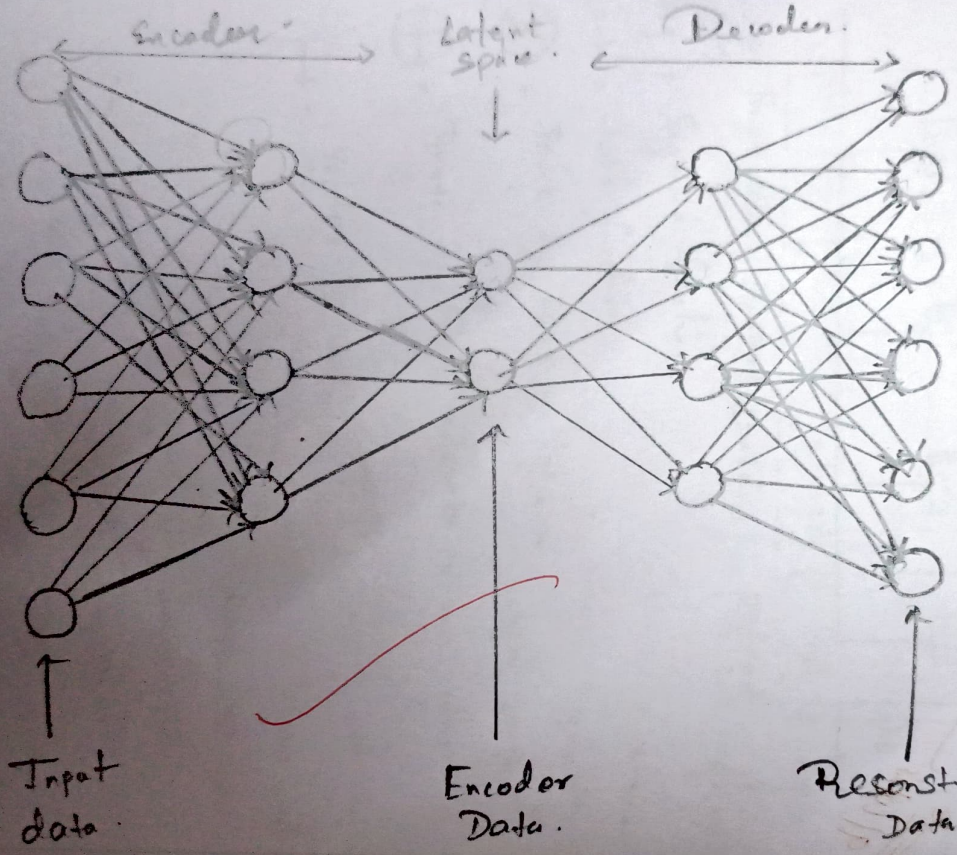
Architecture Diagram :



17/03/25 Exp: 10 Perform Compression on MNIST Dataset using auto encoder

Lab

Aim:- To perform image compression on the MNIST dataset using an autoencoder, and evaluate the usefulness of compressed representations by training a classifier on the encoded (latent) features.

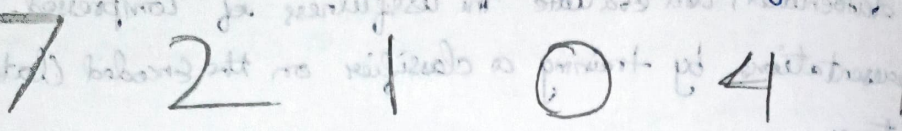
Objectives:-

1. Implement an Autoencoder in pytorch for MNIST image Compression.
2. Use the encoder output to train a classifier.
3. Generate a classifier classification report to evaluate accuracy, Precision, recall and f1-score.
4. Analyse how well the compressed representation retains discriminative information.

Pseudocode:-

1. Import necessary libraries.
2. Load MNIST dataset and normalize it.
3. Define Autoencoder with Encoder and decoder.
4. Train autoencoder using reconstruction loss (MSELoss).
5. Freeze encoder weights after training.
6. Extract compressed features (latent vectors) from encoder for all train / test samples.
7. Train a Simple classifier using Sklearn.
8. Predict labels for tests features.
9. Generate Classifications report using Sklearn.metrics.
10. Display classifications metrics and reconstruction images.

Original Original Original Original Original Original.



Reconstructed Reconstructed Constructed Reconstructed Reconstruced Reconstructed

Classification Report:-

0	0.9519	0.9490	0.9504	980
1	0.9426	0.9692	0.9557	1135
2	0.8175	0.6986	0.7534	1032
3	0.6288	0.5871	0.6073	1010
4	0.6875	0.4817	0.5665	982
5	0.6042	0.5135	0.5552	892
6	0.8322	0.8956	0.8627	958
7	0.8750	0.8416	0.8733	1028
8	0.6165	0.7608	0.6811	974
9	0.5572	0.7334	0.6333	1009
accuracy			0.7510	10000
macro avg	0.7513	0.7460	0.7439	10000
weighted avg	0.7555	0.7510	0.7485	10000

Result:-

Successfully perform compression on MNIST Dataset using auto encoder.

Observation:-

1. The autoencoder successfully learned to reconstruct MNIST images, as seen from decreasing loss.
2. The 3D latent space effectively compressed important digit features.
3. Logistic Regression on encoded features achieved moderate classification accuracy.
4. Reconstructed images resemble original but are slightly blurred.