Data Science

CS301

Exploratory First Steps

Week 4

Fall 2024

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Getting, Printing User Input

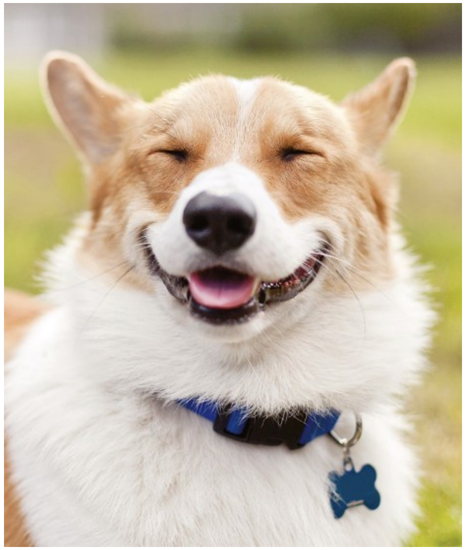
- Get some user input:

  -
    ```
    myVar = readline(prompt = "Enter something :")
    ```
- Print the input

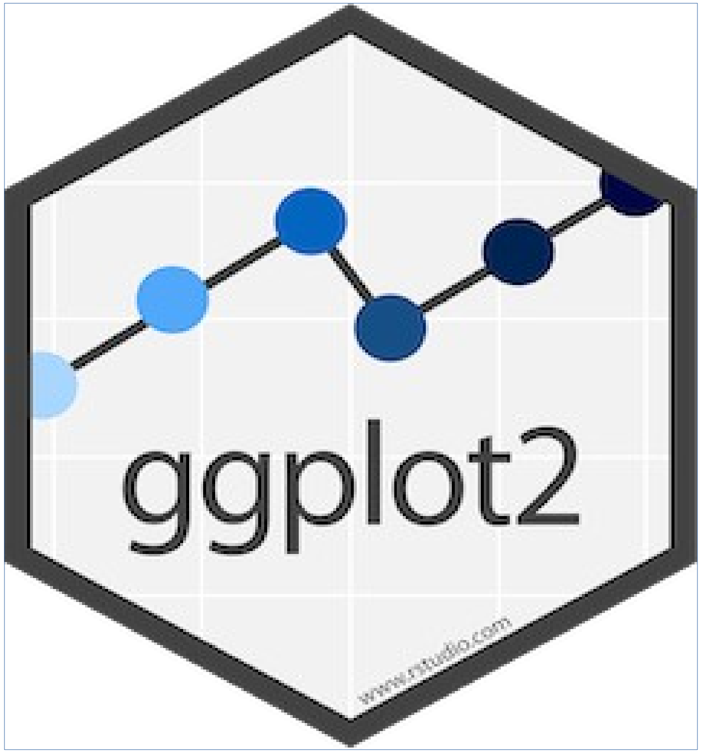
  -
    ```
    cat("You entered : ",myVar, "\n") #print the output, then drop a line.
    ```
- Find out what kind of data is stored in the variable

  -
    ```
    typeof(myVar)
    ```

Typically, many of the inputs are hard-coded into scripts



Tidyverse and Ggplot



https://tidyverse.tidyverse.org
/

https://ggplot2.tidyverse.org
/

```
# Try loading the tidyverse library
library(tidyverse)

#If errors or not working, then try the following instead
library(ggplot2)
```

Ask Data about Mileage

Ask: *What classes of cars (i.e,. suv’s, trucks, etc.) get the best city and highway mileage?*

I know! I will use some MPG data from the Tidyverse library and see what the data says!!

