1 ROBUST FACE RECOGNITION UNDER CHALLENGIN VISUAL CONDITIONS USING DEEP LEARNING

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Technical Summary

Objective:
To build a deep learning-based face recognition model that remains accurate under visual distortions like blur, fog, rain, and overexposure.

Approach & Innovations:
The model learns to recognize faces using both clean and synthetically distorted images, allowing it to extract distortion-invariant features. The use of identity-labeled distortion variants helps improve generalization without explicit preprocessing.

Dataset Structure:
Images are organized by identity folders (`001frontal`, etc.), each with a clean image and a subfolder of distorted versions. This supports supervised training for identity classification.

Model Architecture:
A ResNet-like CNN with:

- Convolutional + ReLU + BatchNorm layers
- MaxPooling for downsampling
- Fully Connected layers
- Softmax output for classification
  Supports use with contrastive or triplet loss.

Training Strategy:

- Input: 224×224 images, normalized and augmented
- Loss: CrossEntropyLoss
- Optimizer: Adam
- GPU training enabled
- Tracked with `tqdm`

Evaluation Metrics:
Used top-1 accuracy, confusion matrix, and t-SNE/PCA plots. Good performance under most distortions, weaker under extreme conditions.

Conclusion:
The model successfully recognizes identities despite visual distortions. Future improvements could focus on better balance in distortion types and embedding-based loss functions.