Training Discriminator

$$\max_D V(D) = \mathbb{E}_{x \sim p_{data}(x)}[logD(x)] + \mathbb{E}_{z \sim p_z(z)}[log(1 - D(z))]$$

Training Generator

$$\max_G V(G) = \mathbb{E}_{z \sim p_z(z)}[log(1 - D(G(z)))]$$

GAN for Image Colorization

$$\min_{\theta_G} J^{(G)}(\theta_D, \theta_G) = \min_{\theta_G} -\mathbb{E}_z[log(D(G(0_z|x)))] + \lambda \parallel G(0_z|x) - y \parallel 1$$

$$\max_{\theta_G} J^{(D)}(\theta_D, \theta_G) = \max_{\theta_D}(\mathbb{E}_y[log(D(y|x))] + \mathbb{E}_z[log(1 - D(G(0_x|x)|x))])$$