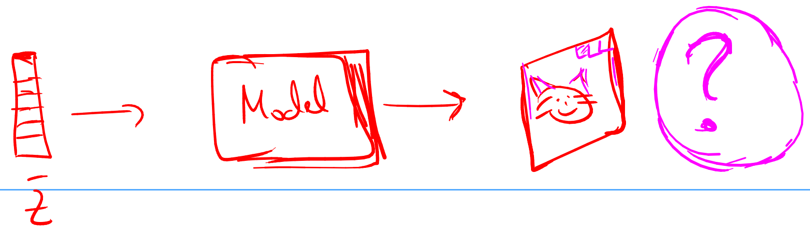
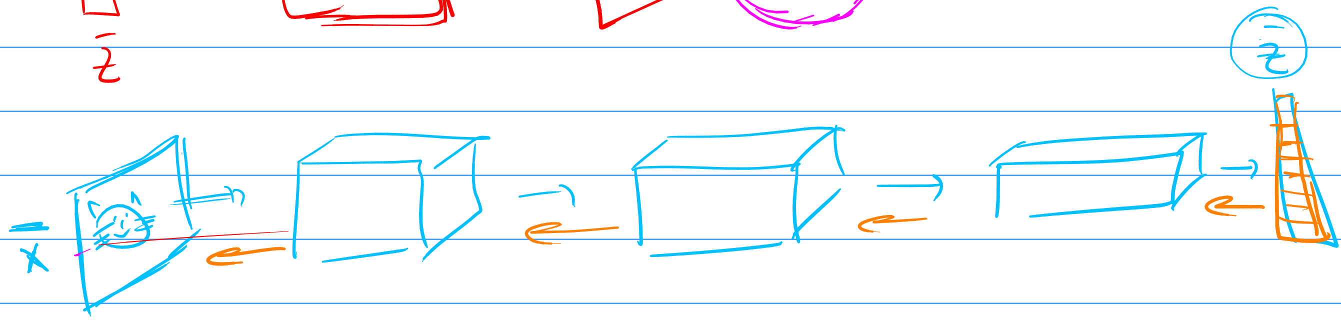
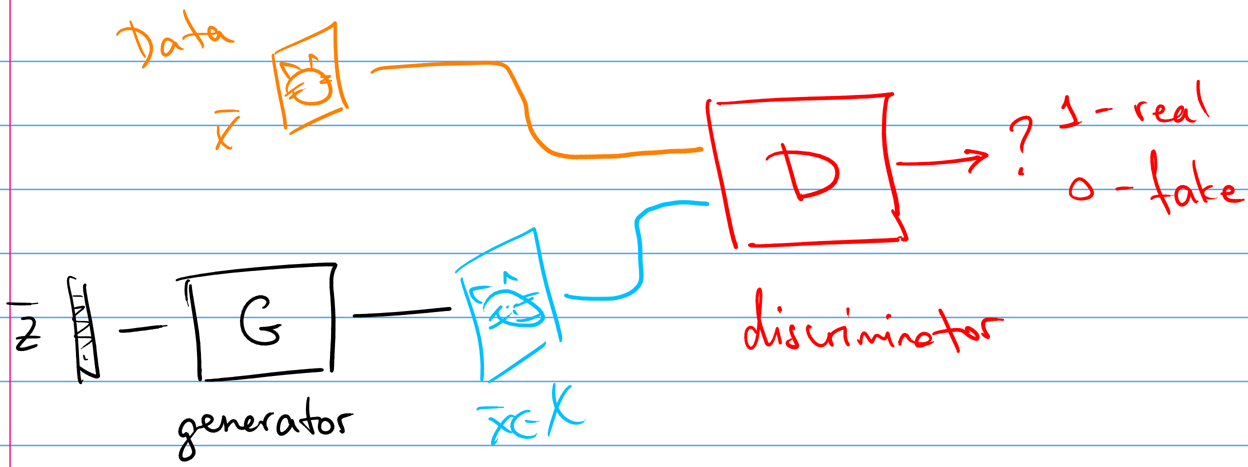






