

Project 4

Each group should

- Submit one lab report to Canvas by May 10, 11:59 pm.
 - Include a thoughtful and reflective paragraph from each team member summarizing what has been learned.
 - Include a section describing the work done by each member of the group.
 - Attach your well-documented code in the appendix of the report.
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1. (DHS, page 80) Computer Exercises - Problem 2.
 2. Consider a two-dimensional classification problem that involves two classes, ω_1 and ω_2 , which are modeled by Gaussian distributions with means $\boldsymbol{\mu}_1 = [0, 0]^T$ and $\boldsymbol{\mu}_2 = [2, 2]^T$, respectively, and common covariance matrix $\boldsymbol{\Sigma} = \begin{bmatrix} 1 & 0.25 \\ 0.25 & 1 \end{bmatrix}$. Assuming equal priors.
 - (a) Form and plot a data set \mathcal{X} consisting of 500 points from ω_1 and another 500 points from ω_2 .
 - (b) Assign each one of the points of \mathcal{X} to either ω_1 or ω_2 , according to the Bayes decision rule, and plot the points with different colors, depending on the class they are assigned to. Plot the corresponding classifier.
 - (c) Based on (b), compute the error probability.
 - (d) Let $\lambda_{11} = \lambda_{22} = 0, \lambda_{12} = 1, \lambda_{21} = 0.005$. Assign each of the points of \mathcal{X} to either ω_1 or ω_2 , to minimize the overall risk.
 - (e) Based on (d), compute the overall risk.
 - (f) Comment on the results above.