



# Variational AutoEncoders with Disentanglements

- Aryaman Gupta  
IIT (BHU), Varanasi

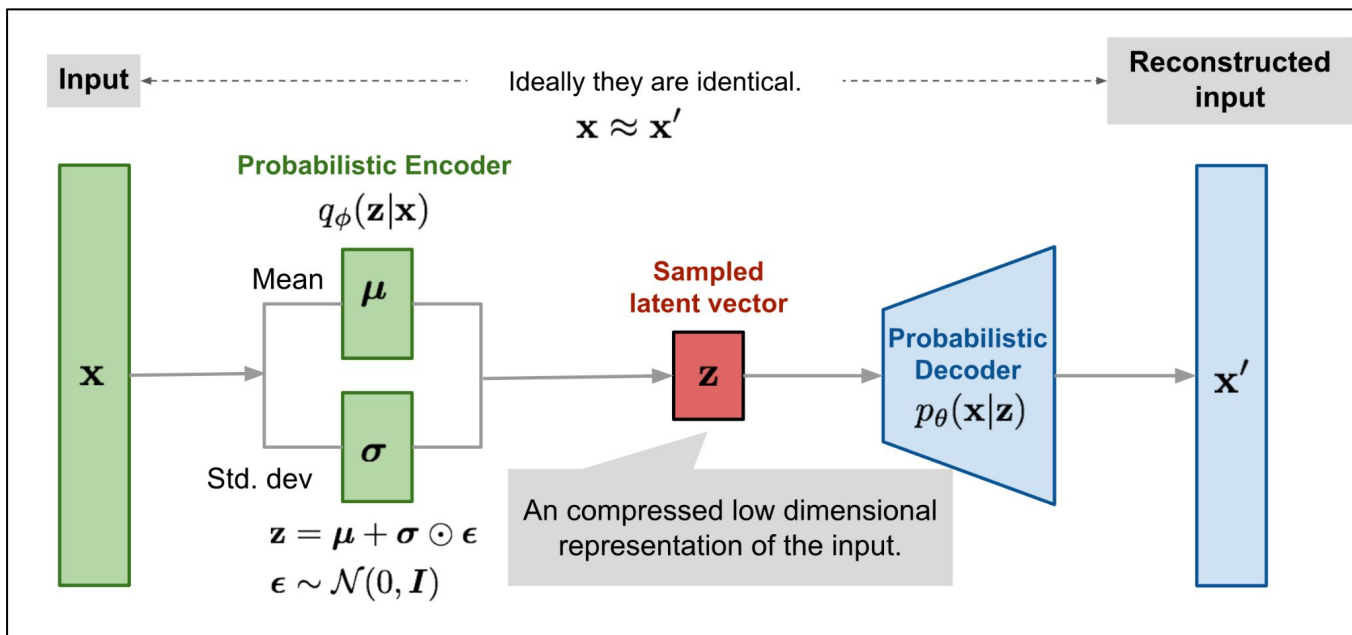
[Colab Notebook](#)

# Task

Train an Variational AutoEncoder on Fashion MNIST dataset with disentanglements, and study the transitions in produced outputs by changes in latent space.



# Autoencoder Architecture





## BETA-VAE

In Beta VAE, we add introduce a beta term in the loss function. It is multiplied with the KL Divergence loss, increasing its importance over the reconstruction loss. New loss function looks like:

$$\begin{aligned} L_{\text{SAE}}(\theta) &= L(\theta) + \beta \sum_{l=1}^L \sum_{j=1}^{s_l} D_{\text{KL}}(\rho \| \hat{\rho}_j^{(l)}) \\ &= L(\theta) + \beta \sum_{l=1}^L \sum_{j=1}^{s_l} \rho \log \frac{\rho}{\hat{\rho}_j^{(l)}} + (1 - \rho) \log \frac{1 - \rho}{1 - \hat{\rho}_j^{(l)}} \end{aligned}$$



# Hyper-parameters Used

NUM\_EPOCHS = 20

LR =  $3e-4$

LATENT\_SPACE\_DIM = 20

BETA = 4

OPTIMIZER - ADAM

RECONSTRUCTION LOSS - BCE

# Results

