Face Re-Identification Project Documentation

1. Project Overview

This project is to develop a face re-identification system that can identify the individuals from the facial images. In this they are three deep learning pre-trained models are used to train: **MobilNetV2**, **VGG16** and **ResNet50V2**. The system was trained and evaluated using 7 facial images (Classes), predictions were done on test images of 10, 50 and 100 Images.

2. Dataset Information

The dataset contains of Facial Images that belongs to 7 different persons. Each Class corresponds to different Persons:

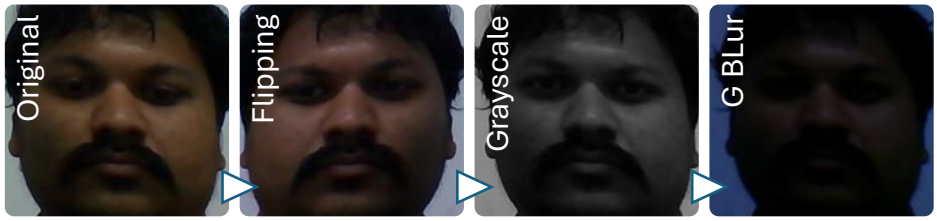
1. Chakri	2. Sai Priya	3. Uday
4. Vijay	5. Kavya Sri	6. Gowthami
7. Kumar		

Number Of Images

- Each class contains 4000 images after augmentations.
- Total 31, 976 images were used in this dataset for model building.
- Dataset was split into Training, Validation and Testing sets with a random split ratio of 80% train, 10% val and 10% test.

Sample Images

Class 1: Chakri



Class: Gowthami

3. Model Architecture

- **MobileNetV2:** A lightweight neural network designed for mobile devices, focusing on efficiency while maintaining accuracy.
- **VGG16:** A deep neural network with 16 convolutional layers, commonly used as a baseline for image classification tasks.
- **ResNet50:** A deep residual neural network that uses skip connections to avoid the vanishing gradient problem, making it effective for training very deep networks.

4. Training Process

➢ Hyperparameters

Model were trained with the following hypermaters:

- Batch Size: 32
- Epochs: 10 (Early stopping added)
- Optimizer: Adam
- Loss Function: Categorical Crossentropy

➢ Data Augmentation

To increase the variability of the dataset and prevent overfitting, the following augmentation techniques were applied.

- Gaussian Blur
- Grayscale
- Flipping

5. Training Process

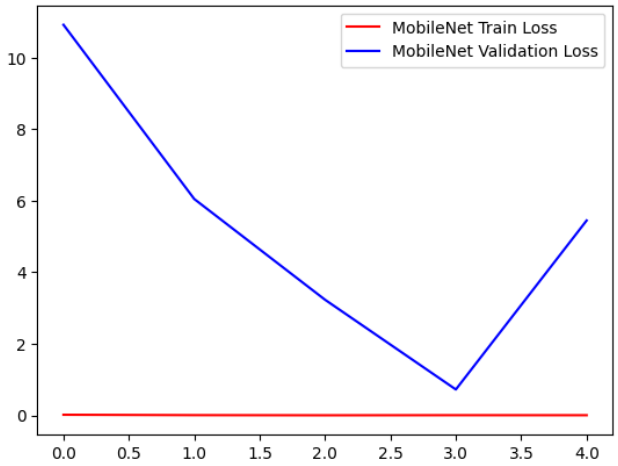
The models were trained on the dataset for up to 10 epochs with **early stopping** implemented to halt the training when the validation loss stopped improving. The models were trained using three architectures: **MobileNetV2**, **VGG16**, and **ResNet50V2**.

