HW - Data Visualization

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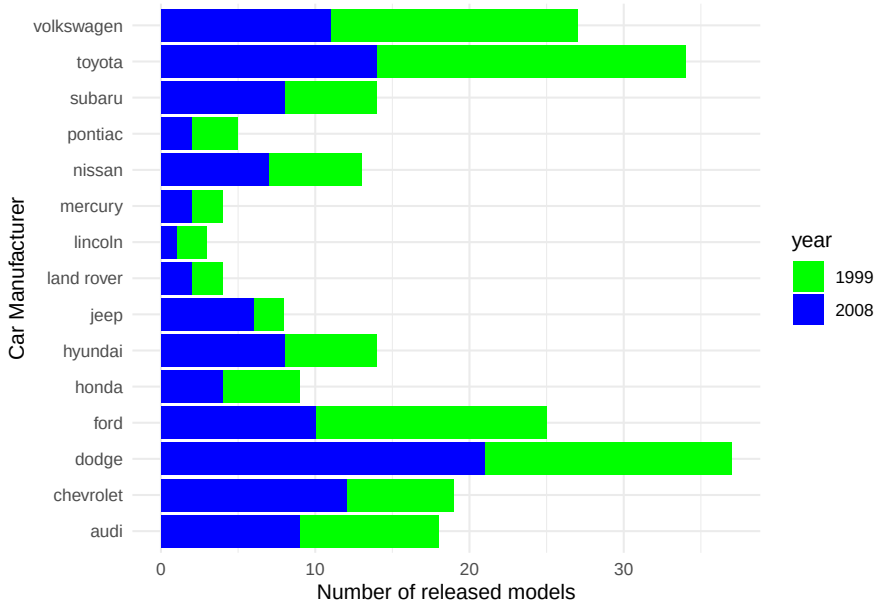
Chart#1: Number of car model released by manufacturer between 1999 and 2008

```
library(tidyverse)
library(ggthemes)
library(patchwork)

mpg$year <- as.factor(mpg$year)
ggplot(mpg, aes(y=manufacturer, fill=year))+
  geom_bar() +
  theme_minimal() +
  #scale_fill_brewer(palette = "Set2") +
  scale_fill_manual(values = c("green","blue"))+
  labs(
  x= "Number of released models",
  y= "Car Manufacturer"
  )
```



Summary: Dodge, Toyota, and Volkswagen are top 3 of car manufacturer releasing number of models in 1999 and 2008

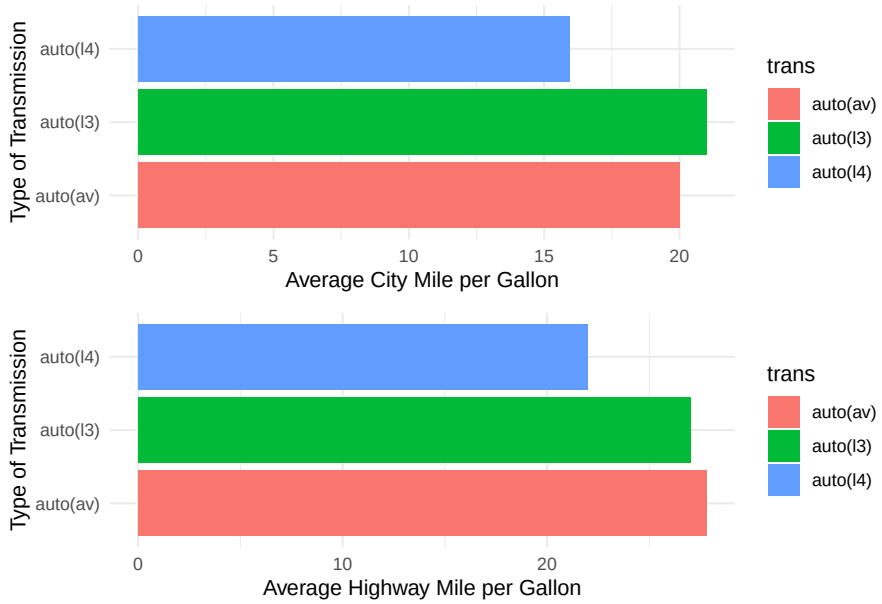
Chart#2: Top 3 of type of transimission vs. Avg. City/Highway Mile per Gallon, Car models released in 1999 and 2008

```
avg1 <- mpg %>%
  group_by(trans) %>%
  summarise(AvgCTY = mean(cty), n = n()) %>%
  head(3) %>%
  ggplot(data = ., mapping=aes(x=AvgCTY,y=trans, fill= trans))

avg2 <- mpg %>%
  group_by(trans) %>%
  summarise(AvgHWY = mean(hwy), n = n()) %>%
  head(3) %>%
  ggplot(data = ., mapping=aes(x=AvgHWY,y=trans, fill= trans))

cty1 <- avg1+geom_col() +
  theme_minimal() +
  labs(
  x= "Average City Mile per Gallon",
  y= "Type of Transmission"
  )

hwy1 <- avg2+geom_col() +
  theme_minimal() +
  labs(
  x= "Average Highway Mile per Gallon",
  y= "Type of Transmission"
  )
cty1/hwy1
```



