Forensic Latent Fingerprint Preprocessing

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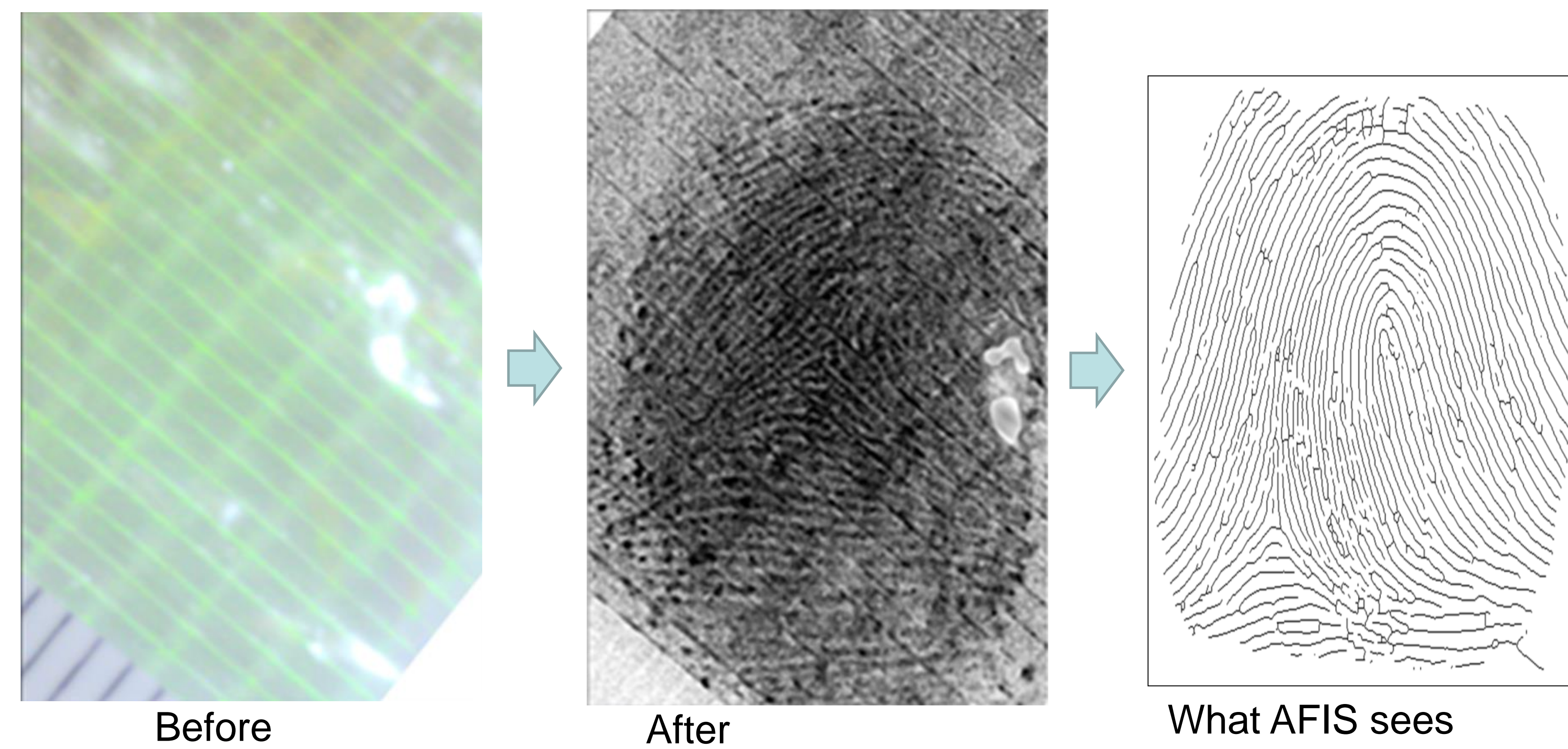
1. Motivation

Why latent fingerprint preprocessing study?

