Variational Autoencoders

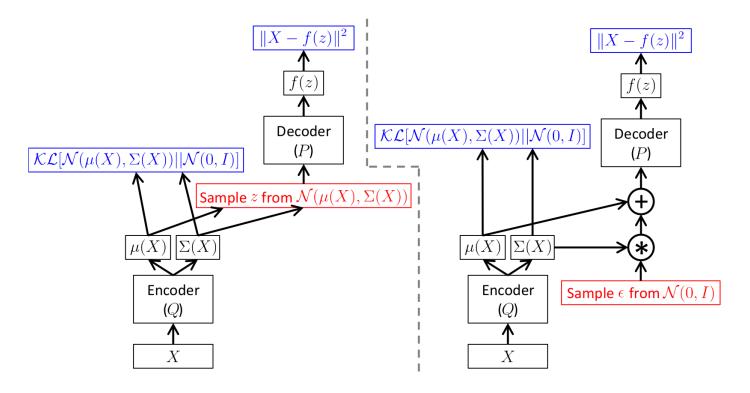

Figure 1: A basic example of a VAE

Optimization Terms

KL Loss:

$$\mathrm{KL}\left[\,\mathcal{N}\left(\boldsymbol{\mu}(X),\Sigma(X)\right)\,\big|\,\mathcal{N}\left(\mathbf{0},\mathbf{I}\right)\right] \;=\; \frac{1}{2}\left(\mathrm{Tr}\left(\Sigma(X)\right)+\left(\boldsymbol{\mu}(X)\right)^{\mathrm{T}}\left(\boldsymbol{\mu}(X)\right)-D+\log\left(\det\left(\Sigma(X)\right)\right)\right)$$

Reconstruction Loss:

$$L \;=\; \|X-z\|_2^2$$