Spring 2025: Neural Networks & Deep Learning – ICP -6

Assignment -6

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Github Link: https://github.com/VanithaChintalapudi10/Neural-network-deep-learning

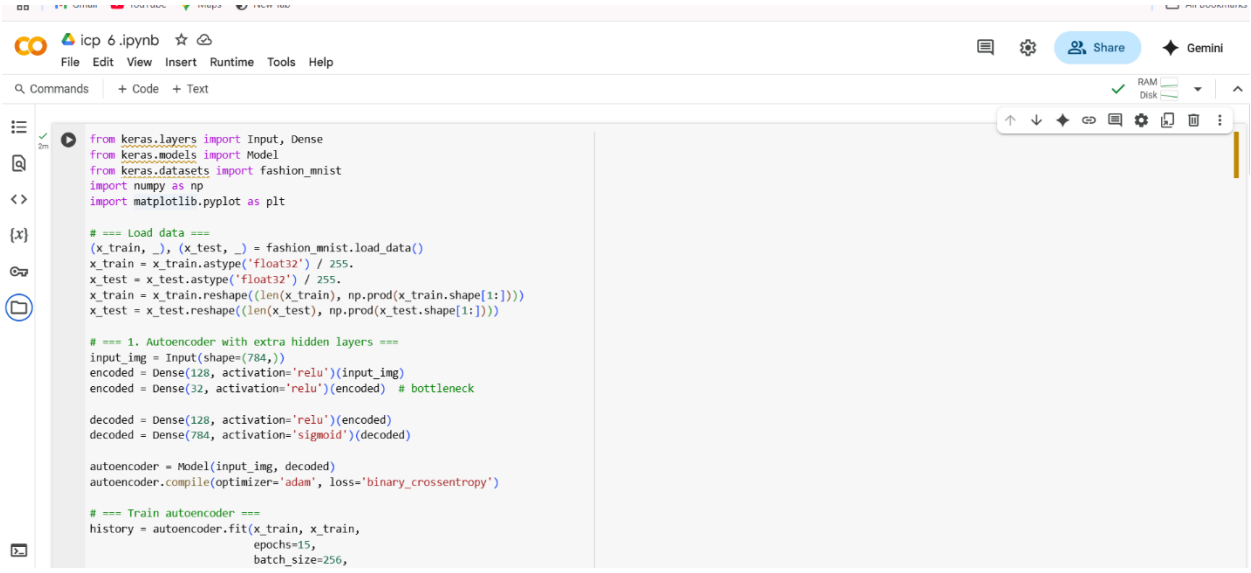
Video Link: https://drive.google.com/file/d/1OmOJQLiMaBG7ujRWbXzSZLCl6webni1/view?usp=drive_link

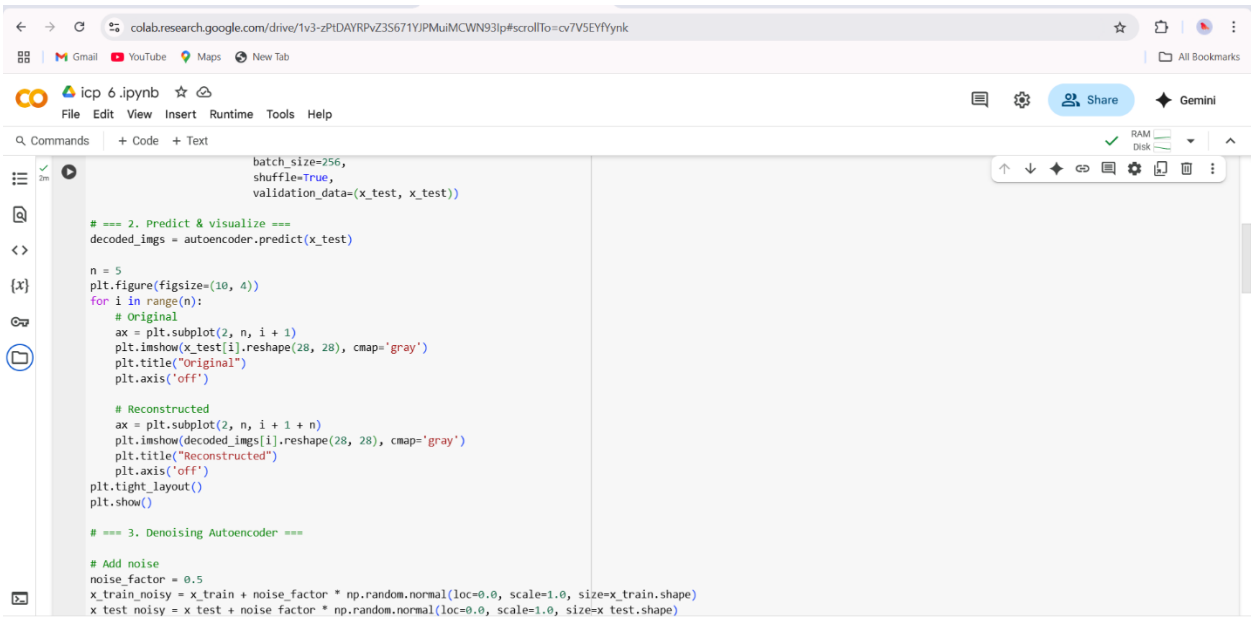
1. Add one more hidden layer to autoencoder

