# Assignment #1: Fingerprint recognition

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***Abstract*—This assignment implemented fingerprint recognition using NBIS. Classification accuracy was assessed with various thresholds on the FVC2004 DB1 fingerprint dataset, with general classification yielding higher accuracy than type-based classification**

## I. Introduction

The goal of this assignment was to implement fingerprint recognition using NBIS and assess its accuracy.

## II. Methodology

Minutiae points were extracted to calculate similarity scores between samples. The classification was performed using a threshold, which was determined empirically by testing various thresholds to find the one that maximized accuracy. This process was first applied to all samples and then specifically to samples within the same fingerprint class.

## III. Experiments

Using the FVC2004 DB1 fingerprint dataset, which contains 80 samples from 10 different fingerprints, bozoroth similarity scores, nfiq quality scores, and fingerprint type classifications were computed with the NBIS software. The accuracy was calculated by dividing the number of correctly classified pairs by the number of all comparisons.

## IV. Results and Discussion

### A. Results

Fig. 1 displays a concentrated impostor curve with lower scores, while genuine scores are more dispersed. Fig. 2 shows higher scores along the diagonal, however some higher scores that are detached from it can be recognized. Table I presents the calculated accuracy and thresholds.

TABLE I
Comparison of General and Type-Based Classification

| Classification | Threshold | Accuracy [%] |
|---|---|---|
| **General** | 20 | 97.3 |
| **Type-Based** | $20.5 \pm 3.8$ | $94.4 \pm 4.8$ |

### B. Discussion

Fig. 1 shows a substantial portion of genuine matches below the curve showing impostor matches. The possible cause might be lower qualities of samples as shown in Fig. 3. Coincidentally, both accuracies do not reach the highest values. The reduced accuracy for type-based classification is likely due to greater similarity among subjects within the same class, resulting in fewer easily identifiable impostors.

## V. Conclusion

In this task, I evaluated classification accuracy using thresholds for both general and type-based methods, finding that general classification yielded higher accuracy.

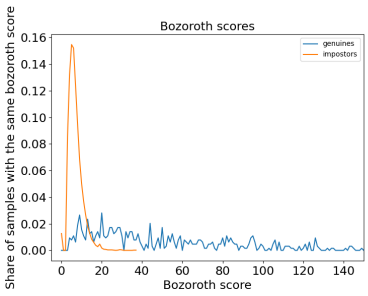


Fig. 1. Distribution of bozorth scores for both impostor and genuine comparisons

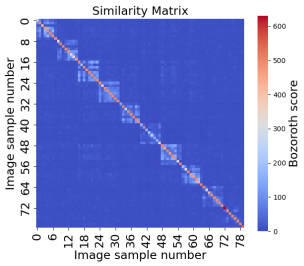


Fig. 2. Similarity matrix showing bozoroth scores of the comparison of all fingerprint samples

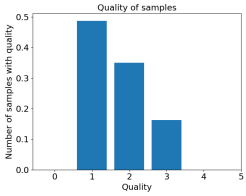


Fig. 3. Distribution of quality scores of fingerprint samples calculated by the nfiq algorithm