ASSIGNMENT

## 1. Calculation of the Decision Boundary

The Bayesian decision rule for two classes with identical, spherical covariance matrices and equal priors reduces to a linear discriminant of the form

where

### 1.1. Compute the normal vector

### 1.2. Compute the midpoint

### 1.3. Plug into the discriminant equation

Dividing by gives the **final linear equation** of the decision boundary:

Equivalently,

### 2. Geometric Description

* **Midpoint (bisector point)**: The line passes through the point
* which is the exact midpoint of the segment joining the class means and .
* **Normal vector**: The vector
* is **normal** (perpendicular) to the decision boundary. Hence the line is orthogonal to the direction that connects the two means, i.e., it is the **perpendicular bisector** of the segment .
* **Slope**: Solving for yields , a line with slope . This confirms that the line is at a angle to both coordinate axes and cuts the line segment between the means exactly in half.