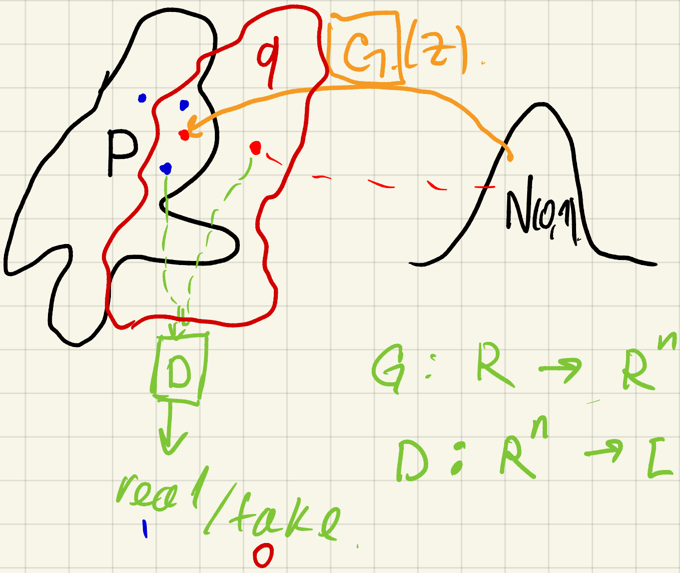


$$G : \mathbb{R} \to \mathbb{R}^n$$

$$D : \mathbb{R}^n \to [0, 1]$$

$$\left[\begin{array}{l} \mathcal{L}_D = \mathbb{E}_{x\sim p} -\log_2 D(x) + \mathbb{E}_{x\sim q} -\log_2 (1 - D(x)). \qquad \times 1-5 \\ \mathcal{L}_G = \mathbb{E}_{x\sim q} -\log_2 D(x). \qquad \times 1. \end{array}\right.$$

$$\parallel$$

$$\mathbb{E}_{z\sim N(0,I)} -\log_2 D(G(z)).$$

$$L(G, D) = \min_G \max_D \left(\mathbb{E}_{x\sim p} -\log_2 D(x) + \mathbb{E}_{x\sim q} -\log_2 (1 - D(x)) \right)$$

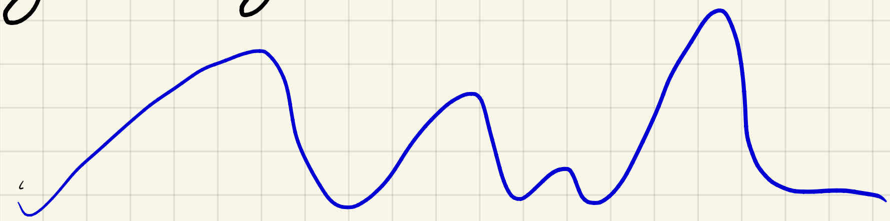
1) gradients.

2) $f(x,y) = x\,y.$

$L(x) = -f \qquad \dfrac{\partial L}{\partial x} = -y$

$L(y) = f. \qquad \dfrac{\partial L}{\partial y} = x.$

$$x = x + \lambda y$$
$$y = y - \lambda x$$

3) 

$$\underbrace{D^* = \frac{p(x)}{p(x)+q(x)}}$$

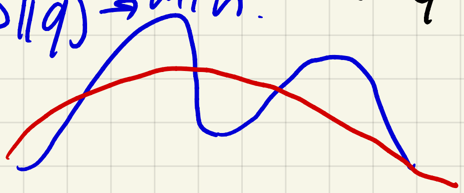
$$L(G, D^*) = 2\,JS(p\|q) - 2\log 2$$

$$JS(p\|q) = \frac{1}{2}\left(KL\left(p\,\Big\|\,\frac{p+q}{2}\right) + KL\left(q\,\Big\|\,\frac{p+q}{2}\right)\right)$$

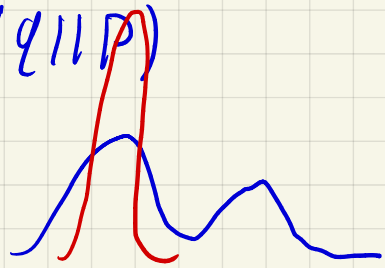
$$KL(p\|q) = \mathop{\mathbb{E}}_{x\sim p} \log\frac{p(x)}{q(x)} = \int_x p(x)\log\frac{p(x)}{q(x)}$$

