

## Introduction to the tidyverse and ggplot2 libraries

```
library(tidyverse)
```

```
## -- Attaching core tidyverse packages ----- tidyverse 2.0.0 --
## v dplyr      1.1.4      v readr      2.1.5
## v forcats    1.0.0      v stringr   1.5.1
## v ggplot2    3.5.1      v tibble    3.2.1
## v lubridate  1.9.3      v tidyr     1.3.1
## v purrr      1.0.2
## -- Conflicts ----- tidyverse_conflicts() --
## x dplyr::filter() masks stats::filter()
## x dplyr::lag()     masks stats::lag()
## i Use the conflicted package (<http://conflicted.r-lib.org/>) to force all conflicts to become errors
```

```
data() # lists all the available datasets
?mtcars # Details of the mtcars dataset
```

```
# Load the Motor Trend Car Road Tests (mtcars) dataset
carData = read.csv('mtcars.csv')
#carData = mtcars

# Print the first five rows (or samples) in the data frame
head(carData, 5)
```

Check the datasets available in R

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

```
# Print the structure of the data frame
str(carData)
```

```
## 'data.frame':   32 obs. of  12 variables:
## $ X : chr  "Mazda RX4" "Mazda RX4 Wag" "Datsun 710" "Hornet 4 Drive" ...
## $ mpg : num  21 21 22.8 21.4 18.7 18.1 14.3 24.4 22.8 19.2 ...
## $ cyl : int   6 6 4 6 8 6 8 4 4 6 ...
## $ disp: num  160 160 108 258 360 ...
## $ hp : int  110 110 93 110 175 105 245 62 95 123 ...
## $ drat: num   3.9 3.9 3.85 3.08 3.15 2.76 3.21 3.69 3.92 3.92 ...
## $ wt : num   2.62 2.88 2.32 3.21 3.44 ...
## $ qsec: num   16.5 17 18.6 19.4 17 ...
## $ vs : int   0 0 1 1 0 1 0 1 1 1 ...
## $ am : int   1 1 1 0 0 0 0 0 0 0 ...
## $ gear: int   4 4 4 3 3 3 3 4 4 4 ...
```

```
## $ carb: int  4 4 1 1 2 1 4 2 2 4 ...

# Print the names of the columns (features or variables)
colnames(carData)

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

# Print the number of samples (rows) and features (columns) in the data frame
nrow(carData)

## [1] 32

ncol(carData)

## [1] 12

# Basic data management using the tidyverse package

# mutate() function is used to add new columns (features or variables) or modify current ones
# Add a new column called cyltype
carData %>% mutate(cyltype = 'High')

##           X mpg cyl  disp  hp drat   wt  qsec vs am gear carb
## 1      Mazda RX4 21.0   6 160.0 110 3.90 2.620 16.46 0  1   4   4
## 2      Mazda RX4 Wag 21.0   6 160.0 110 3.90 2.875 17.02 0  1   4   4
## 3      Datsun 710 22.8   4 108.0  93 3.85 2.320 18.61 1  1   4   1
## 4    Hornet 4 Drive 21.4   6 258.0 110 3.08 3.215 19.44 1  0   3   1
## 5   Hornet Sportabout 18.7   8 360.0 175 3.15 3.440 17.02 0  0   3   2
## 6        Valiant 18.1   6 225.0 105 2.76 3.460 20.22 1  0   3   1
## 7        Duster 360 14.3   8 360.0 245 3.21 3.570 15.84 0  0   3   4
## 8        Merc 