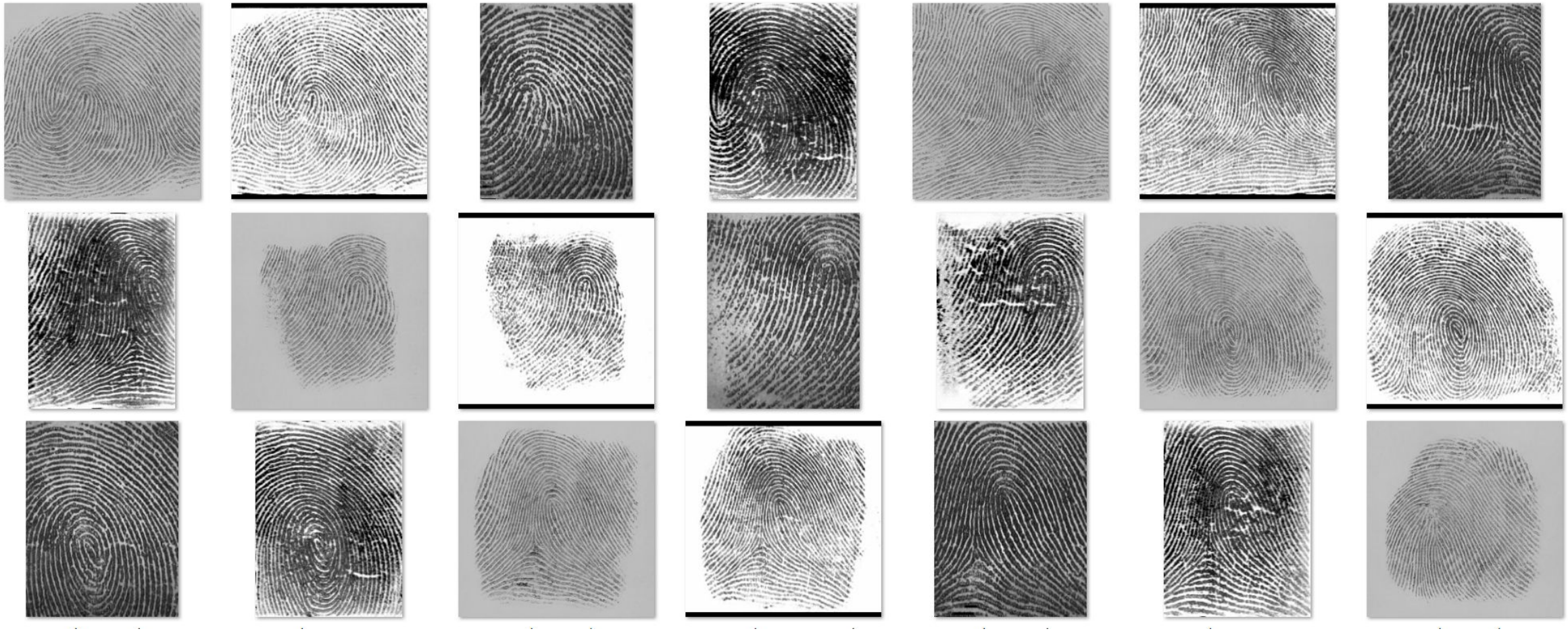
Problems which could not be solved before AI, now can be solved

