

COP2073C Practice Exercise 12

For this exercise you will need to install and load the ggplot2 package.

In this exercise we will use ggplot2 to create a plot that explores relationships within the mpg dataset, specifically focusing on highway fuel efficiency (hwy) in relation to the number of engine cylinders (cyl). We will also incorporate the engine displacement (displ) and fuel type (fl) to create a visual representation that helps illustrate how different variables interact in influencing fuel efficiency in cars.

The mpg dataset is part of the ggplot2 package, so no additional data loading is necessary. You can use the help feature ("?mpg") to find the name and description of the variables.

Use ggplot() to set up the base for your plot, and add layers to make the visualization more informative.

Additional hints:

- Use **color** to represent fuel type and **size** to represent engine displacement to visualize additional dimensions of data effectively. This makes the relationships clearer without overcomplicating the plot.
- Set the alpha parameter to make overlapping points more distinguishable (e.g., alpha = 0.7). This will help when viewing densely packed points, especially where data overlaps. (for more information see https://ggplot2.tidyverse.org/reference/scale_alpha.html)
- Add a descriptive **title**, **subtitle**, **axis labels**, and a **caption** using labs(). This helps viewers understand the context of the plot quickly. (<https://ggplot2-book.org/annotations#sec-titles>)
- Use scale_color_discrete(name = "Fuel Type") to give a more descriptive legend label (<https://ggplot2-book.org/scales-colour.html#sec-colour-discrete>)
- Position the legend (theme(legend.position = "bottom")) to avoid overlap with the data. (<https://ggplot2-book.org/scales-colour.html#sec-legend-layout>)
- Use a minimal theme (theme_minimal()) as a clean base style to keep the focus on the data, then use theme() to make fine-tuned adjustments, such as title alignment, text size, and legend positioning, for improved readability and customization. (<https://ggplot2-book.org/themes>)
- Center the title (plot.title = element_text(hjust = 0.5)) and increase its size and **boldness** (face = "bold") to make the main message of the plot stand out.

Save the plot as a PNG file (highway_mileage_plot.png).

Write a short analysis (150-200 words) summarizing your observations about the relationships between the variables.