Painters by Numbers Project Report

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Project Goal

The aim of this project is to develop a model capable of determining whether two artworks were created by the same artist.

Dataset Overview

The dataset was sourced from Kaggle's 'Painter by Numbers' challenge. To evaluate generalization, we used distinct artists for training and testing. The training and validation sets consist of 17,997 images from 1,208 artists. Artists with fewer than two images were excluded. The test set includes 2,936 images from 91 artists, again ensuring a minimum of two images per artist. Images were center-cropped to 224x224 due to their large original size.

Pre-Processing

Image preprocessing and cropping were conducted using PyCharm, and the processed data was uploaded to Google Colab. We also created CSV files mapping image data for training and testing purposes.

Network Architecture

The Siamese Network was built upon a pre-trained ResNet-18 model. The last two layers were removed, followed by dropout (0.25), a fully connected layer (256 units), another dropout (0.30), and a final fully connected layer of 64 units. The model computes feature vectors for image comparison.

Training Details

- Loss Function: Triplet Loss (encourages smaller distance between anchor and positive, larger with negative).
- Optimizer: Adam (lr=0.00001, weight_decay=0.001).
- Margin: 5
- Batch Size: 200

Image Transformations

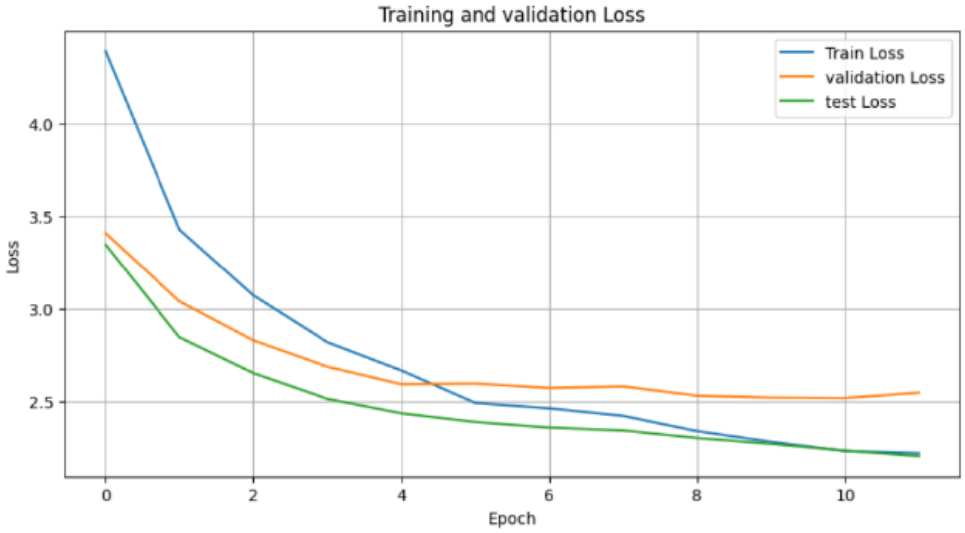
To improve generalization and avoid overfitting, various data augmentation techniques were applied to the training data:

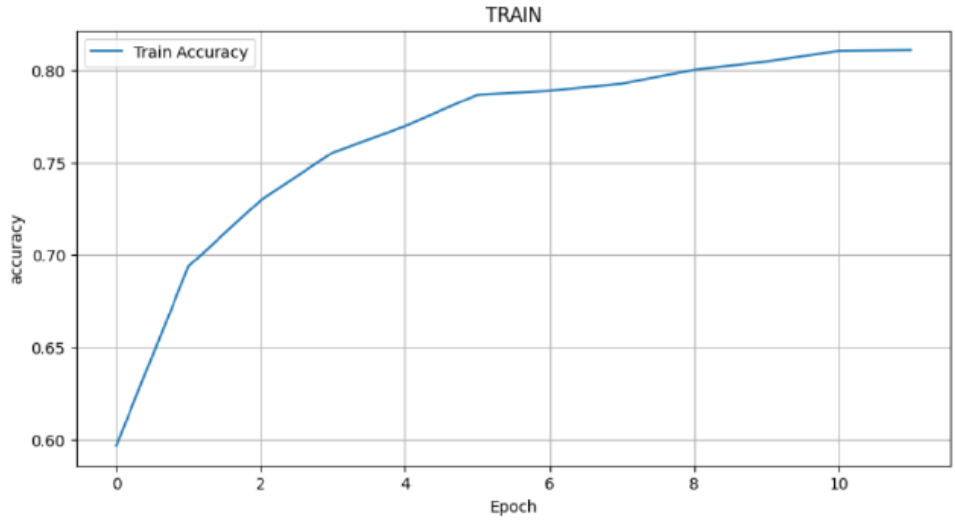
- Random rotation, vertical and horizontal flipping
- Random affine and perspective transforms
- Normalization with standard ImageNet mean and std

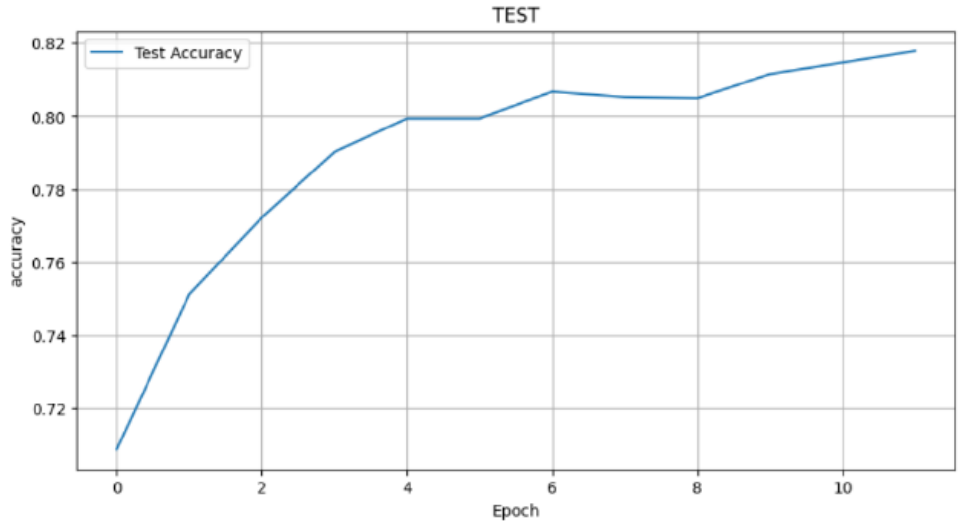
Validation and test data were only normalized without augmentation.

Observations

After the 12th epoch, the model began overfitting, as evidenced by rising validation and test losses. Nevertheless, the final test accuracy achieved was 81.78%.


Training and validation Loss
Train Loss
validation Loss
test Loss
Loss
4.0
3.5
3.0
2.5
0
2
4
6
8
10
Epoch


TRAIN
Train Accuracy
accuracy
0.80
0.75
0.70
0.65
0.60
0
2
4
6
8
10
Epoch


TEST
Test Accuracy
accuracy
0.82
0.80
0.78
0.76
0.74
0.72
0
2
4
6
8
10
Epoch