```
library(tidyverse) #not working? Try library(ggplot2)
   # check the data
View(mpg) # note the capital ‘V’
   # run simple plot
ggplot(mpg) +
  geom_point(mapping = aes(x = mpg$displ, y = mpg$hwy ))
```

From Last Time:
Code for a Simple GGPlot

- **ggplot(*data =* mpg) + geom_point(mapping = aes(x = displ, y = hwy))**

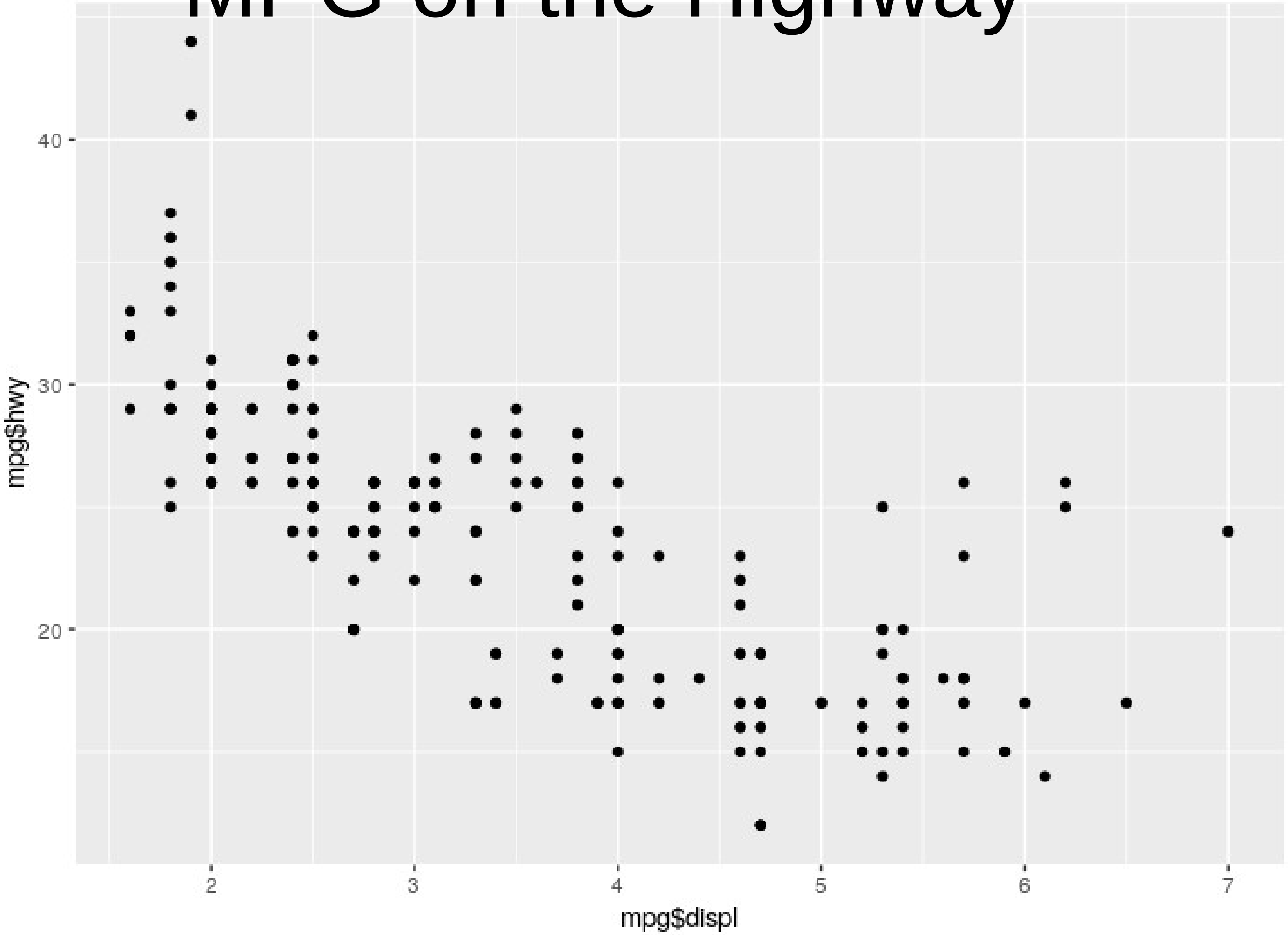
- Establish the *canvas* (where the plot is shown)
  - **ggplot()**

- Link to the data (set is called, ‘mpg’). We do not need to add “data =”
  - **ggplot(data = mpg)**

- Compute the geometery of point placement on canvas
  - **geom_point(mapping = …)**

- Compute the aesthetics of the plot (titles, color, point type, etc)
  - **aes(x = displ, y = hwy)**

Displacement (Car Weight) by MPG on the Highway

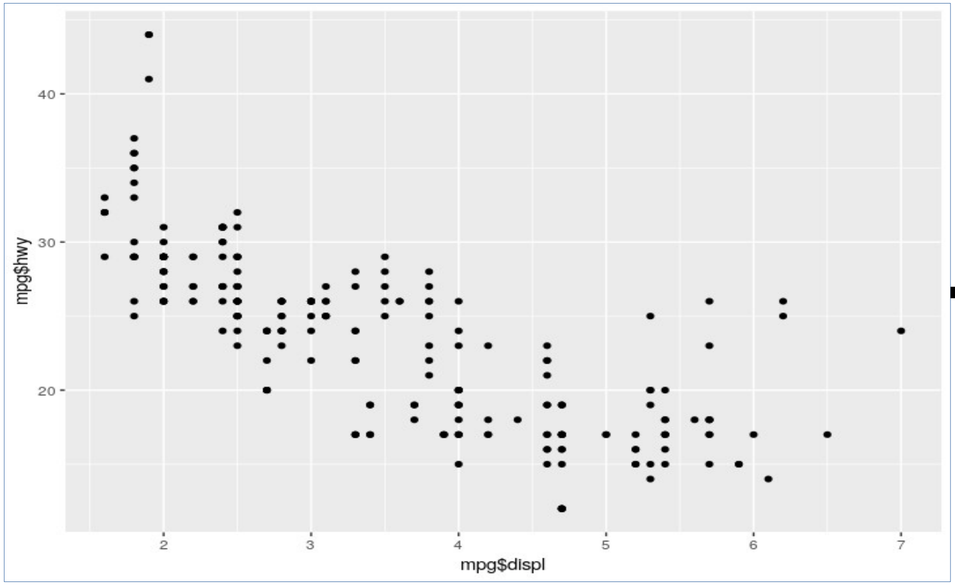


