UNIVERSITY OF TEXAS AT AUSTIN

Homework Assignment 6

Correlation. Bivariate normal. LDA. QDA.

Please, provide your **complete solutions** to the following problems. Final answers only, even if correct will earn zero points for those problems.

Problem 6.1. (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 6.2. (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 6.3. (20 points) Solve problem **4.8.3** (page 189) from the textbook.

Problem 6.4. ($3 + 3 + 2 + 2 = 10$ points) Solve problem **4.8.5** (page 190) from the textbook.