TF2-10

VAE

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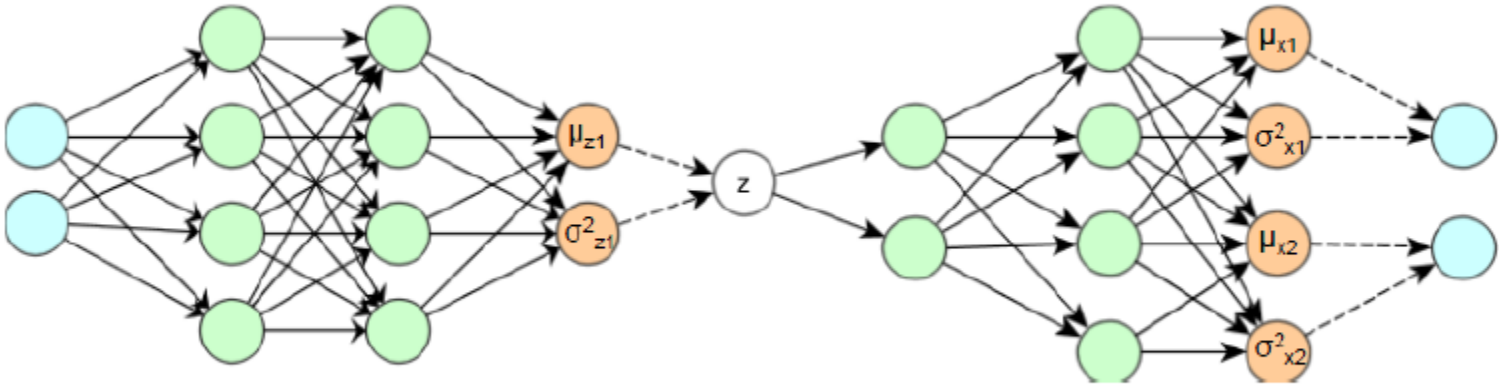
VAE Structure

$q_\varphi(z|x)$ $p_\theta(x|z)$



Encoder Decoder

Prior p(z) ~ N(0,1) and p, q Gaussian

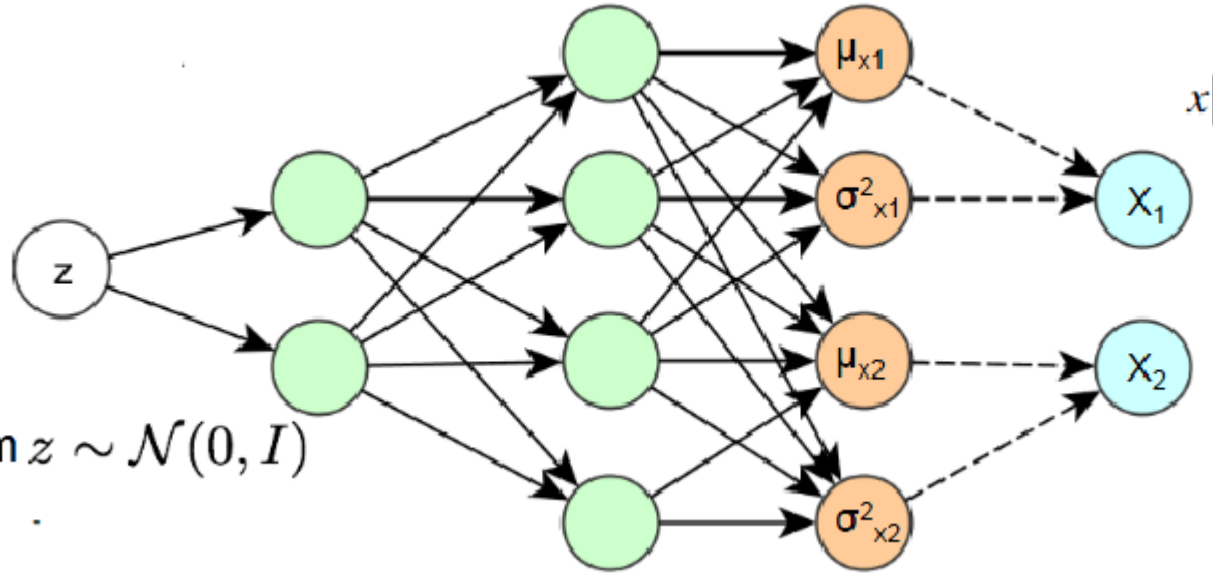
VAE Cost function

- ELBO

$$\mathcal{L}(x^{(i)}, \theta, \phi) = \mathbf{E}_z \left[\log p_\theta(x^{(i)} \mid z) \right] - D_{KL}(q_\phi(z \mid x^{(i)}) \,||\, p_\theta(z))$$

$$= \sum_{j=1}^{D} \frac{1}{2} \log(\sigma_{x_j}^2) + \frac{(x_j^{(i)} - \mu_{x_j})^2}{2\sigma_{x_j}^2} - \frac{1}{2} \sum_{j=1}^{J} \left(1 + \log(\sigma_{z_j}^{(i)^2}) - \mu_{z_j}^{(i)^2} - \sigma_{z_j}^{(i)^2} \right)$$

VAE Generation



$x|z \sim N(\mu_x, \sigma_x^2)$

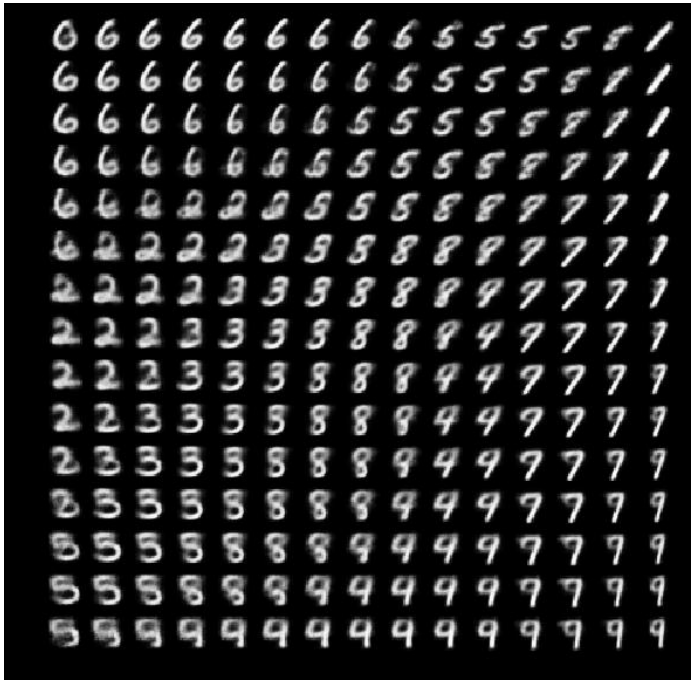
Sample z from $z \sim \mathcal{N}(0, I)$

Decoder

Exercise 10-1.

Tf2-10-1-mnist_vae.py

VAE Results : **Learned MNIST manifold**



VAE Results : **Generation**

https://jaan.io/what-is-variational-autoencoder-vae-tutorial/