```
ggplot(mpg) +  geom_point(mapping = aes(x = displ, y = hwy ))
```

Displacement (Car Weight) by MPG on the Highway

Is there more to learn from this data?

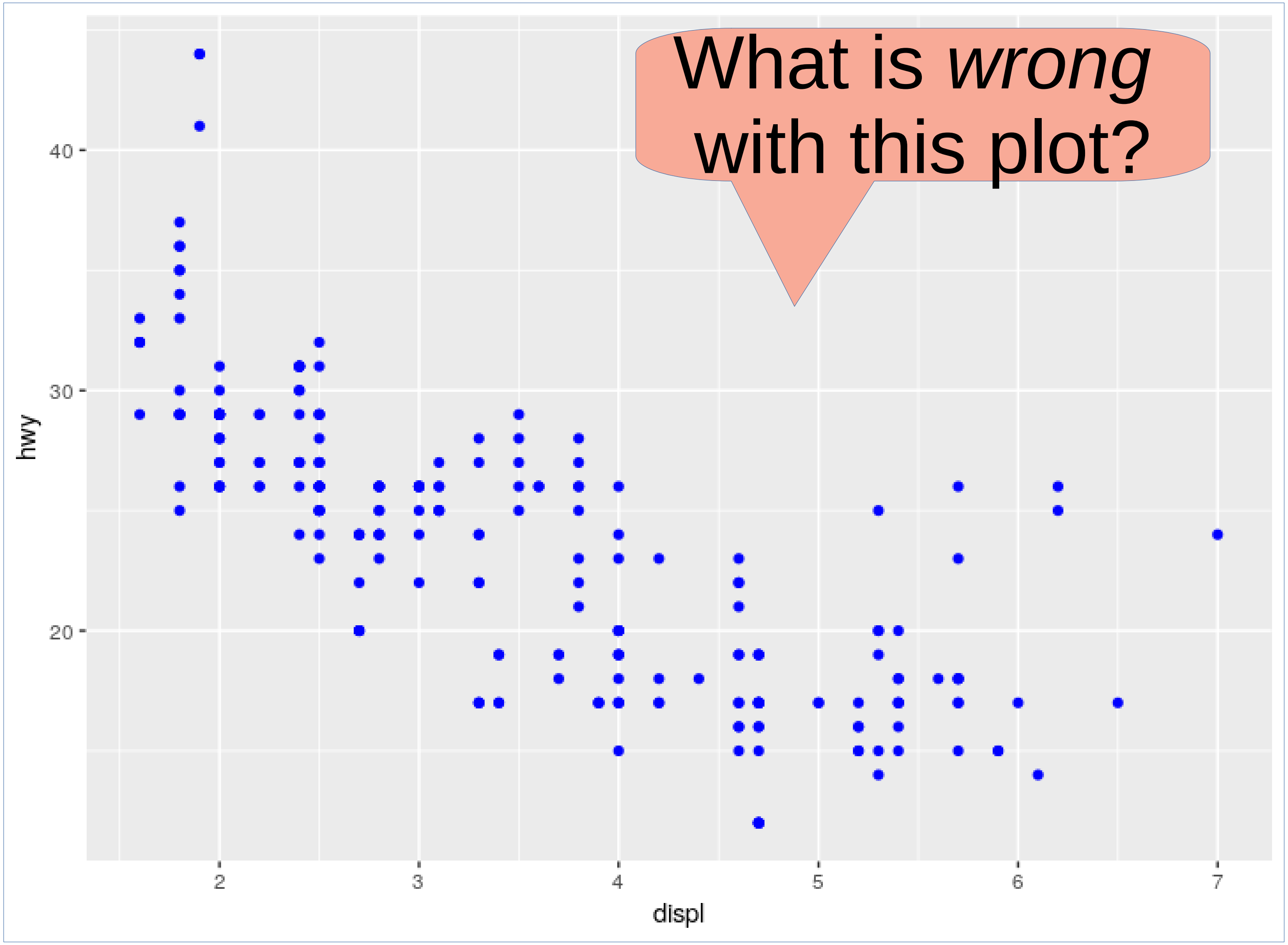
What is *wrong* with this the previous plot?



Yes!

No??

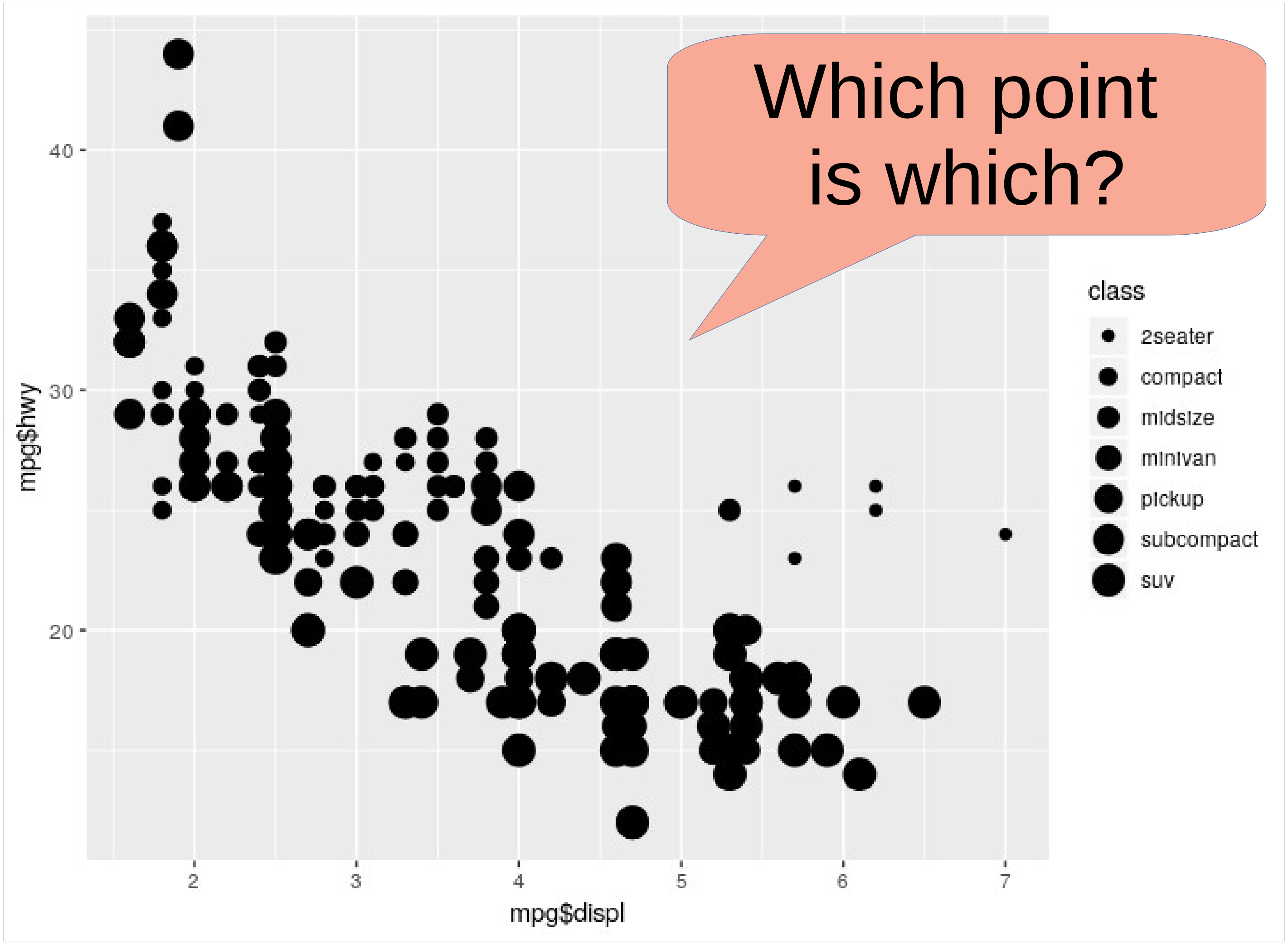
New Blue Plot?



What is *wrong* with this plot?