- Directly affects the performance of latent fingerprint recognition (by examiner or by machine)
- A very complex procedure
- Less rules, guides, and standards

Before   After   What AFIS sees

2. Objective

- To **characterize the effects** of image preprocessing that transforms the latent fingerprint image obtained from the crime scene ('before image') to the image used for identity analysis ('after image').
- To put preprocessing on firmer **scientific and reproducible** grounds.
- To study **integrity** problem.

Before   After by examiner A   After by examiner B
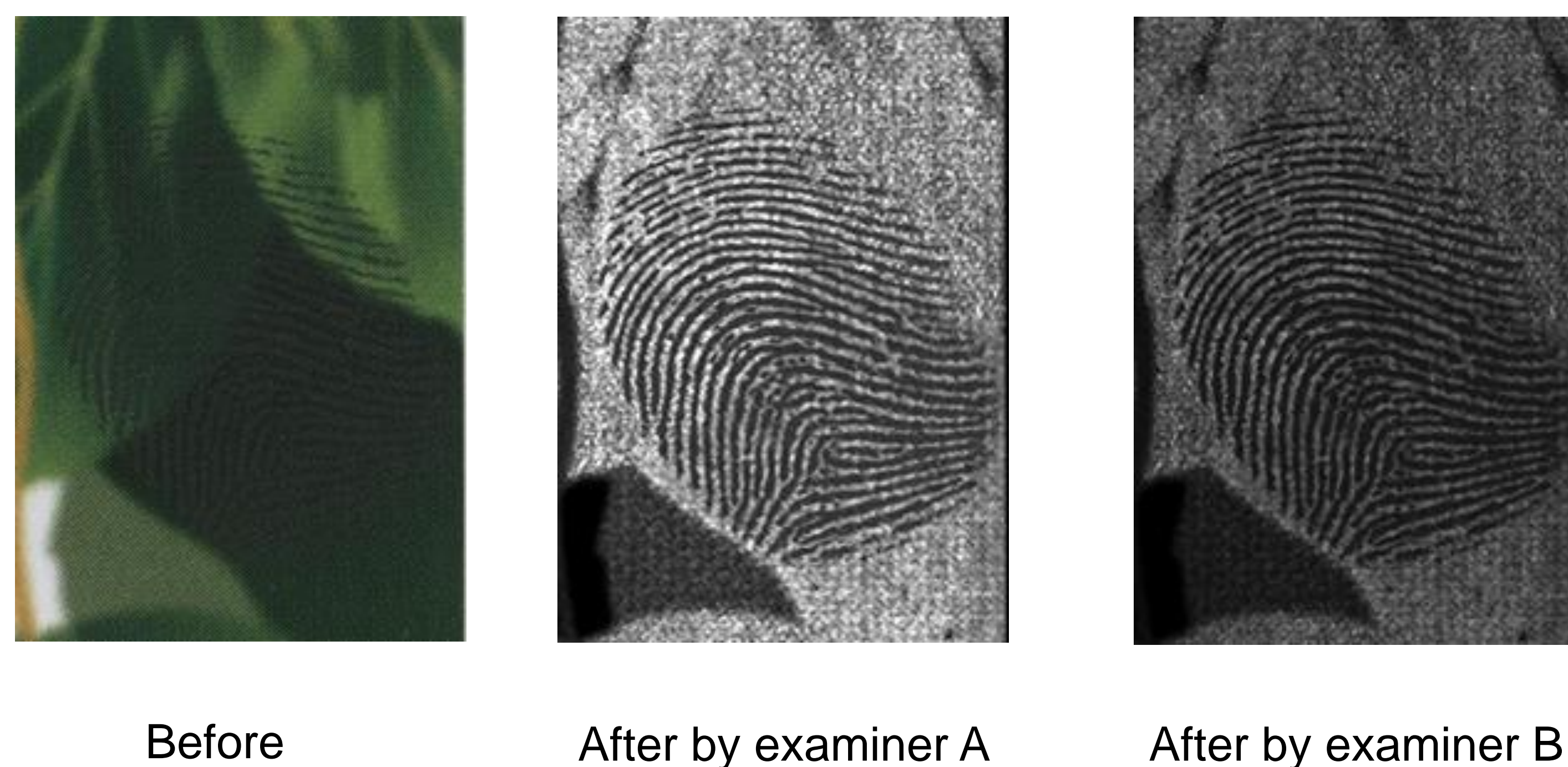
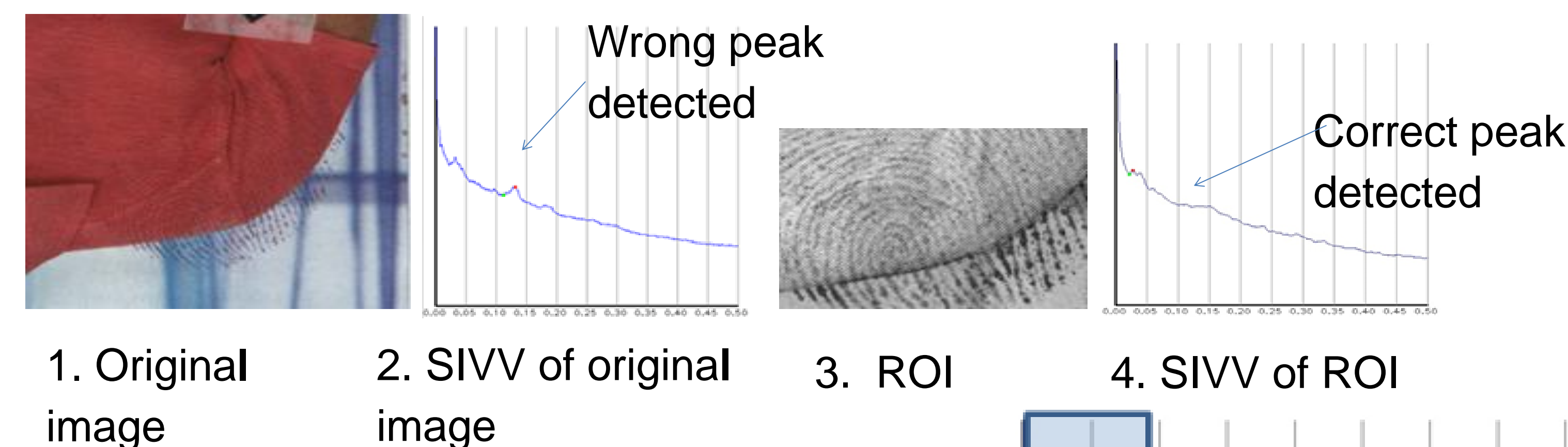## 3. A complex procedure