240D 24.4   4 146.7  62 3.69 3.190 20.00 1  0   4   2
## 9        Merc 230 22.8   4 140.8  95 3.92 3.150 22.90 1  0   4   2
## 10       Merc 280 19.2   6 167.6 123 3.92 3.440 18.30 1  0   4   4
## 11       Merc 280C 17.8   6 167.6 123 3.92 3.440 18.90 1  0   4   4
## 12       Merc 450SE 16.4   8 275.8 180 3.07 4.070 17.40 0  0   3   3
## 13       Merc 450SL 17.3   8 275.8 180 3.07 3.730 17.60 0  0   3   3
## 14       Merc 450SLC 15.2   8 275.8 180 3.07 3.780 18.00 0  0   3   3
## 15  Cadillac Fleetwood 10.4   8 472.0 205 2.93 5.250 17.98 0  0   3   4
## 16 Lincoln Continental 10.4   8 460.0 215 3.00 5.424 17.82 0  0   3   4
## 17  Chrysler Imperial 14.7   8 440.0 230 3.23 5.345 17.42 0  0   3   4
## 18         Fiat 128 32.4   4  78.7  66 4.08 2.200 19.47 1  1   4   1
## 19      Honda Civic 30.4   4  75.7  52 4.93 1.615 18.52 1  1   4   2
## 20     Toyota Corolla 33.9   4  71.1  65 4.22 1.835 19.90 1  1   4   1
## 21     Toyota Corona 21.5   4 120.1  97 3.70 2.465 20.01 1  0   3   1
## 22   Dodge Challenger 15.5   8 318.0 150 2.76 3.520 16.87 0  0   3   2
## 23      AMC Javelin 15.2   8 304.0 150 3.15 3.435 17.30 0  0   3   2
## 24      Camaro Z28 13.3   8 350.0 245 3.73 3.840 15.41 0  0   3   4
## 25   Pontiac Firebird 19.2   8 400.0 175 3.08 3.845 17.05 0  0   3   2
## 26        Fiat X1-9 27.3   4  79.0  66 4.08 1.935 18.90 1  1   4   1
## 27    Porsche 914-2 26.0   4 120.3  91 4.43 2.140 16.70 0  1   5   2
## 28      Lotus Europa 30.4   4  95.1 113 3.77 1.513 16.90 1  1   5   2
## 29   Ford Pantera L 15.8   8 351.0 264 4.22 3.170 14.50 0  1   5   4
## 30      Ferrari Dino 19.7   6 145.0 175 3.62 2.770 15.50 0  1   5   6
## 31    Maserati Bora 15.0   8 301.0 335 3.54 3.570 14.60 0  1   5   8
## 32     Volvo 142E 21.4   4 121.0 109 4.11 2.780 18.60 1  1   4   2
##      cyltype
```

```
## 1    High
## 2    High
## 3    High
## 4    High
## 5    High
## 6    High
## 7    High
## 8    High
## 9    High
## 10   High
## 11   High
## 12   High
## 13   High
## 14   High
## 15   High
## 16   High
## 17   High
## 18   High
## 19   High
## 20   High
## 21   High
## 22   High
## 23   High
## 24   High
## 25   High
## 26   High
## 27   High
## 28   High
## 29   High
## 30   High
## 31   High
## 32   High
```

```
carData %>% mutate(cyltype = ifelse(cyl >6, 'High', 'Low'))
```

```
##           X mpg cyl  disp  hp drat   wt  qsec vs am gear carb
## 1      Mazda RX4 21.0   6 160.0 110 3.90 2.620 16.46 0  1    4    4
## 2      Mazda RX4 Wag 21.0   6 160.0 110 3.90 2.875 17.02 0  1    4    4
## 3      Datsun 710 22.8   4 108.0  93 3.85 2.320 18.61 1  1    4    1
## 4      Hornet 4 Drive 21.4   6 258.0 110 3.08 3.215 19.44 1  0    3    1
## 5      Hornet Sportabout 18.7   8 360.0 175 3.15 3.440 17.02 0  0    3    2
## 