$G: Z \to X$

$D: X \to [0,1]$

$V(D, G)$ $\quad \mathbb{E}_p[f] = \int f(\bar x)\, p(\bar x)\, d\bar x$

$$L_D = \mathbb{E}_{\bar x \sim p_{data}}\left[\log D(\bar x)\right] + \mathbb{E}_{\bar x \sim p_g}\left[\log(1 - D(\bar x))\right] \to \max$$

$$L_G = \mathbb{E}_{\bar x \sim p_g}\left[\log(1 - D(\bar x))\right] = \mathbb{E}_{\bar z}\left[\log(1 - D(G(\bar z)))\right] \to \min$$

$$\min_G \left[\max_D V(D, G)\right]$$

$$L_D = \int \left(p_{data}(\bar x) \log D(\bar x) + p_g(\bar x) \log(1 - D(\bar x))\right) d\bar x \to \max$$

$$p_{data}(\bar x) \log a + p_g(\bar x) \log(1 - a) \to \max$$

$$\frac{p_{data}(\bar{x})}{a^*} - \frac{p_g(\bar{x})}{1-a^*} = 0$$

$$(1-a^*)\,p_{data}(\bar{x}) - a^*\,p_g(\bar{x}) = 0$$

$$\boxed{\underline{D_G^*(\bar{x})} = \frac{p_{data}(\bar{x})}{p_{data}(\bar{x}) + p_g(\bar{x})}}$$

$$\min_G V(D_G^*, G) = ?$$

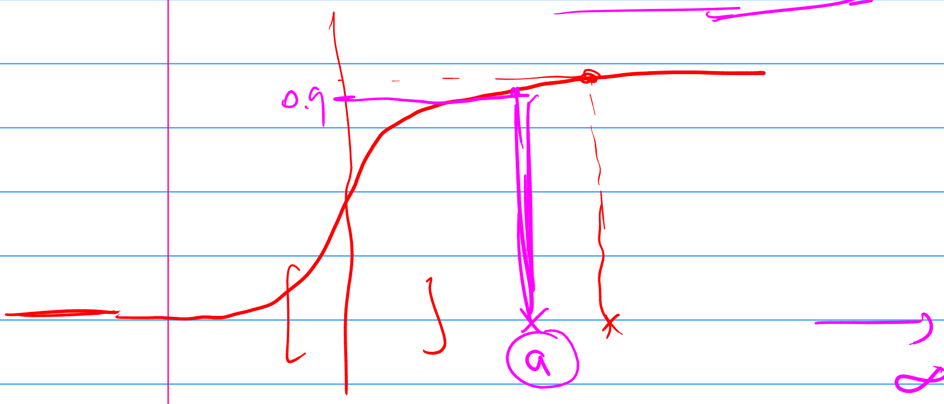
$$\int \left(p_d(\bar{x}) \log \frac{2\,p_d(\bar{x})}{p_d(\bar{x}) + p_g(\bar{x})} + p_g(\bar{x}) \log \frac{2\,p_g(\bar{x})}{p_g(\bar{x}) + p_d(\bar{x})} \right) d\bar{x} - 2\log 2$$

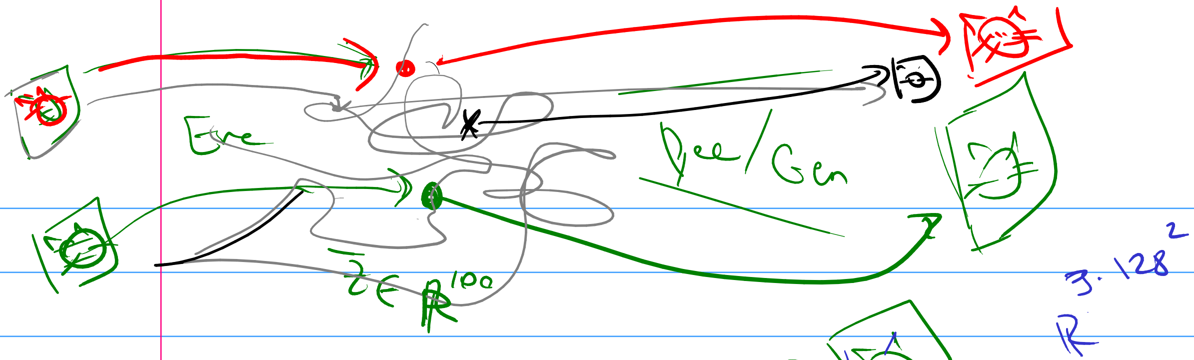
$$KL(p\,\|\,q) = \int p(x) \log \frac{p(x)}{q(x)}\,dx \qquad \frac{p_d + p_g}{2}$$

