Face Verification Using FaceNet Embeddings

ComSys Hackathon 5 - Task B

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1. Objective

The goal of Task B is to verify whether two facial images belong to the same identity using deep face embeddings and similarity measures. This is treated as a binary classification task (match or non-match).

2. Pipeline Overview

- Face detection using **MTCNN**.
- Embedding extraction via pretrained **InceptionResnetV1 (FaceNet)**.
- Generation of positive (same person) and negative (different person) verification pairs.
- Cosine similarity computation between embeddings.
- Threshold selection using ROC curve analysis on training pairs.

3. Dataset

- Images organized by identity in `train/` and `val/`.
- Pairs generated from all available identities.
- Embeddings cached and reused for efficiency.

4. Evaluation Strategy

- Cosine similarity score computed for each pair.
- ROC curve used to determine optimal threshold.
- Evaluation performed on an 80/20 train-test split of the pair dataset.

5. Final Metrics

Training Metrics

- Accuracy: 88.25%
- Precision: 92.54%
- Recall: 83.18%
- F1 Score: 87.61%

Validation Metrics

- Accuracy: 88.26%
- Precision: 92.56%
- Recall: 83.26%
- F1 Score: 87.67%

6. Summary

The proposed face verification pipeline leverages FaceNet embeddings and cosine similarity for reliable pairwise identity verification. It achieves consistent training and validation performance above 88% accuracy.

At the time of model development, it was not specified that separate training and testing metrics would be required. Due to time constraints during submission, we are reporting the evaluation results obtained from our combined training and validation process. However, in the submitted code, we have updated the evaluation metrics for ease of verification.