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# Week 3 Homework - Applying Good Design Principles using mtcars

## Load the dataset

data("mtcars")

## Step 1: Understand the relationship between horsepower and fuel efficiency

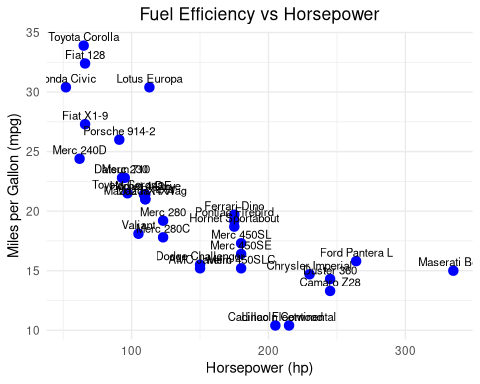
summary(mtcars[, c("mpg", "hp")])

## mpg hp   
## Min. :10.40 Min. : 52.0   
## 1st Qu.:15.43 1st Qu.: 96.5   
## Median :19.20 Median :123.0   
## Mean :20.09 Mean :146.7   
## 3rd Qu.:22.80 3rd Qu.:180.0   
## Max. :33.90 Max. :335.0

## Step 2: Create a scatter plot to visualize the relationship

### Principle 1: Clarity - Scatter plot showing how mpg (fuel efficiency) relates to hp (horsepower)

library(ggplot2)  
ggplot(mtcars, aes(x = hp, y = mpg, label = rownames(mtcars))) +  
 geom\_point(color = "blue", size = 3) +  
 geom\_text(vjust = -0.5, size = 3) + # Add car names to the points  
 theme\_minimal() +  
 labs(title = "Fuel Efficiency vs Horsepower",   
 x = "Horsepower (hp)",   
 y = "Miles per Gallon (mpg)") +  
 theme(plot.title = element\_text(hjust = 0.5))



## Step 3: Simple Analysis

### Principle 2: Simplicity - We filter cars with higher-than-average mpg and horsepower

avg\_mpg <- mean(mtcars$mpg)  
avg\_hp <- mean(mtcars$hp)  
  
efficient\_powerful\_cars <- subset(mtcars, mpg > avg\_mpg | hp > avg\_hp)  
  
cat("\nCars that provide a balance of good fuel efficiency and power:\n")

##   
## Cars that provide a balance of good fuel efficiency and power:

print(efficient\_powerful\_cars)

## mpg cyl disp hp drat wt qsec vs am gear carb  
## Mazda RX4 21.0 6 160.0 110 3.90 2.620 16.46 0 1 4 4  
## Mazda RX4 Wag 21.0 6 160.0 110 3.90 2.875 17.02 0 1 4 4  
## Datsun 710 22.8 4 108.0 93 3.85 2.320 18.61 1 1 4 1  
## Hornet 4 Drive 21.4 6 258.0 110 3.08 3.215 19.44 1 0 3 1  
## Hornet Sportabout 18.7 8 360.0 175 3.15 3.440 17.02 0 0 3 2  
## Duster 360 14.3 8 360.0 245 3.21 3.570 15.84 0 0 3 4  
## Merc 240D 24.4 4 146.7 62 3.69 3.190 20.00 1 0 4 2  
## Merc 230 22.8 4 140.8 95 3.92 3.150 22.90 1 0 4 2  
## Merc 450SE 16.4 8 275.8 180 3.07 4.070 17.40 0 0 3 3  
## Merc 450SL 17.3 8 275.8 180 3.07 3.730 17.60 0 0 3 3  
## Merc 450SLC 15.2 8 275.8 180 3.07 3.780 18.00 0 0 3 3  
## Cadillac Fleetwood 10.4 8 472.0 205 2.93 5.250 17.98 0 0 3 4  
## Lincoln Continental 10.4 8 460.0 215 3.00 5.424 17.82 0 0 3 4  
## Chrysler Imperial 14.7 8 440.0 230 3.23 5.345 17.42 0 0 3 4  
## Fiat 128 32.4 4 78.7 66 4.08 2.200 19.47 1 1 4 1  
## Honda Civic 30.4 4 75.7 52 4.93 1.615 18.52 1 1 4 2  
## Toyota Corolla 33.9 4 71.1 65 4.22 1.835 19.90 1 1 4 1  
## Toyota Corona 21.5 4 120.1 97 3.70 2.465 20.01 1 0 3 1  
## Dodge Challenger 15.5 8 318.0 150 2.76 3.520 16.87 0 0 3 2  
## AMC Javelin 15.2 8 304.0 150 3.15 3.435 17.30 0 0 3 2  
## Camaro Z28 13.3 8 350.0 245 3.73 3.840 15.41 0 0 3 4  
## Pontiac Firebird 19.2 8 400.0 175 3.08 3.845 17.05 0 0 3 2  
## Fiat X1-9 27.3 4 79.0 66 4.08 1.935 18.90 1 1 4 1  
## Porsche 914-2 26.0 4 120.3 91 4.43 2.140 16.70 0 1 5 2  
## Lotus Europa 30.4 4 95.1 113 3.77 1.513 16.90 1 1 5 2  
## Ford Pantera L 15.8 8 351.0 264 4.22 3.170 14.50 0 1 5 4  
## Ferrari Dino 19.7 6 145.0 175 3.62 2.770 15.50 0 1 5 6  
## Maserati Bora 15.0 8 301.0 335 3.54 3.570 14.60 0 1 5 8  
## Volvo 142E 21.4 4 121.0 109 4.11 2.780 18.60 1 1 4 2

## Step 4: Visualize best cars

### Principle 3: Consistency - A consistent format is used to highlight selected cars

ggplot(efficient\_powerful\_cars, aes(x = hp, y = mpg, label = rownames(efficient\_powerful\_cars))) +  
 geom\_point(color = "green", size = 4) +  
 geom\_text(vjust = -0.5, size = 3) + # Add car names  
 theme\_minimal() +  
 labs(title = "High Efficiency & Power Cars",   
 x = "Horsepower (hp)",   
 y = "Miles per Gallon (mpg)") +  
 theme(plot.title = element\_text(hjust = 0.5))

