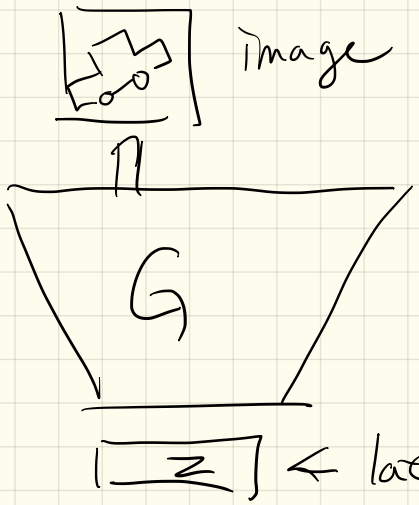
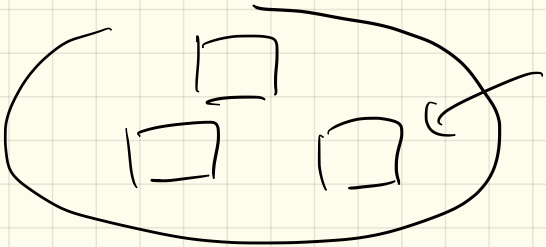
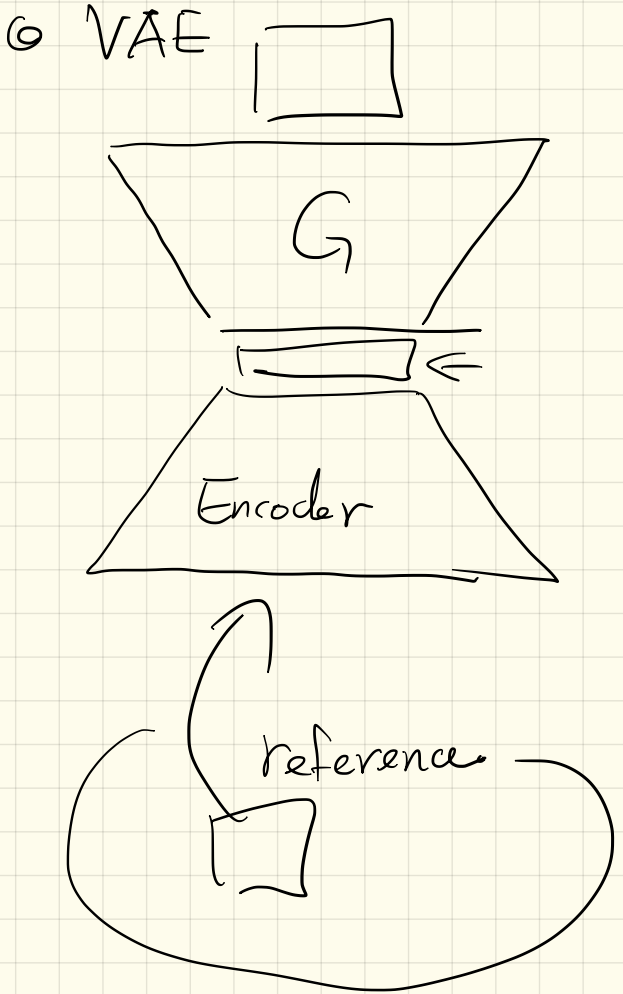


⇒ How to assess the quality of the generated images?





