Семинар 3

2024 курс: Генеративные модели

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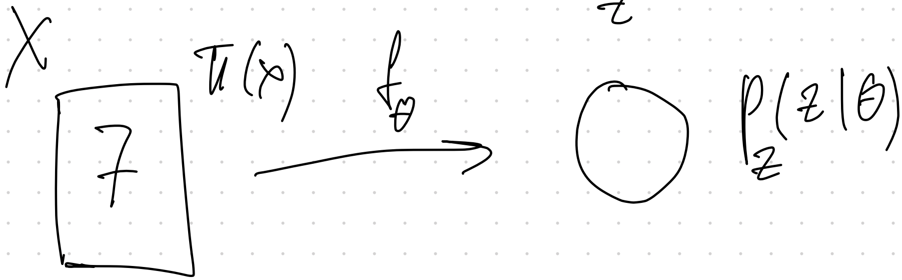
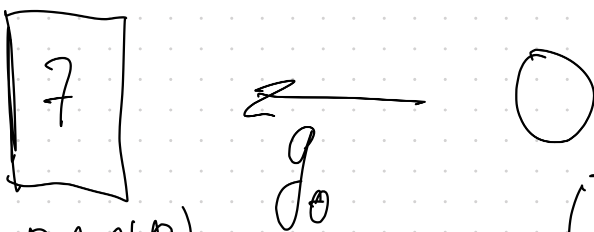
$$1 + \underset{\tanh}{h'}(\underbrace{w^T z + b}_{0 < h' < 1}) w^T u \neq 0 \quad \forall z$$

$= \operatorname{def} J_g$

$$1 + h'(\dots) w^T u > 0$$

$$w^T u > \frac{-1}{h'(\dots)} \Rightarrow w^T u \geq -1$$





$p_z(z) \sim N(0,1)$

$p_x(X|\theta)$

$$p_x(x)\,dx = p_z(z)\,dz$$

$$\Downarrow$$

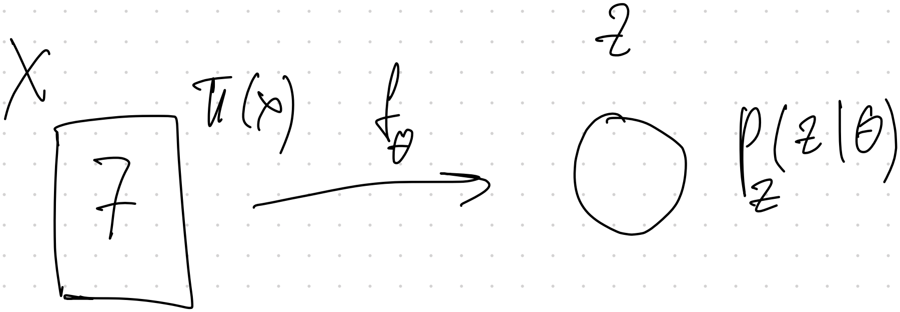
$$p(x) = p(z)\frac{dz}{dx}$$

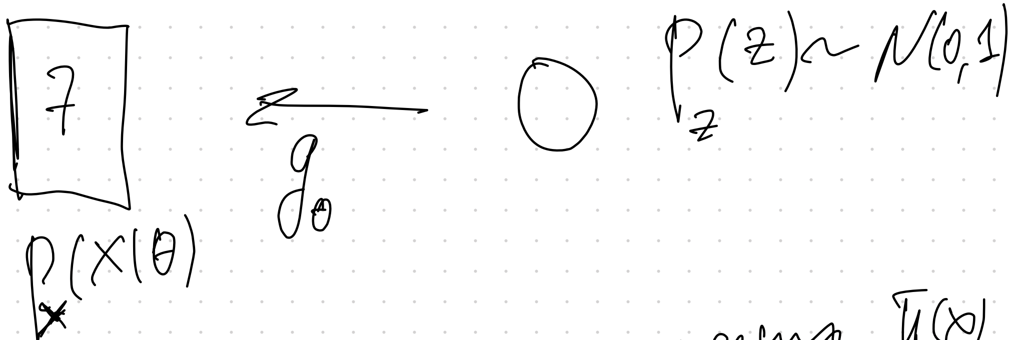
$\pi(x)$ - страшное, не понятное

$$p(X|\theta) = p_z(f(x)) \cdot |\det J_f|$$

$$p(z|\theta) = p_x(g(z)) \cdot |\det J_g|$$

$$p(z) \sim N(0,1)$$





Задача – оценить плотность $\pi(x)$

1. Перегнать $X \to z$, знаем $p(z)$, посчитаем $\pi(X)$

2. Перегоним $z \to X$, знаем $p(z) \Rightarrow$
$\Rightarrow$ знаем $p(x|\theta)$

$$KL\left[\pi, p(x|\theta)\right] = \int \pi(x) \log \frac{\pi(x)}{p(x|\theta)} dx =$$

$$= -\underbrace{\int \pi(x) \log p(x|\theta)\, dx}_{-\mathbb{E}_{\pi(x)} \log p(x|\theta)} + \underbrace{\int \pi(x) \log \pi(x)\, dx}_{\text{const}}$$

$$-\mathbb{E}_{\pi} \log\left[p_z(f(x)) \cdot |\det J_f|\right] =$$

$$= -\mathbb{E}_{\pi}\left[\log p_z(f(x)) + \log |J_f|\right]$$

1. $f(x) = z$
2. $p_z(f(x)) = p_z(z)$
3. $\det J_f$
4. $x \sim \pi$

$\boxed{gHH}$

MLE

$$KL[p(x|\theta), \pi] =$$

$$\int p(x|\theta) \log \frac{p(x|\theta)}{\pi(x)} dx =$$

$$= \mathbb{E}_{p(x|\theta)}[\log p(x|\theta) - \log \pi(x)]$$

$$= \mathbb{E}_{p(x|\theta)}[\log_{z}(f(x)) + \log|\det J_f| - \log \pi(x)]$$

$$\mathbb{E}_{p(z)}[\log p_z(z) - \log|\det J_g| - \log \pi(g(z))]$$

$KL[p(x|\theta), \pi(x)]$ <u>Reverse KL</u>

$$\mathbb{E}_{p(z)}[\log p_z(z) - \log|\det J_g| - \log \pi(g(z))]$$

1. $g(z) = x$ <u>не MLE</u>
2. $\det J_g$
3. $p(z)$, sampling
4. оцениваю $\pi(x)$