Lecture 2

decision loss

$$\ell(y, a)$$

$$a \in \mathcal{A}, \quad y \in \mathcal{Y}$$

Prod problem

$$a \equiv \hat{y}$$

$$P_\theta(y|x) \approx Pr(y|x)$$

$$\hat{\theta} \leftarrow \underset{\theta}{\operatorname{argmin}} \underbrace{-\sum_i \log P_\theta(y|x)}$$

(model) loss

$$R_1^{(x)} = P_r(y=1 \mid x=x)\, \ell_{TP} + (1 - P_r(y=1 \mid x))\, \ell_{FP}$$

Assume $\hat{p}(x) \equiv \hat{p} = P_r(y=1 \mid x=x)$

$$R_1(x) = \hat{p}\, \ell_{TP} + (1-\hat{p})\, \ell_{FP}$$

$$R_0(x) = \hat{p}\, \ell_{FN} + (1-\hat{p})\, \ell_{TN}$$

$$R_1(x) < R_0(x)$$

$$(1-\hat{p})[\ell_{FP} - \ell_{TN}] < \hat{p}[\ell_{FN} - \ell_{TP}]$$

$$\frac{[\ell_{FP} - \ell_{TN}]}{\ell_{FN} - \ell_{TP}} < \frac{\hat{p}}{1-\hat{p}}$$

$$L_1 \quad \frac{\ell_{FP}}{\ell_{FN}}$$