$\| \square - \square \|_2$

in (reference)

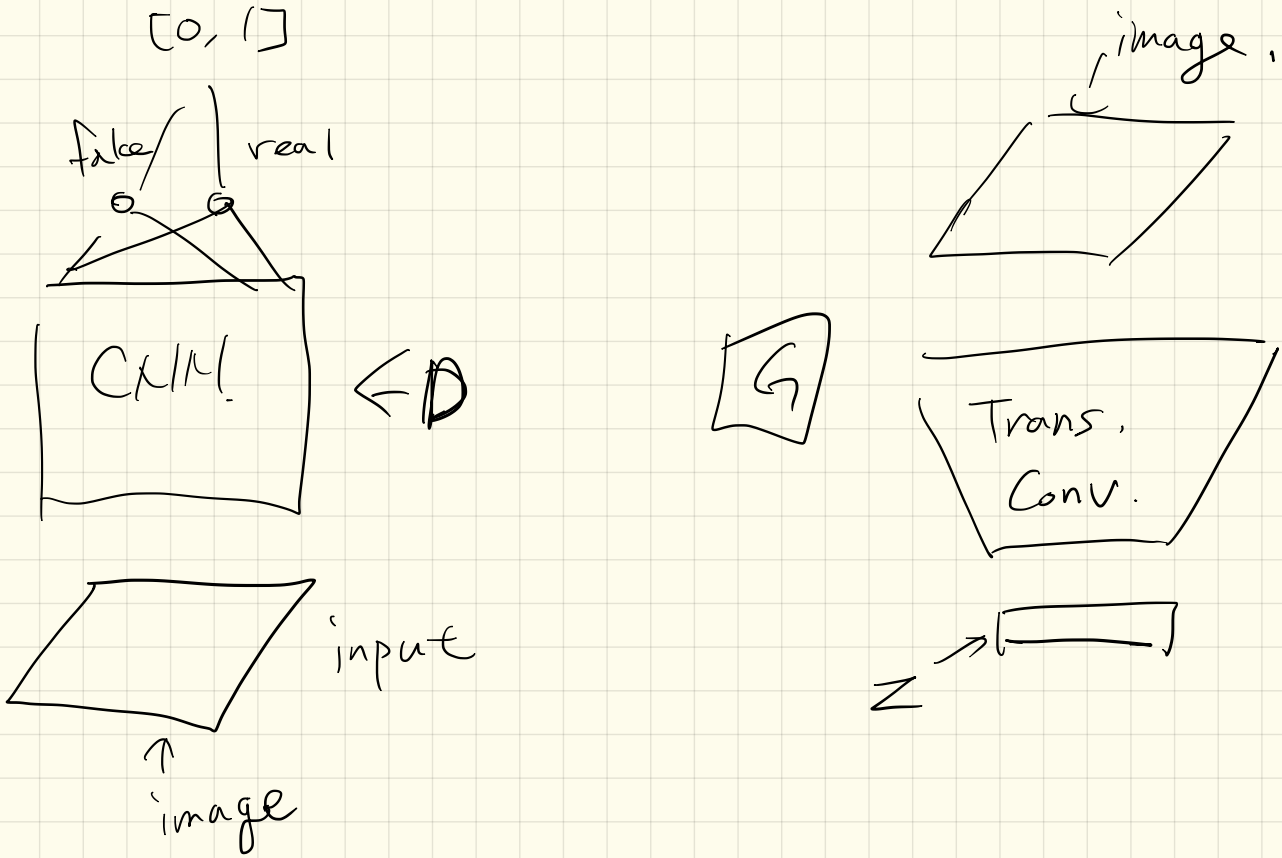
out (generated image)

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

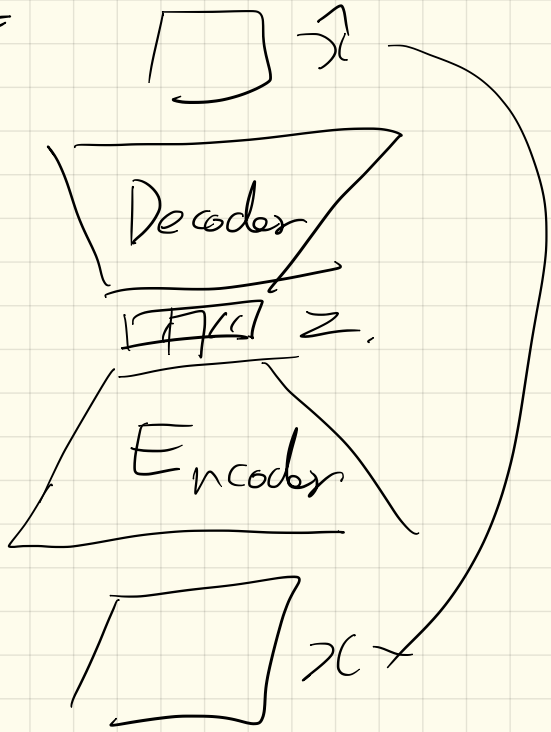
② Find a function that can assess the quality of the generated images.

