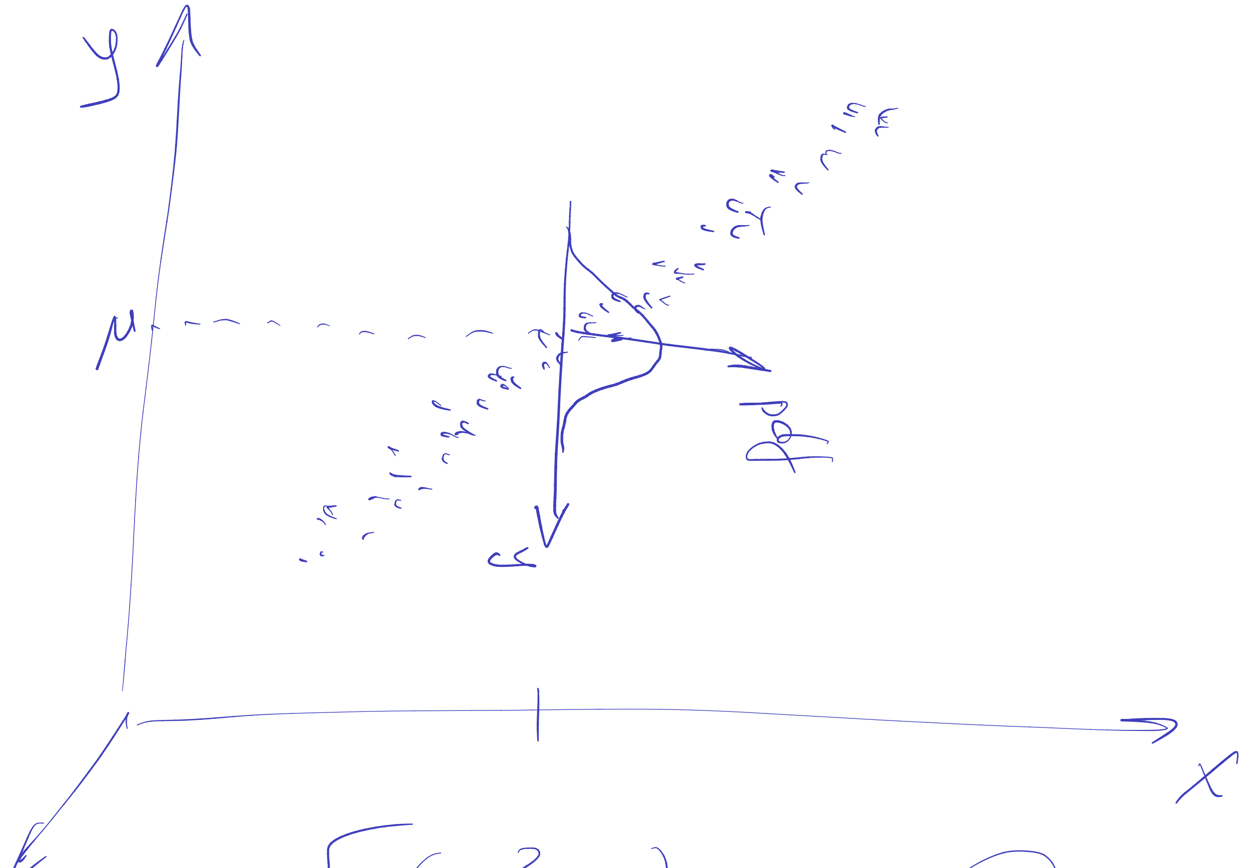
Линейная регрессия

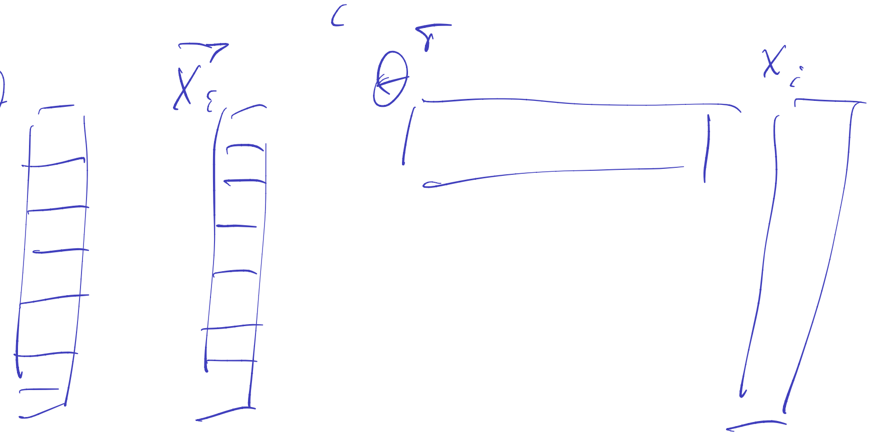
LINE



$y_i \sim \mathcal{N}(\sigma_i^2, \mu_i)$ — N

E - equivariance $\sigma_i^2 = \sigma^2$

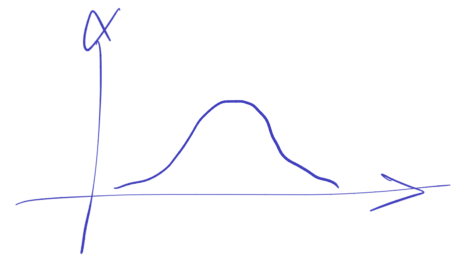
$\mu_i = \theta^T x_i$ L θ



I: independence

i.i.d.