2. Do the prediction on the test data and then visualize one of the reconstructed version of that test data. Also, visualize the same test data before reconstruction using Matplotlib

3. Repeat the question 2 on the denoisening autoencoder

4. plot loss and accuracy using the history object




colab.research.google.com/drive/1v3-zPtDAYRPvZ3S671YJPMuiMCWN93Ip#scrollTo=cv7V5EYfYynk
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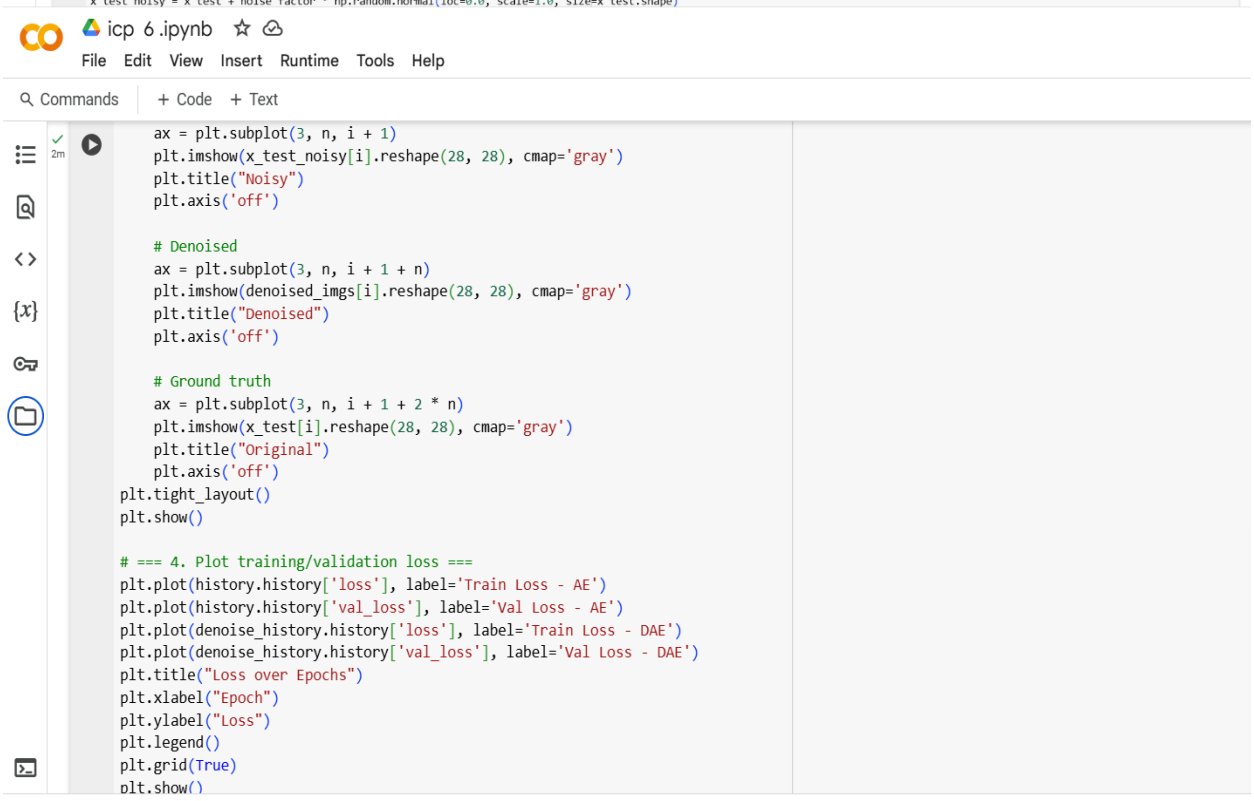
batch_size=256,
shuffle=True,
validation_data=(x_test, x_test))
# === 2. Predict & visualize ===
decoded_imgs = autoencoder.predict(x_test)
n = 5
plt.figure(figsize=(10, 4))
for i in range(n):
# Original
ax = plt.subplot(2, n, i + 1)
plt.imshow(x_test[i].reshape(28, 28), cmap='gray')
plt.title("Original")
plt.axis('off')
# Reconstructed
ax = plt.subplot(2, n, i + 1 + n)
plt.imshow(decoded_imgs[i].reshape(28, 28), cmap='gray')
plt.title("Reconstructed")
plt.axis('off')
plt.tight_layout()
plt.show()
# === 3. Denoising Autoencoder ===
# Add noise
noise_factor = 0.5
x_train_noisy = x_train + noise_factor * np.random.normal(loc=0.0, scale=1.0, size=x_train.shape)
x_test_noisy = x_test + noise_factor * np.random.normal(loc=0.0, scale=1.0, size=x_test.shape)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ax = plt.subplot(3, n, i + 1)
plt.imshow(x_test_noisy[i].reshape(28, 28), cmap='gray')
plt.title("Noisy")
plt.axis('off')
# Denoised
ax = plt.subplot(3, n, i + 1 + n)
plt.imshow(denoised_imgs[i].reshape(28, 28), cmap='gray')
plt.title("Denoised")
plt.axis('off')
# Ground truth
ax = plt.subplot(3, n, i + 1 + 2 * n)
plt.imshow(x_test[i].reshape(28, 28), cmap='gray')
plt.title("Original")
plt.axis('off')
plt.tight_layout()
plt.show()
# === 4. Plot training/validation loss ===
plt.plot(history.history['loss'], label='Train Loss - AE')
plt.plot(history.history['val_loss'], label='Val Loss - AE')
plt.plot(denoise_history.history['loss'], label='Train Loss - DAE')
plt.plot(denoise_history.history['val_loss'], label='Val Loss - DAE')
plt.title("Loss over Epochs")
plt.xlabel("Epoch")
plt.ylabel("Loss")
plt.legend()
plt.grid(True)
plt.show()