```
ggplot(mpg) + geom_point(mapping = aes(x = displ, y = hwy), color = "blue")
```

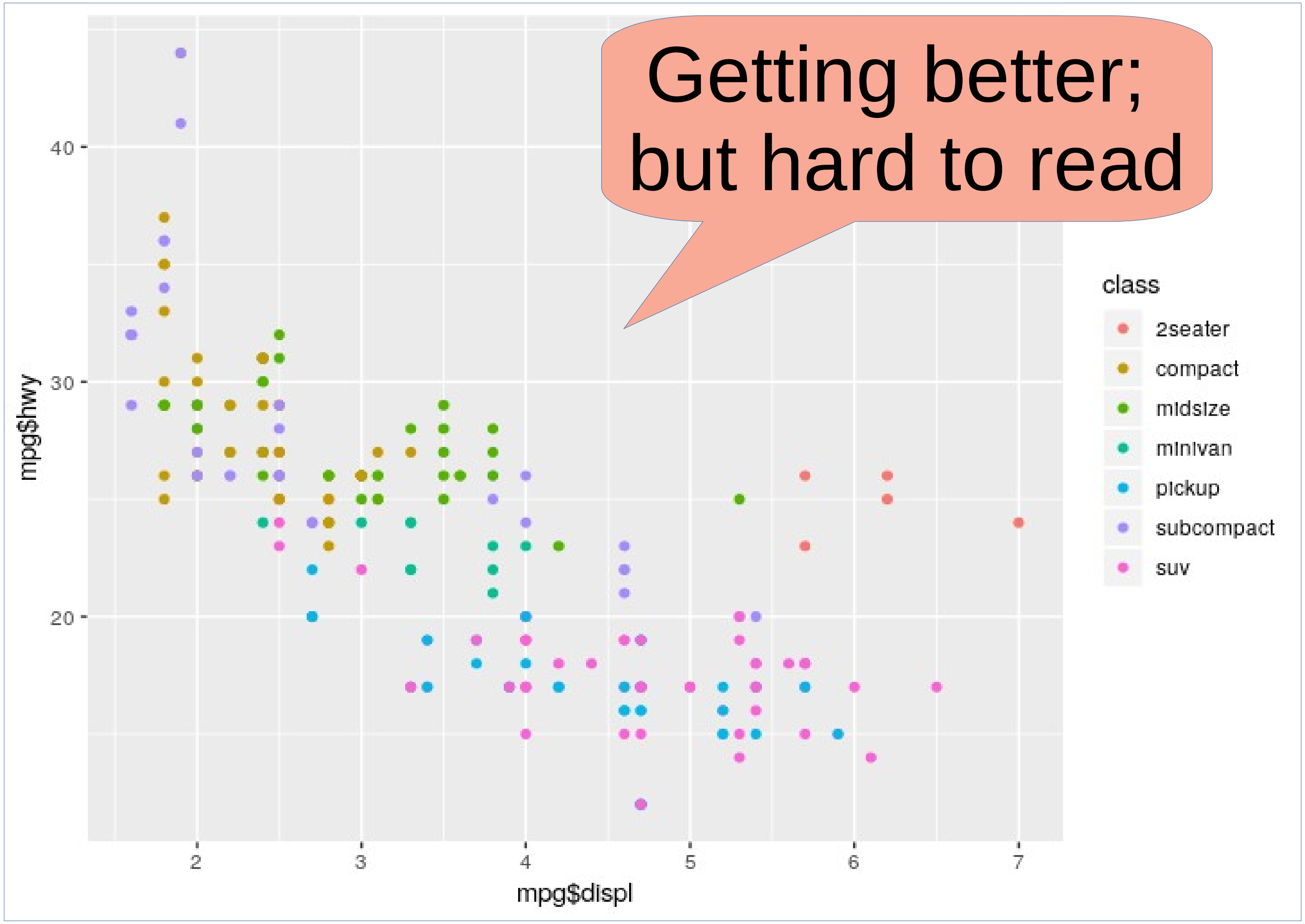
Try Sizing the points for Dimension



Which point is which?

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

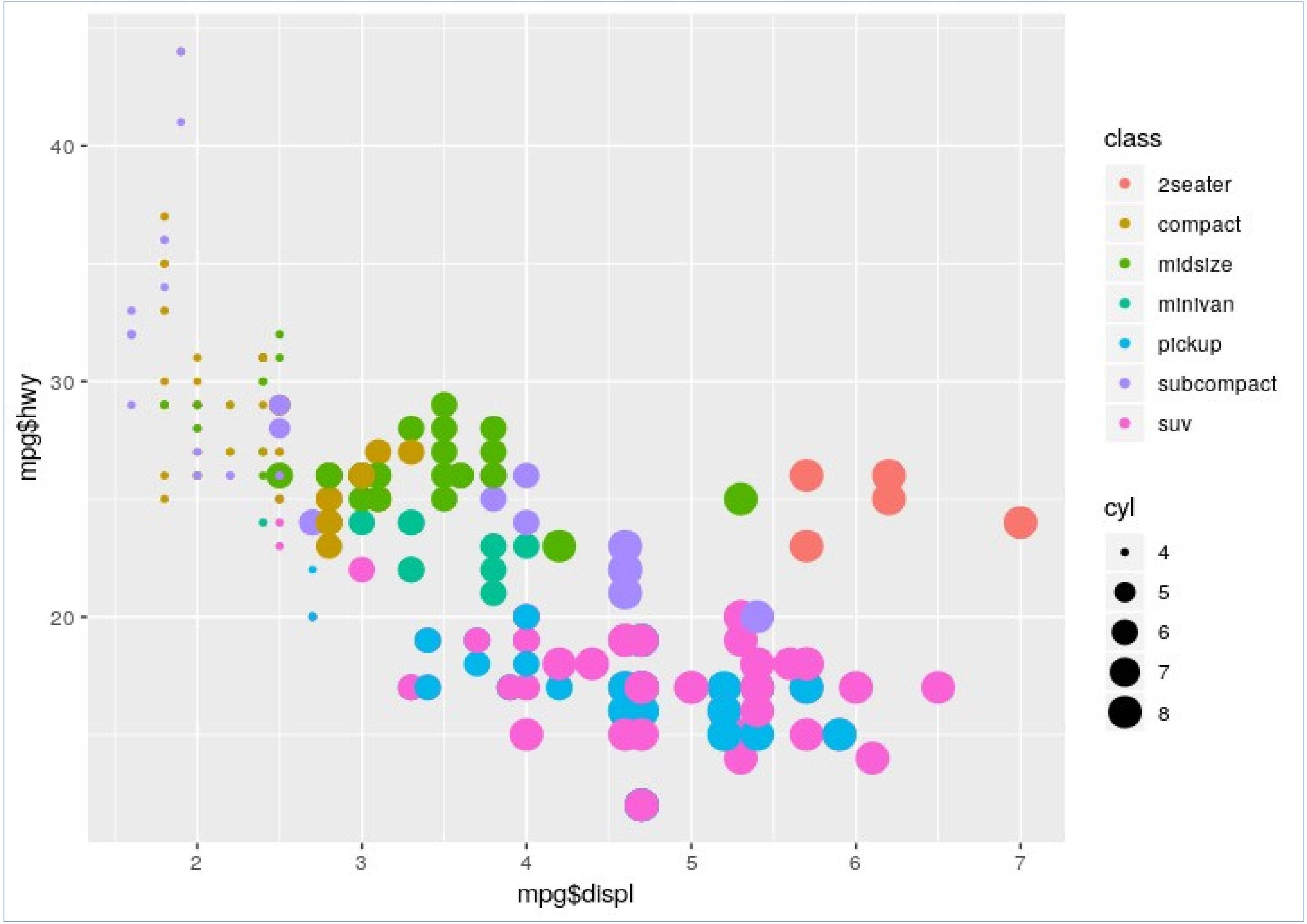
