LEHRSTUHL FÜR MENSCH-MASCHINE-KOMMUNIKATION

Pattern Recognition

Tutorial No. 10
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Exercise 22

For a Bayes-classifier for normal distributed vectors $\underline{y}$, the decision function of the i-th class is:

$$d_i = \log P(W_i) - \frac{1}{2}\log |C_i| - \frac{1}{2}(\underline{y} - \underline{m}_i)^T \times C_i^{-1} \times (\underline{y} - \underline{m}_i)$$

a) Derive a simplified form for d_i, for the special case that all class covariance matrices are set to $C_i = C$.
b) If furthermore $C_i = I$ and all a-priori probabilities $p(\Delta_i)$ are equal, which known classifier can be derived?
c) In this case, what is the meaning of the vector $\underline{m}_i$?

Exercise 23

Given is the general form of a Bayes-classifier with the decision function for the i-th class:

$$d_i(\underline{y}) = p(\underline{y} \mid \Omega_i) \cdot p(\Omega_i)$$

a) What is the equation for the error probability $p(e \mid \underline{y})$, if an unknown verctor $\underline{y}$ is presented to the classifier?
b) From the result in a) derive the equation for the complete error probability $p(e)$.
c) Show that the choice of the Bayes-classifier minimises the error probability $p(e)$.