CM515 Day 1: Plotting with ggplot()

Goal: Utilize tidy data to generate complex graphs with few lines of code

Start by loading the data

```
mpg <- mpg
```

Check out the data

```
# What are 5 functions we could use to explore the mpg dataset?
str(mpg)
```

```
## tibble [234 x 11] (S3: tbl_df/tbl/data.frame)
##  $ manufacturer: chr [1:234] "audi" "audi" "audi" "audi" ...
##  $ model       : chr [1:234] "a4" "a4" "a4" "a4" ...
##  $ displ       : num [1:234] 1.8 1.8 2 2 2.8 2.8 3.1 1.8 1.8 2 ...
##  $ year        : int [1:234] 1999 1999 2008 2008 1999 1999 2008 1999 1999 2008 ...
##  $ cyl         : int [1:234] 4 4 4 4 6 6 6 4 4 4 ...
##  $ trans       : chr [1:234] "auto(l5)" "manual(m5)" "manual(m6)" "auto(av)" ...
##  $ drv         : chr [1:234] "f" "f" "f" "f" ...
##  $ cty         : int [1:234] 18 21 20 21 16 18 18 18 16 20 ...
##  $ hwy         : int [1:234] 29 29 31 30 26 26 27 26 25 28 ...
##  $ fl          : chr [1:234] "p" "p" "p" "p" ...
##  $ class       : chr [1:234] "compact" "compact" "compact" "compact" ...
```

```
summary(mpg)
```

```
##  manufacturer          model               displ            year     
##  Length:234         Length:234         Min.   :1.600   Min.   :1999  
##  Class :character   Class :character   1st Qu.:2.400   1st Qu.:1999  
##  Mode  :character   Mode  :character   Median :3.300   Median :2004  
##                                        Mean   :3.472   Mean   :2004  
##                                        3rd Qu.:4.600   3rd Qu.:2008  
##                                        Max.   :7.000   Max.   :2008  
##       cyl           trans               drv                 cty       
##  Min.   :4.000   Length:234         Length:234         Min.   : 9.00  
##  1st Qu.:4.000   Class :character   Class :character   1st Qu.:14.00  
##  Median :6.000   Mode  :character   Mode  :character   Median :17.00  
##  Mean   :5.889                                         Mean   :16.86  
##  3rd Qu.:8.000                                         3rd Qu.:19.00  
##  Max.   :8.000                                         Max.   :35.00  
##       hwy             fl               class          
##  Min.   :12.00   Length:234         Length:234        
##  1st Qu.:18.00   Class :character   Class :character  
##  Median :24.00   Mode  :character   Mode  :character  
##  Mean   :23.44                                        
##  3rd Qu.:27.00                                        
##  Max.   :44.00                                        
```

```r
colnames(mpg)
```

```
##  [1] "manufacturer" "model"        "displ"        "year"         "cyl"
##  [6] "trans"        "drv"          "cty"          "hwy"          "fl"
## [11] "class"
```

```r
?mpg

head(mpg)
```

```
## # A tibble: 6 x 11
##   manufacturer model displ  year   cyl trans      drv     cty   hwy fl    class
##   <chr>        <chr> <dbl> <int> <int> <chr>      <chr> <int> <int> <chr> <chr>
## 1 audi         a4      1.8  1999     4 auto(l5)   f        18    29 p     compa~
## 2 audi         a4      1.8  1999     4 manual(m5) f        21    29 p     compa~
## 3 audi         a4      2    2008     4 manual(m6) f        20    31 p     compa~
## 4 audi         a4      2    2008     4 auto(av)   f        21    30 p     compa~
## 5 audi         a4      2.8  1999     6 auto(l5)   f        16    26 p     compa~
## 6 audi         a4      2.8  1999     6 manual(m5) f        18    26 p     compa~
```

```r
# Which manufacturer has the most models in this dataset?
mpg %>%
  count(model) %>%
  arrange(n)
```

```
## # A tibble: 38 x 2
##    model                      n
##    <chr>                  <int>
##  1 land cruiser wagon 4wd     2
##  2 a6 quattro                 3
##  3 expedition 2wd             3
##  4 maxima                     3
##  5 navigator 2wd              3
##  6 k1500 tahoe 4wd            4
##  7 mountaineer 4wd            4
##  8 pathfinder 4wd             4
##  9 range rover                4
## 10 c1500 suburban 2wd         5
## # i 28 more rows
```

```r
mpg %>%
  count(model) %>%
  arrange(desc(n))
```

```
## # A tibble: 38 x 2
##    model                   n
##    <chr>               <int>
##  1 caravan 2wd            11
##  2 ram 1500 pickup 4wd    10
##  3 civic                   9
##  4 dakota pickup 4wd       9
##  5 jetta                   9
##  6 mustang                 9
##  7 a4 quattro              8
##  8 grand cherokee 4wd      8
##  9 impreza awd             8
## 10 a4                        7
## # i 28 more rows
```