Try Coloring for Dimension



Getting better; but hard to read

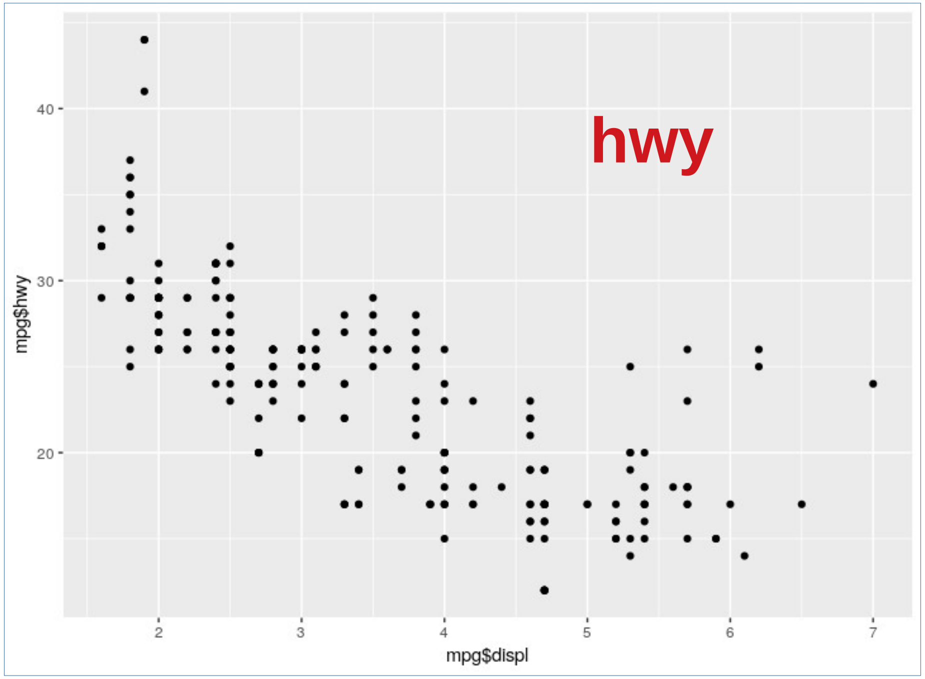
```
ggplot(mpg) + geom_point(mapping = aes(x = displ, y = hwy, color = class))
```

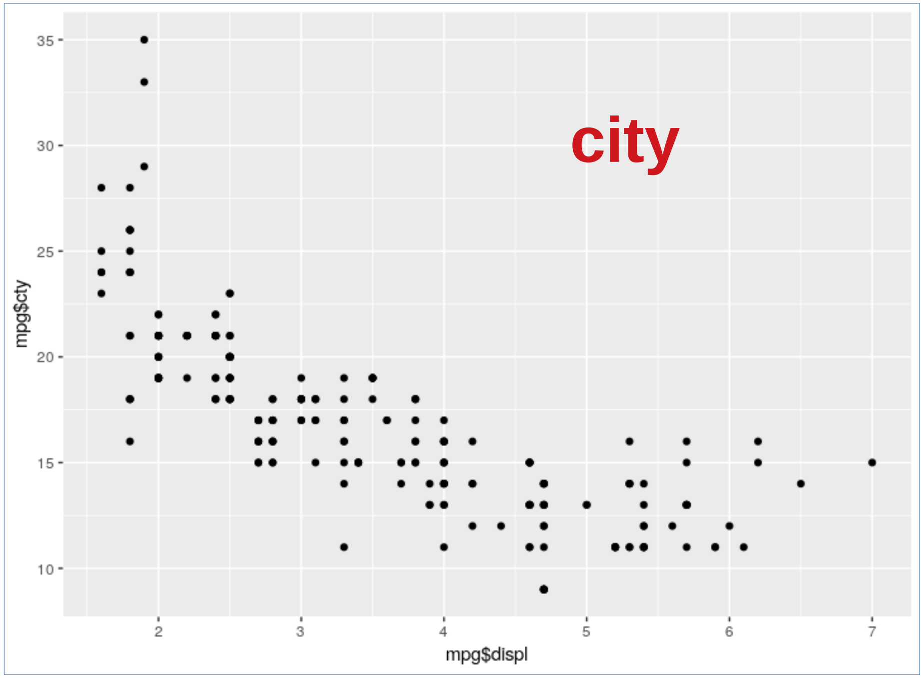
Combine Color, Sized Points and Cycle