Fingerprint Data Acquisition

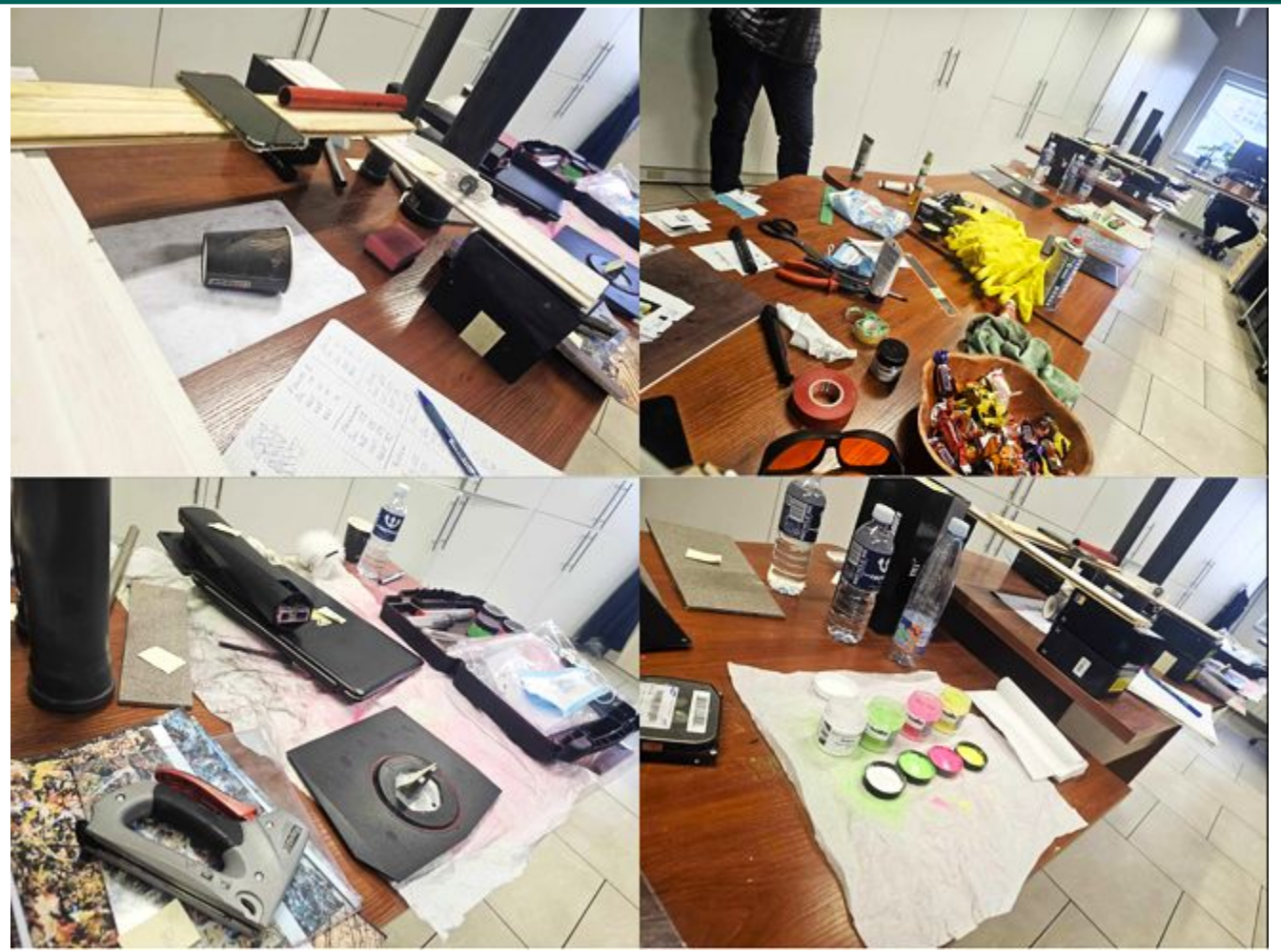
Collecting data - civil use case

Generating data – plain fingerprints

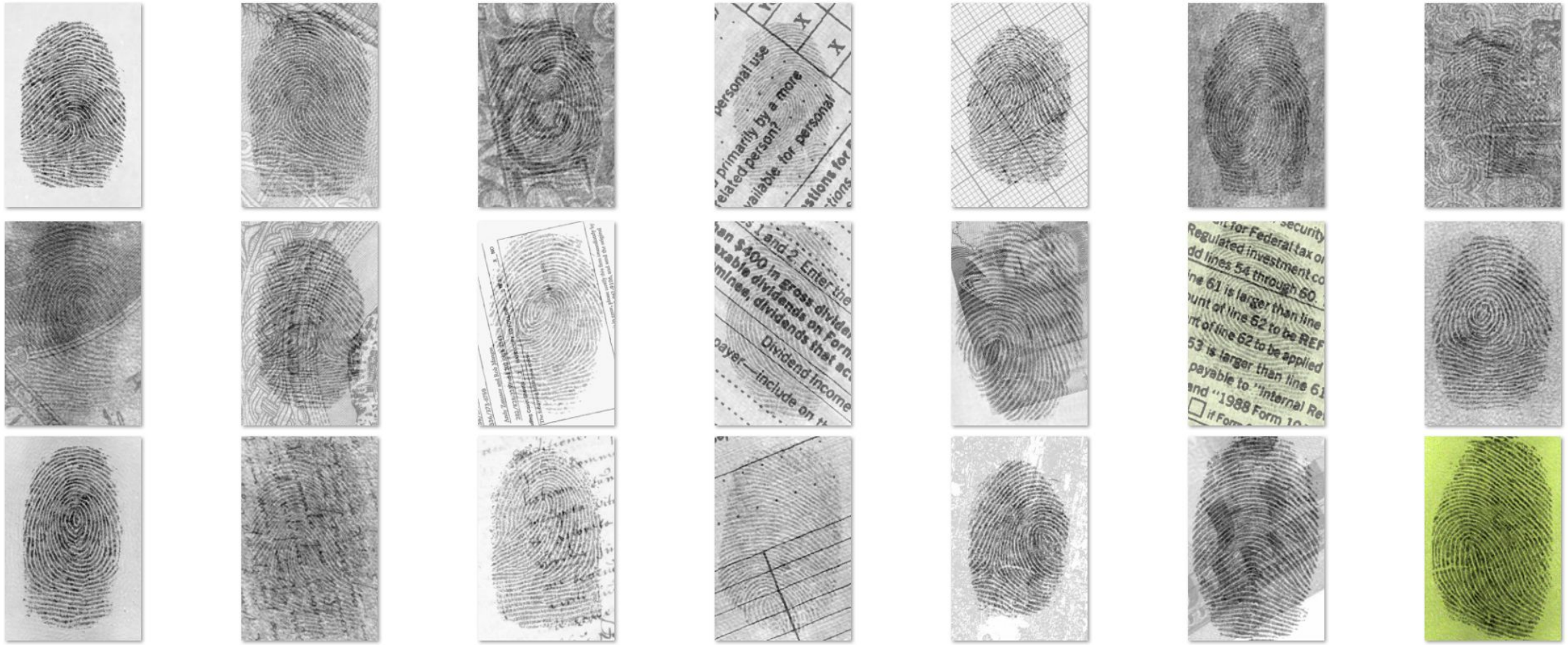
Generating data - rolled fingerprints



Collecting data - criminal use case

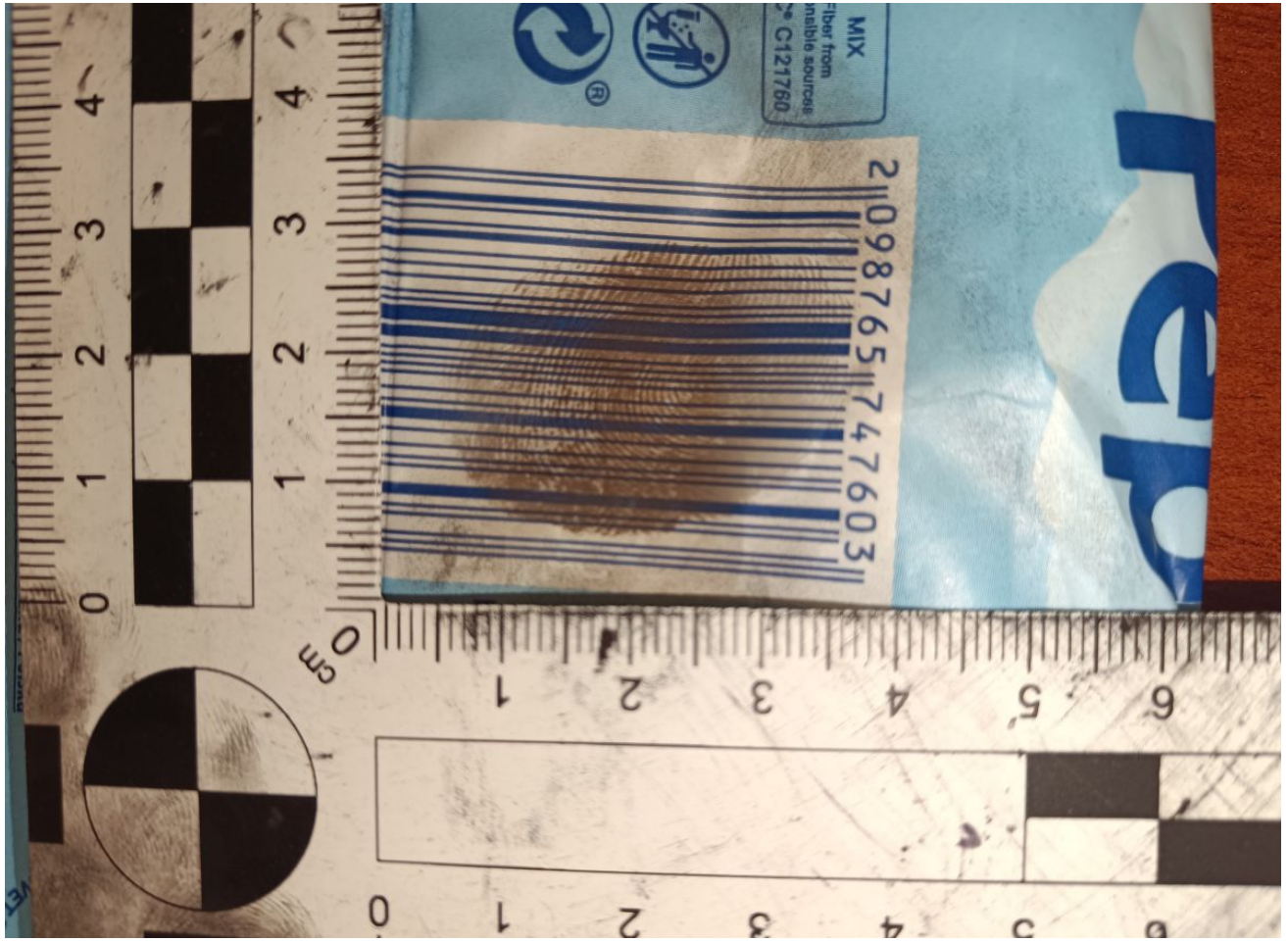