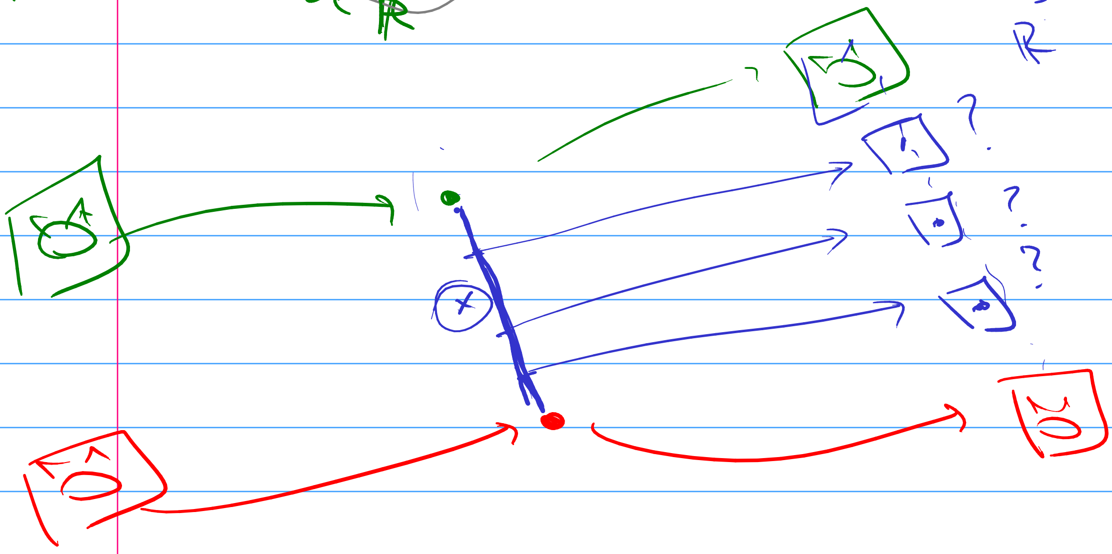
$$= \underbrace{KL\left(p_{data} \,\Big\|\, \frac{p_{data} + p_g}{2}\right) + KL\left(p_g \,\Big\|\, \frac{p_{data} + p_g}{2}\right)}_{\|} - 2\log 2$$

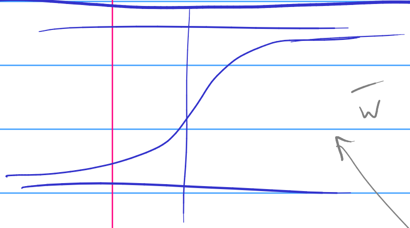
Jensen-Shannon

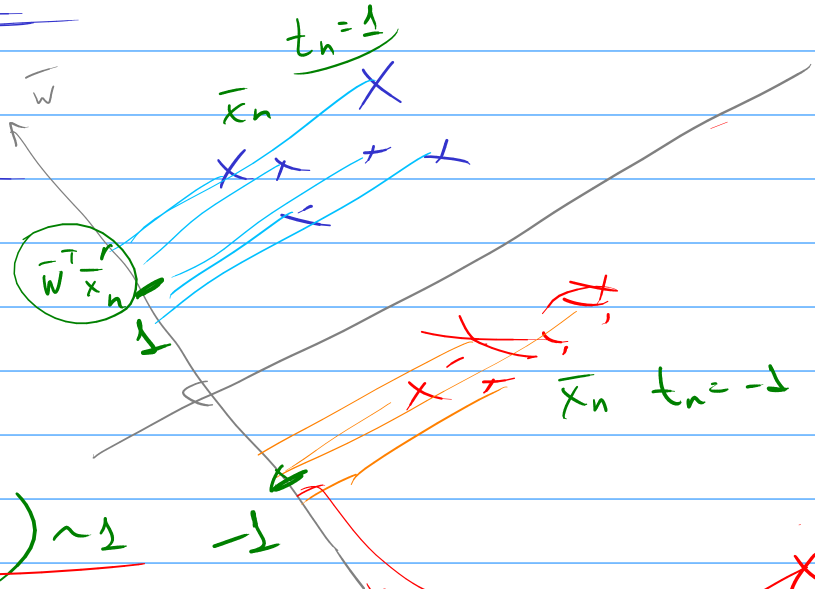
$$JSD(p_{data}\,\|\,p_g) \xrightarrow[G]{} \min$$