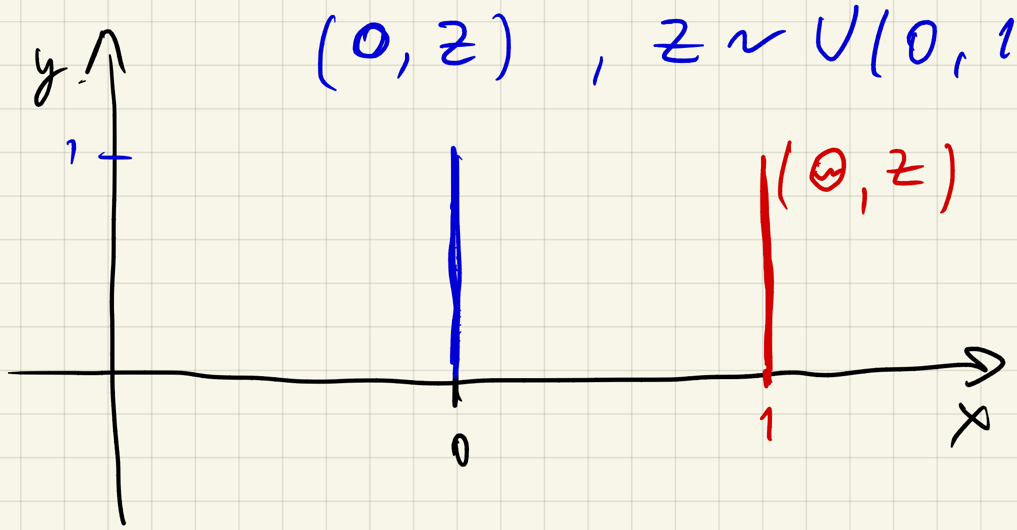
$$KL(q\|p) = \mathop{\mathbb{E}}_{x\sim q} \log\frac{q(x)}{p(x)}$$

$KL(p\|q) \to \min$

p 

$KL(q\|p)$



4) 

$(0, z)$, $z \sim U(0,1)$

(θ, z) $z \sim U(0,1)$

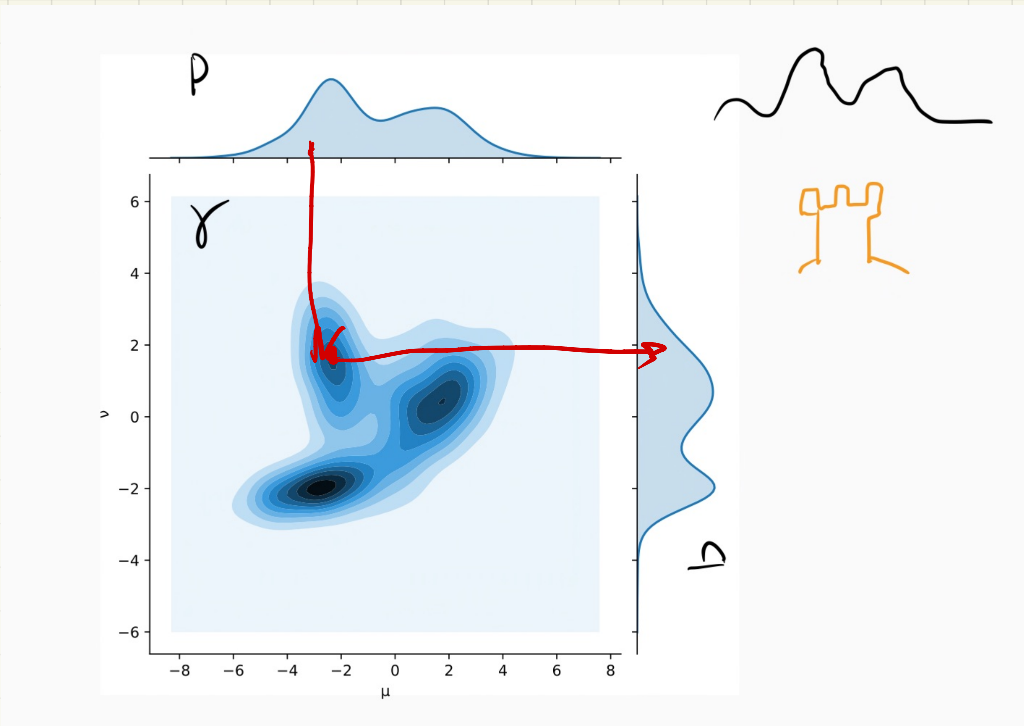
1) $KL(p\|q) \geq 0$

2) $KL(q \| p) = \infty$

3) $JS(p, q) =$

$$KL\left(p \,\Big\|\, \frac{p+q}{2}\right) = \mathbb{E}_{x \sim p} \log \frac{2p}{p+q}$$

$$W(p, q) = \inf_{\gamma \sim \Pi(p, q)} \mathbb{E}_{(p,q) \sim \gamma} \|x - y\|$$



$\underline{\text{WGAN-GP}}$