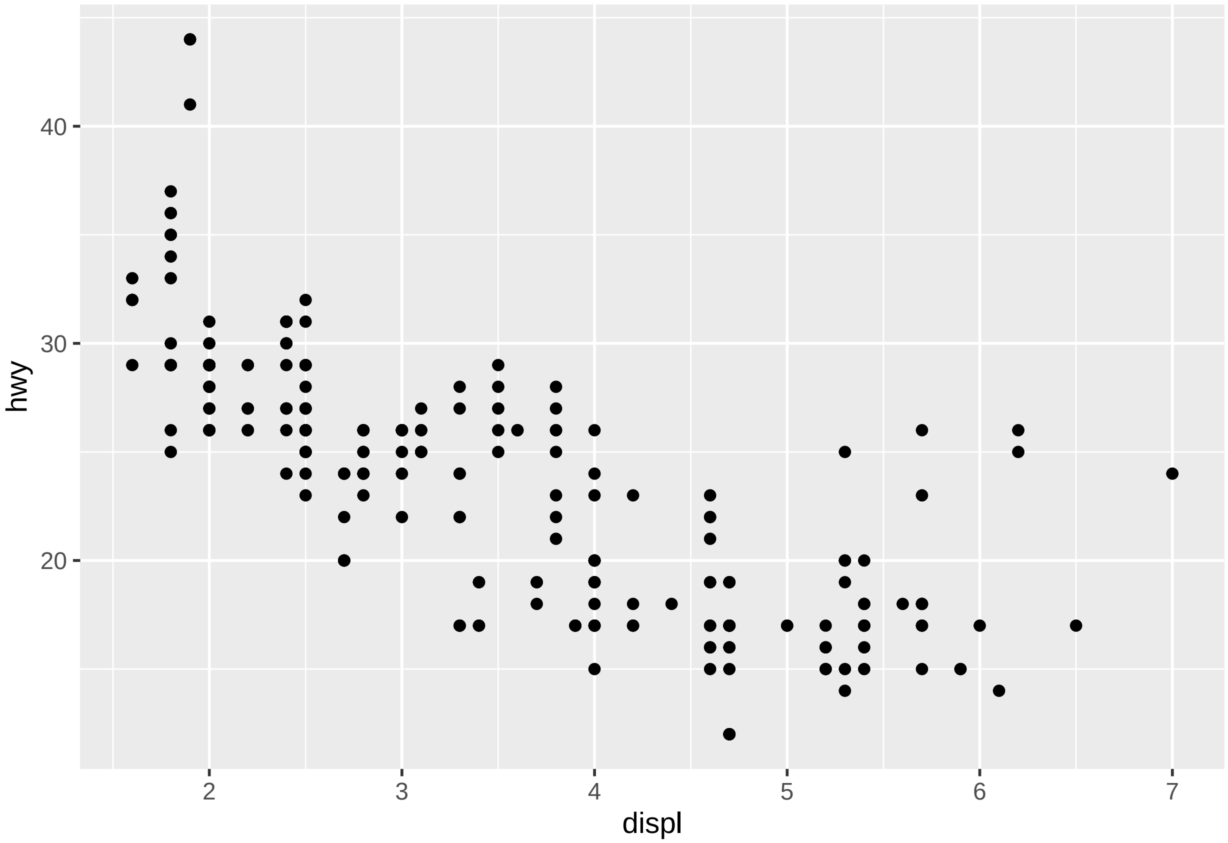
This dataset suggests many interesting questions. How are engine size and fuel economy related? Do certain manufacturers care more about fuel economy than others? Has fuel economy improved in the last ten years? We will try to answer some of these questions, and in the process learn how to create some basic plots with ggplot2.

