

Serial. No.	Topic.	Date.	Signature
1)	Exploring the Deep Learning Platforms & Frameworks	31/07/2025	<del>✓</del>
2)	Implement a Classifier using an open-source dataset	7/8/2025	<del>✓</del>
3)	Study of Classifiers with respect to Statistical Parameters	7/8/2025	<del>✓</del> 1/17/25
4)	Build a simple feed forward network to recognize handwritten character	14/8/2025	<del>✓</del> 1/17/25
5)	Study of Activation Functions and its role	9/9/2025	<del>✓</del> 9/9
6)	Implement gradient descent and backpropagation in deep neural network.	13/9/2025	<del>✓</del>
7)	Build a CNN model to classify Cat & dog image	13/9/2025	<del>✓</del>
8)	Experiment using LSTM	13/9/2025	<del>✓</del>
9)	Build a Recurrent Neural Network	13/9/2025	<del>✓</del> 1/17/25
10)	Perform compression on MNIST		
11)	Experiment using VAE		
12)	Implement a DCGAN	02/11/25	<del>✓</del>
13)	Understand pre-trained model Transfer Learning		
14)	YOLO Model		
15)			

~~Completed~~

# Exp-11 - Experiments using Variational Autoencoder.

Aim:-

To implement a Variational Autoencoder (VAE) on the MNIST dataset for learning latent distributions and generating new handwritten digits.

objective:-

To train a generative model that learns a probabilistic latent space representation of MNIST digits and can reconstruct and generate similar images.

Algorithm:-

- 1) Start
- 2) Import Libraries - PyTorch, Torchvision, Matplotlib
- 3) Load dataset:-
  - Convert MNIST images to tensors & normalize them.
  - Use DataLoader for batching.
- 4) Define VAE architecture
  - Encoder:
  - Reparameterization:
    - Sample latent vector  $Z = \mu + \sigma * E$

Deviation after training - 11/9/2020

Iteration A

<u>Epoch</u>	<u>Average Loss</u>
1	164.4102
2	121.4515
3	114.4432.
4	111.5549
5	109.8265
6	108.6836
7	107.8378
8	107.2146
9	106.6651
10	106.2620.

## ④ Decoder

5) Define loss function:

- Reconstruction Loss (BCE)
- KL Divergence.
- Total Loss = BCE + KL Divergence.

6) Initialize model, optimizer (Adam) and set number of epochs.

7) Training:-

- a) Forward pass
- b) Compute VAE loss
- c) Backpropagate and update weights.
- d) Display avg loss per epoch.

8) Testing:-

- Generate new images by sampling random latent vectors  $\mathbf{z}$ .

9) Visualization.

10) End.

Observation:- Successfully encoded images using mean & variance parameters. Both the loss functions decreased across epochs and the decoder generated clear, realistic digit samples.

Result:-

The experiment was successfully implemented.