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plt.grid(True)
plt.show()
```

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Downloading data from https://storage.googleapis.com/tensorflow/tf-keras-datasets/train-labels-idx1-ubyte.gz
29515/29515 ━━━━━━━━━━━━━━━━━━━━ 0s 0us/step
Downloading data from https://storage.googleapis.com/tensorflow/tf-keras-datasets/train-images-idx3-ubyte.gz
26421880/26421880 ━━━━━━━━━━━━━━━━━━━━ 0s 0us/step
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5148/5148 ━━━━━━━━━━━━━━━━━━━━ 0s 0us/step
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4422102/4422102 ━━━━━━━━━━━━━━━━━━━━ 0s 0us/step
Epoch 1/15
235/235 ━━━━━━━━━━━━━━━━━━━━ 8s 25ms/step - loss: 0.4481 - val_loss: 0.3138
Epoch 2/15
235/235 ━━━━━━━━━━━━━━━━━━━━ 5s 19ms/step - loss: 0.3078 - val_loss: 0.3008
Epoch 3/15
235/235 ━━━━━━━━━━━━━━━━━━━━ 4s 18ms/step - loss: 0.2973 - val_loss: 0.2955
Epoch 4/15
235/235 ━━━━━━━━━━━━━━━━━━━━ 3s 15ms/step - loss: 0.2920 - val_loss: 0.2918
Epoch 5/15
235/235 ━━━━━━━━━━━━━━━━━━━━ 5s 14ms/step - loss: 0.2894 - val_loss: 0.2893
Epoch 6/15
235/235 ━━━━━━━━━━━━━━━━━━━━ 4s 18ms/step - loss: 0.2867 - val_loss: 0.2876
Epoch 7/15
235/235 ━━━━━━━━━━━━━━━━━━━━ 4s 14ms/step - loss: 0.2849 - val_loss: 0.2867
Epoch 8/15
235/235 ━━━━━━━━━━━━━━━━━━━━ 5s 15ms/step - loss: 0.2840 - val_loss: 0.2858
Epoch 9/15
235/235 ━━━━━━━━━━━━━━━━━━━━ 4s 19ms/step - loss: 0.2820 - val_loss: 0.2838
Epoch 10/15
235/235 ━━━━━━━━━━━━━━━━━━━━ 4s 15ms/step - loss: 0.2813 - val_loss: 0.2829
Epoch 11/15
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plt.grid(True)
plt.show()
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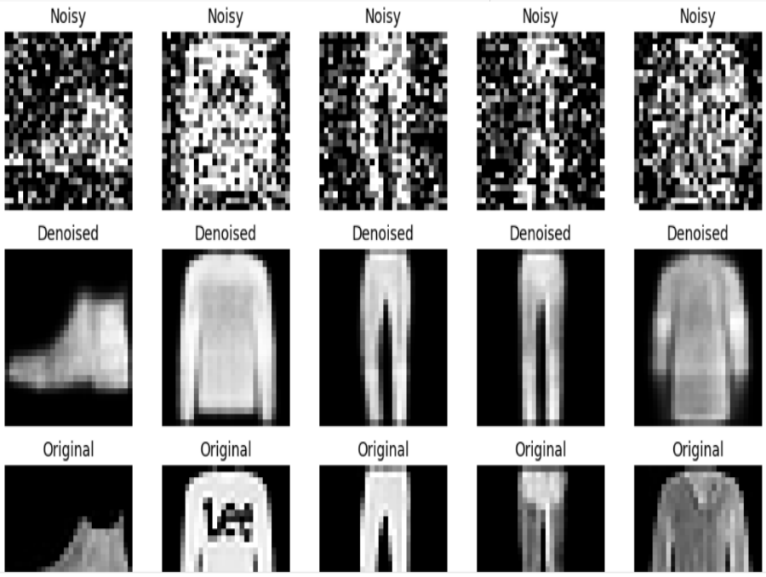

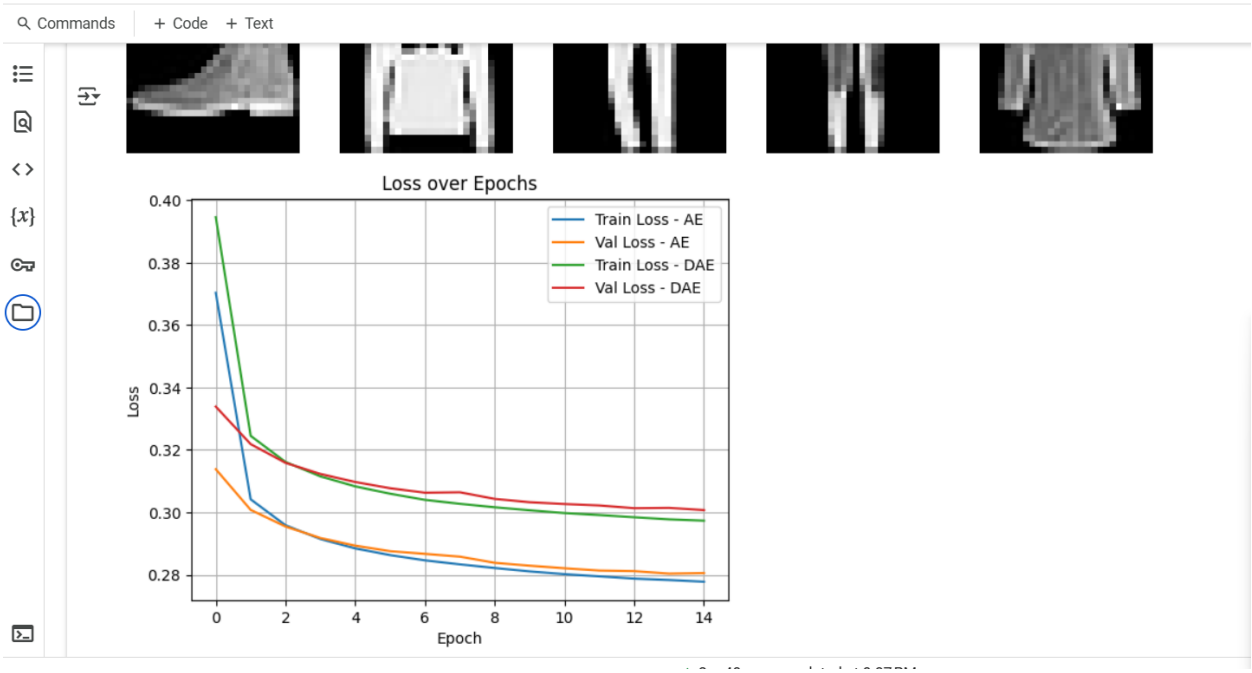

Loss over Epochs
Train Loss - AE
Val Loss - AE
Train Loss - DAE
Val Loss - DAE
Loss
Epoch
0.40
0.38
0.36
0.34
0.32
0.30
0.28
0
2
4
6
8
10
12
14