Generating data – latent fingerprints

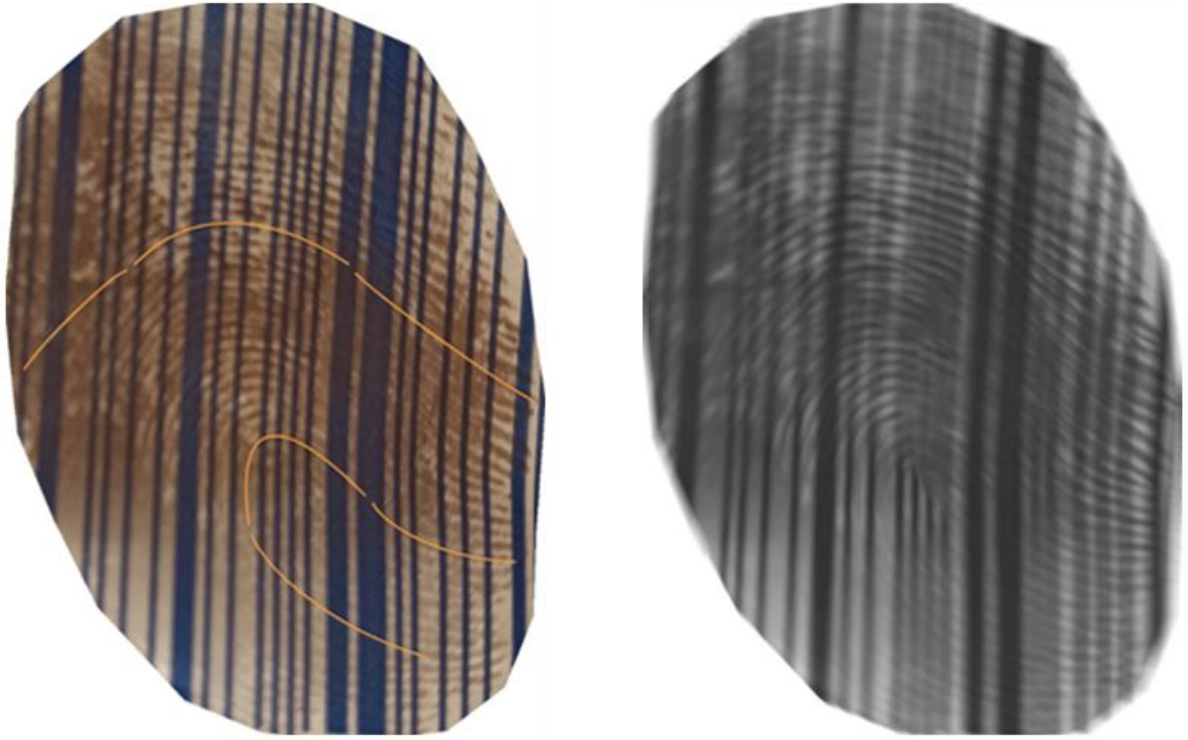


Fingerprint Enhancement

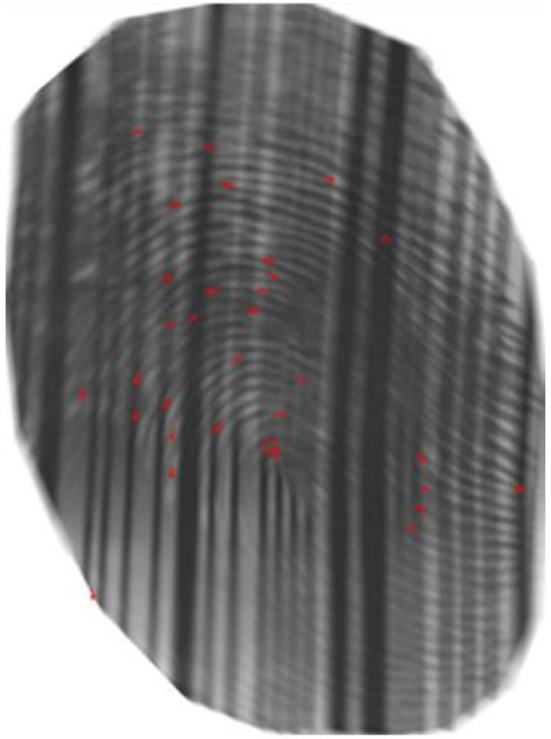
Hard fingerprint case



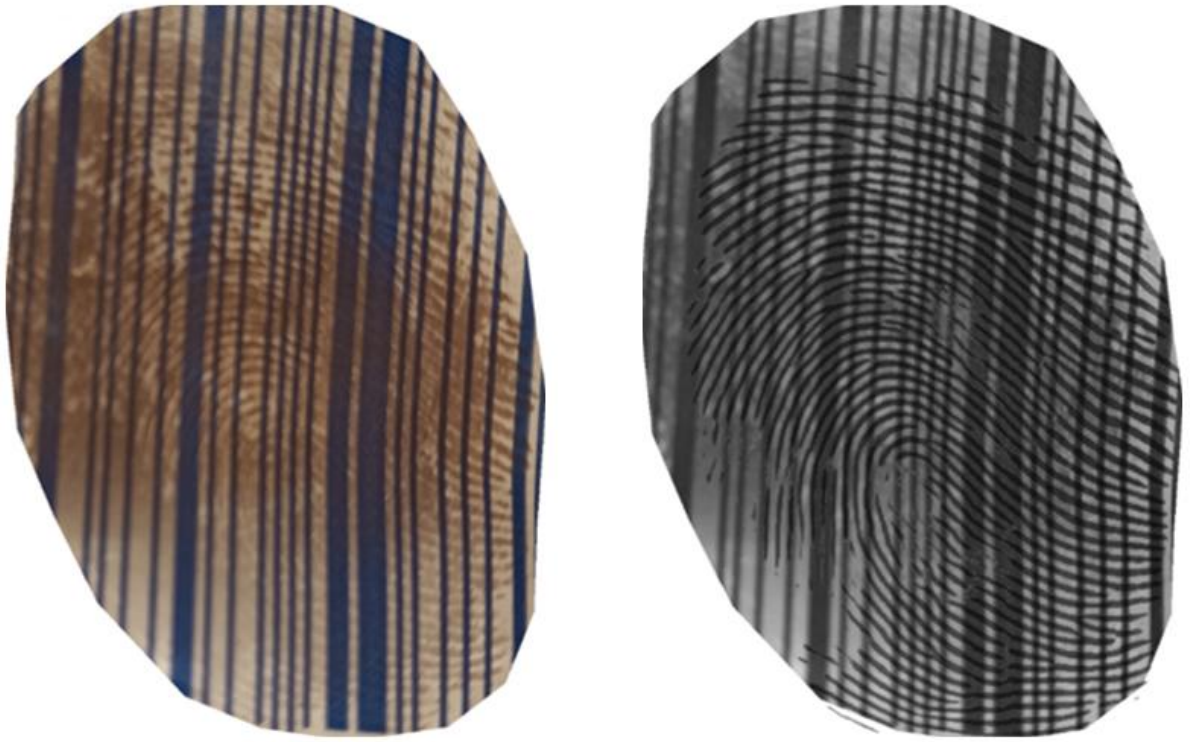
Fingerprint Enhancement – Classic way



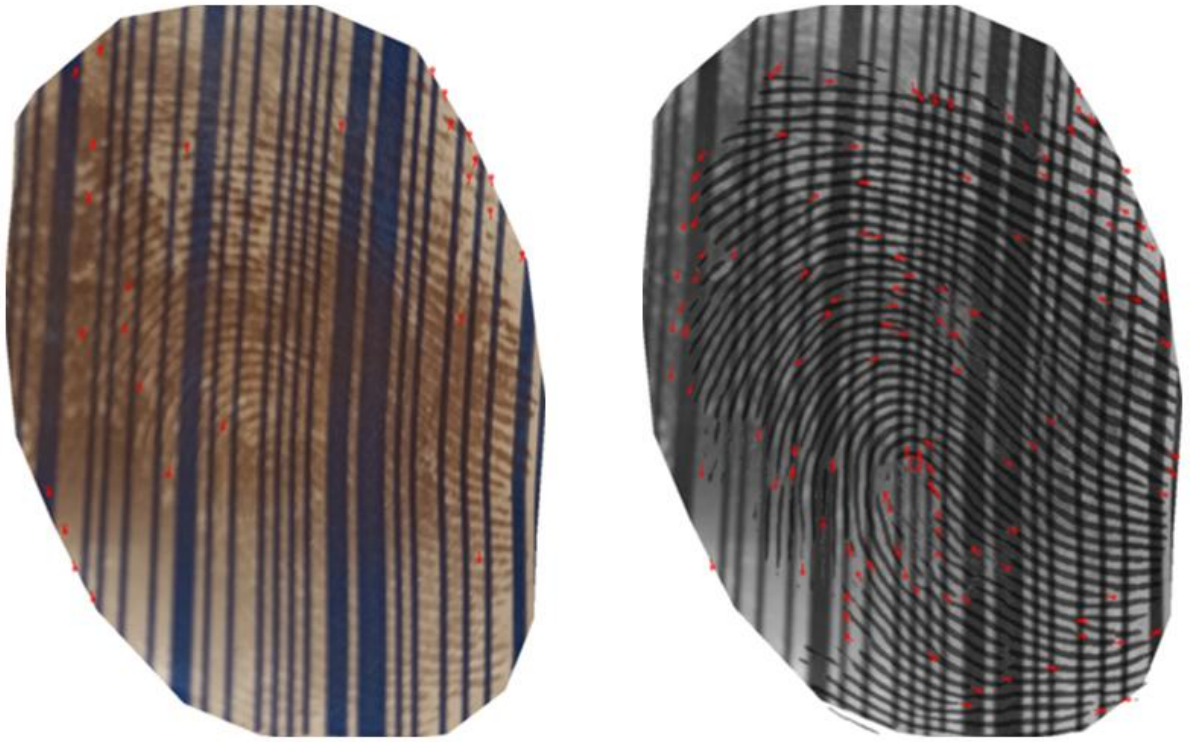
Fingerprint Enhancement – Classic way



