Lesson 4 Overview

**Learning Objectives**

This lesson covers linear discriminant analysis. By the end of the lesson, we will have explored how to:

* Work with Bayes’ rule to compute conditional probabilities.
* Understand sensitivity and specificity in context of predicting a qualitative response.
* Describe how such classification will be accomplished.
* Understand basic development of LDA classification.
* State underlying assumptions for LDA classification with a single predictor.
* Recognize situations appropriate for single-predictor classification.
* Understand how assumptions enter into LDA classification.
* Apply single-predictor LDA using *lda* function and check assumptions.
* Assess predictive abilities via cross-validation.
* State (and check) underlying assumptions for LDA classification with multiple predictors.
* Understand basic reason for QDA classification and state (and check) underlying assumptions.
* Understand how estimators are differently developed.
* Recognize situations appropriate for multiple-predictor classification.
* Apply multiple-predictor LDA and QDA via lda and qda functions.
* Compare models via cross-validation.

**Learning Resources**

**Watch**

* [Bayes' Rule and ClassificationLinks to an external site.](https://media.uwex.edu/content/ds/ds740_r21/ds740_lesson4_presentation1)
* [Linear Discriminant Analysis and Bayes’ Rule: Theory of LDALinks to an external site.](https://media.uwex.edu/content/ds/ds740_r21/ds740_lesson4_presentation2)  
  Download [Lesson4presentation2LDA.R](https://uweau.instructure.com/courses/566248/files/55290560?wrap=1)[Download Lesson4presentation2LDA.R](https://uweau.instructure.com/courses/566248/files/55290560/download?download_frd=1) to be used in the demonstration.
* [LDA Extended and QDA: Multiple Predictors and Nonconstant VarianceLinks to an external site.](https://media.uwex.edu/content/ds/ds740_r21/ds740_lesson4_presentation3/)  
  Download [Lesson4presentation3QDA.R](https://uweau.instructure.com/courses/566248/files/55290671?wrap=1)[Download Lesson4presentation3QDA.R](https://uweau.instructure.com/courses/566248/files/55290671/download?download_frd=1) to be used in the demonstration.

**Read**

* Introduction to Statistical Learning: Sections 4.4–4.5

**Supplemental Resources**

* [WeBWorK 4 Problem 1 Background.pdf](https://uweau.instructure.com/courses/566248/files/55290724?wrap=1)[Download WeBWorK 4 Problem 1 Background.pdf](https://uweau.instructure.com/courses/566248/files/55290724/download?download_frd=1)demonstrates how to use the formulas from the presentations to obtain the equations provided in WeBWorK 4, problem 1.