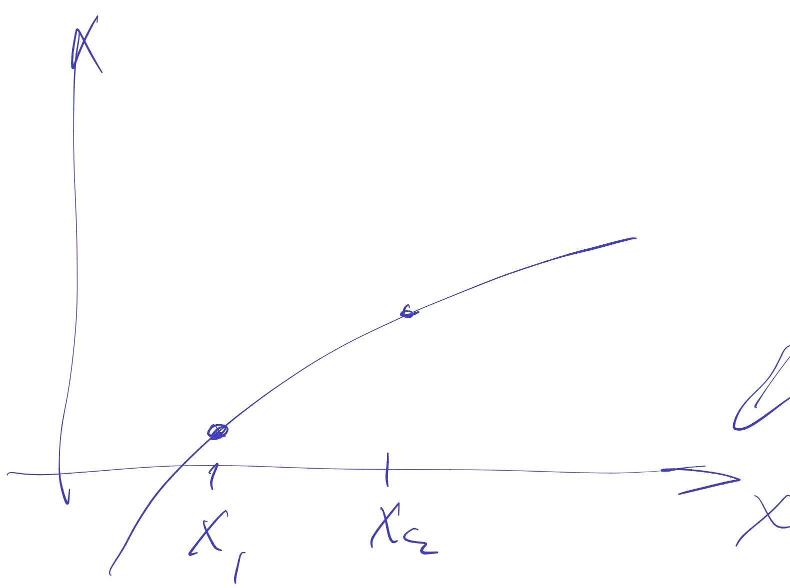
$$p_i(x_i, y_i, \theta) = \frac{1}{\sqrt{2\pi\sigma_i^2}} e^{-\frac{(\mu_i - y_i)^2}{2\sigma_i^2}}$$

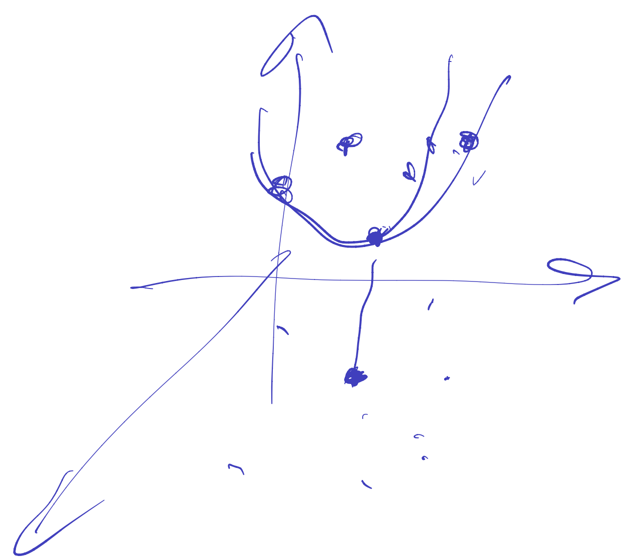


$$y_i \sim \mathcal{N}(\sigma^2, \theta^T x_i)$$

$$L(\mathcal{J}, \theta) = \prod_{i=1}^{N} \frac{1}{\sqrt{2\pi\sigma_i^2}} e^{-\frac{(\mu_i - y_i)^2}{2\sigma_i^2}}$$

$$\hat{\theta} = \arg\max_{\theta} L(\mathcal{J}, \theta)$$





$$l(\mathcal{T},\theta) = \ln L(\mathcal{T},\theta) =$$

$$= \sum \ln\left(\frac{1}{\sqrt{\quad}}\, e^{-\frac{(\quad)}{2\sigma_i^2}}\right) =$$

$$= \sum_{1}^{N} \ln \frac{1}{\sqrt{2\pi\sigma^2}} + \sum_{1}^{N} \ln\left(e^{-\frac{(\mu_i-y_i)^2}{2\sigma_i^2}}\right)$$

$$\hat{\theta} = \arg\max_{\theta} (l) =$$

$$= \arg\max_{\theta} \sum_{1}^{N} \ln e^{-\frac{(\mu_i-y_i)^2}{2\sigma^2}} =$$

$$= \arg\max_{\theta} \sum_{1}^{N} \left(-\frac{(\mu_i-y_i)^2}{2\sigma^2}\right) =$$

$$= \arg\max_{\theta} -c^2 \sum_{1}^{N} (\mu_i-y_i)^2 =$$

$$= \arg\min_{\theta} \sum_{1}^{N} (\theta^T x_i - y_i)^2$$

$$\hat{\theta} = \underset{\Theta}{\operatorname{argmin}} \sum_{1}^{N} (\underbrace{\theta^T x_i}_{\hat{y}_i} - y_i)^2$$

$$\hat{\theta} = \underset{\Theta}{\operatorname{argmin}}\ \mathcal{L}(\mathcal{J}, \theta)$$