LS FOR CLASSIFICATION (CH. 4.1.3)

CLASS C_k : $\boxed{y_k(\underline{x}) = \underline{w}_k^T \underline{x} + w_{k0}}$ $\quad k = 1 \cdots K$

$$\boxed{\underline{y}(\underline{x}) = \tilde{\underline{\underline{W}}}^T \tilde{\underline{x}}} \qquad \tilde{\underline{\underline{W}}} = [\cdots \tilde{\underline{w}}_k \cdots]$$

$\tilde{\underline{x}} = (1, \underline{x}^T)^T \qquad \tilde{\underline{w}}_k = (w_{k0}, \underline{w}_k^T)^T$

WHERE

$y_k = \tilde{\underline{w}}_k^T \tilde{\underline{x}}$ IS THE LARGEST

TRAINING SET: $\{\underline{x}_n, \underline{t}_n\}$ $n = 1 \cdots N$

$\underline{t}_n$: K-CLASS CODING

$$\underline{\underline{T}} = \begin{bmatrix} \vdots \\ \underline{t}_n^T \\ \vdots \end{bmatrix} \qquad \tilde{\underline{\underline{X}}} = \begin{bmatrix} \vdots \\ \tilde{\underline{x}}_n^T \\ \vdots \end{bmatrix}$$

(ERROR: EVERY k, EVERY n)

$$E_D(\tilde{\underline{\underline{W}}}) = \frac{1}{2} \mathrm{Tr}\left\{ (\tilde{\underline{\underline{X}}} \tilde{\underline{\underline{W}}} - \underline{\underline{T}})^T (\tilde{\underline{\underline{X}}} \tilde{\underline{\underline{W}}} - \underline{\underline{T}}) \right\} \qquad \frac{\partial}{\partial \tilde{\underline{\underline{W}}}} \equiv \emptyset \;!$$

$$\boxed{\tilde{\underline{\underline{W}}} = (\tilde{\underline{\underline{X}}}^T \tilde{\underline{\underline{X}}})^{-1} \tilde{\underline{\underline{X}}} \underline{\underline{T}} = \tilde{\underline{\underline{X}}}^+ \underline{\underline{T}}}$$

$$\boxed{\underline{y}(\underline{x}) = \tilde{\underline{\underline{W}}}^T \tilde{\underline{x}} = \underline{\underline{T}}^T (\tilde{\underline{\underline{X}}}^+)^T \tilde{\underline{x}}}$$

DISCRIMINANT FUNCTION

$\left(d\, \mathrm{tr}(AX) = \mathrm{tr}(A (dX)) \right.$ ETC. $\left. \right)$

- LIKE LS REGRESSION
- SENSITIVE TO OUTLIERS (HERE "SURE" DATA → FIG. 4,4)

FISHER'S LINEAR DISCRIMINANT (CH. 4.1.4, 4.1.6) (FIG. 4,6)

C_1, C_2 PROJECTION TO 1 DIM

EVEN IF LINEARLY SEPARABLE
→ OVERLAPPING POSSIBLE

COMPARE PROJECTIONS
P1, P2, P3 !