6          Valiant 18.1   6 225.0 105 2.76 3.460 20.22 1  0    3    1
## 7      Duster 360 14.3   8 360.0 245 3.21 3.570 15.84 0  0    3    4
## 8      Merc 240D 24.4   4 146.7  62 3.69 3.190 20.00 1  0    4    2
## 9      Merc 230 22.8   4 140.8  95 3.92 3.150 22.90 1  0    4    2
## 10     Merc 280 19.2   6 167.6 123 3.92 3.440 18.30 1  0    4    4
## 11     Merc 280C 17.8   6 167.6 123 3.92 3.440 18.90 1  0    4    4
## 12     Merc 450SE 16.4   8 275.8 180 3.07 4.070 17.40 0  0    3    3
## 13     Merc 450SL 17.3   8 275.8 180 3.07 3.730 17.60 0  0    3    3
## 14     Merc 450SLC 15.2   8 275.8 180 3.07 3.780 18.00 0  0    3    3
## 15  Cadillac Fleetwood 10.4   8 472.0 205 2.93 5.250 17.98 0  0    3    4
## 16 Lincoln Continental 10.4   8 460.0 215 3.00 5.424 17.82 0  0    3    4
## 17  Chrysler Imperial 14.7   8 440.0 230 3.23 5.345 17.42 0  0    3    4
## 18          Fiat 128 32.4   4  78.7  66 4.08 2.200 19.47 1  1    4    1
## 19      Honda Civic 30.4   4  75.7  52 4.93 1.615 18.52 1  1    4    2
```

```
## 20      Toyota Corolla 33.9   4  71.1  65 4.22 1.835 19.90 1 1   4   1
## 21      Toyota Corona 21.5   4 120.1  97 3.70 2.465 20.01 1 0   3   1
## 22     Dodge Challenger 15.5   8 318.0 150 2.76 3.520 16.87 0 0   3   2
## 23      AMC Javelin 15.2   8 304.0 150 3.15 3.435 17.30 0 0   3   2
## 24      Camaro Z28 13.3   8 350.0 245 3.73 3.840 15.41 0 0   3   4
## 25     Pontiac Firebird 19.2   8 400.0 175 3.08 3.845 17.05 0 0   3   2
## 26       Fiat X1-9 27.3   4  79.0  66 4.08 1.935 18.90 1 1   4   1
## 27     Porsche 914-2 26.0   4 120.3  91 4.43 2.140 16.70 0 1   5   2
## 28      Lotus Europa 30.4   4  95.1 113 3.77 1.513 16.90 1 1   5   2
## 29     Ford Pantera L 15.8   8 351.0 264 4.22 3.170 14.50 0 1   5   4
## 30      Ferrari Dino 19.7   6 145.0 175 3.62 2.770 15.50 0 1   5   6
## 31     Maserati Bora 15.0   8 301.0 335 3.54 3.570 14.60 0 1   5   8
## 32      Volvo 142E 21.4   4 121.0 109 4.11 2.780 18.60 1 1   4   2
```

```
##      cyltype
```

```
## 1      Low
## 2      Low
## 3      Low
## 4      Low
## 5      High
## 6      Low
## 7      High
## 8      Low
## 9      Low
## 10     Low
## 11     Low
## 12     High
## 13     High
## 14     High
## 15     High
## 16     High
## 17     High
## 18     Low
## 19     Low
## 20     Low
## 21     Low
## 22     High
## 23     High
## 24     High
## 25     High
## 26     Low
## 27     Low
## 28     Low
## 29     High
## 30     Low
## 31     High
## 32     Low
```

```
# Add a new column called wtton
```

```
carData %>% mutate(wtton = 0.45*wt)
```

```
##           X  mpg cyl  disp  hp drat   wt  qsec vs am gear carb
## 1      Mazda RX4 21.0   6 160.0 110 3.90 2.620 16.46 0 1   4   4
## 2      Mazda RX4 Wag 21.0   6 160.0 110 3.90 2.875 17.02 0 1   4   4
## 3      Datsun 710 22.8   4 108.0  93 3.85 2.320 18.61 1 1   4   1
## 4     Hornet 4 Drive 21.4   6 258.0 110 3.08 3.215 19.44 1 0   3   1
```

