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COEN 140
Lab 4 Report

In this lab, I implemented LDA and QDA from scratch. I first trained the model by calculating the mean and sigma for each of the classes, then tested the model by calculating the Bayesian probability. Based on the highest probability, I classified that data into that class and calculated the error rates for each of the models.

Error Rates:

Features Selected	LDA Training Data Error Rate	LDA Testing Data Error Rate	QDA Training Data Error Rate	QDA Testing Data Error Rate
All Attributes	0.025	0	0.0167	0
Without Sepal Length	0.0167	0	0.025	0
Without Sepal Width	0.025	0	0.0167	0
Without Petal Length	0.0583	0	0.04167	0
Without Petal Width	0.04167	0.0333	0.0583	0.0333

Is there any class linearly separable from other classes? Explain your answer based on your experiments.

Features Selected	Without Setosa	Without Versicolor	Without Virginica
All Attributes	0.0375	0	0

When running the LDA model on the arrays, where each array is a combination of 2 out of the 3 classes, the Error Rates for the Iris-Setosa and Iris-versicolor Model and the Iris-Setosa and Iris-Virginica model is 0, thus, the Iris-Setosa class is linearly separable.

Using Diagonal Matrix:

Time:
QDA with Regular Σ: 0.01863899999999996
QDA with Diagonal Matrix for Σ: 0.003290999999999933

Error Rates:

Features Selected	LDA Training Data Error Rate	LDA Testing Data Error Rate
All Attributes	0.04167	0

There is a major difference in time between using the 2 sigmas but in exchange, we get a difference in accuracy rate. By using the diagonal matrix, we get a much faster time but we also get a higher error rate.