Lab 5: Confidence Intervals and Hypothesis Testing

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Overview

In this lab, we will continue examining the Motor Trend Cars data set.

The data was extracted from the 1974 Motor Trend US magazine, and comprises fuel consumption and 10 aspects of automobile design and performance for 32 automobiles (1973–74 models).

Load the Data in StatCrunch

A Tab Separated File (.tsv) containing the data can be found here:

http://stat.wvu.edu/~draffle/111/week1/lab1/mtcars2.tsv

1. In StatCrunch, use the menus `Data` → `Load` → `From File` → `On the web`.
2. Copy and Paste the address given above into `WWW Address`
3. Click `Load File` at the bottom of the page.

Complete the following problems on a separate piece of paper. Read these instructions carefully.

- Hand in your answers at the end of lab – make sure to include you name and the lab number. Instructions are included for making graphs and finding the necessary statistics for each problem.
- Each question will be worth two points, and you can receive partial credit for incorrect answers if your process was correct.
- When performing calculations, keep intermediate steps rounded to **four decimal places**, and round your final answer to **two decimal places**.
- For this assignment, you do **not** need to write a sentence unless the problem specifically instructs it.

For all problems, you can find your answers following the steps:

Confidence Intervals:

- For Proportions:
  - `Stat` → `Proportions` → `One Sample` → `With Data`
  - Select Column of interest
  - Type value for success, e.g. auto
  - Select the radio button for `Confidence interval for p`
  - Enter the Confidence Level
  - Hit `Compute!`
- For Means:
  - `Stat` → `T Stats` → `One Sample` → `With Data`
  - Select the Column of interest
  - Select the radio button for `Confidence interval for` μ.
  - Enter the Confidence Level
  - Hit `Compute!`

Hypothesis Testing

- For Proportions:
  - `Stat` → `Proportions` → `One Sample` → `With Data`
  - Select Column of interest
  - Type value for success, e.g. auto
  - Select the radio button for `Hypothesis test for p`
  - Specify your hypotheses
  - Hit `Compute!`
- For Means:
  - `Stat` → `T Stats` → `One Sample` → `With Data`
  - Select the Column of interest
  - Select the radio button for `Hypothesis test for` μ.
  - Specify your hypotheses
  - Hit `Compute!`

Problems:

Part A: Manuals vs. Automatic

1. Create a 90% confidence interval for the proportion of automatics in 1974. Report the confidence interval. Make sure you enter "auto" as success in StatCrunch
2. State your confidence interval from the previous problem as a sentence.
3. Across most of the world, manual cars are much more common. Assume that 25% of drivers have automatics world-wide. If we wanted to test the hypothesis that American drivers prefer automatics more than the rest of the world, state the hypotheses (null and alternative) that we would use.
4. Test the hypotheses you came up with in Question 3. Report the test statistic and the $p-$value.
5. Interpret the results of your test in a sentence, using a cut-off of 5% for significance.

Part B: Fuel Efficiency

1. Create a 95% confidence interval for the mean fuel efficiency (`mpg`) of cars in 1974.
2. Write a sentence interpreting your confidence interval.
3. Say the historical average fuel efficience of all cars is 22 mpg. If we wanted to test that cars in 1974 had a **lower** fuel efficiency than this average, what would the hypotheses be?
4. Test the hypotheses you came up with in Question 3. Report the test statistic and the $p-$value.
5. Interpret the results of your test, using a cut-off of 5% for significance.