Summary: auto(av), auto(I3), and auto(I4) are top 3 of type of transmission, having high fuel saving efficiency and high average mile per gallon (City & Highway)

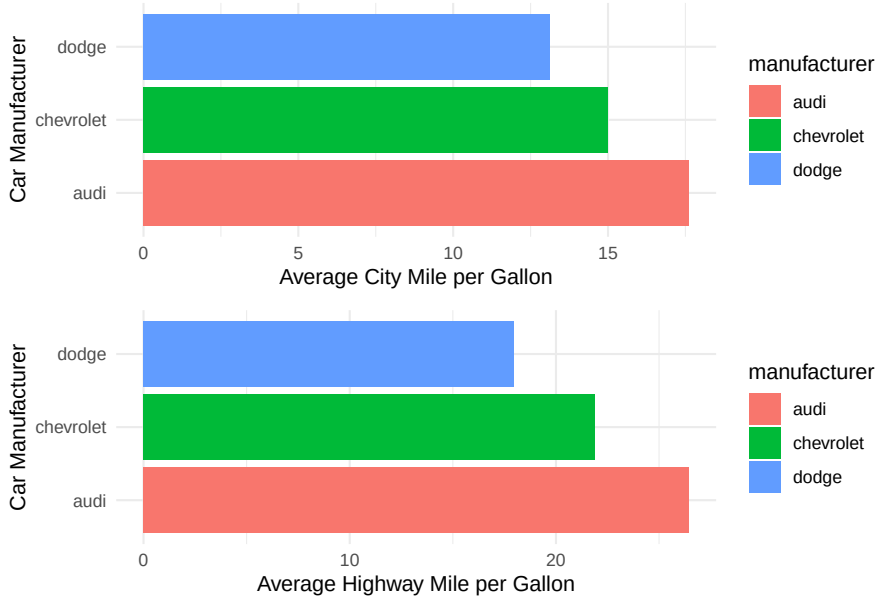
Chart#3: Top 3 of car manufacturer having high Avg. Mile per Gallon, Car models released in 1999 and 2008

```
avg3 <- mpg %>%
  group_by(manufacturer) %>%
  summarise(AvgCTY = mean(cty), n = n()) %>%
  head(3) %>%
  ggplot(data = ., mapping=aes(x=AvgCTY,y=manufacturer, fill= manufacturer))

avg4 <- mpg %>%
  group_by(manufacturer) %>%
  summarise(AvgHWY = mean(hwy), n = n()) %>%
  head(3) %>%
  ggplot(data = ., mapping=aes(x=AvgHWY,y=manufacturer, fill= manufacturer))

cty2 <- avg3+geom_col() +
  theme_minimal() +
  labs(
  x= "Average City Mile per Gallon",
  y= "Car Manufacturer"
  )

hwy2 <- avg4+geom_col() +
  theme_minimal() +
  labs(
  x= "Average Highway Mile per Gallon",
  y= "Car Manufacturer"
  )
cty2/hwy2
```



Summary: Audi, Chevrolet, and Dodge are top 3 of car manufacturer having high average city and highway mile per gallon for their car models released in 1999 and 2008