## 5	Hornet Sportabout	18.7	8	360.0	175	3.15	3.440	17.02	0	0	3	2
## 6	Valiant	18.1	6	225.0	105	2.76	3.460	20.22	1	0	3	1
## 7	Duster 360	14.3	8	360.0	245	3.21	3.570	15.84	0	0	3	4
## 8	Merc 240D	24.4	4	146.7	62	3.69	3.190	20.00	1	0	4	2
## 9	Merc 230	22.8	4	140.8	95	3.92	3.150	22.90	1	0	4	2
## 10	Merc 280	19.2	6	167.6	123	3.92	3.440	18.30	1	0	4	4
## 11	Merc 280C	17.8	6	167.6	123	3.92	3.440	18.90	1	0	4	4
## 12	Merc 450SE	16.4	8	275.8	180	3.07	4.070	17.40	0	0	3	3
## 13	Merc 450SL	17.3	8	275.8	180	3.07	3.730	17.60	0	0	3	3
## 14	Merc 450SLC	15.2	8	275.8	180	3.07	3.780	18.00	0	0	3	3
## 15	Cadillac Fleetwood	10.4	8	472.0	205	2.93	5.250	17.98	0	0	3	4
## 16	Lincoln Continental	10.4	8	460.0	215	3.00	5.424	17.82	0	0	3	4
## 17	Chrysler Imperial	14.7	8	440.0	230	3.23	5.345	17.42	0	0	3	4
## 18	Fiat 128	32.4	4	78.7	66	4.08	2.200	19.47	1	1	4	1
## 19	Honda Civic	30.4	4	75.7	52	4.93	1.615	18.52	1	1	4	2
## 20	Toyota Corolla	33.9	4	71.1	65	4.22	1.835	19.90	1	1	4	1
## 21	Toyota Corona	21.5	4	120.1	97	3.70	2.465	20.01	1	0	3	1
## 22	Dodge Challenger	15.5	8	318.0	150	2.76	3.520	16.87	0	0	3	2
## 23	AMC Javelin	15.2	8	304.0	150	3.15	3.435	17.30	0	0	3	2
## 24	Camaro Z28	13.3	8	350.0	245	3.73	3.840	15.41	0	0	3	4
## 25	Pontiac Firebird	19.2	8	400.0	175	3.08	3.845	17.05	0	0	3	2
## 26	Fiat X1-9	27.3	4	79.0	66	4.08	1.935	18.90	1	1	4	1
## 27	Porsche 914-2	26.0	4	120.3	91	4.43	2.140	16.70	0	1	5	2
## 28	Lotus Europa	30.4	4	95.1	113	3.77	1.513	16.90	1	1	5	2
## 29	Ford Pantera L	15.8	8	351.0	264	4.22	3.170	14.50	0	1	5	4
## 30	Ferrari Dino	19.7	6	145.0	175	3.62	2.770	15.50	0	1	5	6
## 31	Maserati Bora	15.0	8	301.0	335	3.54	3.570	14.60	0	1	5	8
## 32	Volvo 142E	21.4	4	121.0	109	4.11	2.780	18.60	1	1	4	2
##	wtton											
## 1	1.17900											
## 2	1.29375											
## 3	1.04400											
## 4	1.44675											
## 5	1.54800											
## 6	1.55700											
## 7	1.60650											
## 8	1.43550											
## 9	1.41750											
## 10	1.54800											
## 11	1.54800											
## 12	1.83150											
## 13	1.67850											
## 14	1.70100											
## 15	2.36250											
## 16	2.44080											
## 17	2.40525											
## 18	0.99000											
## 19	0.72675											
## 20	0.82575											
## 21	1.10925											
## 22	1.58400											
## 23	1.54575											
## 24	1.72800											
## 25	1.73025											

```
## 26 0.87075
## 27 0.96300
## 28 0.68085
## 29 1.42650
## 30 1.24650
## 31 1.60650
## 32 1.25100

# Create a new data frame with the cyltype and wtton added
carData.new = carData %>% mutate(cyltype = ifelse(cyl >6, 'High', 'Low'), wtton = 0.45*wt)
str(carData.new)

