Assignment #1: Fingerprint Recognition

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I. Introduction

Fingerprint recognition is an important task in image based biometry for use cases, such as identity verification on mobile devices. In this report we describe the use of existing tools for fingerprint matching.

II. Methodology

We used datasets of fingerprint scans labeled for genuine and impostor pairs. We converted the images into a unified format and calculated fingerprint similarities. We selected a threshold and reported classification accuracies.

III. Experiments

We downloaded 3 datasets from the FVC2002 competition, each consisting of 8 impressions of 10 fingerprints. We used the NBIS software [1] for image conversion and `Bozorth3` similarity calculation. We chose the EER thresholding strategy. We used `nfiq` for estimating fingerprint quality and `pcasys` for types. We first considered all pairs of fingerprints and later focused only on matching types.

IV. Results and Discussion

A. Results

The thresholds and accuracies before / after introducing fingerprint types are reported in Table I. We see that within type comparison did not improve our results. The similarity score distribution, heatmap and quality distribution for dataset DB3 are presented in Fig.1, 2 and 3.

TABLE I
Datasets used, thresholds and final classification accuracies

Dataset	**Sensor**	**t @ EER**	**CA [%]**
DB2	Optical	18 / 19	97.6 / 95.6
DB3	Capacitive	12 / 13	90.7 / 90.8
DB4	Synthetic	17 / 19	94.6 / 94.6

B. Discussion

The initial CA on DB2 was high, while some type prediction confidences were low ($< 0,5$). This could be why we observed a performance decrease.

V. Conclusion

We developed a Python workflow for fingerprint matching and achieved high accuracy across different datasets. The threshold can be adjusted based on the application criteria.

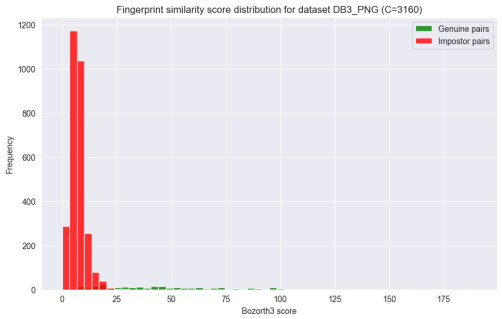

Fig. 1. Similarity score distribution for genuine and impostor fingerprint pairs from DB3.

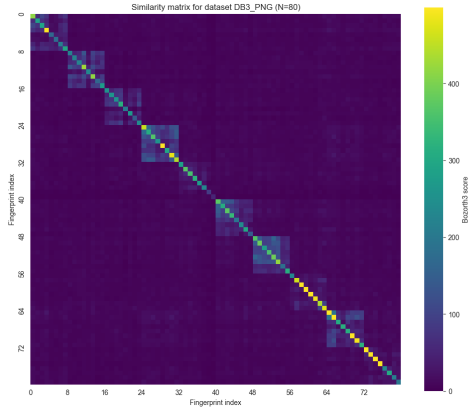

Fig. 2. Similarity matrix based on Bozorth3 score for DB3.

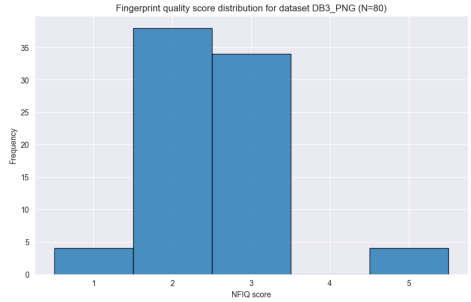

Fig. 3. Distribution of NFIQ fingerprint quality scores for DB3.

References

[1] K. Ko, "User's guide to nist biometric image software (nbis)," 2007.