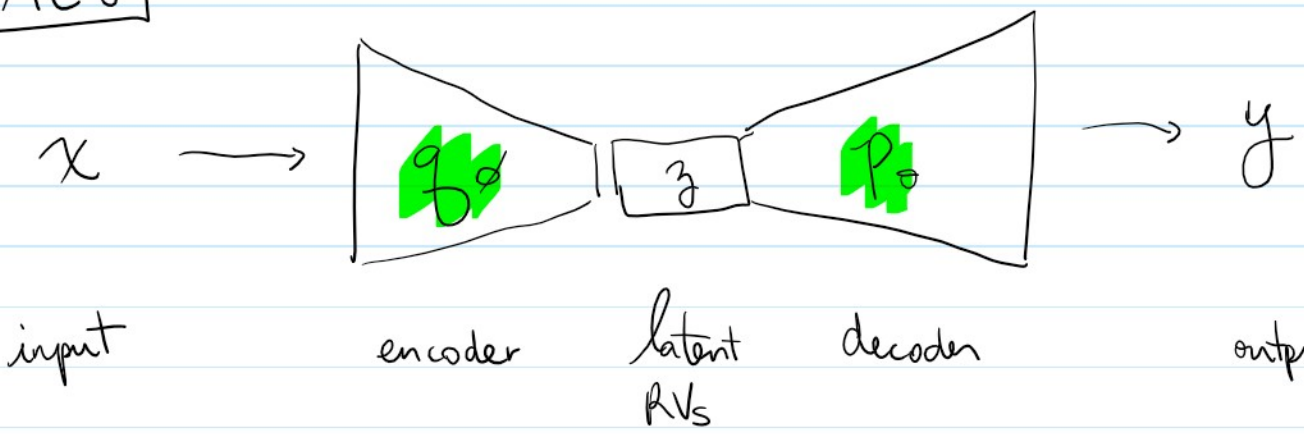
Tutorial #11

October 4, 2021 4:48 PM

VAEs



Optimizing the ELBO:

$$\mathbb{E}^{Q_\phi}\left[\log \mathbb{P}(x \mid z, \theta)\right] \quad \} \text{ Reconstruction loss.}$$

$$-\mathbb{E}^{Q_\phi}\left[\log \frac{Q(z \mid x, \phi)}{\mathbb{P}(z \mid \theta)}\right] \quad \} \text{ KL divergence.}$$

Procedure to optimize the ELBO with the ANNs ϕ and θ. (see notes #9).

- Reconhoss function:

- using the data x, pass them through the VAE to obtain the output x^*.
- Make x^* as close as possible to x.
- $\mathbb{E}^{Q_\phi}$ means take the average when the $z \sim Q_\phi$

- KL Divergence:

- depends on the distributions for ϕ and θ.
- Example with two Gaussian distributions in "STA2536 - 08.pdf", e.g.

$$\mathbb{E}^{Q_\phi}\left[-\frac{1}{2}\left(d \cdot \log 2\pi + \log\left(\det \Sigma_\theta(z)\right) + (x-\mu_\theta(z))^T \Sigma_\theta^{-1}(z)(x-\mu_\theta(z))\right)\right]$$