Task-A : Gender Classification Using ResNet-18

Objective

To develop a binary gender classification model (male/female) using transfer learning with ResNet-18. The model is optimized to handle visually degraded and imbalanced face images.

Architecture & Approach

- Backbone: Pretrained ResNet-18 (ImageNet weights).
Transfer Learning: Frozen convolution layers.
Classifier: Final layer replaced with Linear(in_features, 1).
Activation: Sigmoid via BCEWithLogitsLoss.
Input Image Size: 224x224.
Device: GPU/CPU compatible.

Dataset Handling & Preprocessing

- Augmentations: Horizontal flip, Color jitter, Gaussian blur.
Normalization: ImageNet mean and std.
Dataset split: train/val from Task_A_Dataset.
Sampler: WeightedRandomSampler for balanced batches.
Class Weights: Used in BCEWithLogitsLoss.

Training Details

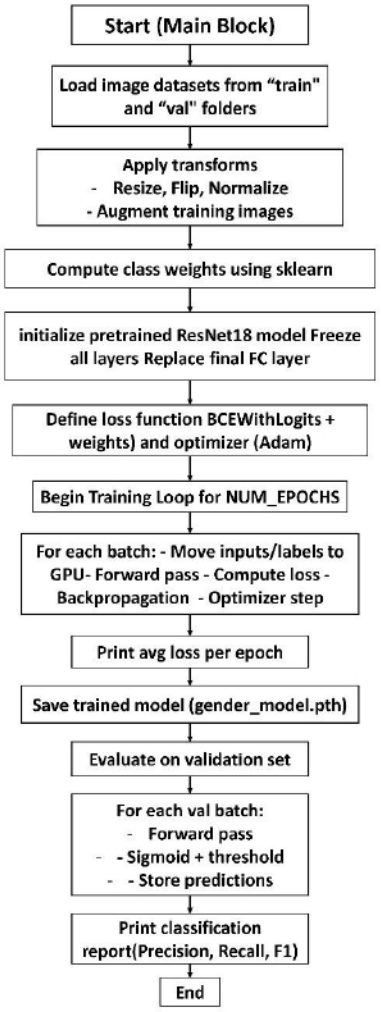
- Epochs: 30.
Batch Size: 32.
Optimizer: Adam (LR=0.0001).
Loss Function: BCEWithLogitsLoss with class weights.
Output: Model saved to Binary_Classification_model.pth

Evaluation & Prediction

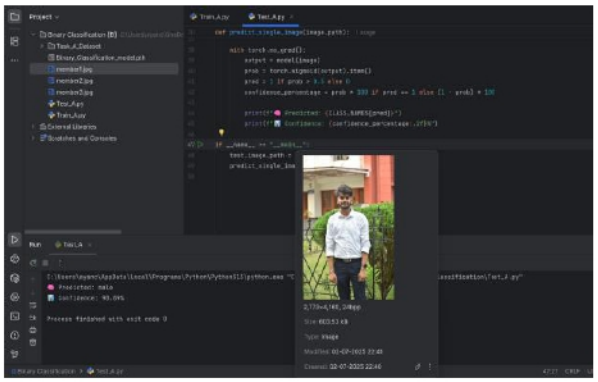
- Metrics: Precision, Recall, F1-score on validation set.
Test: Single image prediction with confidence %.
Threshold: Sigmoid > 0.5 = male; else female.

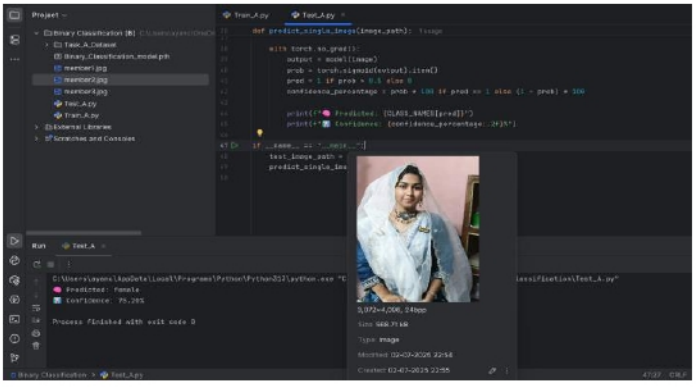
Innovations

- Handles imbalanced data with sampler and weighted loss.
Robust to noise using GaussianBlur and ColorJitter.
Outputs human-readable confidence percentage in prediction.
- Combines simplicity of transfer learning with real-world effectiveness.



workflow





outputs