Face Recognition using PCA (Eigenfaces) + ANN

This report summarizes a PCA + ANN pipeline for face recognition, including surrogate covariance PCA for eigenfaces, a simple backprop neural network for classification, and open-set imposter detection via softmax-thresholding.

Dataset & Preprocessing

Dataset root: /mnt/data/dataset_extracted

Images are converted to grayscale, resized to 64x64, vectorized (mn x p), mean-centered, and projected onto the top-k principal components (eigenfaces).

Methodology

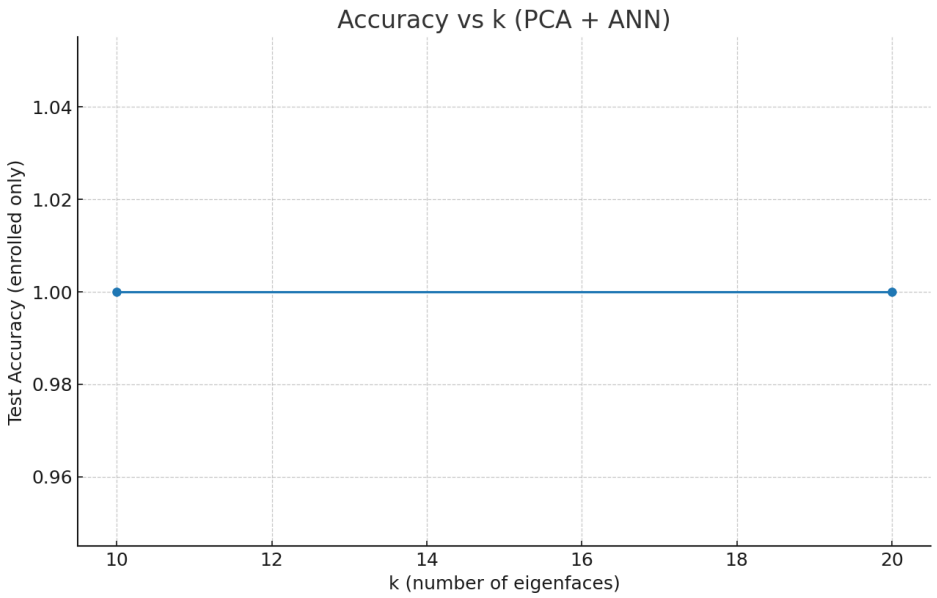
1) Build Face_Db (mn x p). 2) Compute mean face M (mn x 1). 3) Mean-center: Δ = X - M. 4) Surrogate covariance S = Δ■Δ (p x p). 5) Eigen-decomposition of S; map eigenvectors back to image space to get eigenfaces. 6) Project each face to k-D signature ω. 7) Train an ANN on ω to predict identity. 8) Calibrate a softmax threshold on validation data for imposter detection.

Results (Enrolled Only)

k values tried: [10, 20]

Test accuracy (per k): [1.0, 1.0]

Best k: 10



Open-Set (Imposter) Metrics

k=10: thr=1.0, enroll_acc_open=1.0, imp_det_rate=nan | k=20: thr=1.0, enroll_acc_open=1.0, imp_det_rate=nan

Notes

If this PDF shows placeholders or empty plots, run the script locally to download the dataset and regenerate results. The script produces images and a fresh PDF with actual metrics.