## 'data.frame': 32 obs. of 14 variables:
## $ X : chr "Mazda RX4" "Mazda RX4 Wag" "Datsun 710" "Hornet 4 Drive" ...
## $ mpg : num 21 21 22.8 21.4 18.7 18.1 14.3 24.4 22.8 19.2 ...
## $ cyl : int 6 6 4 6 8 6 8 4 4 6 ...
## $ disp : num 160 160 108 258 360 ...
## $ hp : int 110 110 93 110 175 105 245 62 95 123 ...
## $ drat : num 3.9 3.9 3.85 3.08 3.15 2.76 3.21 3.69 3.92 3.92 ...
## $ wt : num 2.62 2.88 2.32 3.21 3.44 ...
## $ qsec : num 16.5 17 18.6 19.4 17 ...
## $ vs : int 0 0 1 1 0 1 0 1 1 1 ...
## $ am : int 1 1 1 0 0 0 0 0 0 0 ...
## $ gear : int 4 4 4 3 3 3 3 4 4 4 ...
## $ carb : int 4 4 1 1 2 1 4 2 2 4 ...
## $ cyltype: chr "Low" "Low" "Low" "Low" ...
## $ wtton : num 1.18 1.29 1.04 1.45 1.55 ...

head(carData.new, 5)

##           X mpg cyl disp hp drat wt qsec vs am gear carb cyltype
## 1 Mazda RX4 21.0 6 160 110 3.90 2.620 16.46 0 1 4 4 Low
## 2 Mazda RX4 Wag 21.0 6 160 110 3.90 2.875 17.02 0 1 4 4 Low
## 3 Datsun 710 22.8 4 108 93 3.85 2.320 18.61 1 1 4 1 Low
## 4 Hornet 4 Drive 21.4 6 258 110 3.08 3.215 19.44 1 0 3 1 Low
## 5 Hornet Sportabout 18.7 8 360 175 3.15 3.440 17.02 0 0 3 2 High
## wtton
## 1 1.17900
## 2 1.29375
## 3 1.04400
## 4 1.44675
## 5 1.54800

# summarize() function collapses all rows (samples) and returns a summary
# Return the mean weight (in tons) of the cars
carData.new %>% summarise(mean(wtton))

## mean(wtton)
## 1 1.447763

# Return the mean weight (in tons) and mean displacement of the cars
carData.new %>% summarise(mean(wtton), mean(displacement))

## mean(wtton) mean(displacement)
## 1 1.447763 230.7219

# group_by() function is used to group samples according to features
# Group cars according to cyltype and calculate mean weight and mean displacement
```

```
carData.new %>% group_by(cyltype) %>%
  summarise(mean(wtton), mean(dis))
```

```
## # A tibble: 2 x 3
##   cyltype `mean(wtton)` `mean(dis)`
##   <chr>      <dbl>      <dbl>
## 1 High         1.80        353.
## 2 Low          1.17        136.
```

```
# filter() function is used to retain samples satisfying a specific condition
# Filter cars that weight more than 2 tons
carData.new %>% filter (wtton > 2)
```

```
##           X mpg cyl disp hp drat   wt  qsec vs am gear carb
## 1 Cadillac Fleetwood 10.4   8  472 205 2.93 5.250 17.98  0  0    3    4
## 2 Lincoln Continental 10.4   8  460 215 3.00 5.424 17.82  0  0    3    4
## 3 Chrysler Imperial 14.7   8  440 230 3.23 5.345 17.42  0  0    3    4
##   cyltype wtton
## 1   High 2.36250
## 2   High 2.44080
## 3   High 2.40525
```

```
# Filter cars that weight more than 2 tons and have more than 4 cylinders
carData.new %>% filter (wtton > 2 & cyl > 4)
```

```
##           X mpg cyl disp hp drat   wt  qsec vs am gear carb
## 1 Cadillac Fleetwood 10.4   8  472 205 2.93 5.250 17.98  0  0    3    4
## 2 Lincoln Continental 10.4   8  460 215 3.00 5.424 17.82  0  0    3    4
## 3 Chrysler Imperial 14.7   8  440 230 3.23 5.345 17.42  0  0    3    4
##   cyltype wtton
## 1   High 2.36250
## 2   High 2.44080
## 3   High 2.40525
```

```
# select() function is used to retain specific features
# Select only the feature wtton
carData.new %>% select(wtton)
```

```
##      wtton
## 1  1.17900
## 2  1.29375
## 3  1.04400
## 4  1.44675
## 5  1.54800
## 6  1.55700
## 7  1.60650
## 8  1.43550
## 9  1.41750
## 10 1.54800
## 11 1.54800
## 12 1.83150
## 13 1.67850
## 14 1.70100
## 15 2.36250
## 16 2.44080
## 17 2.40525
```

```
## 18 0.99000
## 19 0.72675
## 20 0.82575
## 21 1.10925
## 22 1.58400
## 23 1.54575
## 24 1.72800
## 25 1.73025
## 26 0.87075
## 27 0.96300
## 28 0.68085
## 29 1.42650
## 30 1.24650
## 31 1.60650
## 32 1.25100
```