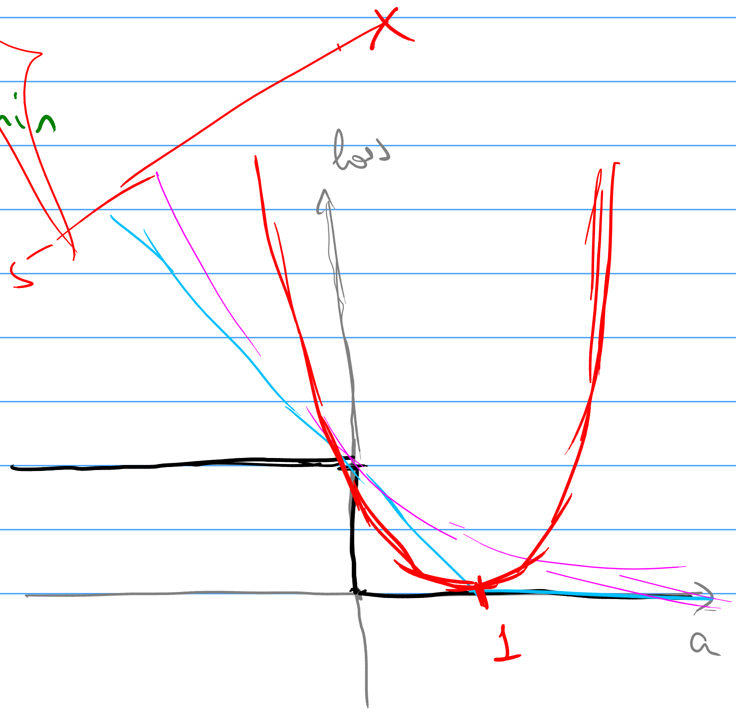




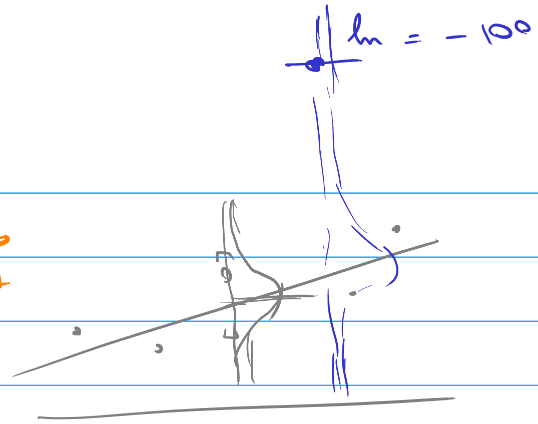
$t_n(\bar w^T \bar x_n) \sim 1$ $\quad -1$

$(t_n \bar w^T \bar x_n - 1)^2 \to \min$

$\sigma(\bar w^T \bar x_n) \sim 0/1$ $\quad -5$



$|x-y|$



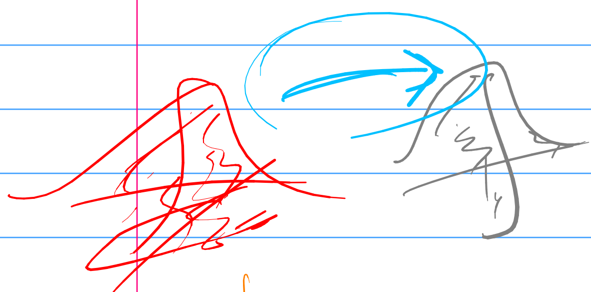
$$KL(p\|q) = \int p \log \frac{p}{q}\, dx = \infty$$

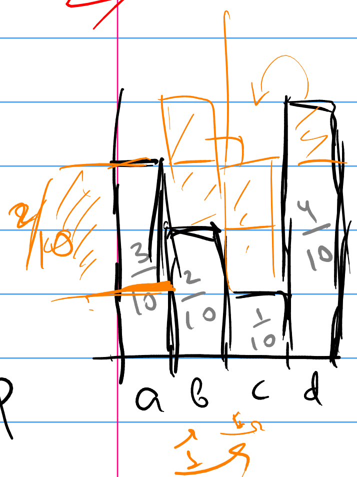
$$KL(q\|p) = \text{—} \quad \text{—} = \infty$$

$$JSD(p\|q) = \underbrace{KL\left(p \,\Big\|\, \frac{p+q}{2}\right)} + KL\left(q \,\Big\|\, \frac{p+q}{2}\right) = \log 2$$

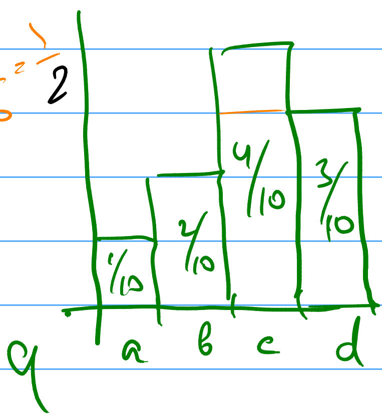
Wasserstein distance / EMD

Earth Mover Distance





$\frac{2}{10} + \frac{2}{10} + \frac{1}{10} = 2$



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