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Neural Network and Deep Learning Assignment-9

[Code link]

a

[Code link]

An autoencoder was trained on the CIFAR-10 dataset, and 2D features were extracted from its bottleneck layer. The output of this model is given below after train the model:

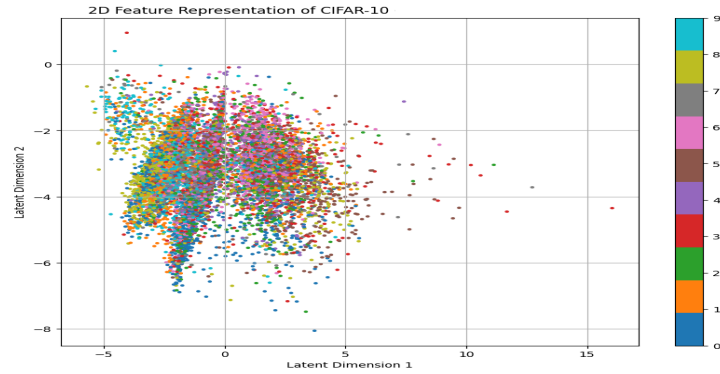


Figure 1: 2D Feature Representation of CIFAR-10 Extracted by the Autoencoder

b

[Code link]

Features were extracted from a pre-trained CNN and reduced to 2D using PCA and t-SNE. Compared to autoencoder features, the CNN-based features showed better class separation in the scatter plot highlighting the power of transfer learning. The output is given below:-

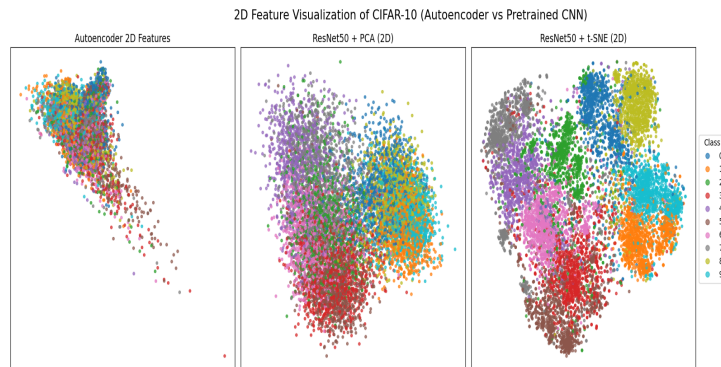


Figure 2: Comparison of 2D Feature Representations from Autoencoder and Pre-trained CNN

[Code link]

A denoising autoencoder was trained on noisy CIFAR-10 images to learn clean image reconstruction. The model successfully removed noise and preserved key image structures showing its ability to learn robust representations. The output of the model is given below:-