```
ggplot(mpg) + geom_point(mapping = aes(x = displ, y = hwy, color = class, size = cyl))
```

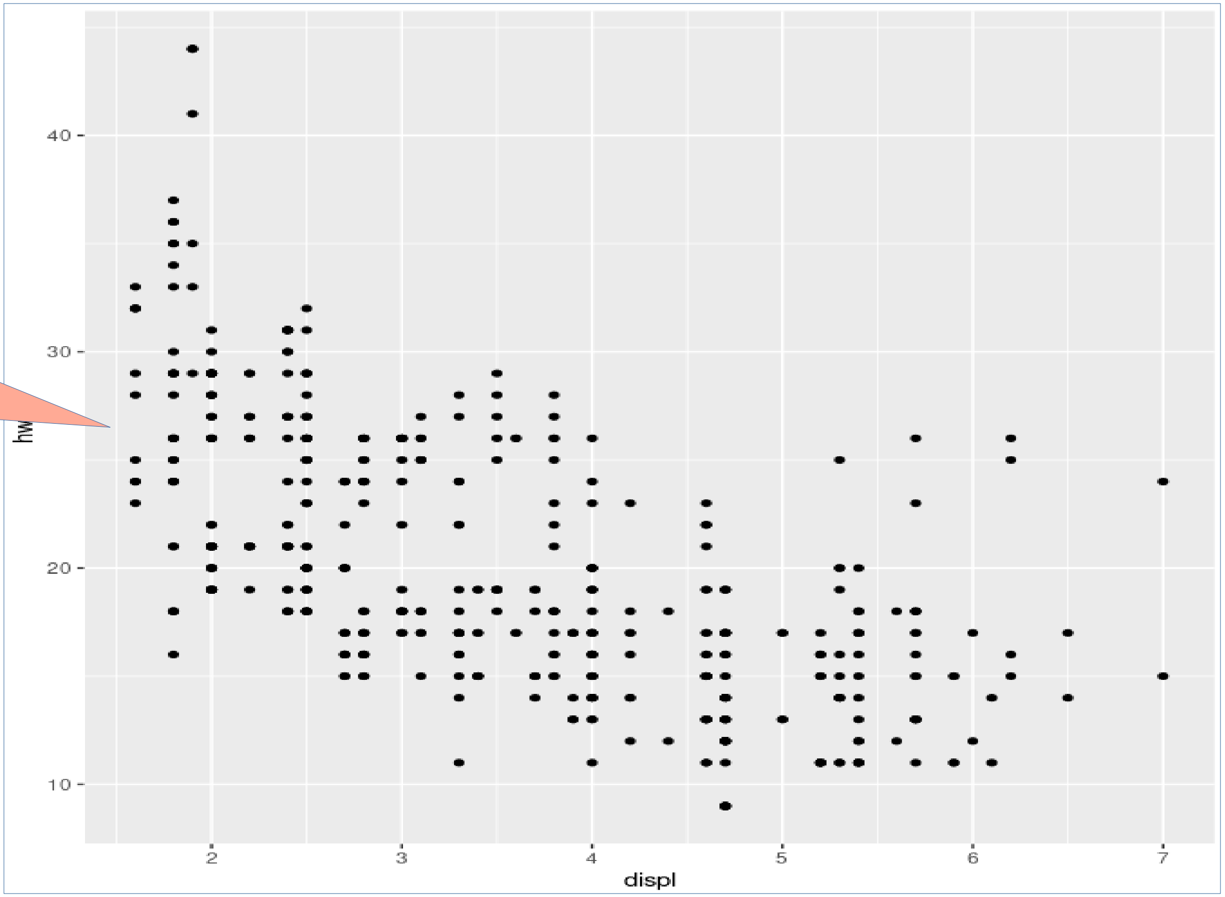
Comparing Hwy and City Mileage





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

# city mileage
ggplot(mpg) + geom_point(mapping = aes(x = displ, y = cty ))
```

