**Stat 021 S'22**

**Week 9**

**Group name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Recorder: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Reporter: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

# Part 1

Suppose you devise a MLR-based method for negotiating prices with used car sales representatives. You collect data from the entire state for the model of car that you are interested in purchasing. Then you approach the salespeople at dealerships based on the residuals of their prices in your regression model.

## Problem 1

Should you pick dealerships that tend to have positive or negative residuals? Why?

## Problem 2

Write down a two-predictor regression model that would use just the *Year* of the car and its *Mileage* to predict *Price*.

## Problem 3

Why might we want to add an interaction term for *Year* · *Mileage* to the model? Would you expect the coefficient of the interaction to be positive or negative? Explain.

# 

# Part 2

## Model 1

**Write the main effects model with transmission type (A as the reference level) and weight as the predictors and mileage as the response.**

1. What is the average gasoline mileage when the transmission is automatic?

2. What is the average gasoline mileage when the transmission is manual?

3. What is the average effect of vehicle weight on gasoline mileage?

4. What is the average effect of vehicle weight on gasoline mileage for automatic transmissions?

5. What is the average effect of vehicle weight on gasoline mileage for manual transmissions?

## Model 2

**Write the main effects model with transmission type (M as the reference level) and weight as the predictors and mileage as the response.**

1. What is the average gasoline mileage when the transmission is automatic?

2. What is the average gasoline mileage when the transmission is manual?

3. What is the average effect of vehicle weight on gasoline mileage?

4. What is the average effect of vehicle weight on gasoline mileage for automatic transmissions?

5. What is the average effect of vehicle weight on gasoline mileage for manual transmissions?

6. Compare your answers to those for Model 1. What do you notice?

## Model 3

**Write the MLR model that includes main effects and interaction effects with transmission type (A as the reference level) and weight as the predictors and mileage as the response.**

1. What is the average gasoline mileage when the transmission is automatic?

2. What is the average gasoline mileage when the transmission is manual?

3. What is the average effect of vehicle weight on gasoline mileage?

4. What is the average effect of vehicle weight on gasoline mileage for automatic transmissions?

5. What is the average effect of vehicle weight on gasoline mileage for manual transmissions?

6. Compare your answers to those for Model 1 and 2. What do you notice?