IA-Assignment 2 Time:- 1 Hrs

Name:- Nabil Ansari
PRN:- 2023020400004
Sub:- GAA

MIT Academy of Engineering
(An Autonomous Institute Affiliated to Savitribai Phule Pune University)

4+5=9
10

Total Mks :- /10

Date:- 16-09-2025

Q1) Explain the working of an Autoencoder with neat diagram (3)

Q2) Why is the re-paramptarization trick is essential in VAE, prove Matahamatically Now it enables Back propogation through stochistic variables. (4)

Q3) What is the role of KL diavergiens in VAE And write down ~~two~~ limitations of VAE. (3)

Q1) → Autoencoder is a nural network which is trained / it Learns to compress the data into Letent representation and reconstruct the data to gene-rate the new data.

Encoder :- The encoder compress the Data into the Latent representation. Store it into the Latent space.

Latent space :- The Data is stored in the Latent representation.

Decoder :- The decoder de compress the data into its orignal form.

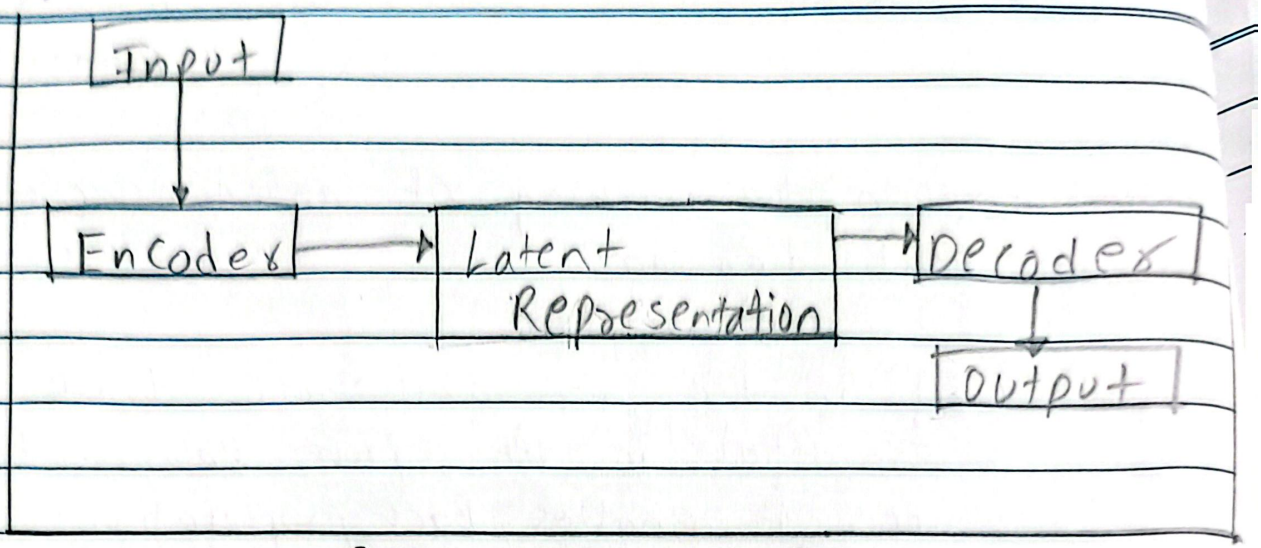

fig. working of Auto encoder.

Applications :-

1) Data compression and de-compression

2) New Data Generation.

2) → The Re-parameterization trick is essential in VAE Because :-

① It enables better tuning of the model.

② It enables back propogation means the previous values can be changed. for better results.

③ It improves the overall stability and performance of VAE.

Q3) The Role of KL divergence in VAE :-

A variational Auto encoder (VAE) tries to learn a latent distribution $q(z|x)$ that approximates the true but intractable posterior $p(z|x)$.

The loss function (ELBO) is used to minimize the distribution loss.

Here, The KL divergence ensures the smooth continuous and structured space.

Limitation of VAE :-

1) Blurry output :- The output is often Blurry and un-clear.

2) Over - regularization :- It tries to over regularize the data. that makes the output unclear.

3) Unable to Learn / generate the complex data (eg. Face of Human, animals etc.) clearly