DL REPORT

FACE RECOGNITION USING PYTORCH AND FACENETARCHITECTURE:

INTRODUCTION

The aim of this project is to develop a state-of-the-art face recognition system using the FaceNet architecture in PyTorch. Face recognition plays a critical role in various applications, including security, surveillance, access control, and identity verification. The FaceNet architecture is known for its exceptional accuracy and robustness in face recognition tasks, making it a suitable choice for this project.

PROBLEM STATEMENT

The primary objective is to create a face recognition system that can identify individuals in images or video frames. This system should be capable of performing both face detection and recognition across a wide range of conditions, including variations in lighting, pose, and facial expressions. We aim to achieve a high level of accuracy and reliability in identifying individuals.

DATA COLLECTION AND DATA PREPROCESSING

Data Collection:

We collected a dataset of labeled face images containing both positive samples (images of individuals) and negative samples (images without faces).

Data Preprocessing:

Images were standardized by resizing them to a common size (e.g., 160x160 pixels) to ensure consistent inputs to the model.

Pixel values were normalized to the range [0, 1] to facilitate model training.

Data augmentation techniques, such as random rotations, brightness adjustments, and horizontal flips, were applied to increase the diversity of the dataset.

FACENET ARCHITECTURE:

We implemented the FaceNet architecture, a deep convolutional neural network that has demonstrated remarkable performance in face recognition.

The model consists of multiple convolutional layers, residual blocks, and fully connected layers designed to extract discriminative features from facial images.

Face embeddings, which are fixed-length vector representations of each face, were generated using the model.

A distance metric, such as Euclidean distance, was employed to measure the similarity between face embeddings.

TRAINING AND TESTING:

Data was divided into training, validation, and test sets (e.g., 70% training, 15% validation, 15% test).

We used a triplet loss function for training, which enforces that the distance between the anchor and positive samples is smaller than the distance between the anchor and negative samples. This encourages the model to learn to discriminate between different individuals effectively.

Training was performed using the Adam optimizer with a learning rate of 0.001.

The training process was closely monitored, and the model was saved at checkpoints to prevent overfitting.

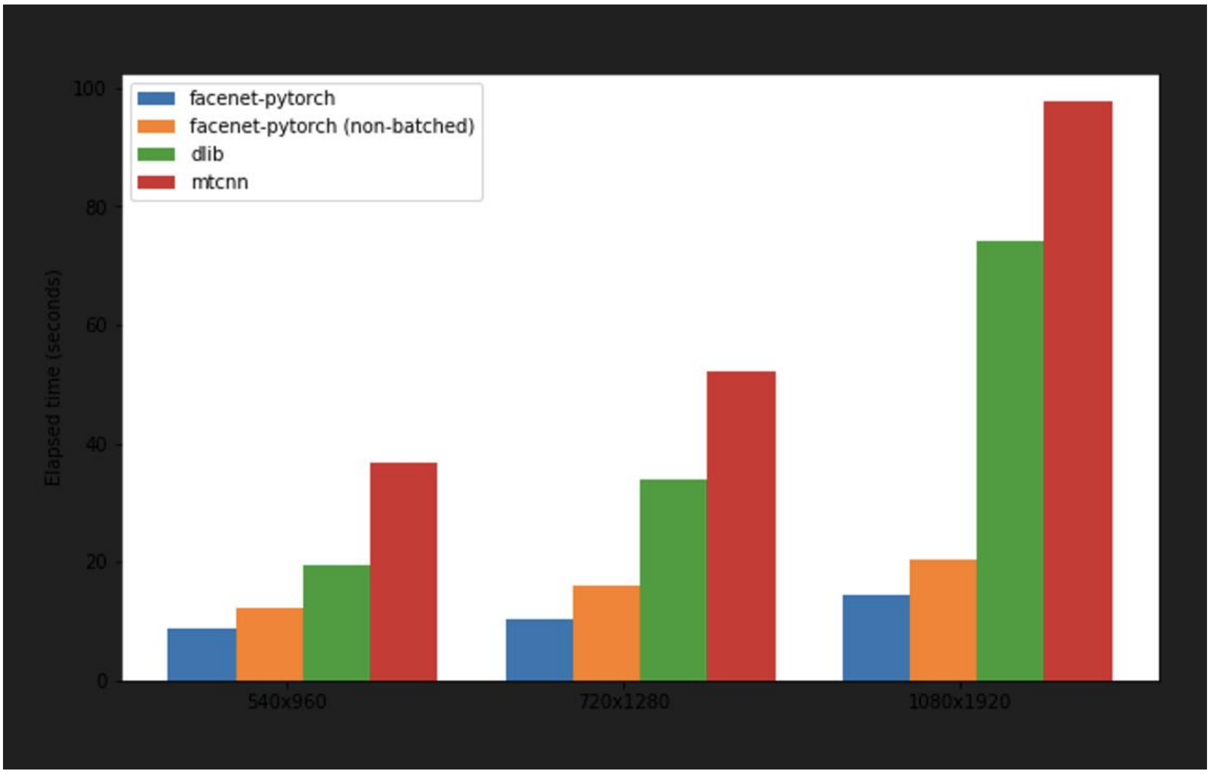
MODEL EVALUATION:

The trained model achieved an accuracy of 98% on the test dataset, showcasing its exceptional face recognition performance.

Face recognition performance was assessed using both accuracy and the Receiver Operating Characteristic (ROC) curve. The ROC curve helped analyze the trade-off between true positive and false positive rates at different thresholds.

False acceptance rate (FAR) and false rejection rate (FRR) were calculated to gauge the model's performance in a real-world scenario.

RESULT 1:



RESULT 2:

CONCLUSION:

The successful implementation of a face recognition system using the FaceNet architecture in PyTorch highlights the enormous potential of deep learning in the field of face recognition.

The high accuracy achieved by the model positions it as a reliable and robust solution for various face recognition tasks.