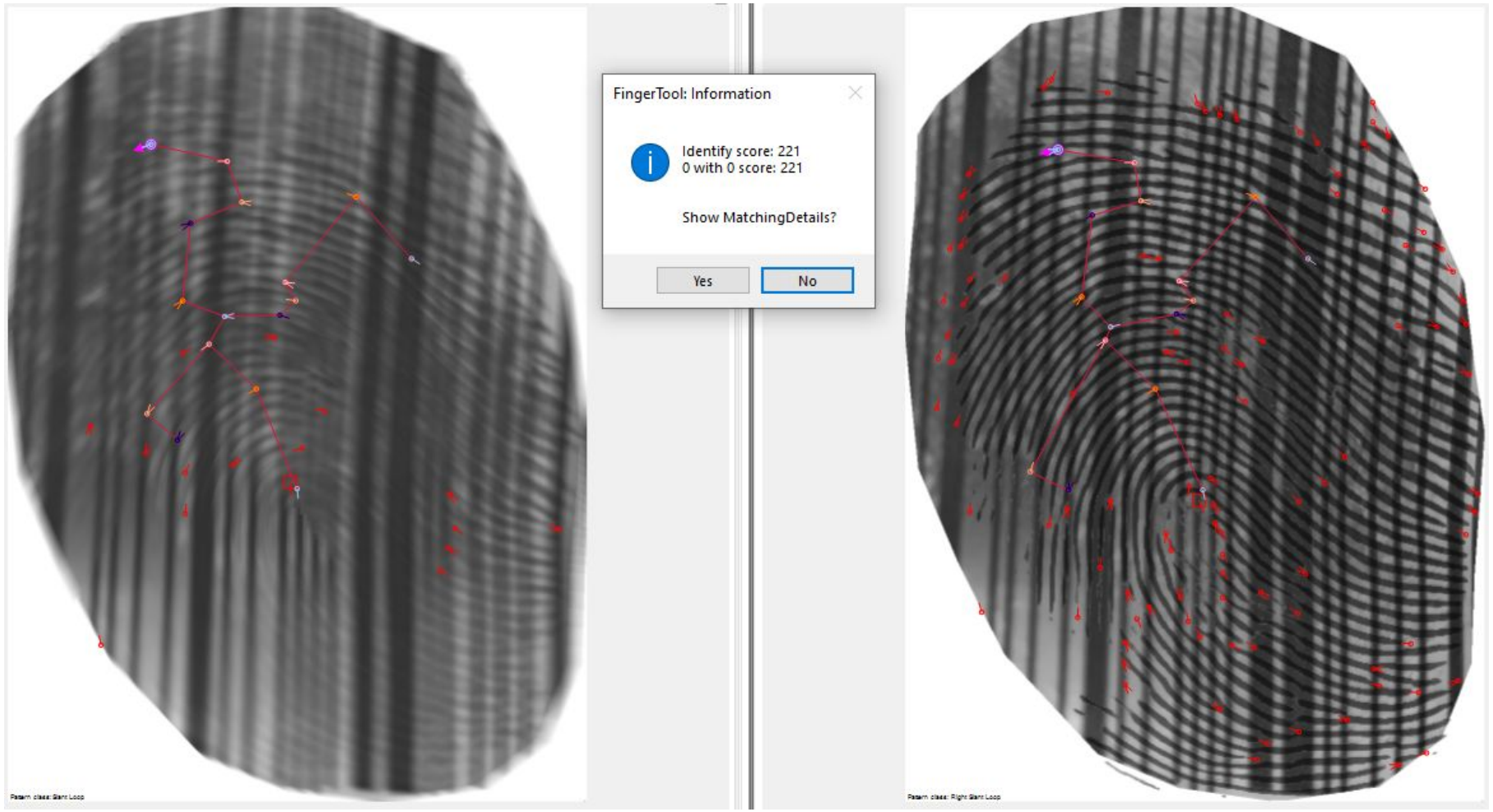
Fingerprint Enhancement – AI way



Fingerprint Enhancement – AI way



Fingerprint Enhancement - Classic vs AI way

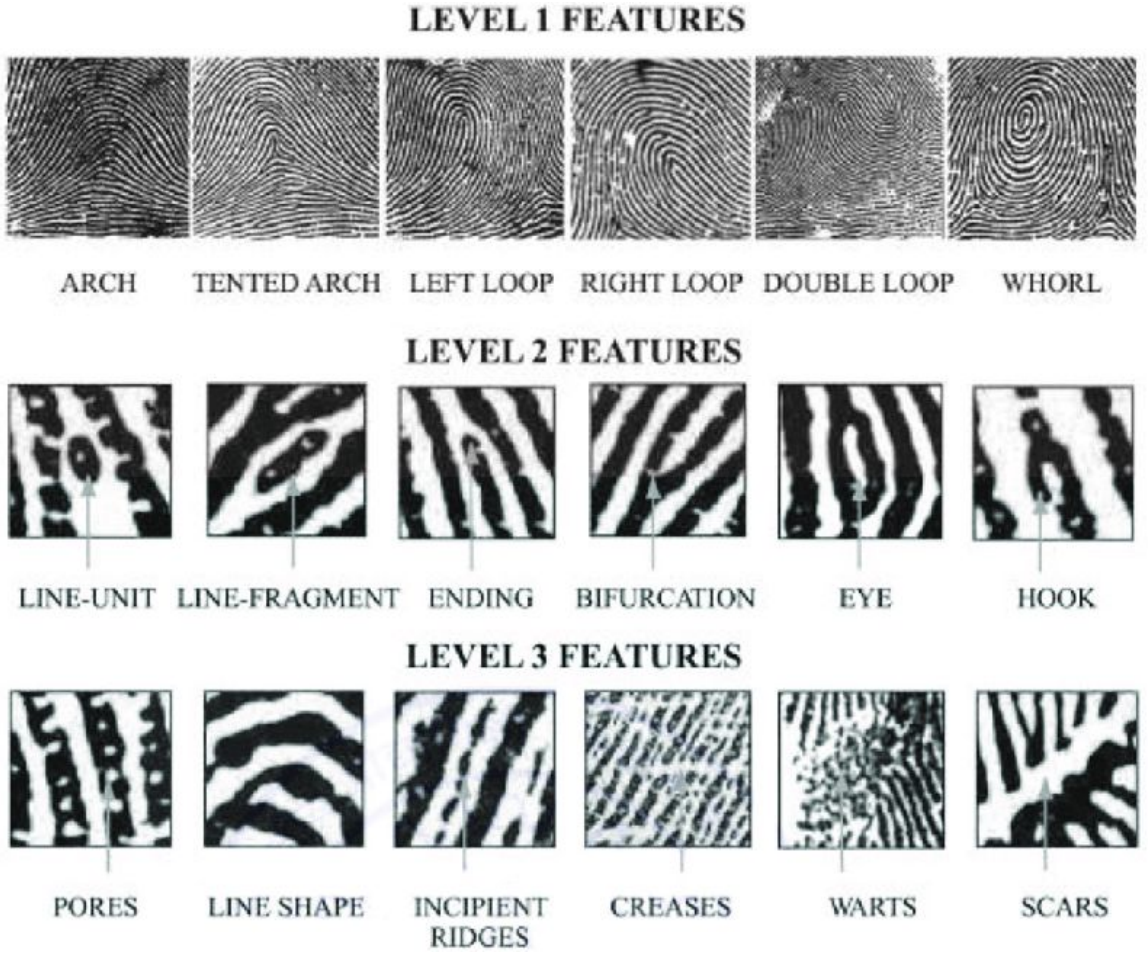


Rolled genuine match with classic enhanced

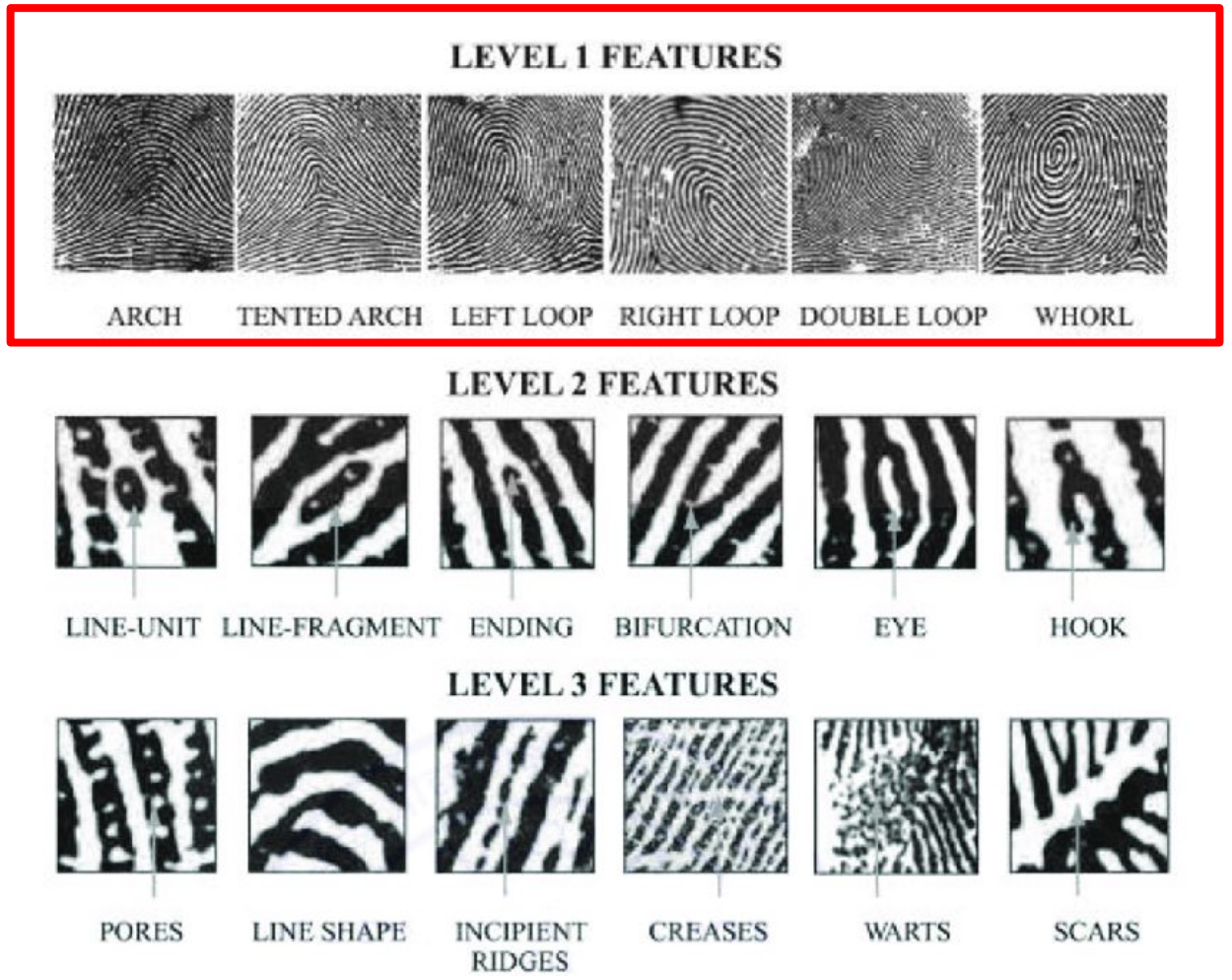
Rolled genuine match with AI enhanced

