Least Squares Generative Adversarial Networks

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GAN

- 目標：

$$\min_G \max_D V_{\text{GAN}}(D, G) = \mathbb{E}_{\boldsymbol{x} \sim p_{\text{data}}(\boldsymbol{x})}[\log D(\boldsymbol{x})] + \mathbb{E}_{\boldsymbol{z} \sim p_{\boldsymbol{z}}(\boldsymbol{z})}[\log(1 - D(G(\boldsymbol{z})))].$$

- 應用：

  discriminator as a classifier

  →vanishing gradients

LSGAN

- least squares loss function

$$\min_D V_{\text{LSGAN}}(D) = \frac{1}{2}\mathbb{E}_{\boldsymbol{x}\sim p_{\text{data}}(\boldsymbol{x})}\left[(D(\boldsymbol{x})-b)^2\right] + \frac{1}{2}\mathbb{E}_{\boldsymbol{z}\sim p_{\boldsymbol{z}}(\boldsymbol{z})}\left[(D(G(\boldsymbol{z}))-a)^2\right]$$

$$\min_G V_{\text{LSGAN}}(G) = \frac{1}{2}\mathbb{E}_{\boldsymbol{z}\sim p_{\boldsymbol{z}}(\boldsymbol{z})}\left[(D(G(\boldsymbol{z}))-c)^2\right]$$

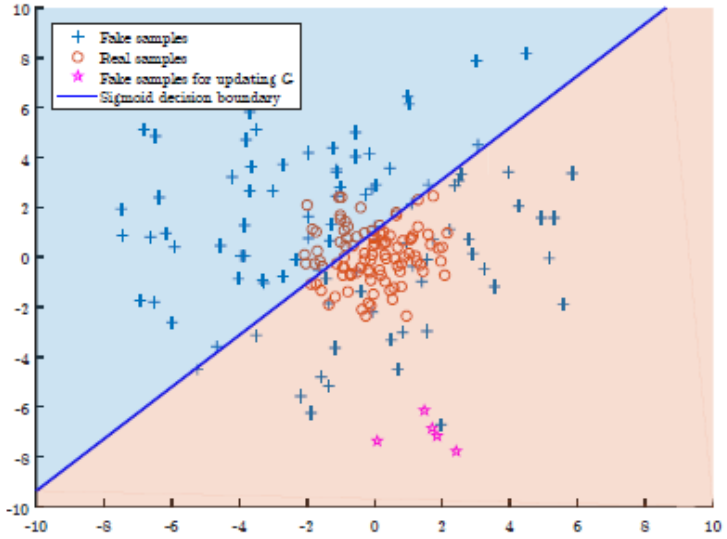
a：label of fake data
b：label of real data
c： 臨界點

