Class Activity - Logistic Regression

Case of Pizza Hut

Undergraduate students at Miami University in Oxford, Ohio, were surveyed in order to evaluate the effect of price on the purchase of a pizza from Pizza Hut. Students were first asked to imagine a situation in which they were planning to call and order for delivery a large two-topping pizza. Then they were asked to select from either Pizza Hut or another pizzeria of their choice. The price they would have to pay to get a Pizza Hut pizza differed from survey to survey. For example, some surveys used the price $ 11.49. Other prices investigated were $8.49, $9.49, $10.49, $ 12.49, $ 13.49, and $14.49. The dependent variable for this study is whether or not a student will select Pizza Hut. Possible independent variables are the price of a Pizza Hut pizza and the gender of the student.

The data file **PizzaHut.csv** contains responses from 220 students and includes these three variables:

Gender: l = male, 0 = female

Price: 8.49, 9.49, 10.49, 11.49, 12.49, 13.49, or 14.49

Purchase: l = the student selected Pizza Hut,

0 = the student selected another pizzeria

a. Develop a logistic regression model to predict the probability that a student selects Pizza Hut based on the price of the pizza. Is price an important indicator of purchase selection?

b. Develop a logistic regression model to predict the probability that a student selects Pizza Hut based on the price of the pizza and the gender of the student. Is price an important indicator of purchase selection? Is gender an important indicator of purchase selection?

c. Calculate and Interpret the Odds Ratios

Using the logistic regression model from part (b):

- Calculate the **odds ratios** for each coefficient in the model (Price and Gender).

- Interpret each odds ratio in clear language.

Then answer:

1. How does a **$1 increase in price** affect the odds that a student selects Pizza Hut?
2. Which variable (Price or Gender) has the **stronger effect** on purchase behaviour in terms of odds?

e. Make a Prediction for a Given Customer Scenario

Using the model from part (b):

- Use the logistic regression model to **predict the probability that a student selects Pizza Hut** under the following conditions:
    - **Price** = **$10.49**
    - **Gender** = **Male** (Gender = 1)

Then answer:

1. What is the predicted **probability** of selecting Pizza Hut?
2. Based on this probability, would you expect this student to choose Pizza Hut or another pizzeria (using a 0.50 cutoff)?
3. Repeat the prediction for a **female student** (Gender = 0). How does gender change the predicted probability?
4. Explain in business terms why price and gender affect the likelihood of choosing Pizza Hut.