Md: Israil Hosen

Roll: 2010876110

Neural Network and Deep Learning Assignment-11

[Code link]

a

[Code link]

Comparison of Face Verification Models using BCE Loss, Contrastive Loss, and Triplet Loss on MNIST digit dataset

Three face verification models were trained using different loss functions: Binary Cross-Entropy Loss, Contrastive Loss, and Triplet Loss, respectively. The outputs for each model are presented below:-

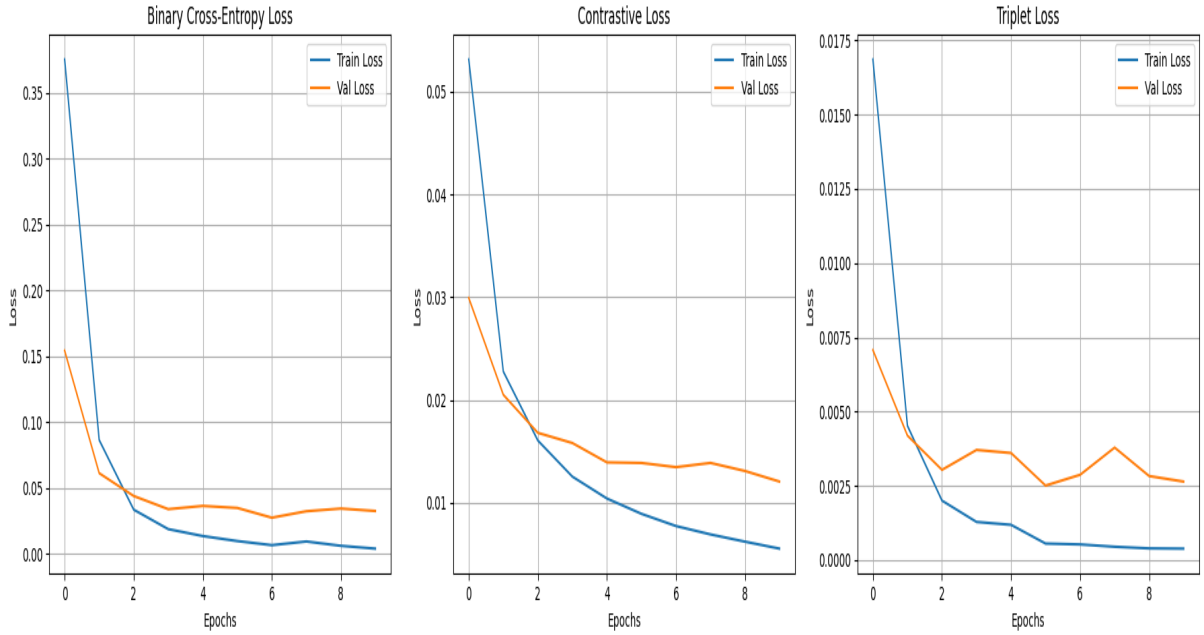

Figure 1: Training and Validation Loss Curves for Face Verifiers Using BCE, Contrastive, and Triplet Losses

Results and Discussion

The model was trained for a total of 10 epochs using three different loss functions: Binary Cross-Entropy (BCE) Loss, Contrastive Loss, and Triplet Loss. After training the gap between training and validation losses was smallest for BCE Loss larger for Contrastive Loss and largest for Triplet Loss. This suggests that the model may have overfitted the most when trained with Triplet Loss and the least with BCE Loss.

b

[**Code link**]

Comparison of Binary Cross-Entropy and Mean Squared Error as Reconstruction Loss Functions in Variational Autoencoder Training

After training the VAE with two different reconstruction losses which are the Binary Cross-Entropy (BCE) and Mean Squared Error (MSE) loss the reconstructed images are shown below. As can be observed, the reconstructions obtained using MSE loss are clearer compared to those generated using BCE loss.

