MATH 4780 (MSSC 5780) In-class Activity 6

December 3, 2023

Anesti and Tanjina, please present your work on Dec 5. Remember to ask undergraduate students two Non-yes-no questions. You, as a teacher, try to get students understand your work.

Interaction (Anesti)

We have a data set with five predictors, $X_1 = \text{GPA}$, $X_2 = \text{IQ}$, $X_3 = \text{Level}$ (1 for College and 0 for High School), $X_4 = \text{Interaction between GPA and IQ}$, and $X_5 = \text{Interaction between GPA and Level}$. The response is starting salary after graduation (in thousands of dollars). The LSEs are $b_0 = 50$, $b_1 = 20$, $b_2 = 0.07$, $b_3 = 35$, $b_4 = 0.01$, $b_5 = -10$.

1. Which answer is correct, and why?

(i) For a fixed value of IQ and GPA, high school graduates earn more, on average, than college graduates.
(ii) For a fixed value of IQ and GPA, college graduates earn more, on average, than high school graduates.
(iii) For a fixed value of IQ and GPA, high school graduates earn more, on average, than college graduates provided that the GPA is high enough.
(iv) For a fixed value of IQ and GPA, college graduates earn more, on average, than high school graduates provided that the GPA is high enough.

2. Predict the salary of a college graduate with IQ of 110 and a GPA of 4.0.

3. True or false: Since the coefficient for the GPA/IQ interaction term is very small, there is very little evidence of an interaction effect. Justify your answer.

Bootstrapping (Tanjina)

What is bootstrapping? Why do we use bootstrapping? How it can be used in regression? Please explain it using a simple linear regression example.