

Comparison of Cylinder Count to Engine Displacement'

Introduction

Our client, Big Dawg, wants to know if having more cylinders in a car's engine actually means a larger engine size. He thinks that more cylinders don't always lead to a bigger engine. To find out, we'll use data from the `mtcars` dataset in R to check the average engine size (displacement) for cars with different numbers of cylinders.

In this report, we'll show the results in both a table and a chart. Using Quarto. This analysis will help Big Dawg see whether his belief about cylinders and engine size is accurate.

1. Loading Necessary Libraries

```
library(ggplot2)
library(dplyr)
```

Attaching package: 'dplyr'

The following objects are masked from 'package:stats':

`filter`, `lag`

The following objects are masked from 'package:base':

`intersect`, `setdiff`, `setequal`, `union`

```
library(knitr)
library(kableExtra)
```

Attaching package: 'kableExtra'

The following object is masked from 'package:dplyr':

group_rows

- **ggplot2**: Used for creating the bar chart.
- **dplyr**: Used for data manipulation, particularly grouping and summarizing data.
- **knitr** and **kableExtra**: Used to create and style the table for displaying results.

2. Loading the mtcars Dataset

```
data(mtcars)
head(mtcars)
```

	mpg	cyl	disp	hp	drat	wt	qsec	vs	am	gear	carb
Mazda RX4	21.0	6	160	110	3.90	2.620	16.46	0	1	4	4
Mazda RX4 Wag	21.0	6	160	110	3.90	2.875	17.02	0	1	4	4
Datsun 710	22.8	4	108	93	3.85	2.320	18.61	1	1	4	1
Hornet 4 Drive	21.4	6	258	110	3.08	3.215	19.44	1	0	3	1
Hornet Sportabout	18.7	8	360	175	3.15	3.440	17.02	0	0	3	2
Valiant	18.1	6	225	105	2.76	3.460	20.22	1	0	3	1

```
colnames(mtcars)
```

```
[1] "mpg" "cyl" "disp" "hp" "drat" "wt" "qsec" "vs" "am" "gear"
[11] "carb"
```

The column names of the `mtcars` dataset that we want are as follows:

1. **mpg**: Miles per gallon (fuel efficiency)
2. **cyl**: Number of cylinders
3. **disp**: Engine size (displacement)

3. Calculating the Mean Engine Size by Cylinder Count

```
mean_displacement <- mtcars %>%
  group_by(cyl) %>%
  summarise(
    mean_displacement = mean(displacement, na.rm = TRUE)
  ) %>%
  arrange(cyl)
```

- `group_by(cyl)`: Groups the data by the number of cylinders.
- `summarise(mean_displacement = mean(displacement, na.rm = TRUE))`: Calculates the mean engine size (`displacement`) for each group (cylinder count). The `na.rm = TRUE` argument ignores any missing values.
- `arrange(cyl)`: Orders the resulting data by cylinder count in ascending order.

The result, `mean_displacement`, is showing the average engine size for each cylinder count.

```
mean_displacement %>%
  kable(
    col.names = c("No. of Cylinders", "Mean Size"),
    caption = "Mean Engine Size by Number of Cylinders"
  ) %>%
  kable_styling(
    bootstrap_options = c("striped", "hover", "condensed", "responsive"),
    font_size = 12
  )
```

Table 1: Mean Engine Size by Number of Cylinders

No. of Cylinders	Mean Size
4	105.1364
6	183.3143
8	353.1000

- `kable()`: Creates a basic table with `mean_displacement` data. The `col.names` argument customizes column names, and `caption` adds a title.
- `kable_styling()`: Adds style options like `striped` (alternating row colors), `hover` (highlight rows on hover), `condensed` (compact format), and `responsive` (adjusts size for different screen widths). `font_size` adjusts the table font size.

This results in a nicely formatted table showing mean engine size by cylinder count.