Every ggplot has three key components:

- Data
- Aesthetic mappings between variables in the data
- A layer to render the information (geom)

A simple example

```
ggplot(mpg, aes(x = displ, y = hwy)) +
  geom_point()
```

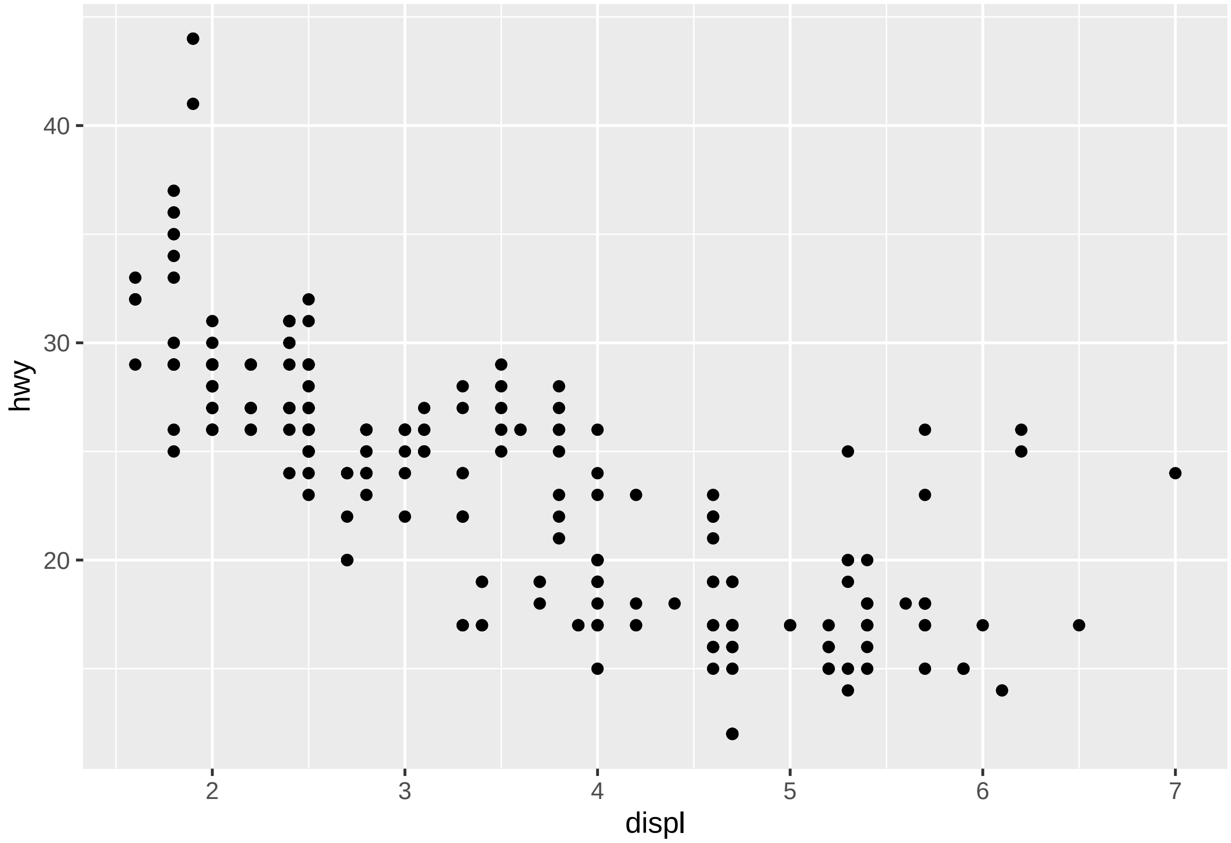


Fill in the following information:

