Intelligent Systems: Reasoning and Recognition

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Exercise 5 18 March 2016

Canonical Form for a Quadratic Discriminant Functions

Assume a discriminant function of the form

$$g_k(\vec{X}) = Log\{p(\vec{X} \mid \omega_k)P(\omega_k)\}$$

where

$p(\vec{X} \mid \omega_k) = \mathcal{N}(\vec{X}; \vec{\mu}_k, \Sigma_k)$ is a Normal Density function and
$P(\omega_k)$ is a probability value.

Show that this is equivalent to a discriminant function of the form

$$g_k(\vec{X}) = \vec{X}^T D_k \vec{X} + \vec{W}_k^T \vec{X} + b_k$$

and give the formulae for D_k, $\vec{W}_k$ and b_k.