- NN ✱ Q How to train?

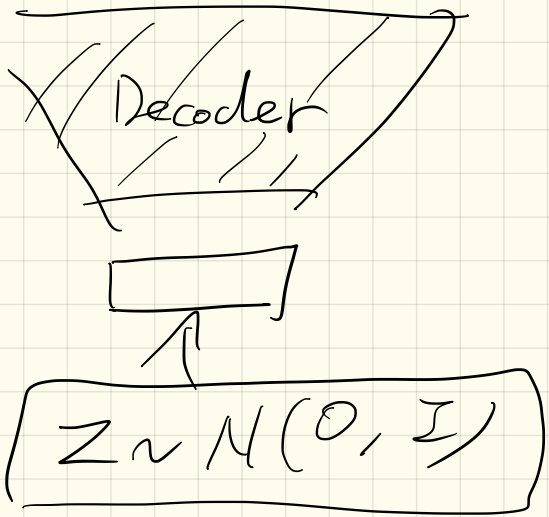
A GAN

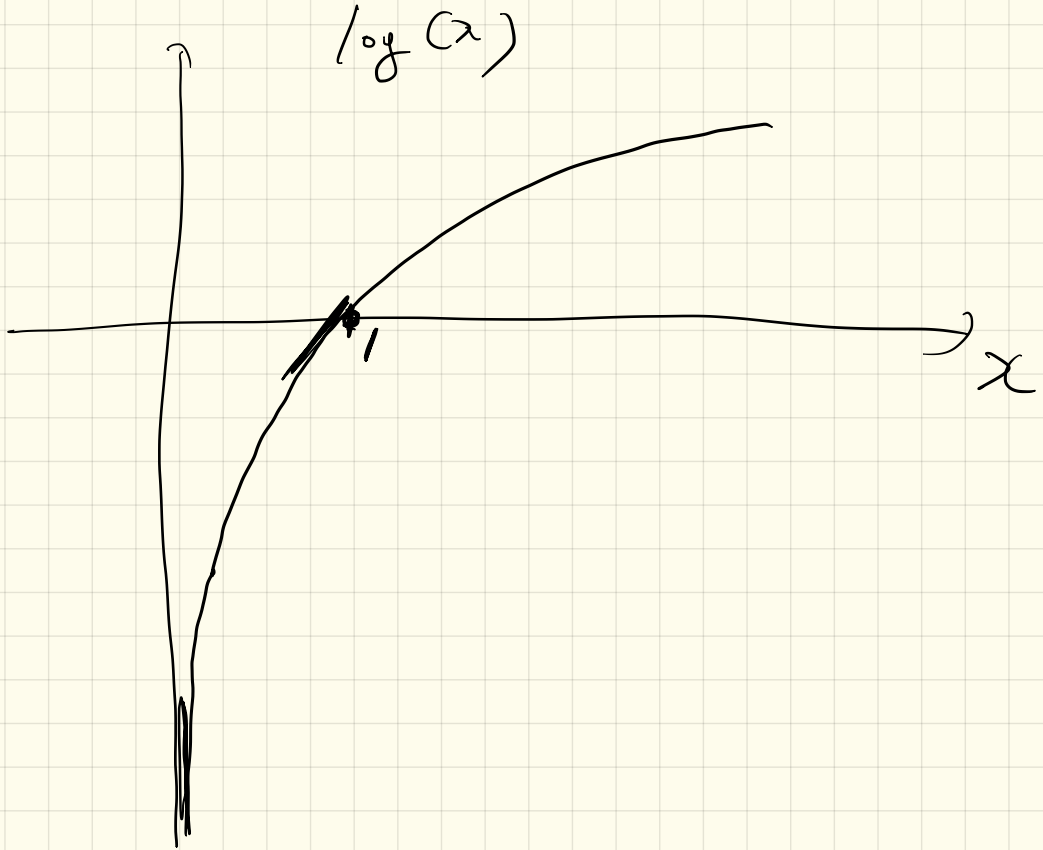

[0, 1]
fake
real
CNN
D
input
image
image
G
Trans.
Conv.
z

VAE



Training




log(x)
1
x

$$KL(P\|Q) = \int P(x) \log \frac{P(x)}{Q(x)} dx$$

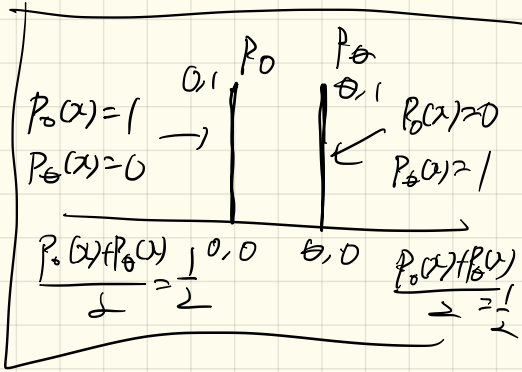
$$P(x) > 0,\ Q(x) = 0 \quad \exists x$$

$$JS(P, Q) = \frac{1}{2} KL\left(P \,\|\, \frac{P+Q}{2}\right) + \frac{1}{2} KL\left(Q \,\|\, \frac{P+Q}{2}\right)$$

