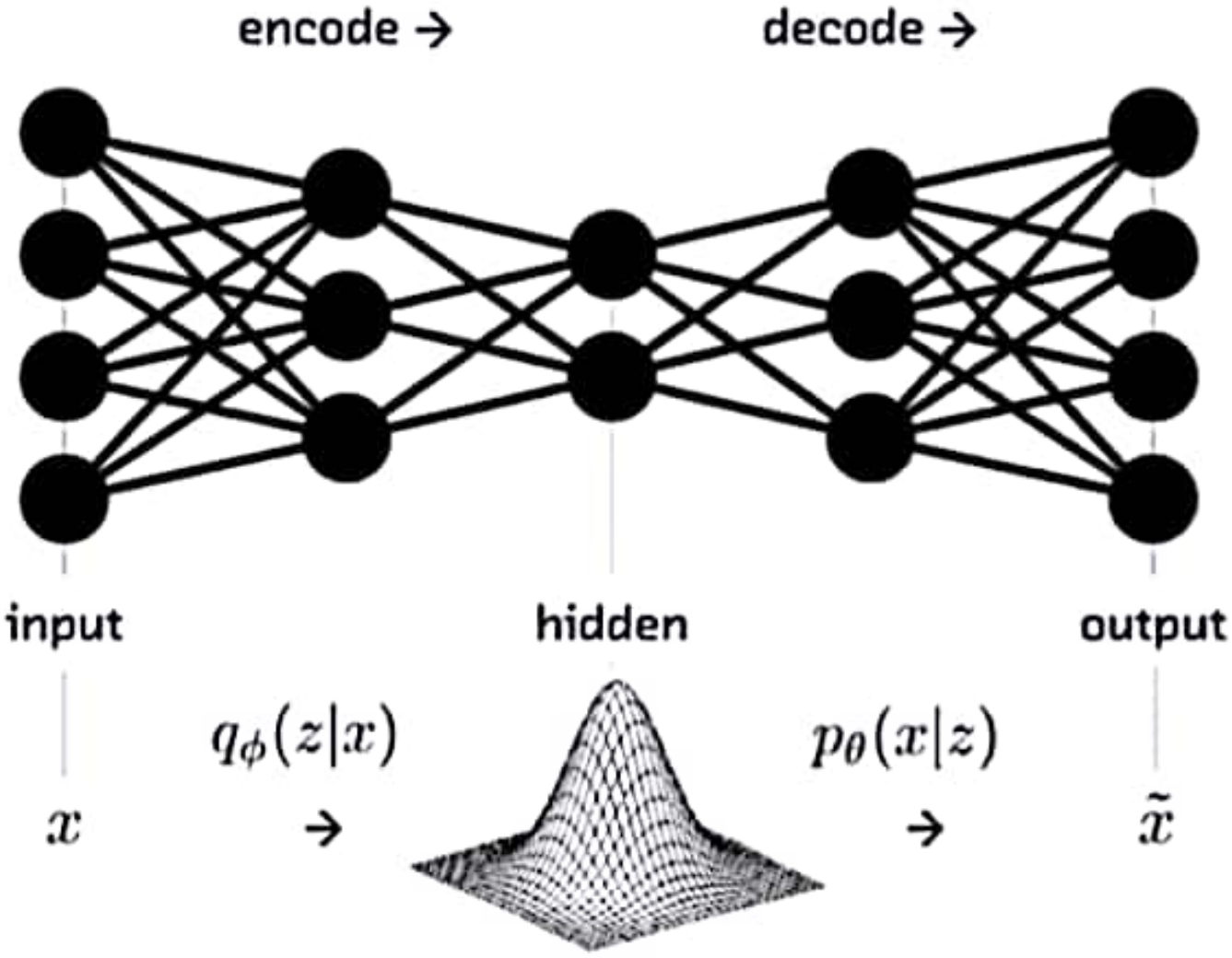

fig 1. The Structure of VAE

$$P\theta(X) = \int P\theta(X, z)dz = \int P\theta(X|z)P\theta(z)dz \quad (1)$$

Here, $f(z;\theta)$ has been replaced by a distribution $P\theta(X|z)$.

