The University of Texas at Austin
Homework Assignment 9

Predictive Analytics

October 31, 2026

Instructions: Provide your complete solution to the following problems. Final answers only, without appropriate justification, will receive zero points even if correct.

Correlation. Bivariate normal. LDA. QDA.

Problem 9.1. (10 points) Let X and Y be two random variables with finite first and second moments. You know that the correlation between X and Y equals 1, i.e., the two random variables are perfectly positively correlated. Prove that each can be expressed as a linear transform of the other. More precisely, prove that there exist α and β such that $Y = \alpha X + \beta$.

Problem 9.2. (10 points) *Source: "Probability" by Jim Pitman.*
Data from a large population indicate that the heights of mothers and daughters in this population follow the bivariate normal distribution with correlation 0.5. Both variables have mean 5 feet 4 inches, and standard deviation 2 inches. Among the daughters of above average height, what percent were shorter than their mothers?

Problem 9.3. (20 points) Solve problem **4.8.3** (page 189) from the textbook.

Problem 9.4. ($3 + 3 + 2 + 2 = 10$ points) Solve problem **4.8.5** (page 190) from the textbook.