THE DEBUGGERS

Robust Face Analysis in Challenging Environments

One-page technical summary

This project offers a comprehensive and modular pipeline for two advanced facial analysis tasks: gender classification and face matching (verification with distorted inputs).

1. **Gender Classification [Task A]:**

This task uses a ResNet18 convolutional neural network to classify face images as male or female. Key features include:

- A clear, folder-based dataset structure for easy data management.
- Robust data augmentation strategies to improve generalization and fairness across diverse images.
- Scripts for automatic dataset parsing, CSV generation, model training, validation, single-image prediction, and real-time webcam inference.
- High performance on standard metrics (accuracy, precision, recall, F1-score), designed for fairness and generalizability.

2. **Face Matching (Verification with Distorted Inputs) [Task B]:**

This system implements face verification using metric learning approaches (Siamese or Triplet networks) to create a discriminative embedding space. It's designed for open-set verification, meaning it can match distorted or altered test images to identities not seen during training. The system is robust against real-world image distortions like occlusion or blur and includes:

- A flexible matching function that computes embeddings and returns positive or negative matches based on a configurable distance threshold.
- Support for evaluation protocols like one-shot or few-shot matching.

3. **Tech Stack:**

- Programming Language: Python 3.8+
- Deep Learning Framework: PyTorch
- Computer Vision: torchvision, albumentations, opencv-python, pillow
- Data Handling: pandas, tqdm
- Evaluation & Metrics: scikit-learn
- Environment Management: Python virtual environments (venv)
- Documentation & Visualization: Markdown, model diagrams (PNG)

4. **Key Features:**

- Modular and Well-Documented.
- Automated Data and Evaluation.
- Transparent and Reproducible.

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