Stability of the LR in the lower region of the within source distribution

A fingerprint case study

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1. Motivation

2. The LR model

3. Datasets used

4. The Experiment

5. Results
• understand how the LR’s behave with increasing / decreasing background populations

• understand how the log(LR’s) behave around the “tipping point” with varying population

• get some insight on how the LR’s behave in the tails of the distribution
Area of interest

![Graph showing Likelihood Ratio and Score Distributions](image)
The LR model

* LR model derived from Meuwly 2006
The Likelihood Ratio

$H_p$ – the fingermark originates from the individual that is also the source of the fingerprint

$H_d$ – the fingermark originates from an unknown individual, randomly selected

$$LR = \frac{P(E \mid H_p, \Delta_{ss}(m, p))}{P(E \mid H_d, \Delta_{ds}(m, p))}$$

$\Delta_{ss}(m, p)$ is the similarity score of the marks and print of the same source

$\Delta_{ds}(m, p)$ is the similarity score of the marks and prints of the different source
Datasets used

Simulated vs Forensic Fingermark
Datasets used

Simulated vs Forensic Fingermark

Simulated Fingermark

Forensic Fingermark
Datasets used

- availability
- scalability

- automatic feature extraction friendly

- realistic – capture a lot more physical distortion than most of the fingermarks recovered (so far)
Datasets used &

<table>
<thead>
<tr>
<th>ID</th>
<th># of fingermarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Individual 1</td>
<td>8455</td>
</tr>
<tr>
<td>Individual 2</td>
<td>4666</td>
</tr>
<tr>
<td>Individual 3</td>
<td>3179</td>
</tr>
<tr>
<td>Individual 4</td>
<td>3758</td>
</tr>
</tbody>
</table>

1. Equal proportion of WS and BS scores (Symmetric)
2. WS[8455] and BS varying (WSmax)
3. WS[500] and BS varying (BSmin)
4. WS varying and BS[500] (BSmin)
5. WS varying and BS[200’000] (Bsmax)
Experiment setup
Results

Individual 1 baseline

[Graphs showing the variation of LR values in % for different population sizes and LR ranges.]
Results
Individual 1 baseline
Results
4 individuals comparison
Thank you for attention,

any questions?