

Linear Discriminant Analysis (LDA)

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Input: data-points $x_1, \dots, x_n \in R^d$ and labels $l_1, \dots, l_n \in \{1, \dots, k\}$.

Let μ and C be the empirical mean and variance of the given dataset. Let n_j be the number of points with label j . Let μ_j and C_j the empirical mean and variance of the vectors with label j .

Define:

$$\text{Within class variability} \quad C_w = \sum_{j=1}^k \frac{n_j}{n} C_j$$

$$\text{Between class variability} \quad C_b = \sum_{j=1}^k \frac{n_j}{n} (\mu_j - \mu)(\mu_j - \mu)^T$$

Dimensionality Reduction: $x \rightarrow w^T x$

Binary LDA: $w = C_w^{-1}(\mu_2 - \mu_1)$.

Multi-class LDA: $w = C_w^{-1} C_b$.