

CLASSIFICATION & DECISION (BISHOP CH. 4) CH. 1

①

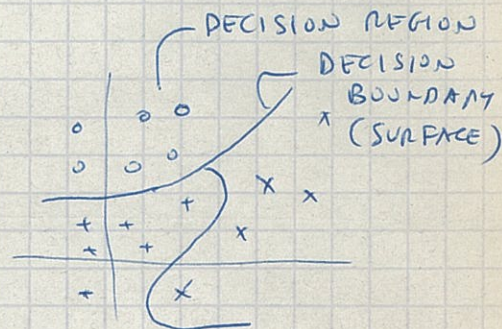
DATA $\{X_n, t_n\}$
CLASS LABEL $\begin{cases} C_1 \\ C_2 \end{cases}$ $\begin{matrix} t_n \\ 1 \\ 0 \end{matrix}$ 1 0 -1 ETC.

PROBABILISTIC MODEL:

$$P(X, t), P(X, C_1) \dots \quad t_n = (0 \ 0 \dots 1 \dots 0)$$

$C_1 \ C_2 \dots C_k \dots C_k$

$$P(C_k) \quad P(X|C_k) \rightarrow P(C_k|X) = \frac{P(X|C_k) P(C_k)}{P(X)}$$

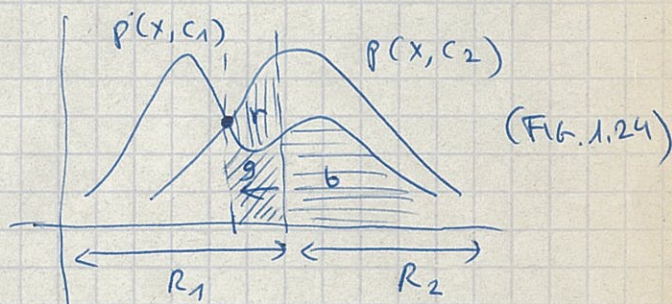


MINIMIZING MISSCLASSIFICATION (CH. 1.5.1)

$$P(\text{miss}) = P(X \in R_1, C_2) + P(X \in R_2, C_1)$$

$$K=2 \quad = \int_{R_1} P(X, C_2) dx + \int_{R_2} P(X, C_1) dx$$

$\underbrace{\text{red + green}}_{\downarrow \text{min } \phi} \quad \underbrace{\text{blue}}_{\text{const}}$



$$P(\text{miss}) = \text{MIN} \quad P(X, C_1) = P(X, C_2)$$

$$\rightarrow \text{test, boundary} \quad \boxed{P(C_1|X) > P(C_2|X)}$$

$$K > 2 \quad P(\text{correct}) = \sum_{u=1}^K P(X \in R_u, C_u) = \sum_{u=1}^K \int_{R_u} P(X, C_u) dx = \text{MAX}$$

X ASSIGNED TO C_k
CLASS WITH $P(C_k|X)$
MAXIMIZED

MINIMIZING THE EXPECTED LOSS (CH. 1.5.2) (MAXIMIZING THE EXPECTED UTILITY)

$$E\{L\} = \sum_{u=1}^K \sum_{j=1}^K \int_{R_j} L_{uj} P(X, C_u) dx$$

$$\left(\text{MIN, IF:} \sum_{u=1}^K \int_{R_j} L_{uj} P(C_k|X) \text{ MINIMAL} \right)$$

LOSS/COST/UTILITY MATRIX

	OK	NOT	
FACT OK	\emptyset	I.	I, II - TYPE ERROR (FIG. 1.25)
NOT	II.	\emptyset	