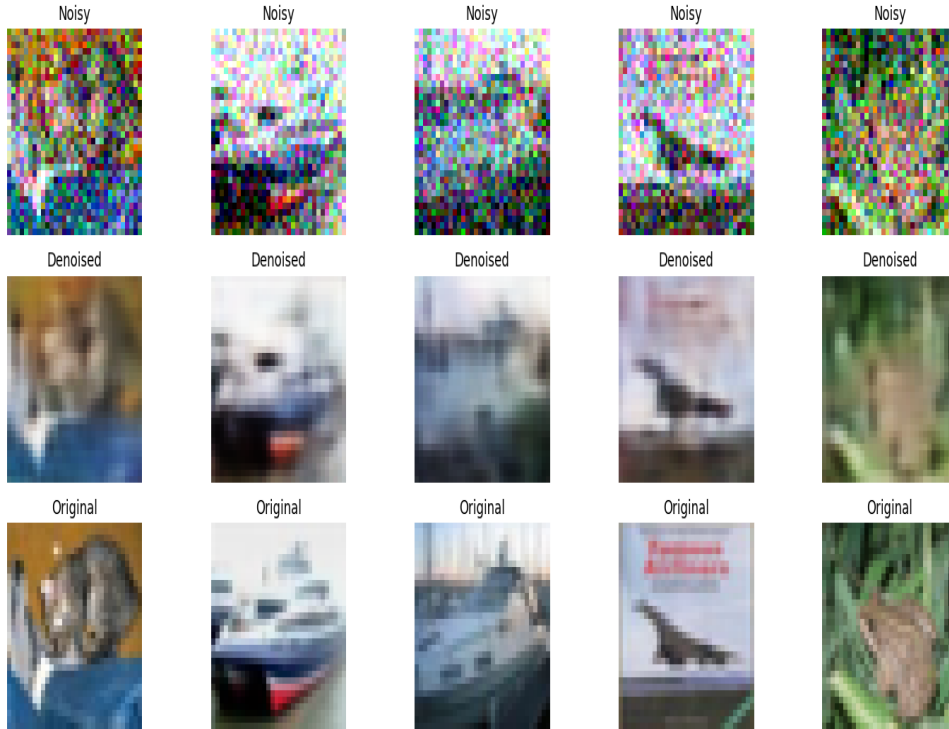


Figure 3: Reconstruction of Noisy CIFAR-10 Images Using a Denoising Autoencoder

d

[Code link]

A CNN classifier was trained on the CIFAR-10 dataset without using any image augmentation techniques. The outputs are given below after training the model:-

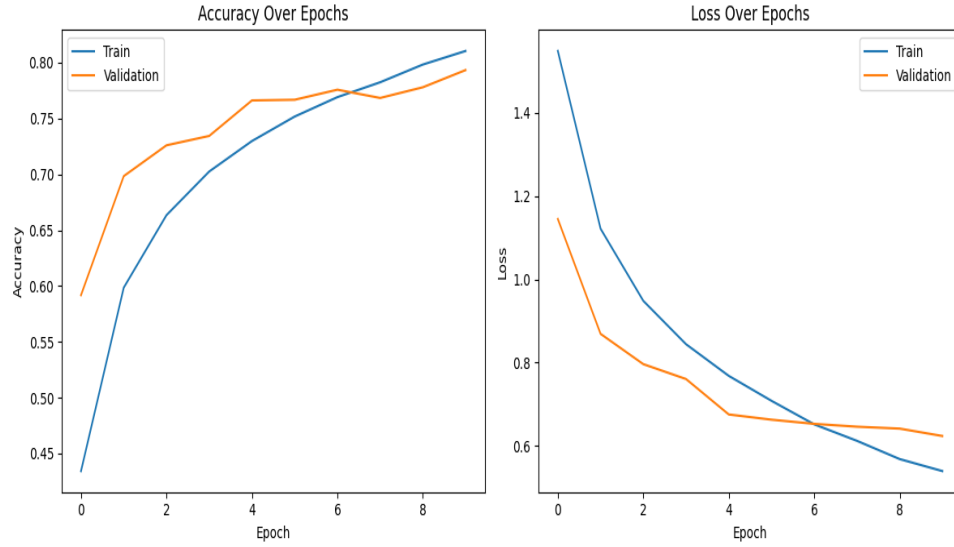


Figure 4: Training and Validation Loss and Accuracy of CNN on CIFAR-10 Without Data Augmentation

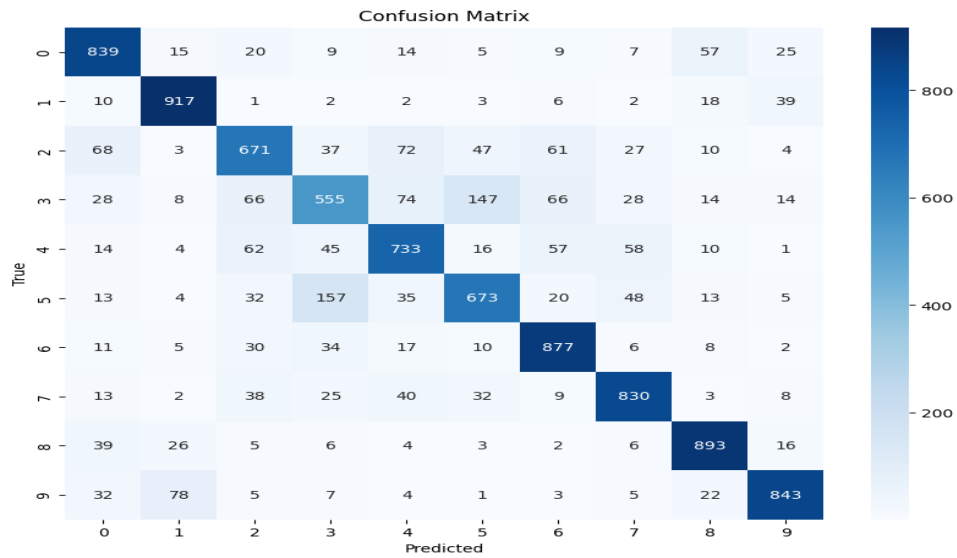


Figure 5: Confusion Matrix of CNN Classifier Predictions on CIFAR-10 Test Set

[Code link]