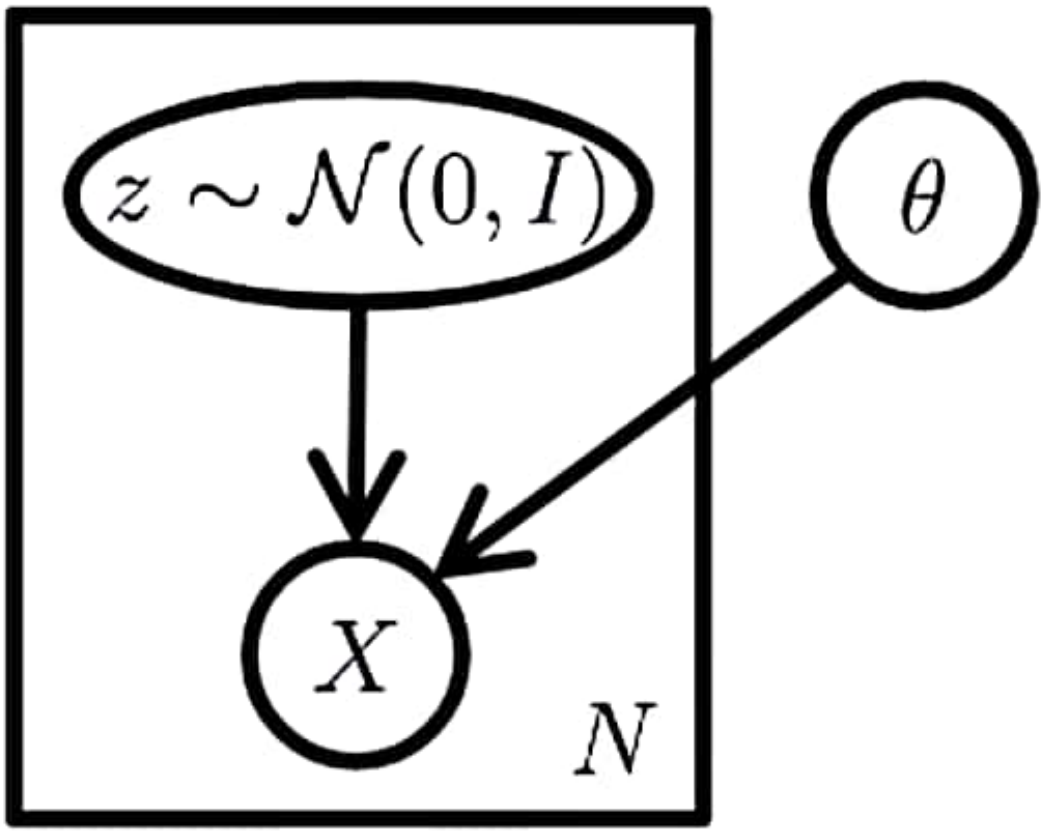

Fig. 2. Latent vector mapped to data distribution using parameter Θ

The final objective function of VAE is :-

$$\log P(X) - D_{KL}[Q(z|X)||P(z|X)] = E[\log P(X|z)] - D_{KL}[Q(z|X)||P(z)]$$

$$D_{KL}[N(\mu(X), \Sigma(X)) \| N(0, 1)] = \frac{1}{2} \sum_{k} \left(\exp(\Sigma(X)) + \mu^2(X) - 1 - \Sigma(X) \right)$$

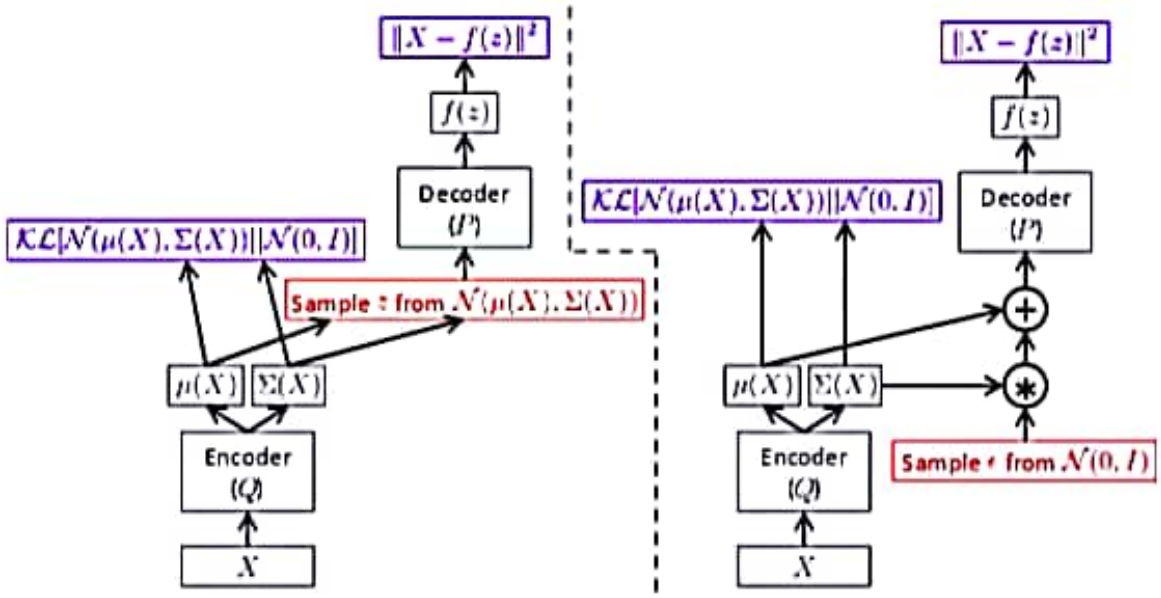

Fig.2. Reparameterization trick used to backpropagate through random nodes