- Data:
- Aesthetic:
- Layers:
- Plus sign:

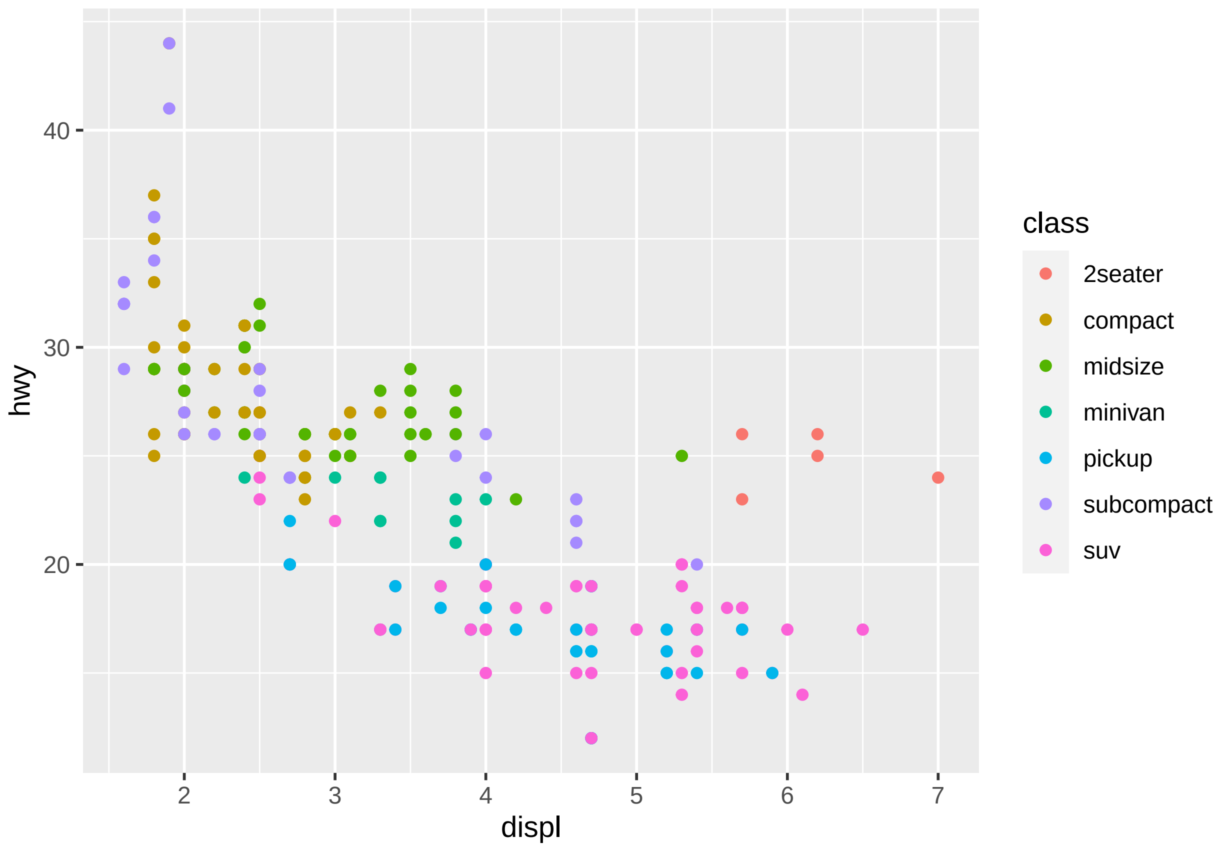
x and y aesthetic can be implied

```
ggplot(mpg, aes(displ, hwy)) +
  geom_point()
```