A CNN classifier was trained on the CIFAR-10 dataset using both single and multiple data augmentation techniques. The results are give below after training the model:-



Figure 6: Training and Validation Loss and Accuracy of CNN on CIFAR-10 With single and multiple data augmentation techniques

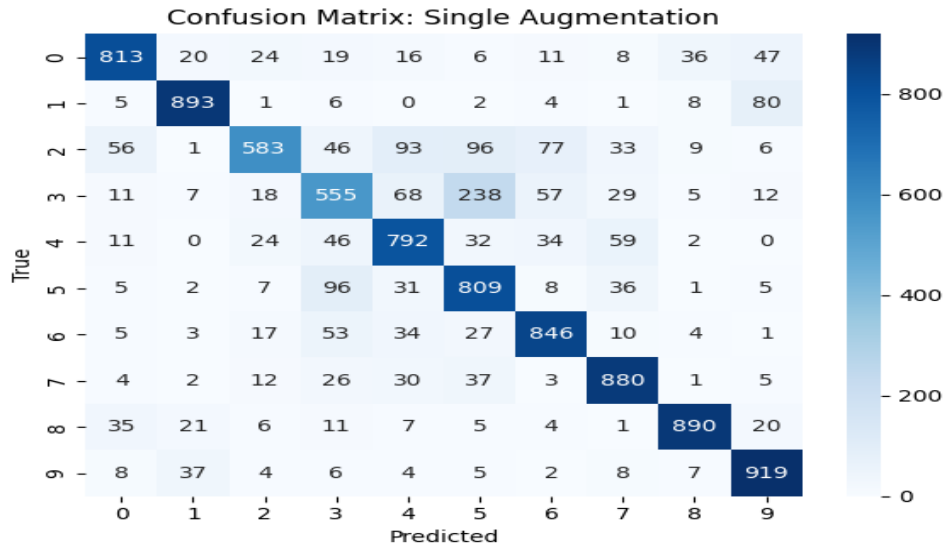


Figure 7: Confusion Matrix of CNN Classifier Predictions on CIFAR-10 Test Set using single data augmentation techniques

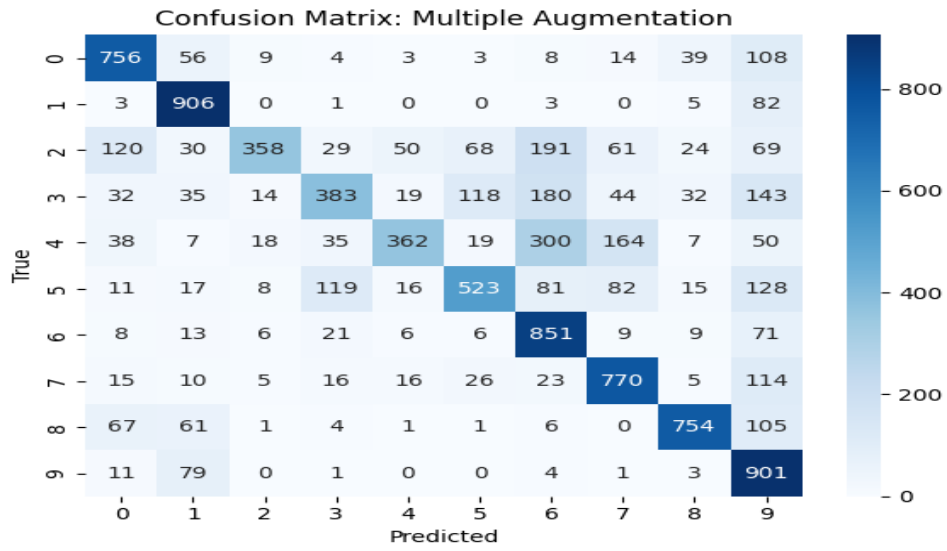


Figure 8: Confusion Matrix of CNN Classifier Predictions on CIFAR-10 Test Set using multiple data augmentation techniques