Before → After workflow

- Not a single activity
- Diverse implementations
  - color filtration
  - contrast adjustment
  - edge enhancement
  - background suppression
  - noise filtration
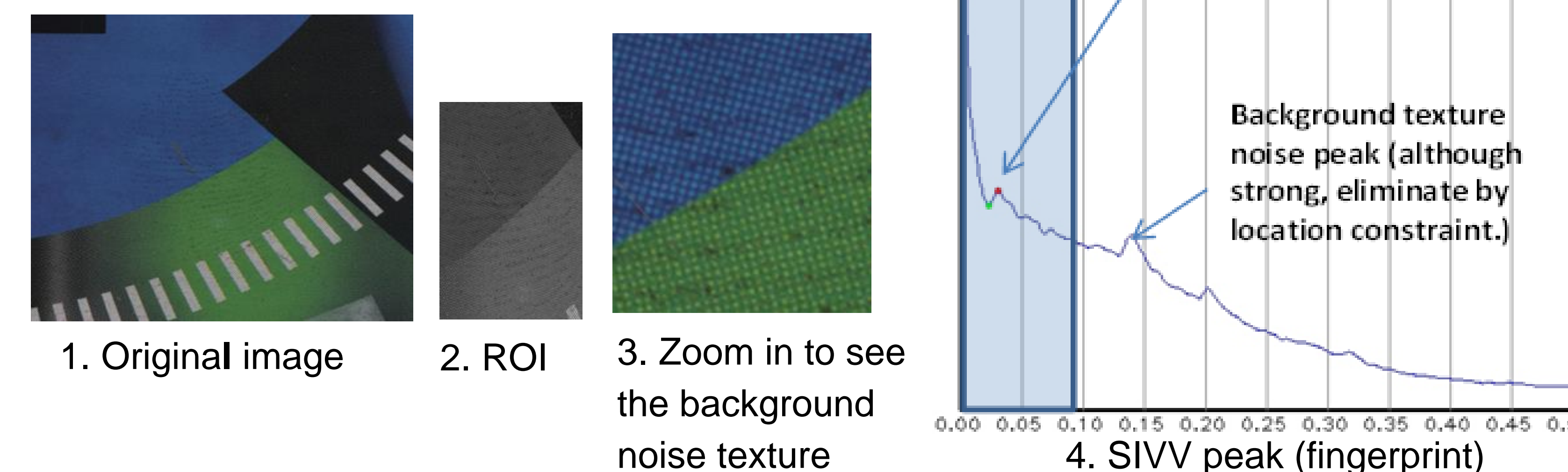- Diverse endpoints
- Integrity