Fingerprint Recognition Features

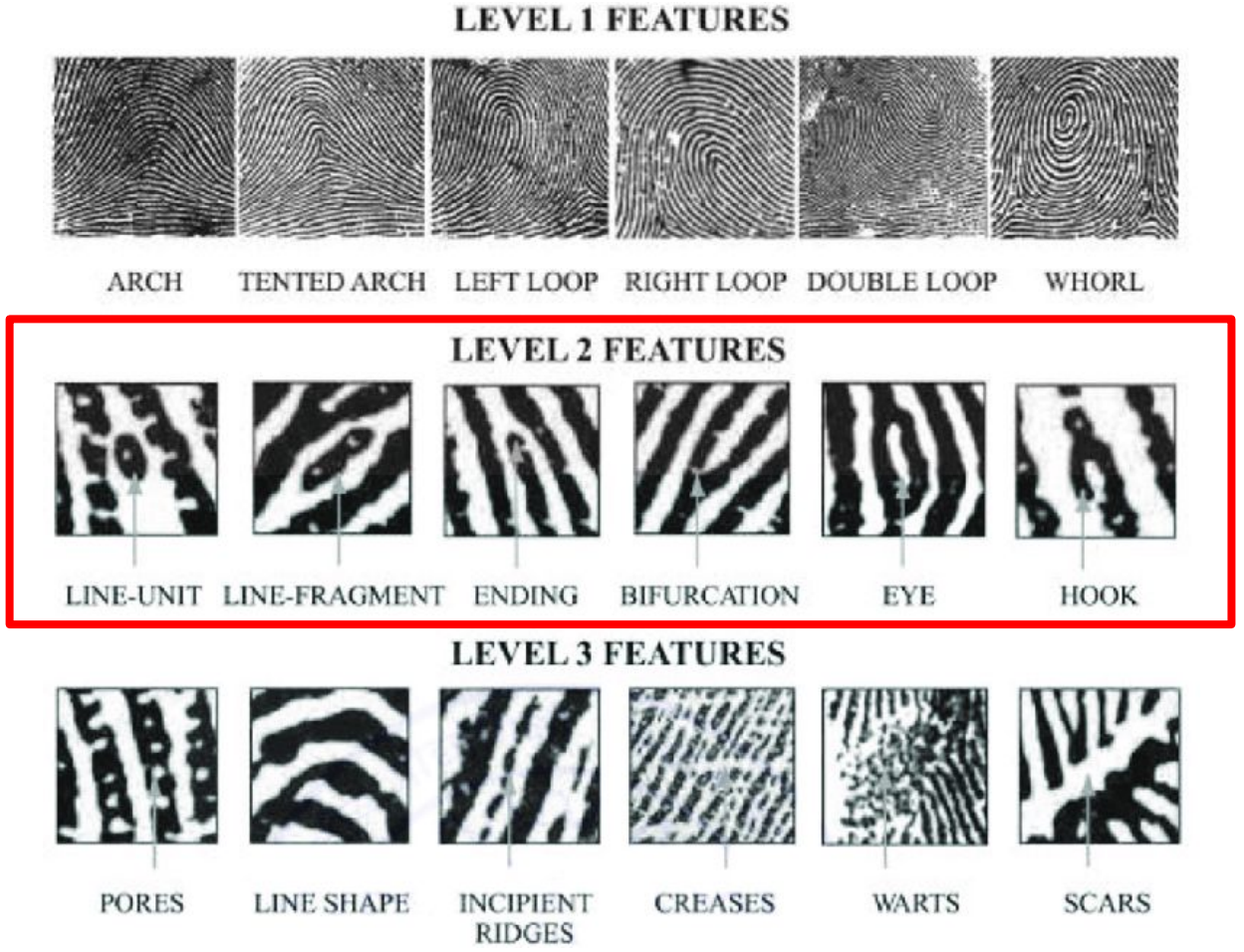
Fingerprint recognition features



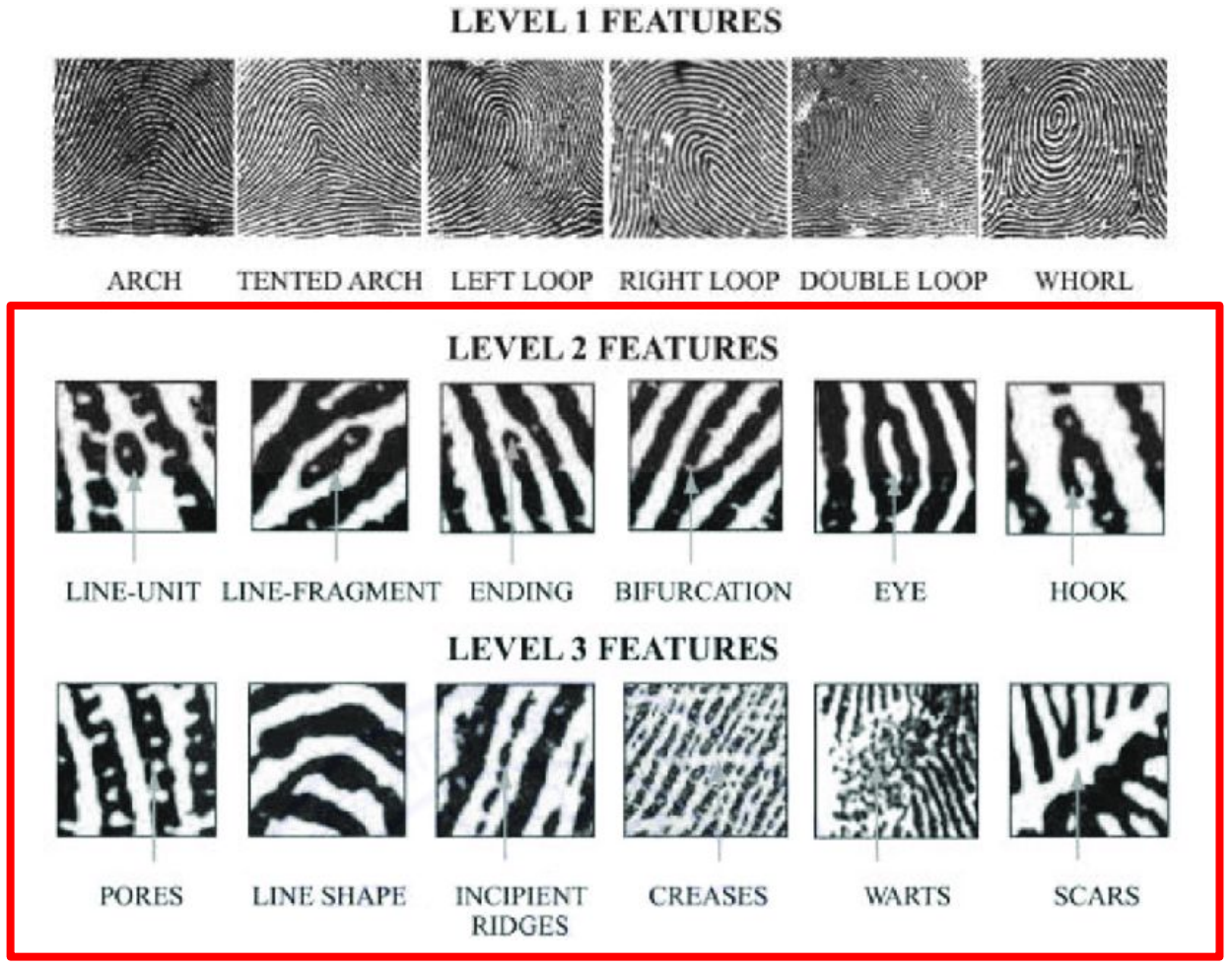
Fast search features – level 1 features



Classic recognition features – level 2 features

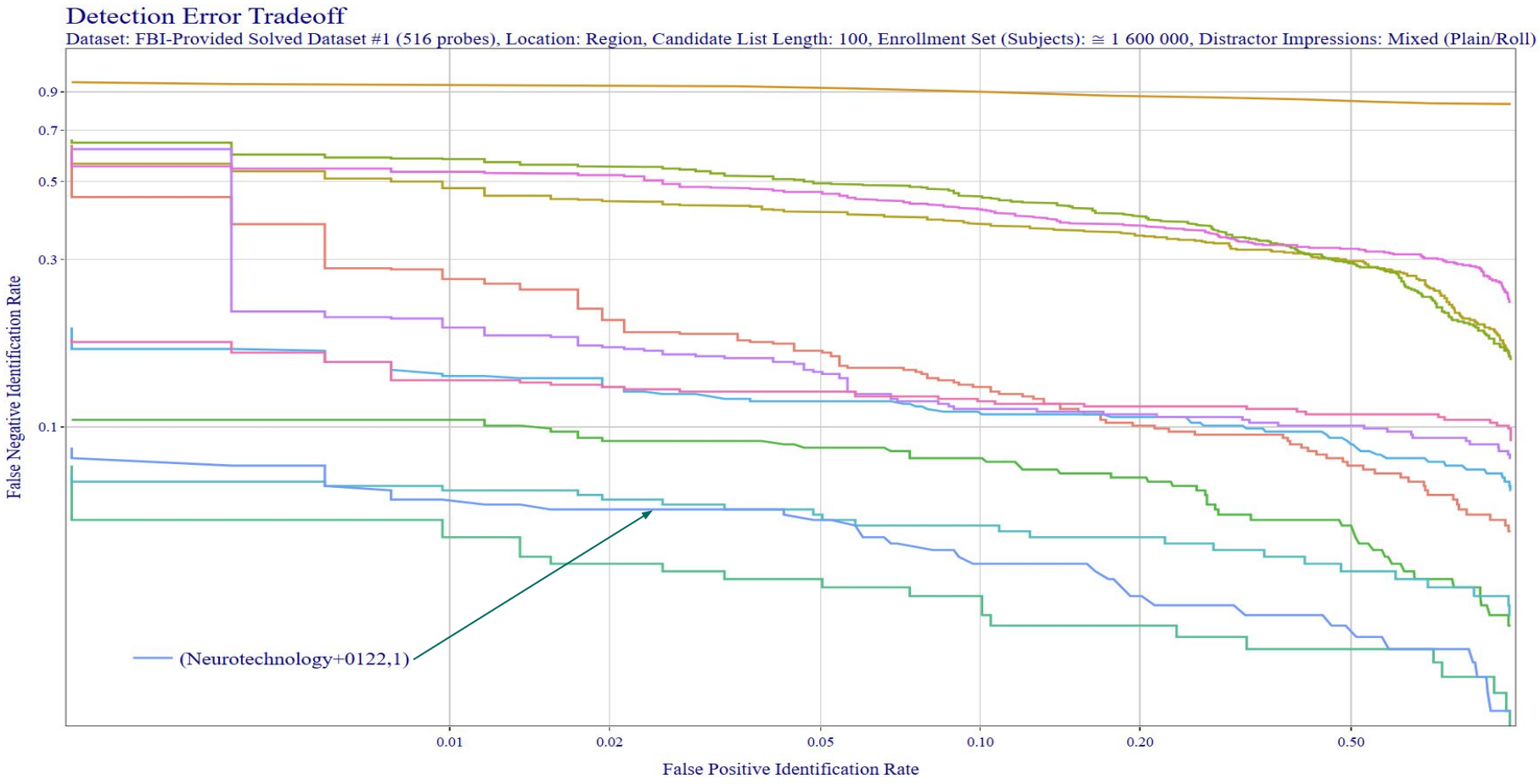