```
# Select everything except the feature wtton
carData.new %>% select(-wtton)
```

```
##           X mpg cyl  disp  hp drat   wt  qsec vs am gear carb
## 1      Mazda RX4 21.0   6 160.0 110 3.90 2.620 16.46 0  1    4    4
## 2      Mazda RX4 Wag 21.0   6 160.0 110 3.90 2.875 17.02 0  1    4    4
## 3      Datsun 710 22.8   4 108.0  93 3.85 2.320 18.61 1  1    4    1
## 4      Hornet 4 Drive 21.4   6 258.0 110 3.08 3.215 19.44 1  0    3    1
## 5      Hornet Sportabout 18.7   8 360.0 175 3.15 3.440 17.02 0  0    3    2
## 6          Valiant 18.1   6 225.0 105 2.76 3.460 20.22 1  0    3    1
## 7          Duster 360 14.3   8 360.0 245 3.21 3.570 15.84 0  0    3    4
## 8          Merc 240D 24.4   4 146.7  62 3.69 3.190 20.00 1  0    4    2
## 9          Merc 230 22.8   4 140.8  95 3.92 3.150 22.90 1  0    4    2
## 10         Merc 280 19.2   6 167.6 123 3.92 3.440 18.30 1  0    4    4
## 11         Merc 280C 17.8   6 167.6 123 3.92 3.440 18.90 1  0    4    4
## 12         Merc 450SE 16.4   8 275.8 180 3.07 4.070 17.40 0  0    3    3
## 13         Merc 450SL 17.3   8 275.8 180 3.07 3.730 17.60 0  0    3    3
## 14         Merc 450SLC 15.2   8 275.8 180 3.07 3.780 18.00 0  0    3    3
## 15  Cadillac Fleetwood 10.4   8 472.0 205 2.93 5.250 17.98 0  0    3    4
## 16 Lincoln Continental 10.4   8 460.0 215 3.00 5.424 17.82 0  0    3    4
## 17  Chrysler Imperial 14.7   8 440.0 230 3.23 5.345 17.42 0  0    3    4
## 18          Fiat 128 32.4   4  78.7  66 4.08 2.200 19.47 1  1    4    1
## 19      Honda Civic 30.4   4  75.7  52 4.93 1.615 18.52 1  1    4    2
## 20     Toyota Corolla 33.9   4  71.1  65 4.22 1.835 19.90 1  1    4    1
## 21     Toyota Corona 21.5   4 120.1  97 3.70 2.465 20.01 1  0    3    1
## 22   Dodge Challenger 15.5   8 318.0 150 2.76 3.520 16.87 0  0    3    2
## 23      AMC Javelin 15.2   8 304.0 150 3.15 3.435 17.30 0  0    3    2
## 24      Camaro Z28 13.3   8 350.0 245 3.73 3.840 15.41 0  0    3    4
## 25   Pontiac Firebird 19.2   8 400.0 175 3.08 3.845 17.05 0  0    3    2
## 26          Fiat X1-9 27.3   4  79.0  66 4.08 1.935 18.90 1  1    4    1
## 27     Porsche 914-2 26.0   4 120.3  91 4.43 2.140 16.70 0  1    5    2
## 28      Lotus Europa 30.4   4  95.1 113 3.77 1.513 16.90 1  1    5    2
## 29     Ford Pantera L 15.8   8 351.0 264 4.22 3.170 14.50 0  1    5    4
## 30      Ferrari Dino 19.7   6 145.0 175 3.62 2.770 15.50 0  1    5    6
## 31     Maserati Bora 15.0   8 301.0 335 3.54 3.570 14.60 0  1    5    8
## 32      Volvo 142E 21.4   4 121.0 109 4.11 2.780 18.60 1  1    4    2
##      cyltype
## 1      Low
## 2      Low
```



```
## 3      Low
## 4      Low
## 5     High
## 6      Low
## 7     High
## 8      Low
## 9      Low
## 10     Low
## 11     Low
## 12     High
## 13     High
## 14     High
## 15     High
## 16     High
## 17     High
## 18     Low
## 19     Low
## 20     Low
## 21     Low
## 22     High
## 23     High
## 24     High
## 25     High
## 26     Low
## 27     Low
## 28     Low
## 29     High
## 30     Low
## 31     High
## 32     Low
```

```
# Select only the features cyltype and wtton
carData.new %>% select(cyltype, wtton)
```

```
##      cyltype  wtton
## 1      Low 1.17900
## 2      Low 1.29375
## 3      Low 1.04400
## 4      Low 1.44675
## 5     High 1.54800
## 6      Low 1.55700
## 7     High 1.60650
## 8      Low 1.43550
## 9      Low 1.41750
## 10     Low 1.54800
## 11     Low 1.54800
## 12     High 1.83150
## 13     High 1.67850
## 14     High 1.70100
## 15     High 2.36250
## 16     High 2.44080
## 17     High 2.40525
## 18     Low 0.99000
## 19     Low 0.72675
## 20     Low 0.82575
```

