Generalizing Linear Discriminant Analysis

Linear Discriminant Analysis

Objective

-Project a feature space (a dataset n-dimensional samples) onto a smaller

-Maintain the class separation

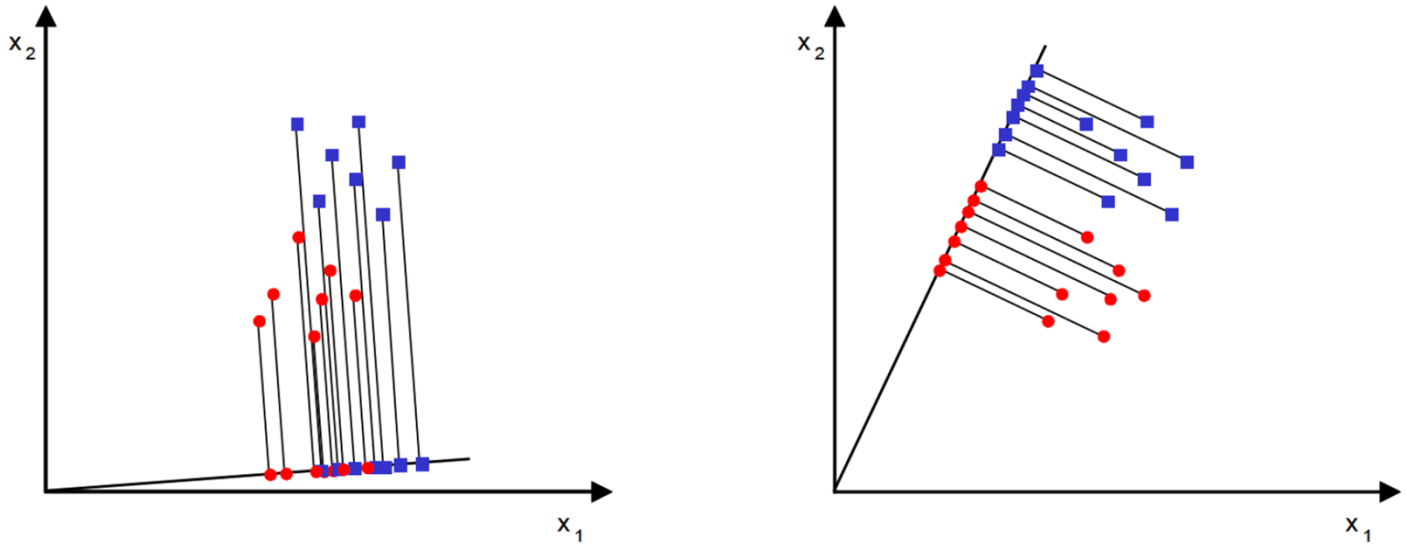
Reason

-Reduce computational costs

-Minimize overfitting

Linear Discriminant Analysis

Want to reduce dimensionality while preserving ability to discriminate



Figures from [1]

Linear Discriminant Analysis

Could just look at means and find dimension that separates means most:

$$\mu_i = \frac{1}{N_i}\sum_{x\in\omega_i} x \text{ and } \tilde{\mu}_i = \frac{1}{N_i}\sum_{y\in\omega_i} y = \frac{1}{N_i}\sum_{x\in\omega_i} w^T x = w^T \mu_i$$

Equation from [1]

Linear Discriminant Analysis

Could just look at means and find dimension that separates means most:

$$\mu_i = \frac{1}{N_i}\sum_{x\in\omega_i} x \text{ and } \tilde{\mu}_i = \frac{1}{N_i}\sum_{y\in\omega_i} y = \frac{1}{N_i}\sum_{x\in\omega_i} w^T x = w^T \mu_i$$

$$J(w) = |\tilde{\mu}_1 - \tilde{\mu}_2| = |w^T(\mu_1 - \mu_2)|$$

Equations from [1]

Linear Discriminant Analysis

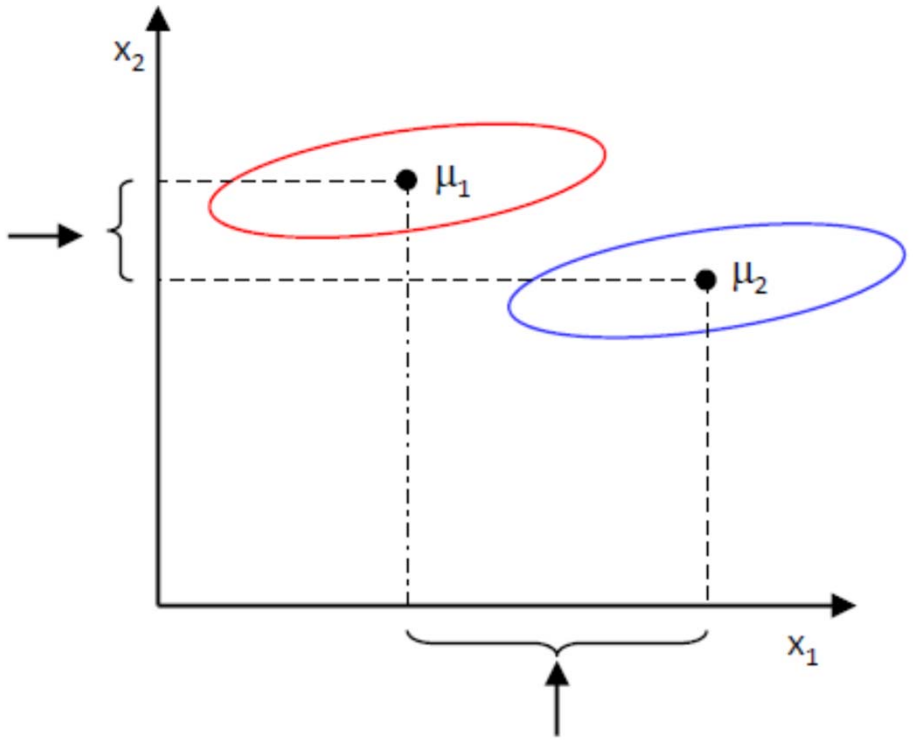


Figure from [1]