

## D.L. Practical 4

### Aims:-

Use Autoencoder to implement anomaly detection. Build the model by using:

- Import required libraries
- Upload / access datasets.
- Encoder converts it into latent representation.
- Decoder networks convert it back to the original input.
- Compile the models with optimizer, loss, and Evaluation Metrics.

### Objective:-

- Import required libraries.
- Upload / access datasets.
- Encoder converts it into latent representation.
- Decoder networks convert it back to the original input.
- Compile the models with optimize, loss & evaluation Metrics.

### Theory:-

#### Autoencoders:

- Autoencoders are artificial neural networks capable of learning efficient representations of the input data, called codings without any supervision.
- These codings typically have much lower dimensionality (depth of info.) than the input data, making autoencoders useful for dimensionality reduction and compression.
- These codings, or simply, the code is compact "summary" or compression of input also called the latent-space representation.

- Autoencoders acts as powerful feature detectors, and they can be used for unsupervised pre-training of deep neural networks.
- Lastly, they are capable of randomly generating new data that looks very similar to training data; this is called a generative model.

#### \* Applications of Autoencoders

1. Image colouring: Autoencoders can be used for converting black and white images into coloured images.
2. Feature Extraction: Autoencoders extract only the required features of an image and generate the output by removing any noise or unnecessary interruption. They can also be used for compression.
3. Dimensionality reduction.
4. Denoising Image: A denoising encoder can be used to reconstruct the image by eliminating the noise from the input image.

#### \* Types of Auto Encoders:-

- ① Undercomplete.
- ② Regularised
- ③ convolution
- ④ Sparse
- ⑤ Stacked
- ⑥ Denoising
- ⑦ Variational
- ⑧ Stochastic
- ⑨ contractive

Conclusion:

Autoencoders can be used as an anomaly detection algorithm when we have an unbalanced dataset where we have a lot of good examples & only a few anomalies. Autoencoders are trained to minimise reconstruction error.