Assignment #1: Fingerprint Recognition

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I. Introduction

We implement a fingerprint recognition pipeline using NBIS components (WSQ, `mindtct`, `bozorth3`, `nfiq`, `pcasys`) and evaluate matching performance through genuine/impostor score distributions and threshold-based classification.

II. Methodology

Images were converted to WSQ and minutiae extracted using `mindtct`. All unique pairs were compared with `bozorth3`. The decision threshold was selected at the Equal Error Rate (EER) where FAR equals FRR, determined by sweeping thresholds (step 5) and computing error rates. NFIQ assessed quality (1=best, 5=worst); PCASYS predicted fingerprint type.

III. Experiments and Results

Dataset: DB1_B subset. **Pipeline:** PNG→WSQ, `mindtct`→.xyt, pairwise `bozorth3`. Fig. 1 shows clear genuine/impostor separation. Fig. 2 displays FAR/FRR curves intersecting at threshold 15 (EER=9.83%). Fig. 3 shows NFIQ distribution. Fig. 4 confirms intra-subject similarity. Table I summarizes key metrics.
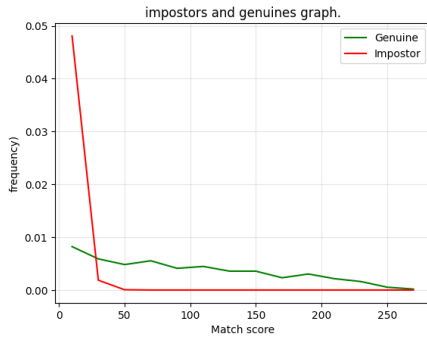

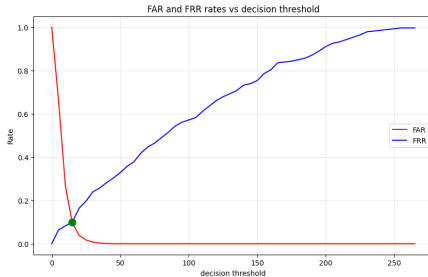Fig. 1. Genuine (green) vs impostor (red) score distributions.

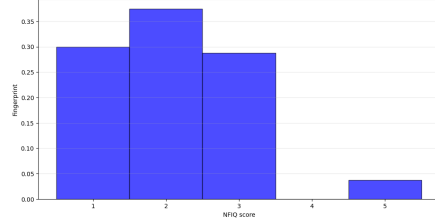Fig. 2. FAR and FRR vs threshold; EER at intersection.
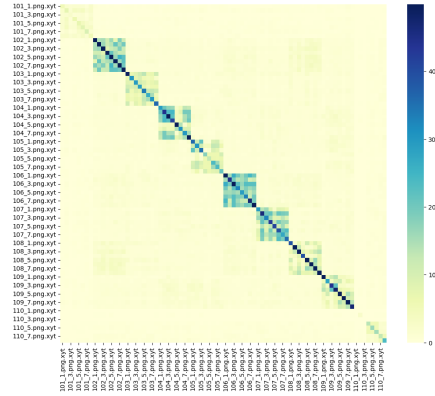

Fig. 3. NFIQ quality distribution (1=best, 5=worst).

Fig. 4. Pairwise similarity matrix showing diagonal blocks.

TABLE I
Key metrics at chosen threshold

Metric	Value
EER threshold	15
EER (%)	9.83
Accuracy	0.9032

IV. Conclusion

The NBIS pipeline successfully separated genuine from impostor matches. EER-based threshold selection provides balanced performance. NFIQ reveals quality variations; PCASYS type filtering can further improve robustness.