Chart#4 Average City/Highway Mile Per Gallon by Year 1999 and 2008

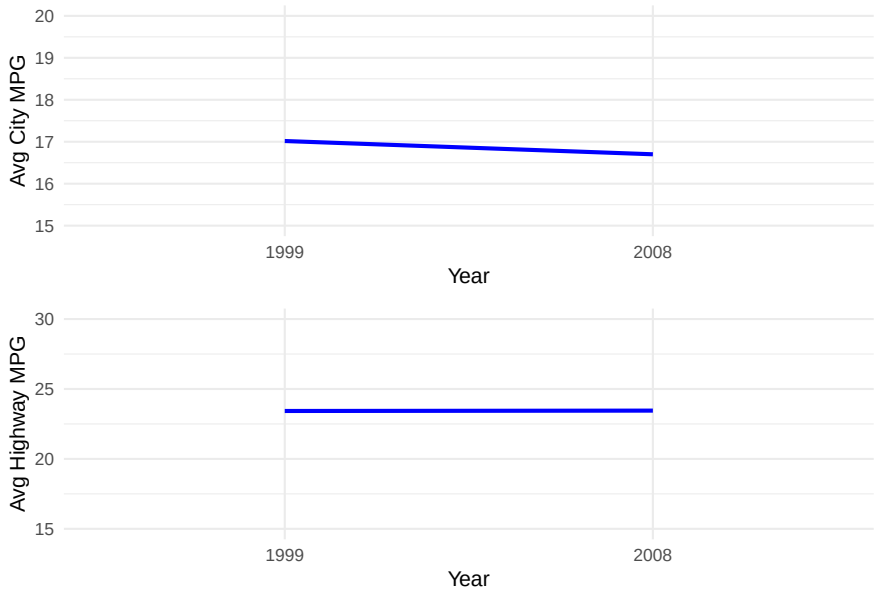
```
library(patchwork)
mpg$year <- as.factor(mpg$year)
cty3 <- mpg %>%
  group_by(year) %>%
  summarise(AvgCTY = mean(cty))

hwy3 <- mpg %>%
  group_by(year) %>%
  summarise(AvgHWY = mean(hwy))

line1 <- ggplot(cty3,aes(year,AvgCTY,ymin=15,ymax=20,group=1))+
  geom_line(color="blue",linewidth=1)+
  theme_minimal() +
  labs(
  y= "Avg City MPG",
  x= "Year"
  )

line2 <- ggplot(hwy3,aes(year,AvgHWY,ymin=15,ymax=30,group=1))+
  geom_line(color="blue",linewidth=1)+
  theme_minimal() +
  labs(
  y= "Avg Highway MPG",
  x= "Year"
  )

line1/line2
```



Summary: No improvement of Average Mile per Gallon for car models released in year 1999 and 2008

Chart#5: Relationship between City/Highway Mile Per Gallon and engine displacement & number of cylinders

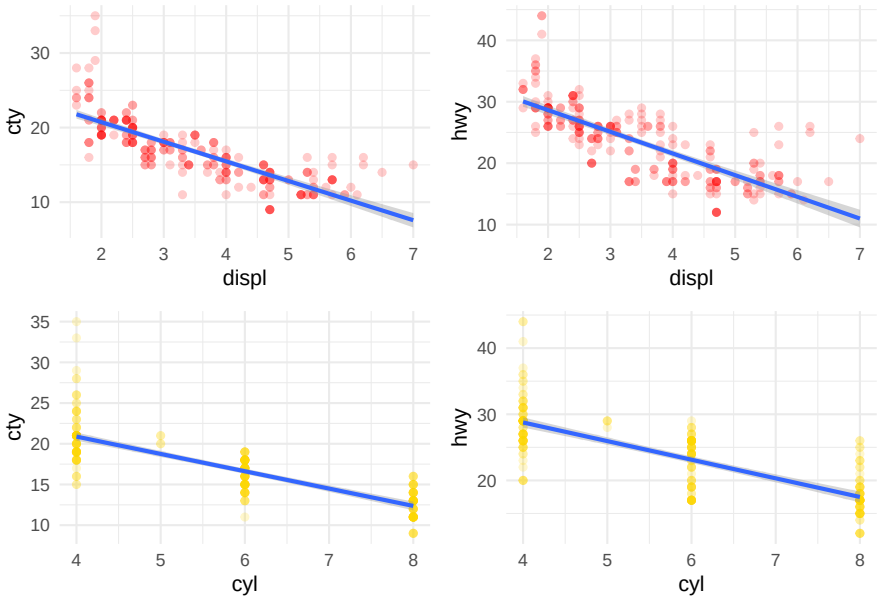
```
library(patchwork)
p1 <- ggplot(mpg, aes(displ,cty)) +
  geom_point(alpha = 0.2, color="red") +
 # geom_smooth(method = "lm") +
  geom_smooth(formula = y ~ x, method = "lm") +
  theme_minimal()

p2 <- ggplot(mpg, aes(displ,hwy)) +
  geom_point(alpha = 0.2, color="red") +
 # geom_smooth(method = "lm") +
  geom_smooth(formula = y ~ x, method = "lm") +
  theme_minimal()

p3 <- ggplot(mpg, aes(cyl,cty)) +
  geom_point(alpha = 0.2, color="gold") +
 # geom_smooth(method = "lm") +
  geom_smooth(formula = y ~ x, method = "lm") +
  theme_minimal()

p4 <- ggplot(mpg, aes(cyl,hwy)) +
  geom_point(alpha = 0.2, color="gold") +
 # geom_smooth(method = "lm") +
  geom_smooth(formula = y ~ x, method = "lm") +
  theme_minimal()

(p1+p2)/(p3+p4)
```



Summary: Negative slope. From trend line, the more numbers of engine displacement and cylinders, the lower city and highway mile per gallon, car models released in 1999 and 2008