Subject /δH_Q3 MLE KL

Date /

Attendants

$P_{model}(x;\theta) \to P_{model}(x)$

brief expression

$X = (x_1, \dots x_n)$ is drawn iid from

a discrete distribution with PMF

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

~~確率質量関数~~

probability mass function

empirical PMF on X as $\hat{p}_{data}(x)$

$$\hat{p}_{data}(x) = \frac{1}{n}\sum_{i=1}^{n} \delta(x - x_i),$$

$\delta(x) = 1$ if $x = 0$

$\delta(x) = 0$ otherwise

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(a) log likelihood objective ?

Let

$q\ (P_{model}(x) \mid \hat{P}_{data}(x))$ be

the probabity of $P_{model}(x)$

when $\hat{P}_{data}(x)$ is given.

$P_{model}(x;\theta)$ can be considered

$$P_{model}(x \mid \theta)$$

log likelihood

$$\log P_{model}(x \mid \theta)$$

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$$D_{KL}(\hat{p}_{data}(x) \| p_{model}(x;\theta))$$

$$= \hat{p} \log\left(\frac{\hat{p}}{p}\right) = \hat{p}\log\hat{p} - \hat{p}\log p \geq 0$$

$\hat{p}\log\hat{p}$ は θ に依存しない

つまり $-\hat{p}\log p \geq 0$ の最小化

$\iff$ $\hat{p}\log p$ の最大化

$$\iff \hat{\Theta} = \arg\max_{\theta} \frac{1}{n}\sum_{i=1}^{n} \delta(x - x_i) \log P_{model}(x;\theta)$$

$\Downarrow$?

$$= \mathbb{E}_{\hat{P}_{data}(x)}\left[\log P_{model}(x;\theta)\right]$$