CST 476-2 Deep Learning

Lab Sheet 09

Activity: Introduction to Autoencoders

Aim:

The aim of this lab session is to implement a basic autoencoder to reconstruct images from the MNIST dataset and understand its functionality.

Dataset:

MNIST Dataset

Description of the Dataset:

The MNIST dataset is a standard benchmark for image recognition tasks. It consists of 70,000 grayscale images of handwritten digits, each of size 28×28 pixels, representing numbers from 0 to 9. The dataset is pre-split into 60,000 training images and 10,000 test images. Each image belongs to one of 10 classes, corresponding to the digits.

Tasks:

- Open your Jupyter Notebook environment and import the necessary libraries.
- Load the MNIST dataset directly using TensorFlow.
- Normalize the pixel values of the images to range [0, 1].
- Reshape the images into flattened vectors for input into the autoencoder.
- Design the encoder to compress the input into a latent space representation.
- Design the decoder to reconstruct the input from the latent space.
- Use the Mean Squared Error as the loss function and Adam as the optimizer.
- Train the model using the training dataset and validate it using the test dataset.
- Reconstruct images from the test dataset using the trained autoencoder.

```
plt.figure(figsize=(8, 4))
ax = plt.subplot(1, 2, 1)
plt.imshow(data_point)
```
- Compare the original and reconstructed images.
- Experiment by reducing the latent space size (e.g., from 64 to 32) and observe the effect on reconstruction quality.