Advanced recognition features – level 2&3 features

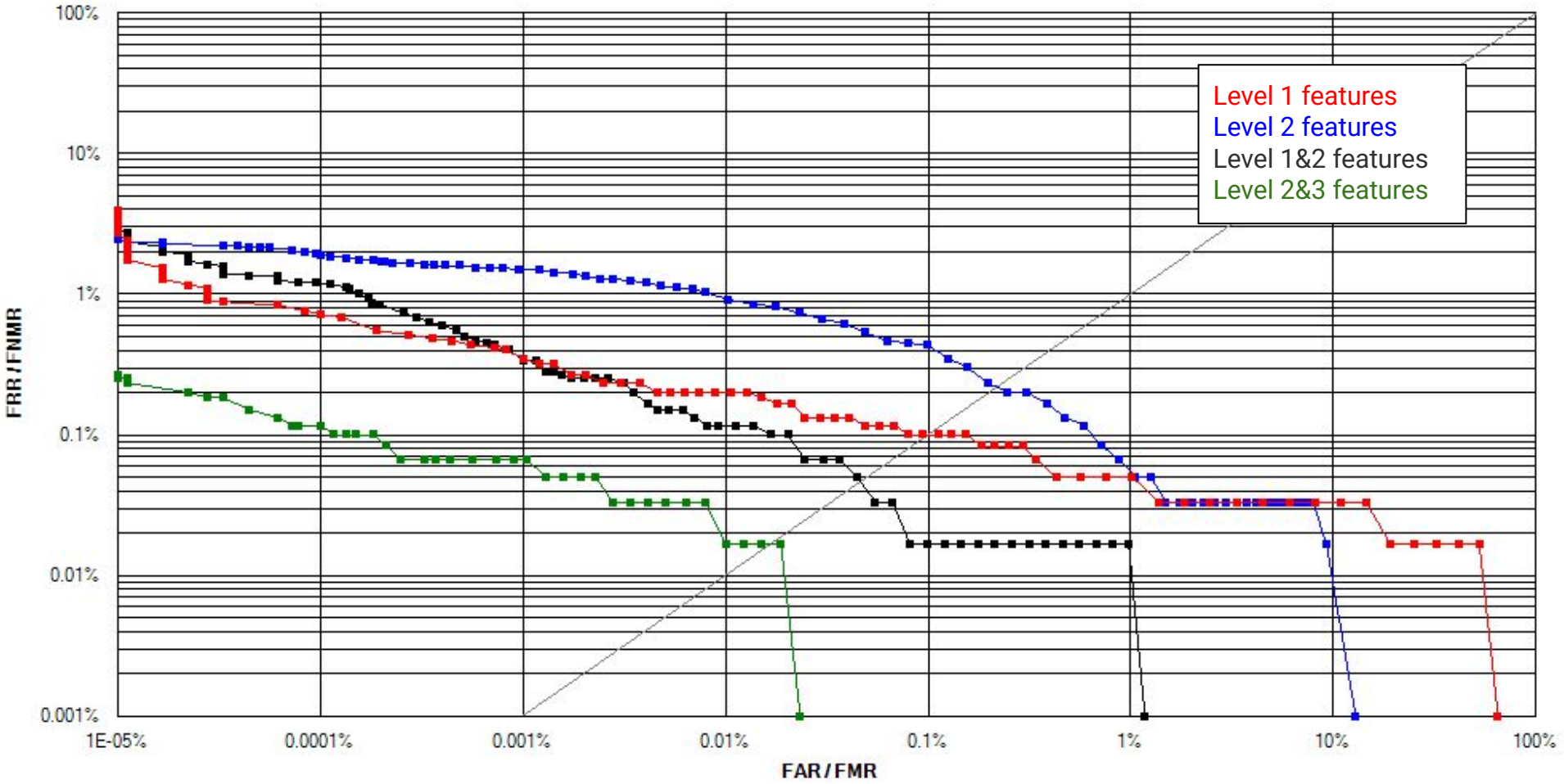


ELFT 0122 with level 1&2&3 features

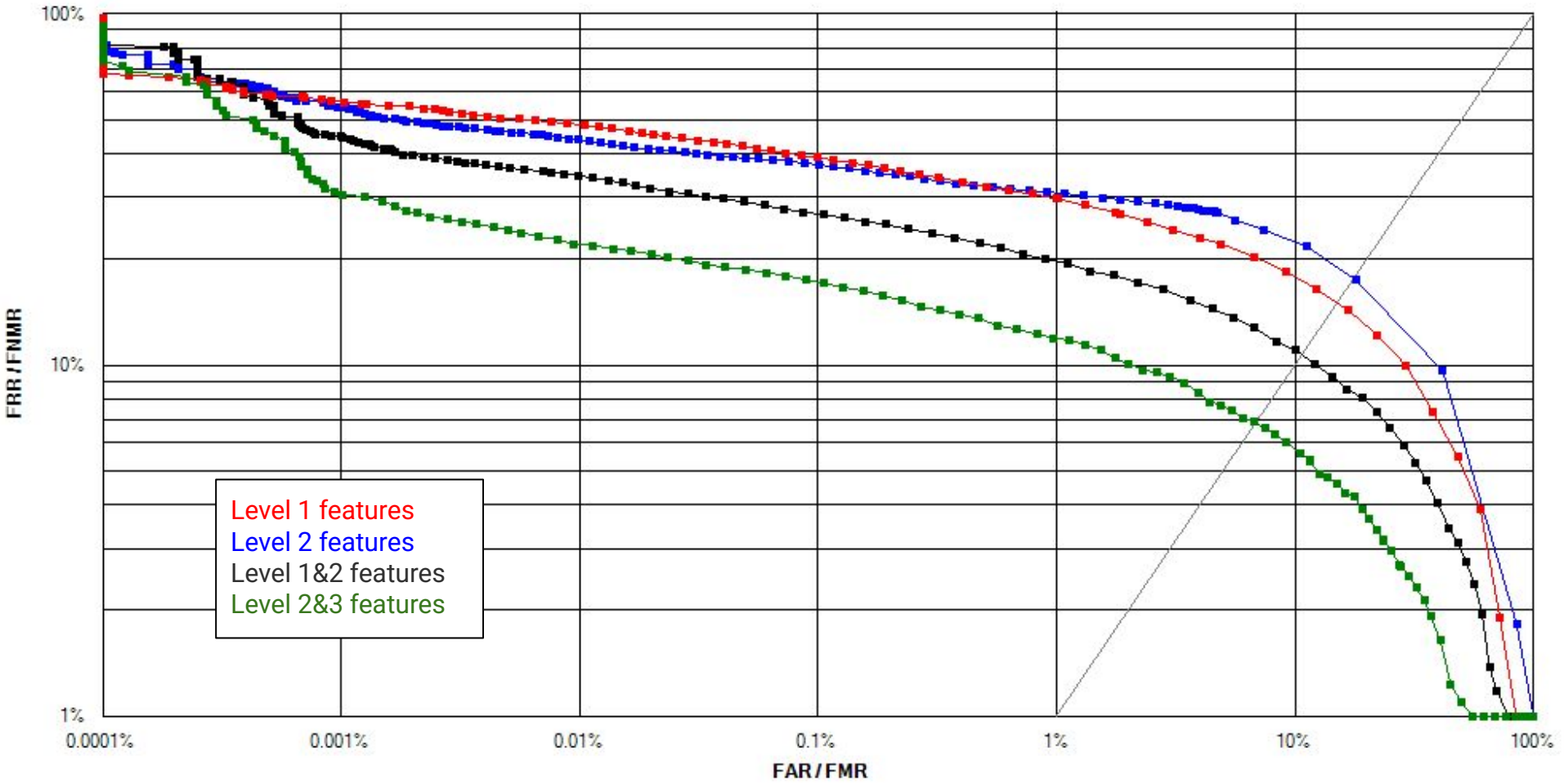
DET—FBI-Provided Solved Dataset #1



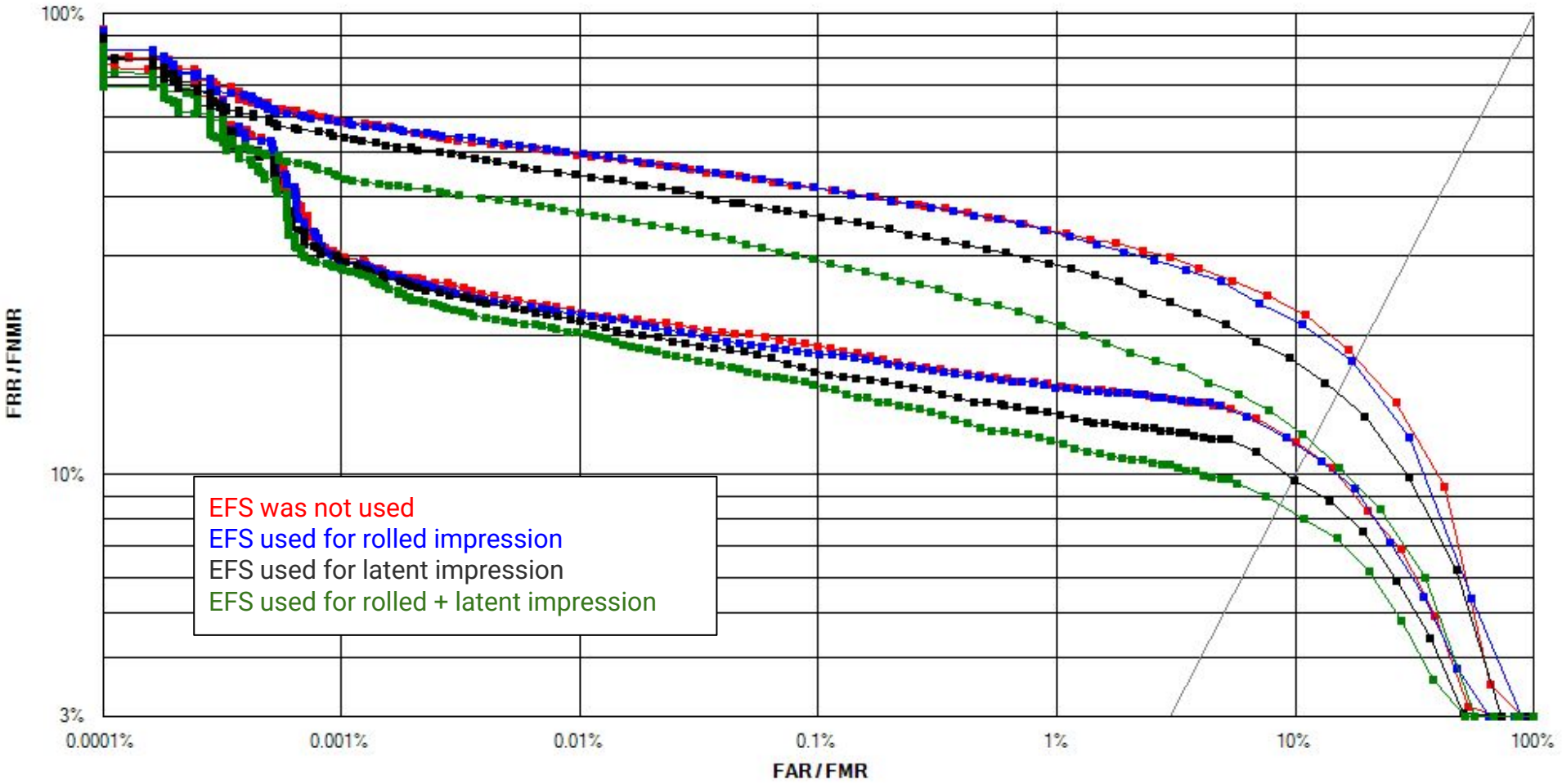
Subset from NIST SD 302 B
Comparison of different features - civil use case