Before   After
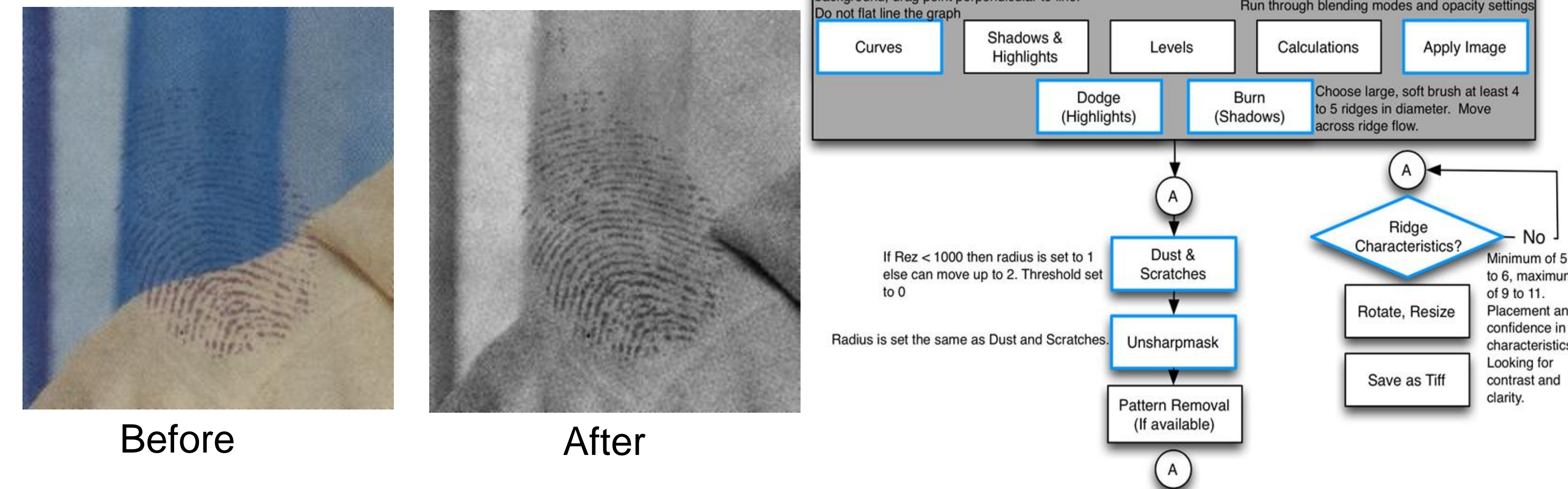
4. Quality measurement using SIVV