```
## 21      Low 1.10925
## 22      High 1.58400
## 23      High 1.54575
## 24      High 1.72800
## 25      High 1.73025
## 26      Low 0.87075
## 27      Low 0.96300
## 28      Low 0.68085
## 29      High 1.42650
## 30      Low 1.24650
## 31      High 1.60650
## 32      Low 1.25100
```

```
# Select everything except the features cyltype and wtton
carData.new %>% select(-cyltype, -wtton)
```

```
##           X mpg cyl  disp  hp drat   wt  qsec vs am gear carb
## 1      Mazda RX4 21.0   6 160.0 110 3.90 2.620 16.46 0  1    4    4
## 2      Mazda RX4 Wag 21.0   6 160.0 110 3.90 2.875 17.02 0  1    4    4
## 3      Datsun 710 22.8   4 108.0  93 3.85 2.320 18.61 1  1    4    1
## 4      Hornet 4 Drive 21.4   6 258.0 110 3.08 3.215 19.44 1  0    3    1
## 5      Hornet Sportabout 18.7   8 360.0 175 3.15 3.440 17.02 0  0    3    2
## 6          Valiant 18.1   6 225.0 105 2.76 3.460 20.22 1  0    3    1
## 7          Duster 360 14.3   8 360.0 245 3.21 3.570 15.84 0  0    3    4
## 8          Merc 240D 24.4   4 146.7  62 3.69 3.190 20.00 1  0    4    2
## 9          Merc 230 22.8   4 140.8  95 3.92 3.150 22.90 1  0    4    2
## 10         Merc 280 19.2   6 167.6 123 3.92 3.440 18.30 1  0    4    4
## 11         Merc 280C 17.8   6 167.6 123 3.92 3.440 18.90 1  0    4    4
## 12         Merc 450SE 16.4   8 275.8 180 3.07 4.070 17.40 0  0    3    3
## 13         Merc 450SL 17.3   8 275.8 180 3.07 3.730 17.60 0  0    3    3
## 14         Merc 450SLC 15.2   8 275.8 180 3.07 3.780 18.00 0  0    3    3
## 15  Cadillac Fleetwood 10.4   8 472.0 205 2.93 5.250 17.98 0  0    3    4
## 16 Lincoln Continental 10.4   8 460.0 215 3.00 5.424 17.82 0  0    3    4
## 17  Chrysler Imperial 14.7   8 440.0 230 3.23 5.345 17.42 0  0    3    4
## 18          Fiat 128 32.4   4  78.7  66 4.08 2.200 19.47 1  1    4    1
## 19         Honda Civic 30.4   4  75.7  52 4.93 1.615 18.52 1  1    4    2
## 20        Toyota Corolla 33.9   4  71.1  65 4.22 1.835 19.90 1  1    4    1
## 21        Toyota Corona 21.5   4 120.1  97 3.70 2.465 20.01 1  0    3    1
## 22      Dodge Challenger 15.5   8 318.0 150 2.76 3.520 16.87 0  0    3    2
## 23         AMC Javelin 15.2   8 304.0 150 3.15 3.435 17.30 0  0    3    2
## 24         Camaro Z28 13.3   8 350.0 245 3.73 3.840 15.41 0  0    3    4
## 25      Pontiac Firebird 19.2   8 400.0 175 3.08 3.845 17.05 0  0    3    2
## 26          Fiat X1-9 27.3   4  79.0  66 4.08 1.935 18.90 1  1    4    1
## 27      Porsche 914-2 26.0   4 120.3  91 4.43 2.140 16.70 0  1    5    2
## 28         Lotus Europa 30.4   4  95.1 113 3.77 1.513 16.90 1  1    5    2
## 29      Ford Pantera L 15.8   8 351.0 264 4.22 3.170 14.50 0  1    5    4
## 30         Ferrari Dino 19.7   6 145.0 175 3.62 2.770 15.50 0  1    5    6
## 31      Maserati Bora 15.0   8 301.0 335 3.54 3.570 14.60 0  1    5    8
## 32         Volvo 142E 21.4   4 121.0 109 4.11 2.780 18.60 1  1    4    2
```

```
# Initiate the ggplot() function binding to the data frame
ggplot(data = carData)
```

```
#ggplot(data = carData.new)

# Create a plot object
carplot = ggplot(data = carData)

# Use the aes() function to specify the aesthetic mapping, that is, which variables should be plotted
carplot = ggplot(data = carData, aes(x = wt, y = disp))

# Use the geom_ type functions to add geometric elements
carplot = ggplot(data = carData, aes(x = wt, y = disp)) +
  geom_point()

# Add labels and title
carplot = carplot + labs(x = 'Weight (lbs)', y = 'Displacement (cu. in.)', title = 'Weight vs. Displacement')
carplot
```