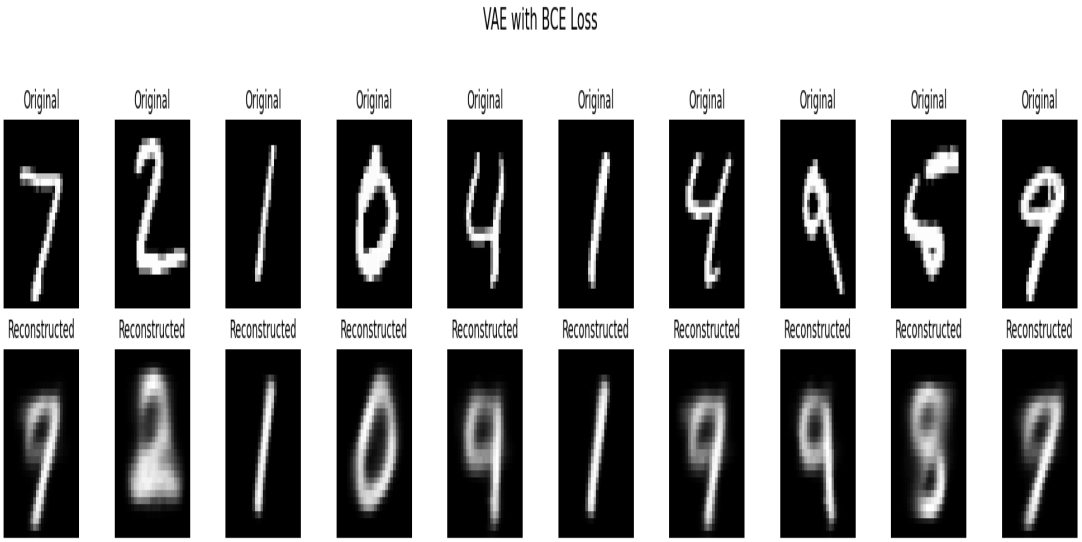

Figure 2: Original and Reconstructed Images with BCE Loss

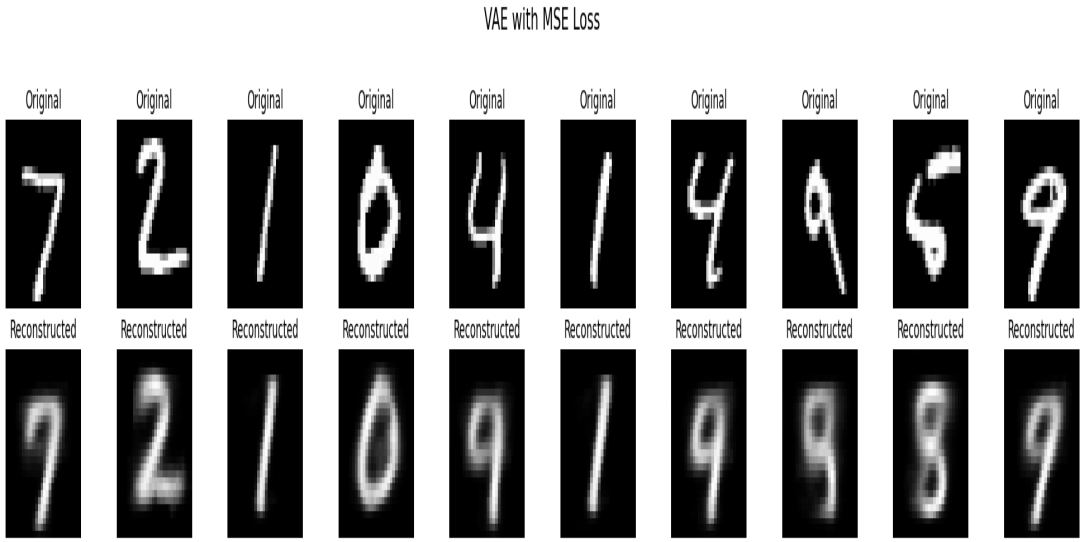

Figure 3: Original and Reconstructed Images with MSE Loss

Here is the comparison of training and validation loss curves for the reconstruction task using Binary Cross-Entropy (BCE) loss and Mean Squared Error (MSE) loss. The curves show how each loss function affects the model's learning and generalization performance during training.

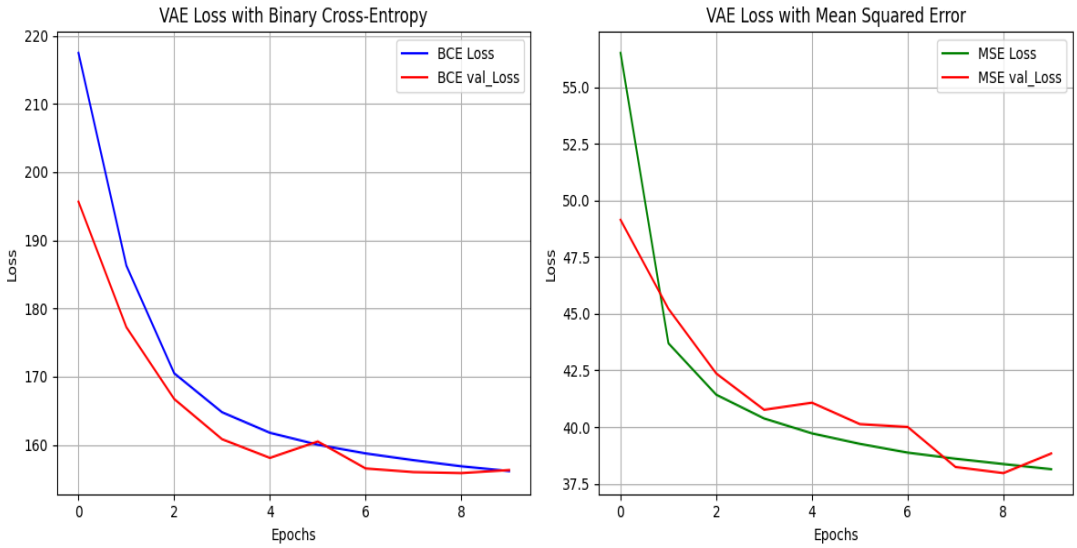

Figure 4: Training and Validation Loss Curves for VAE Using BCE and MSE Reconstruction Losses

Results and Discussion

After training for a few epochs the VAE model was evaluated using two different loss functions as reconstruction losses: Binary Cross-Entropy (BCE) Loss and Mean Squared Error (MSE) Loss. It was observed that the reconstructed images were clearer and more visually accurate when MSE Loss was used. when BCE Loss was applied some of the

generated images appeared blurry and difficult to interpret indicating that the model struggled to reconstruct certain inputs effectively. Therefore, in this experiment better reconstruction quality was achieved when the MSE Loss function was used.

Additionally, the loss curves for both reconstruction losses were plotted. In the case of BCE Loss the validation loss remained consistently lower than the training loss throughout the training process. However for MSE Loss the validation loss was observed to be slightly higher than the training loss during some epochs.