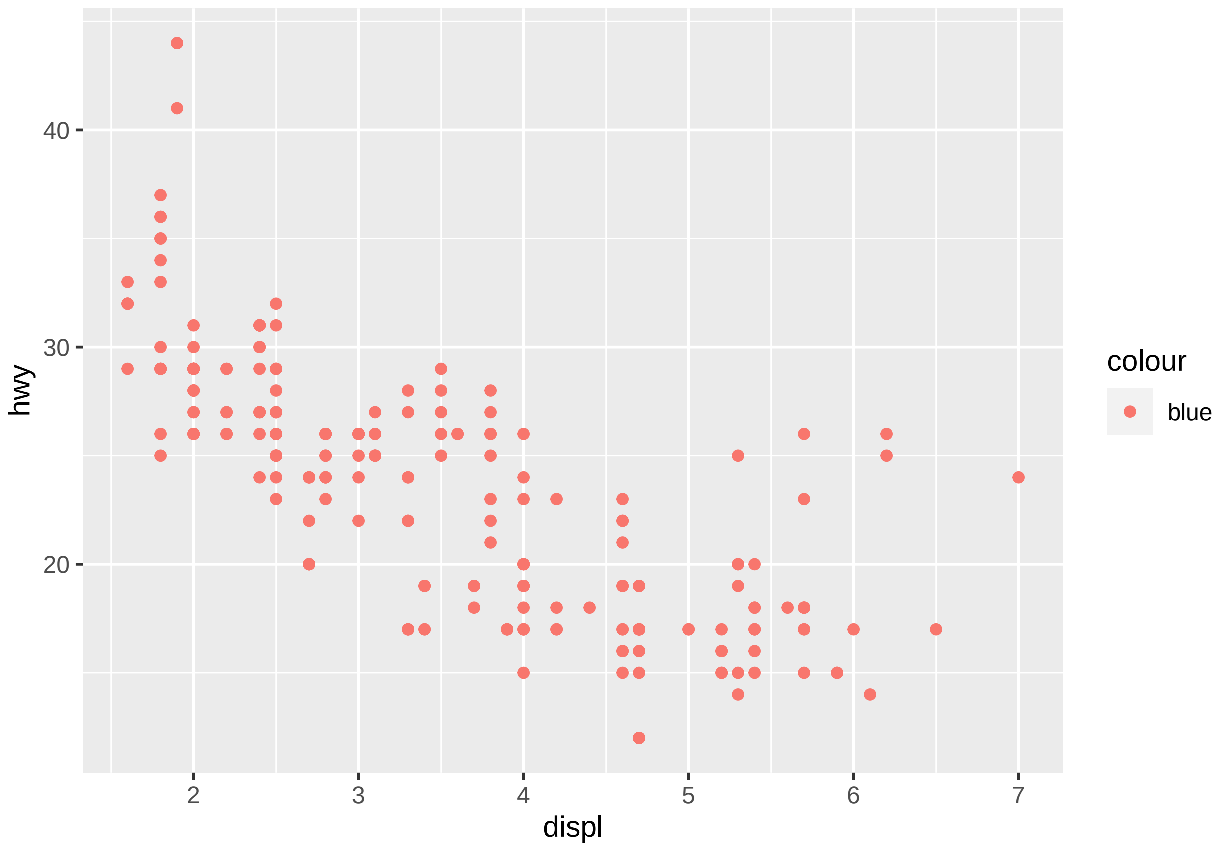


Color, size, shape and other aesthetic attributes

```
ggplot(mpg, aes(displ, hwy, color = class)) +
  geom_point()
```



```
ggplot(mpg, aes(displ, hwy)) + geom_point(aes(colour = "blue"))
```



Princples of good graphics

Appendix

```
library(datasets)
library(tidyverse)
library(knitr)
library(ggplot2)
mpg <- mpg
# What are 5 functions we could use to explore the mpg dataset?
str(mpg)

summary(mpg)

colnames(mpg)

?mpg

head(mpg)

# Which manufacturer has the most models in this dataset?
mpg %>%
  count(model) %>%
  arrange(n)
```

```r
mpg %>%
  count(model) %>%
  arrange(desc(n))
ggplot(mpg, aes(x = displ, y = hwy)) +
  geom_point()
ggplot(mpg, aes(displ, hwy)) +
  geom_point()
ggplot(mpg, aes(displ, hwy, color = class)) +
  geom_point()
ggplot(mpg, aes(displ, hwy)) + geom_point(aes(colour = "blue"))
```