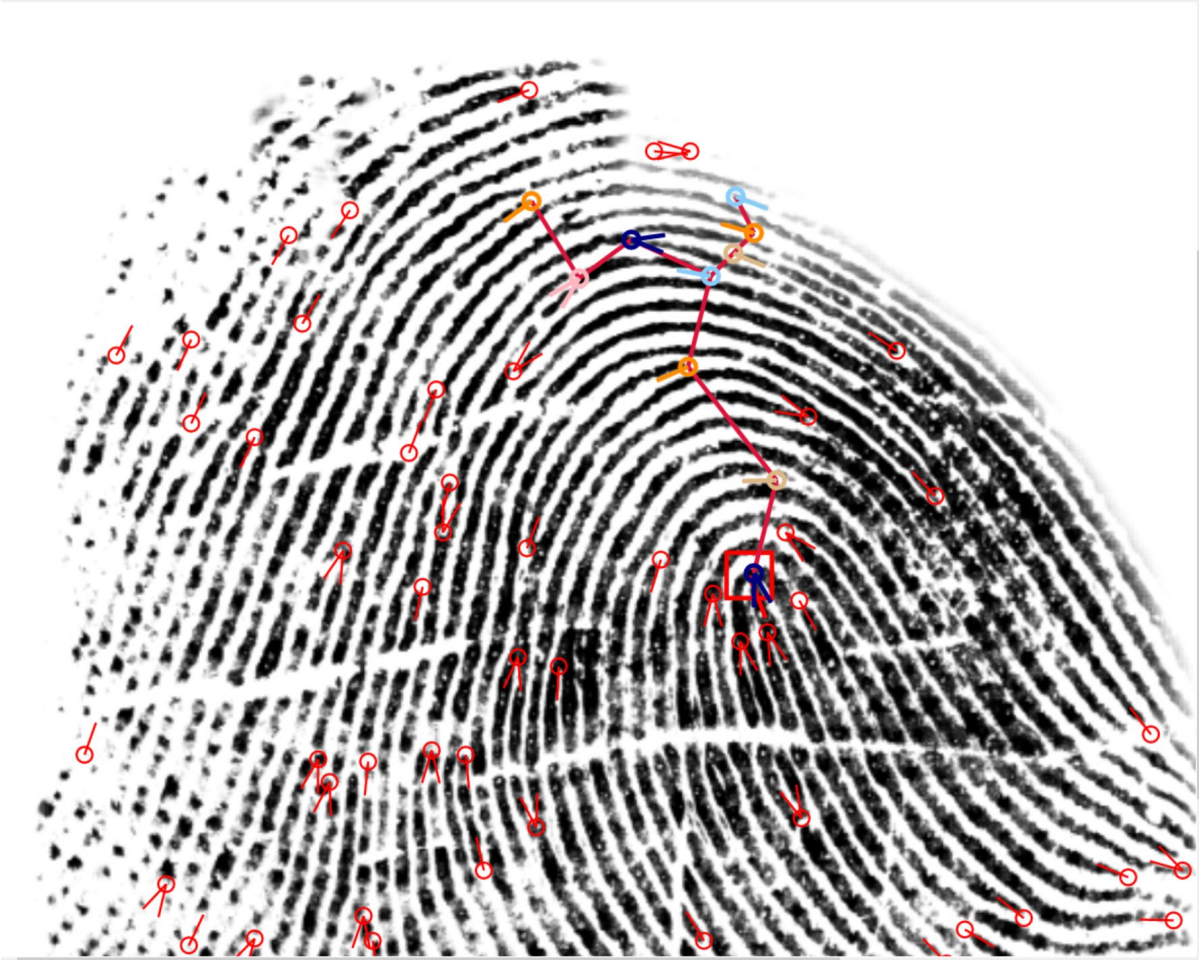
Subset from NIST SD 302 I
Comparison of different features - law enforcement case

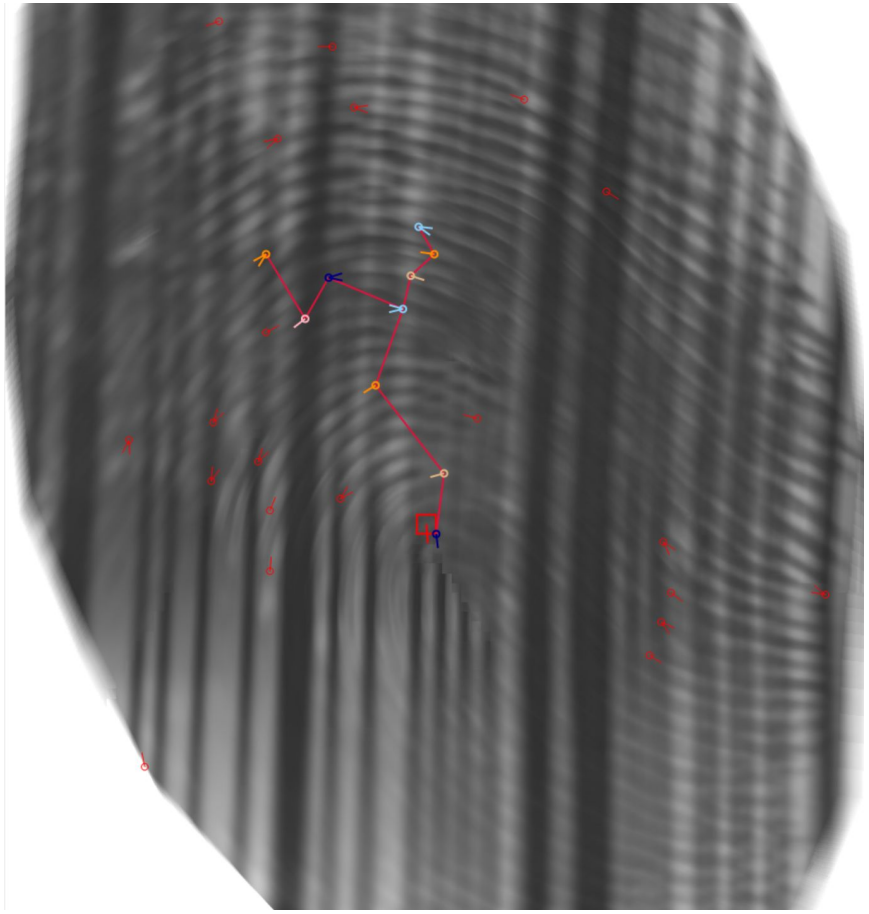


Subset from NIST SD 302 I
EFS usage - law enforcement use case

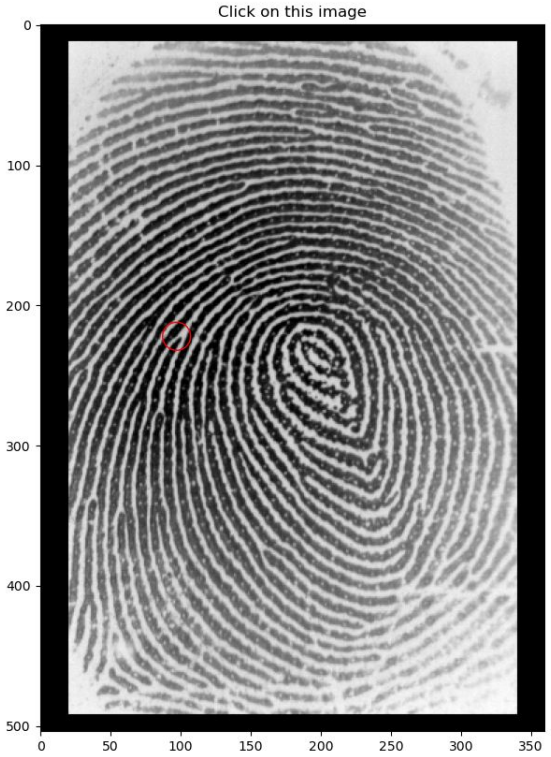


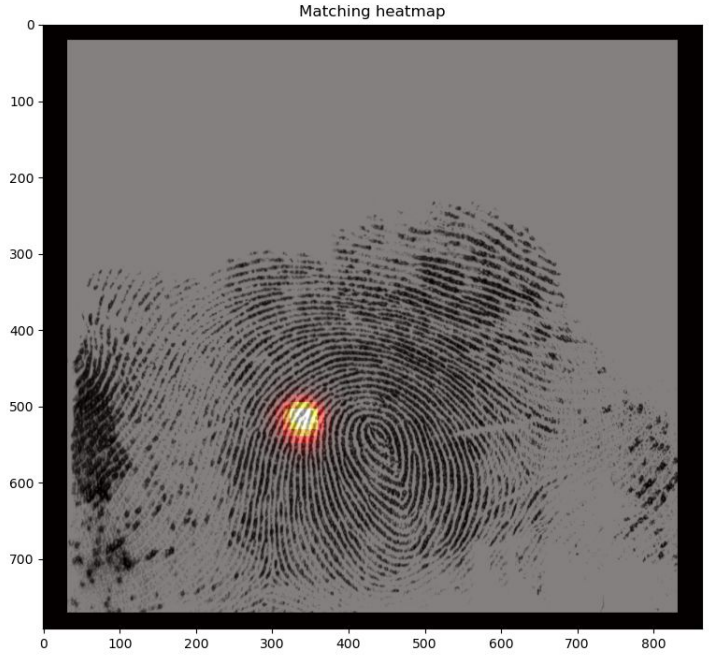
Classic way of visualizing matching details



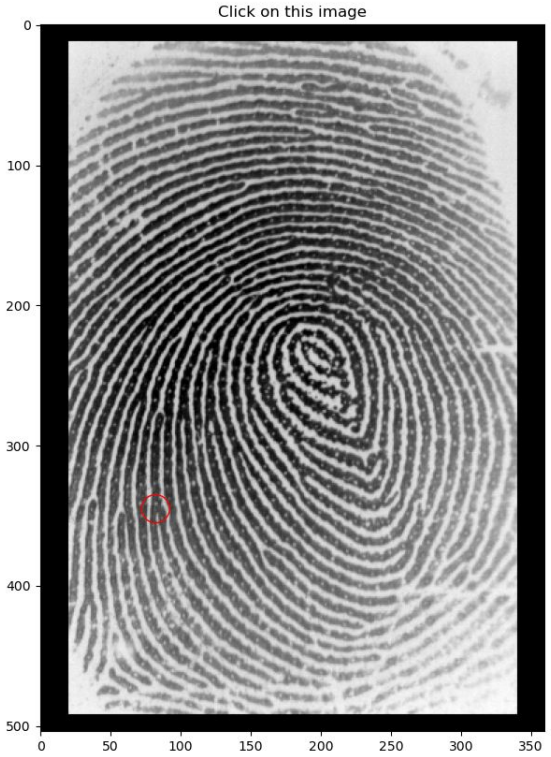


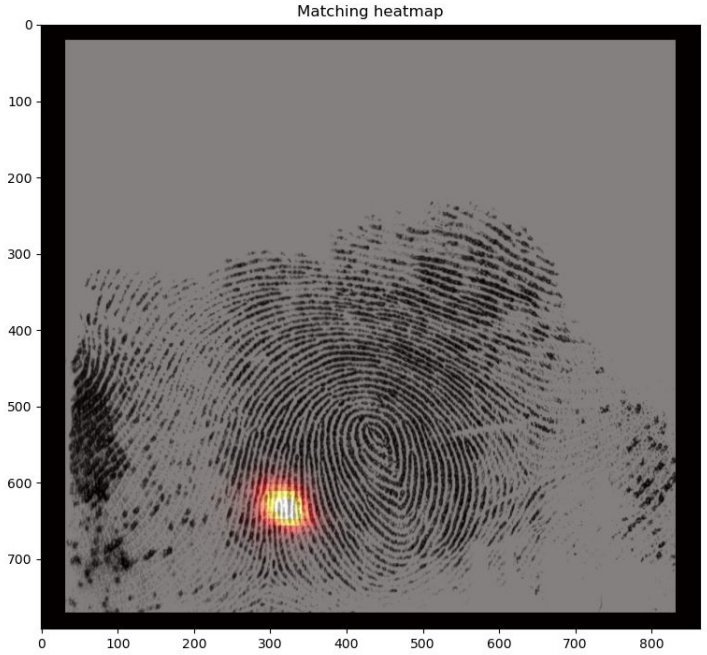
New way of visualizing matching details (1)