SIVV is very successful on flat/rolled fingerprints. Two revisions for latent fingerprint:
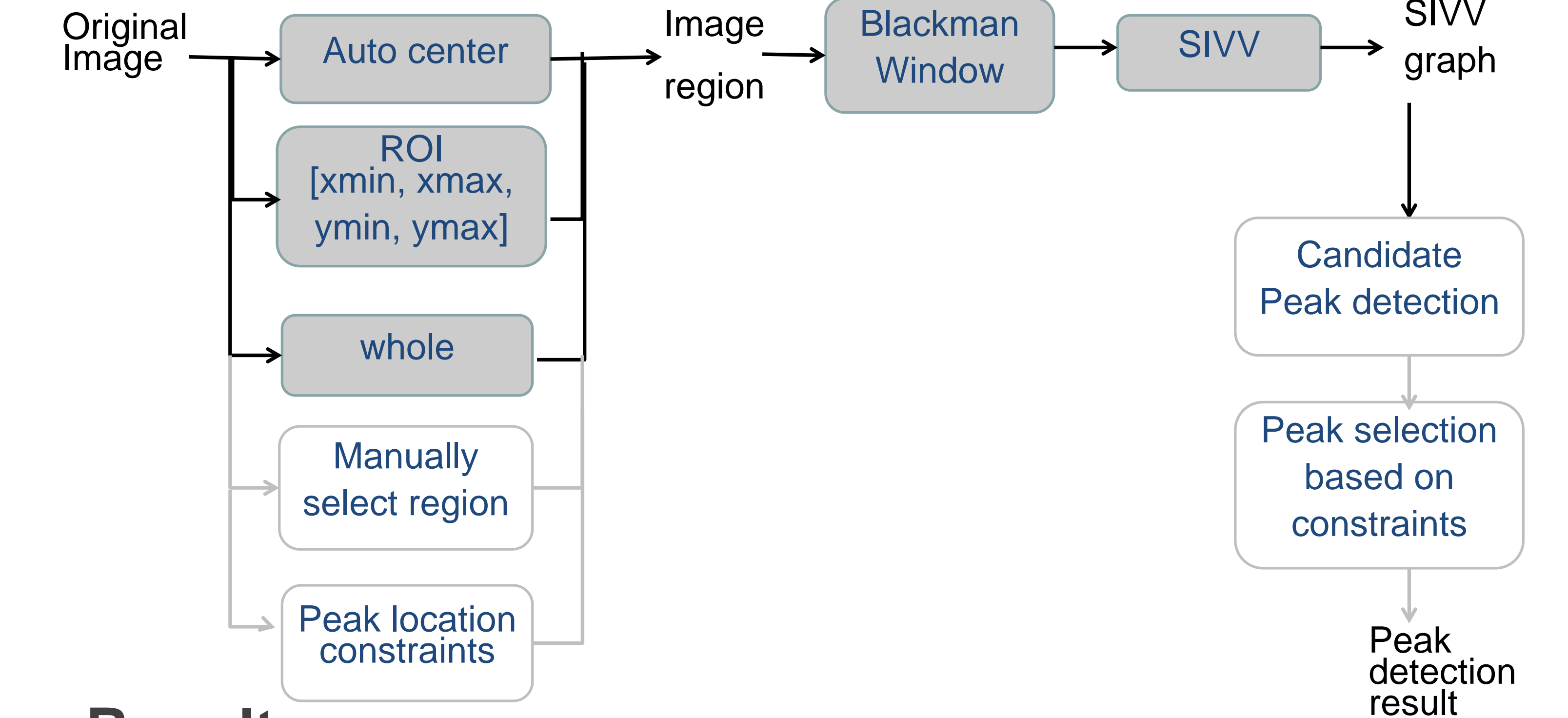
- Region of Interest

Wrong peak detected   Correct peak detected

1. Original image   2. SIVV of original image   3. ROI   4. SIVV of ROI

- SIVV peak location constraints

Fingerprint ridge peak localized by peak location (ridge distance)

Background texture noise peak (although strong, eliminate by location constraint.)