$$P(x) > 0 \Rightarrow \frac{P+Q}{2}(x) > 0$$

$$JS(P_0, P_\theta) = \frac{1}{2}\iint \left[P_0(x) \log \frac{P_0(x)}{P_0(x)+P_\theta(x)} + P_\theta(x) \log \frac{P_\theta(x)}{P_0(x)+P_\theta(x)} \right] dx_1 dx_2$$

$$= \log 2 \quad \text{when } \theta \neq 0$$



W- distance. ?

$\|f\|_L \leq 1$

1-Lipschitz function

L-Lipschitz function

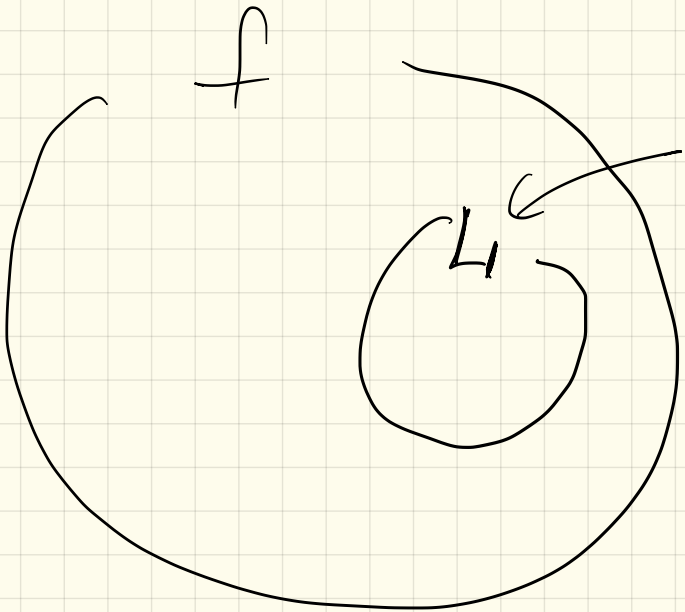
$f: X \to Y$

$$\frac{d_Y(f(x_1), f(x_2))}{d_X(x_1, x_2)} \leq 1 \quad \forall\, x_1 \neq x_2$$

