

Q3.1

$$\text{Exp cost of choosing } y=j = \sum_{k=1}^C \mathbb{1}(d_j | y=k) P(y=k | x)$$

$$= \sum_{\substack{\delta=1 \\ \delta \neq k}}^C \lambda_s P(y=\delta | x) \quad \begin{array}{l} \text{Assume } y=k \\ \text{is grand truth} \end{array}$$

$$= \lambda_s (1 - P(y=k | x))$$

$$\sum_{k=1}^C \mathbb{1}(d_j | y=k) P(y=k | x)$$

$$= \sum_{\substack{k=1 \\ k \neq j}}^C \lambda_s P(y=k | x)$$

$$= \lambda_s \cdot (1 - P(y=j | x))$$

$$\text{If } \lambda_s (1 - P(y=j | x)) \leq \lambda_r$$

$$\underline{1 - \frac{\lambda_r}{\lambda_s} \leq P(y=j | x)} \quad \#$$