

probability mass function PMF

$$P_{\text{model}}(x; \theta^*)$$

$$\hat{P}_{\text{data}}(x) = \frac{1}{n} \sum_{i=1}^n f(x - x_i)$$

$$f(x) = 1 \quad \text{if } x = 0$$

(a) write down log-likelihood

$$\sum_{i=1}^n \log p(x_i; \theta)$$

(b) KL Divergence

$$D_{\text{KL}}(\hat{P} \| P) = \underbrace{\mathbb{E}_{\hat{P}} \left[\log \hat{P} \right]}_{\theta = \hat{\theta}} - \underbrace{\hat{P} \log P}_{\text{true}}$$

$$\Leftrightarrow \arg \max_{\theta} \left\{ \hat{P} \log P \right\}$$

$$\sum_x \hat{p} \log p$$

$$\sum_x \frac{1}{n} \sum_{i=1}^n f(x - x_i) \log p(x; \theta)$$

$$= \sum_x \frac{1}{n} \sum_{i=1}^n \left\{ f(x - x_i) \log p(x; \theta) \right\}$$

$$= \frac{1}{n} \sum_{i=1}^n \left\{ \sum_x f(x - x_i) \log p(x; \theta) \right\}$$

$$x \in \{x_1, \dots, x_n\} \quad x_i \in \{x_1, \dots, x_n\}$$

$$\{ \text{"0" or "1"} \} \quad x = x_i \text{ と } x \neq x_i \text{ の場合}$$

$$f(x - x_i) = 1$$

$$\text{その他} \quad f(x - x_i) = 0$$

$$\rightarrow = \frac{1}{n} \sum_{i=1}^n \left\{ \log p(x_i; \theta) \right\} \leftarrow \text{log likelihood object}$$