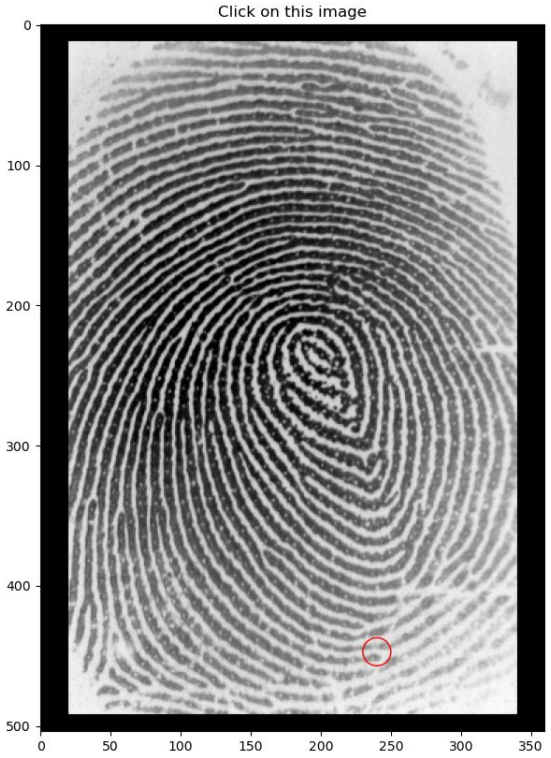


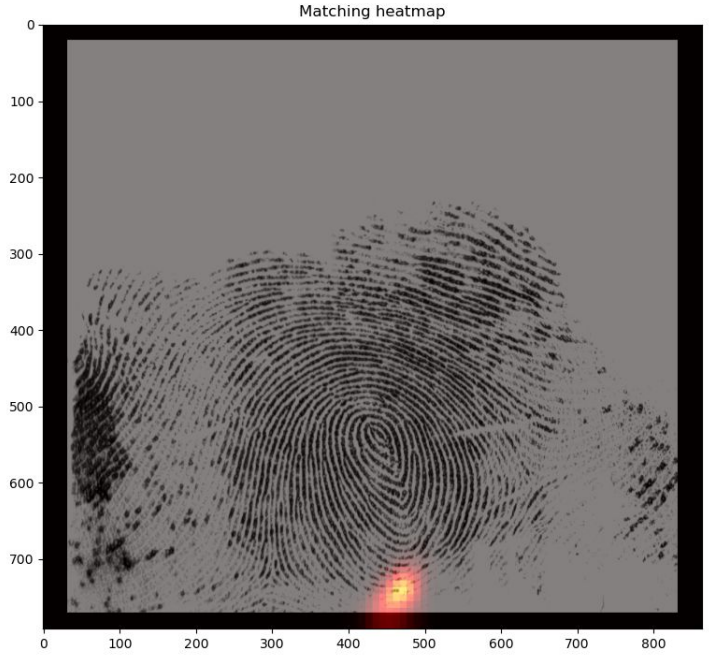
New way of visualizing matching details (2)



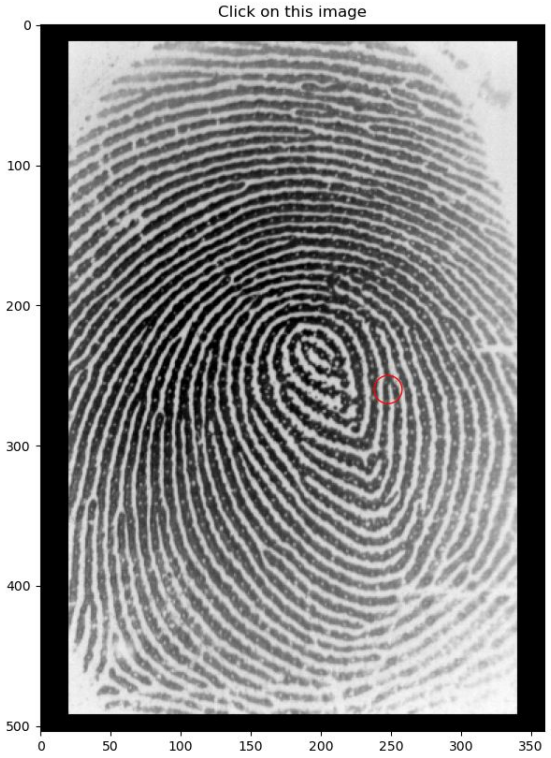


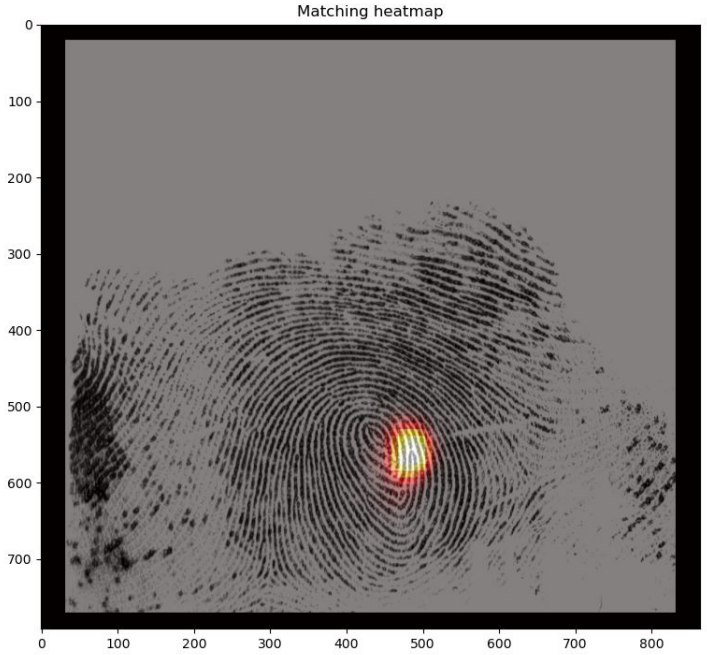
New way of visualizing matching details (3)



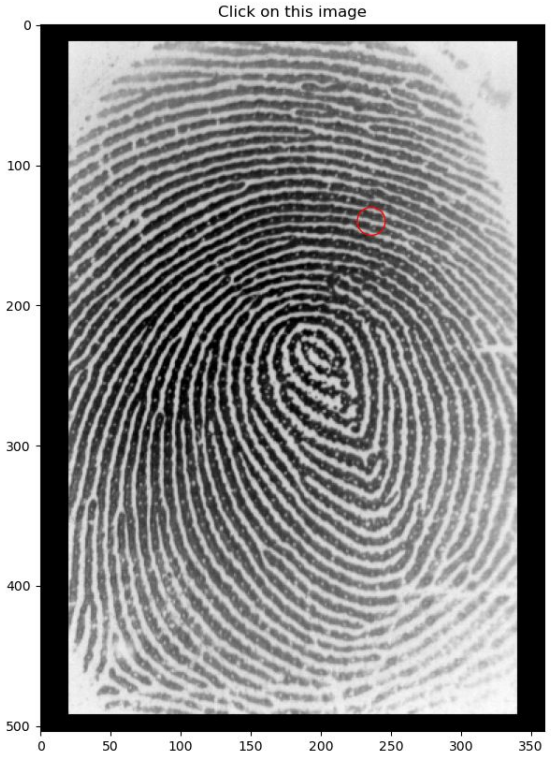


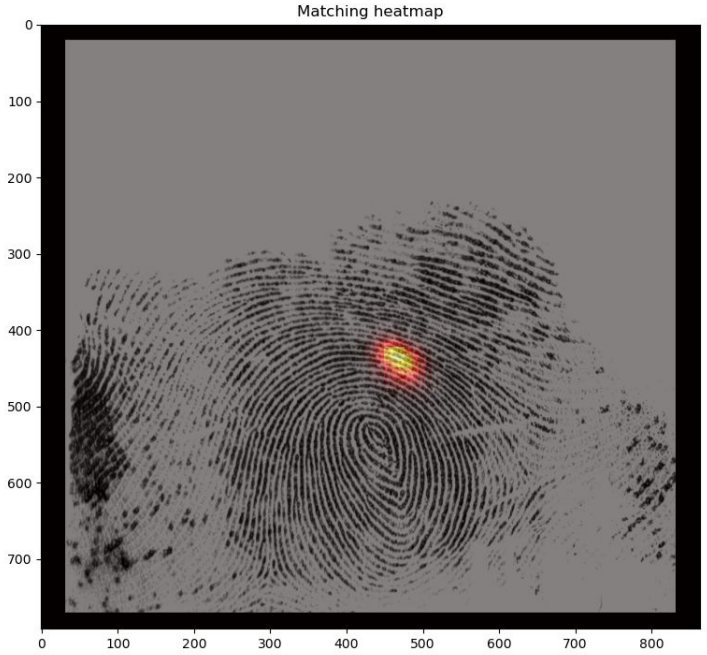
New way of visualizing matching details (4)





New way of visualizing matching details (5)





Conclusions

AI technologies can help with:

- **Smarter data acquisition,** supporting research and the development of more capable systems.
- **Faster and more reliable enhancement** of latent fingerprints, even in complex or degraded conditions.
- **Richer and more informative feature extraction**, allowing us to move beyond classic minutiae and rethink how we visualize and interpret fingerprint matches.

THANK YOU FOR YOUR ATTENTION!

Questions?

Evaldas Borcovas
Head of Biometrics Research
UAB NEUROTECHNOLOGY,
Laisves av. 125A, Vilnius LT-06118

www.neurotechnology.com