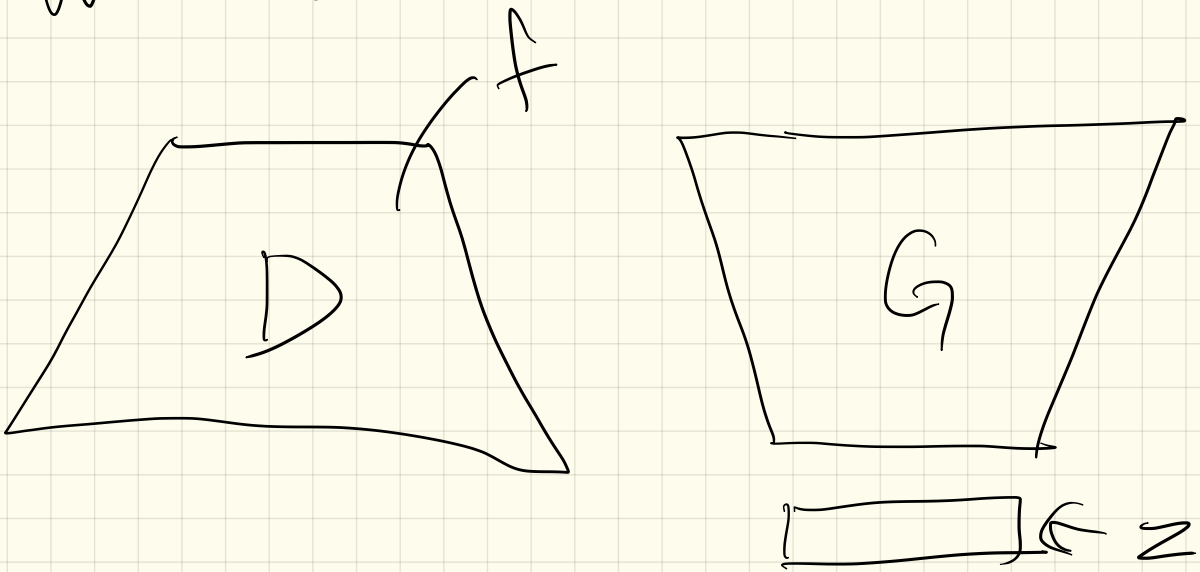
L

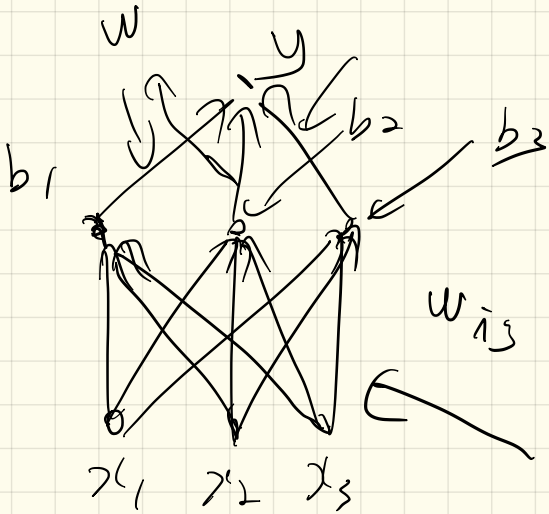
eg. $f: \mathbb{R}^d \to \mathbb{R}$

$$\frac{|f(x_1) - f(x_2)|}{\|x_1 - x_2\|_2} \leq 1$$


f
L
set of functions
1 - Lipschitz.

W- GAN





$$\frac{|f(x^{(1)}) - f(x^{(2)})|}{\|x^{(1)} - x^{(2)}\|} \leq ?$$

$w \leftarrow clip(w, -0.001, 0.001)$