1. Original image   2. ROI   3. Zoom in to see the background noise texture   4. SIVV peak (fingerprint)

5. Experiment results

Implementation

Results

TPR = TP/(TP+FN)	Full image	ROI	ROI & Peak loc. Constraint
Before	33%	79%	85%
After	72%	87%	92%

6. Future Work

Quantitative comparison   **Minutiae quality**
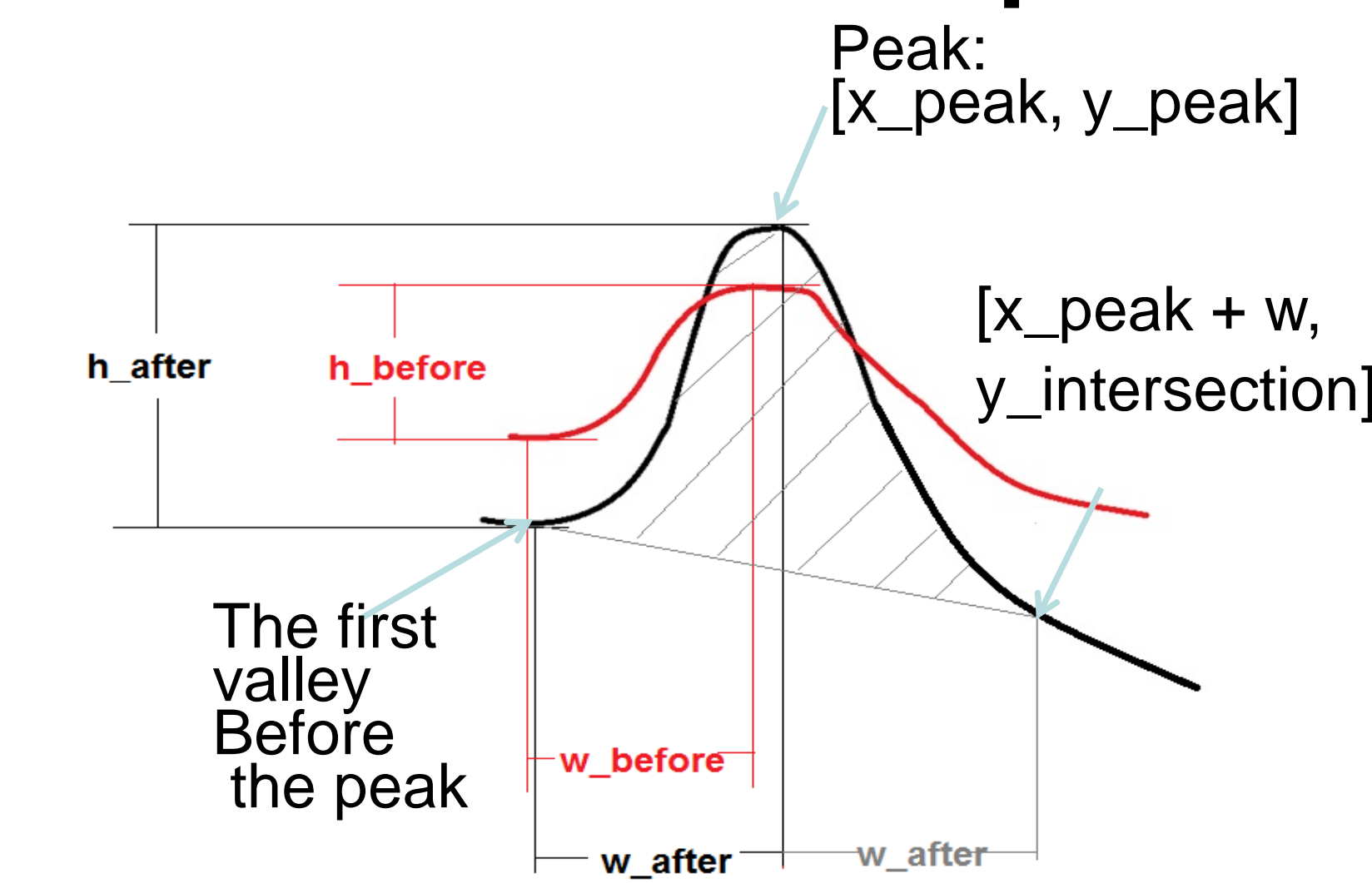
7. Acknowledgements