- Pearson χ^2 divergence

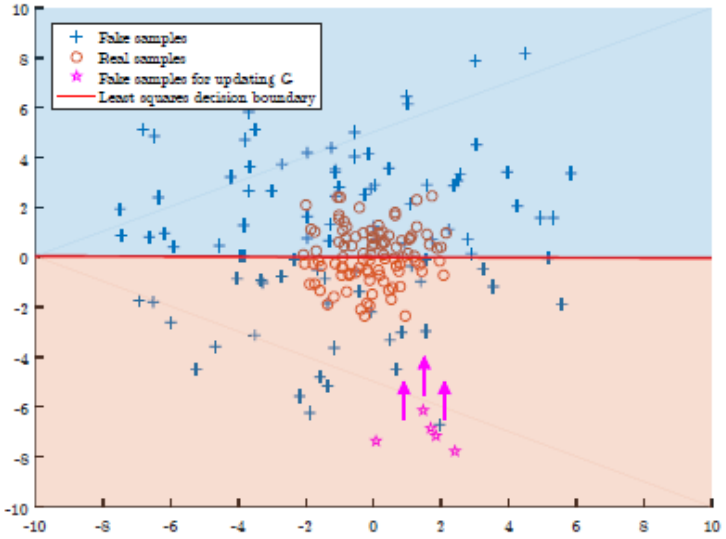
b − c = 1 and b − a = 2

比較

GAN



LSGAN



對於假資料有較高的逞罰，包括被標示為正確標籤但不相像的假資料

結構

generator

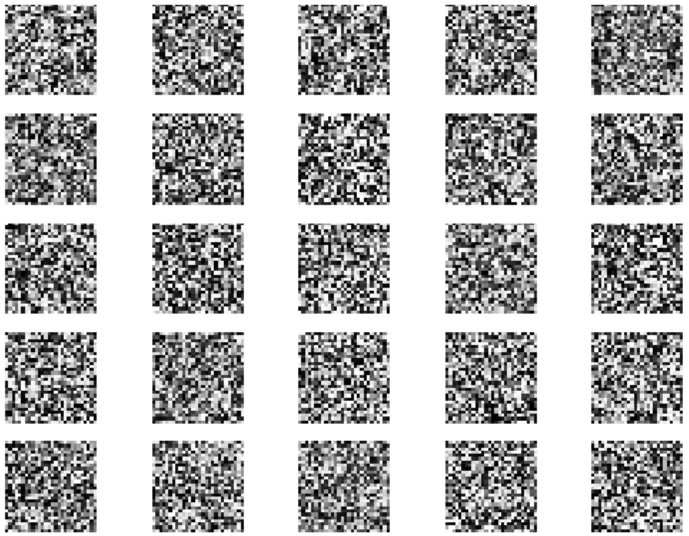
Layer (type)	Output Shape
flatten_1 (Flatten)	(None, 784)
dense_1 (Dense)	(None, 512)
leaky_re_lu_1 (LeakyReLU)	(None, 512)
dense_2 (Dense)	(None, 256)
leaky_re_lu_2 (LeakyReLU)	(None, 256)
dense_3 (Dense)	(None, 1)

discriminator

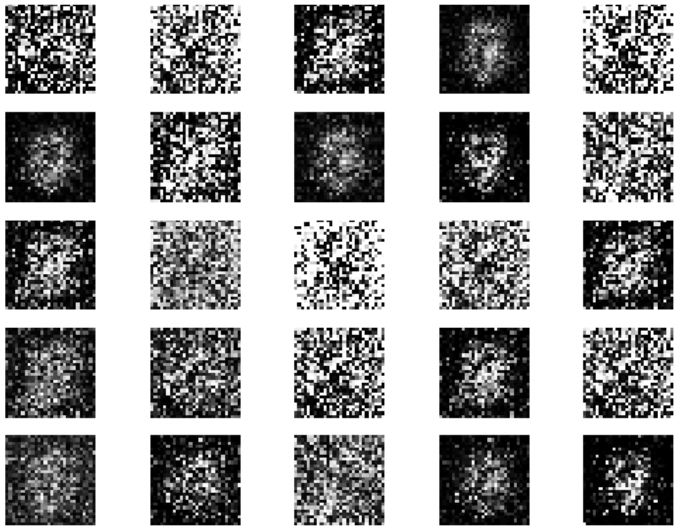
dense_4 (Dense)	(None, 256)
leaky_re_lu_3 (LeakyReLU)	(None, 256)
batch_normalization_1 (Batch	(None, 256)
dense_5 (Dense)	(None, 512)
leaky_re_lu_4 (LeakyReLU)	(None, 512)
batch_normalization_2 (Batch	(None, 512)
dense_6 (Dense)	(None, 1024)
leaky_re_lu_5 (LeakyReLU)	(None, 1024)
batch_normalization_3 (Batch	(None, 1024)
dense_7 (Dense)	(None, 784)

結果(minist)

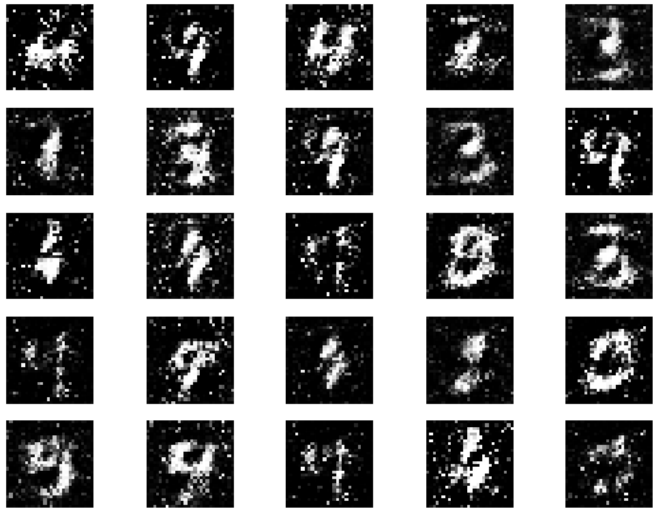
epoch1



epoch600



epoch1000



結果(mixture **Gaussian** distribution)