5.1.Early Stopping and Best Epochs (By Model Wise)

Early stopping was applied with a patience level of epochs to prevent overfitting, based on the **validation loss**. Below are the details of the epochs for each model where training stopped:

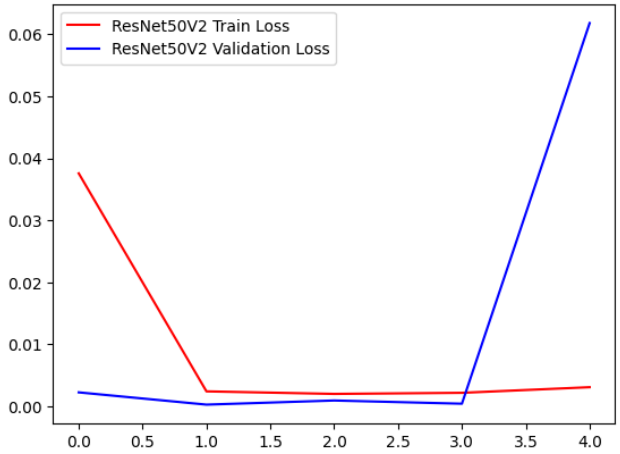
a. **MobileNetV2:**

- **Total Epochs**: Stopped at epoch 4 due to early stopping.
- **Best Epoch**: Epoch 3 with a validation loss of 1.53.



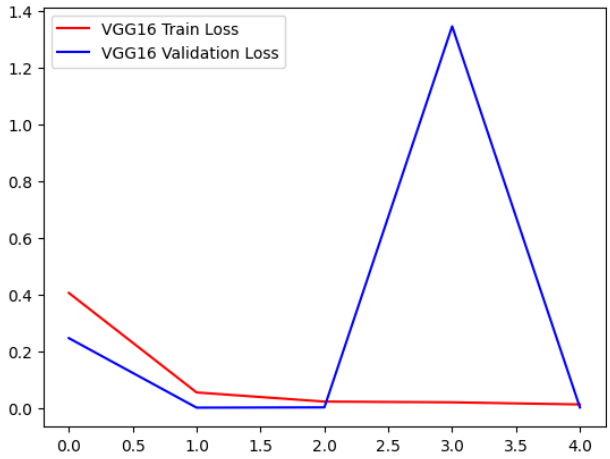
b. **ResNet50V2:**

- **Total Epochs**: Stopped at epoch 4 due to early stopping.
- **Best Epoch**: Epoch 3 with a validation loss of 0.051.



c. **VGG16:**

- **Total Epochs**: Stopped at epoch 4 due to early stopping.
- **Best Epoch**: Epoch 2 with a validation loss of 0.19.



Models Speed Comparison (. keras)

Models	Model Size	10 Images	50 Images	100 Images
MobileNetV2	146 MB	18.75 Seconds	58.72 Seconds	117.18 Seconds
VGG16	216 MB	5.11 Seconds	19.62 Seconds	39.62 Seconds
Resnet50v2	282 MB	11.01 Seconds	12.85 Seconds	25.78 Seconds

Models Speed Comparison (. ONNX)

Models	Model Size	10 Images	50 Images	100 Images
MobileNetV2	48.4 MB	0.27 Seconds	1.23 Seconds	1.73 Seconds
VGG16	72.1 MB	1.98 Seconds	9.14 Seconds	18.18 Seconds
Resnet50v2	153 MB	0.83 Seconds	3.18 Seconds	6.21 Seconds

a. **MobileNetV2**

Serial No.	Predicted Class	Actual Class
1	Uday	Chakri
2	Chakri	Chakri
3	gowthami	Gowthami
4	Uday	Kavya
5	Uday	Kavya

b. **VGG16**

Serial No.	Predicted Class	Actual Class
1	Chakri	Chakri
2	Chakri	Chakri
3	Gowthami	Gowthami
4	Kavya	Kavya
5	Kavya	Kavya

c. **Resnet50v2**

Serial No.	Predicted Class	Actual Class
1	Chakri	Chakri
2	Chakri	Chakri
3	Gowthami	Gowthami
4	Kavya	Kavya
5	Kavya	Kavya