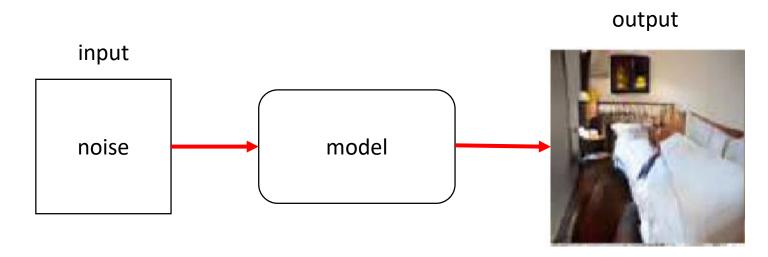
Least Squares Generative Adversarial Networks

Xudong Mao, Qing Li, Haoran Xie, Raymond Y.K. Lau, Zhen Wang, Stephen Paul Smolley IEEE International Conference on Computer Vision (ICCV 2017)

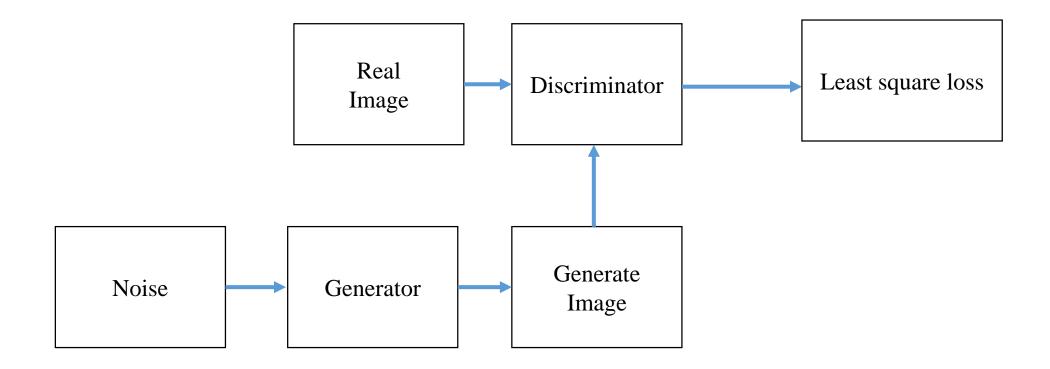
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Introduction

- Input : noise(z) from a uniform or Gaussian distribution
- Target : Generate images



Architecture



Generator & Discriminator architecture

z,1024

fc, 7*7*256, BN

3*3, deconv, 256, stride=2,BN

3*3, deconv, 256, stride=1,BN

3*3, deconv, 256, stride=2,BN

3*3, deconv, 256, stride=1,BN

3*3, deconv, 128, stride=2,BN

3*3, deconv, 64, stride=2,BN

3*3, deconv, 3, stride=1

5*5, conv, 64, stride=2

5*5, conv, 128, stride=2,BN

5*5, conv, 256, stride=2,BN

5*5, conv, 512, stride=2,BN

fc, 1

Least square loss

Generator model architecture

Discriminator model architecture

Least Square Loss Function

•
$$\min_{D} V_{LSGAN}(D) = \frac{1}{2} E_{x \sim p_{data}(x)} [(D(x) - b)^{2}] + \frac{1}{2} E_{z \sim p_{z}(z)} [(D(G(z)) - a)^{2}]$$

•
$$\min_{G} V_{LSGAN}(G) = \frac{1}{2} E_{z \sim p_{z}(z)} [(D(G(z)) - c)^{2}]$$

D: Discriminator, G: Generator

 $x \sim p_{data}(x)$: x from p_{data} distribution

a and b: the label for fake data and real data

c: the value that G wants D to believe for fake data

Least Square Loss Function

•
$$\min_{D} V_{LSGAN}(D) = \frac{1}{2} E_{x \sim p_{data}(x)} [(D(x) - 1)^{2}] + \frac{1}{2} E_{z \sim p_{z}(z)} [(D(G(z)) - 0)^{2}]$$
•
$$\min_{G} V_{LSGAN}(G) = \frac{1}{2} E_{z \sim p_{z}(z)} [(D(G(z)) - 1)^{2}]$$

•
$$\min_{G} V_{LSGAN}(G) = \frac{1}{2} E_{z \sim p_{z}(z)} [(D(G(z)) - 1)^{2}]$$



Result(DCGAN & LSGAN)

Generate images by DCGAN(112*112)









Generate images by LSGAN(112*112)









Reference

- [1] Generative adversarial nets
- [2] Unsupervised Representation Learning with Deep Convolutional Generative Adversarial Networks