Advanced Deep Learning
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Auto encoders Limitations :

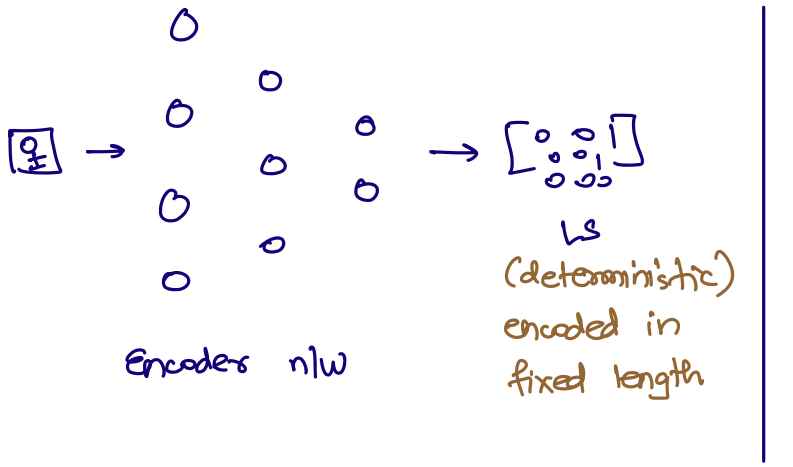
- Regeneration was messy and lossy
- Not designed to generate new data.

Based on research, one of the reason the above happened was due to its sampling and latent space generation strategy.

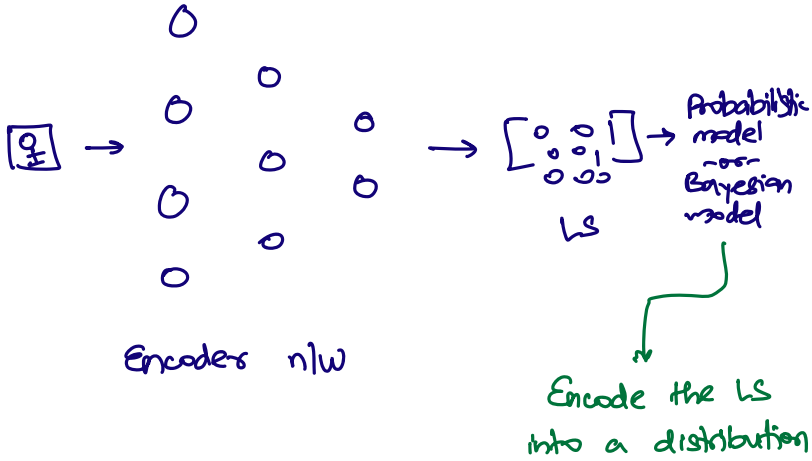
Variational Auto encoder (VAE)

VAE are a class of deep generative model that combines ideas from NN and Bayesian inferences.

- more powerful interms of learning
- helps model to regenerate new data using learned data.



Deterministic



Probablistic.

Typical VAE

① Encoder n/w (Recognition Model)

$x \longrightarrow$ en $\longrightarrow$ probability dist. (assumed to be Gaussian dist)

⑥ Decoder n/w (Generative Model)

probability dist → dn → Reconstruct x -or- Regenerate new data

Takeaway

	AE	VAE
Latent Space (output generated by encoder n/w)	Deterministic (fixed)	Probabilistic (encoded in distribution) eg: gaussian
Reconstruction	Compress and decompress where decompress o/p is always LOSSY.	Use trained model for data regeneration via distribution (loss is minimum to NIL)
Loss Function	Reconstruction Loss : MSE, BCE	ⓐ Reconstruction Loss : (RL) MSE, BCE ⓑ Latent Regularization Loss : (LRL) KL divergence Total loss = RL + LRL.
Use case	Data Compression Data Reconstruction	Data Reconstruction Data Generation * Anomaly Detection (medical)