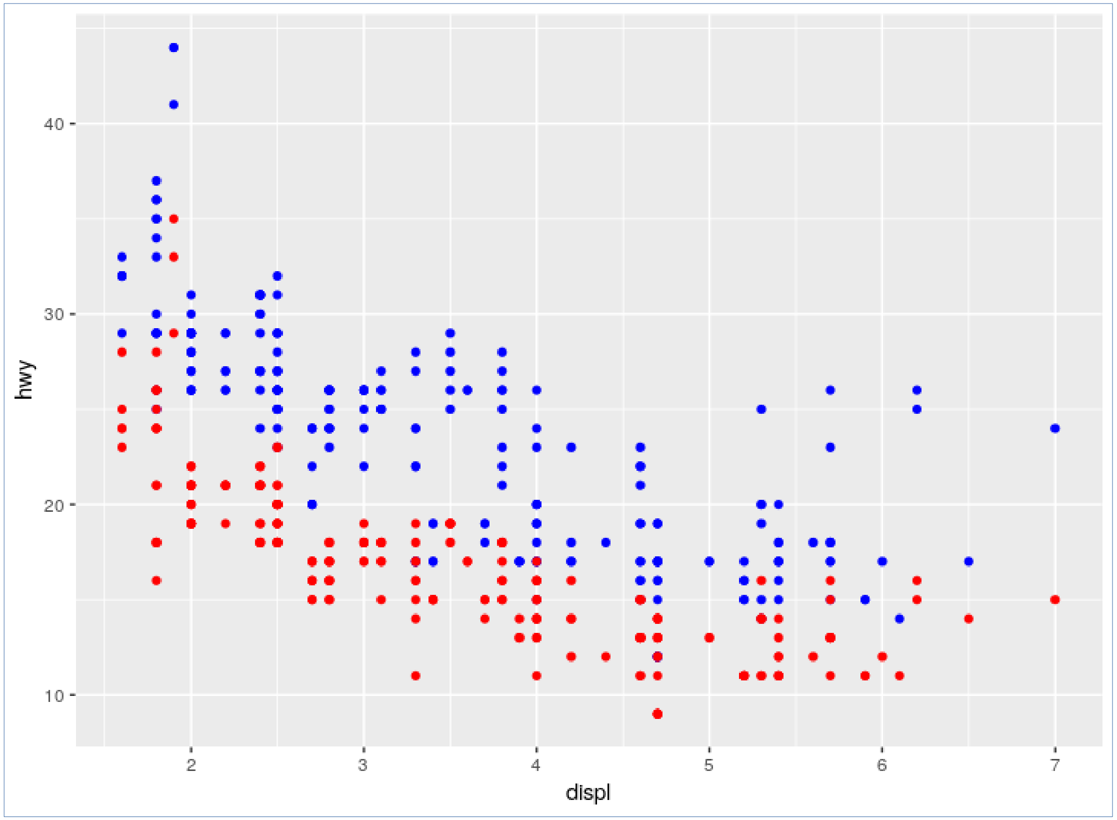
Comparing Hwy and City Mileage



Which Is which?

```
#Place hwy and cty mileage together in same plot
ggplot(mpg) + geom_point(mapping = aes(x = displ, y = hwy), ) +
geom_point(mapping = aes(x = displ, y = cty))
```

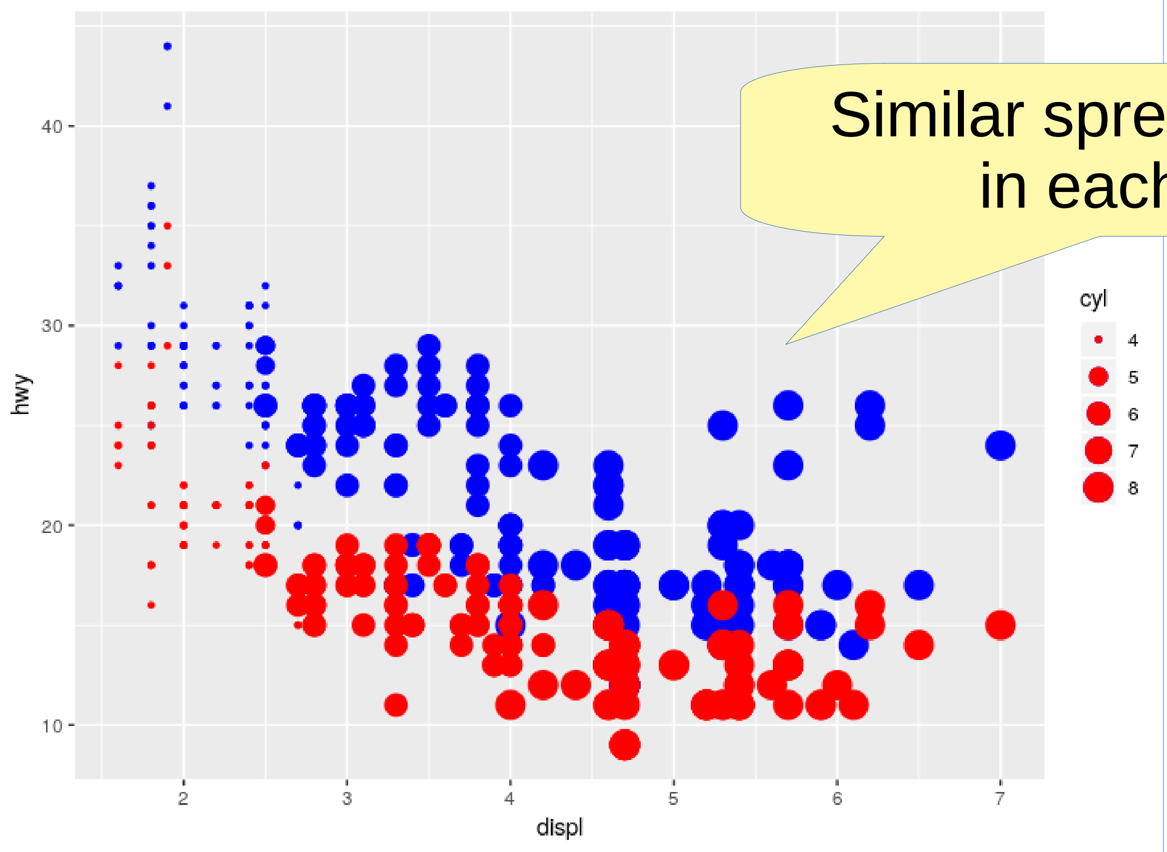
Comparing Hwy and City Mileage



```
#Place hwy and cty mileage together in same plot
ggplot(mpg) +
  geom_point(mapping = aes(x = displ, y = hwy), color = "blue") +
  geom_point(mapping = aes(x = displ, y = cty),   color= "red")
```

Add Sized Points

Hwy

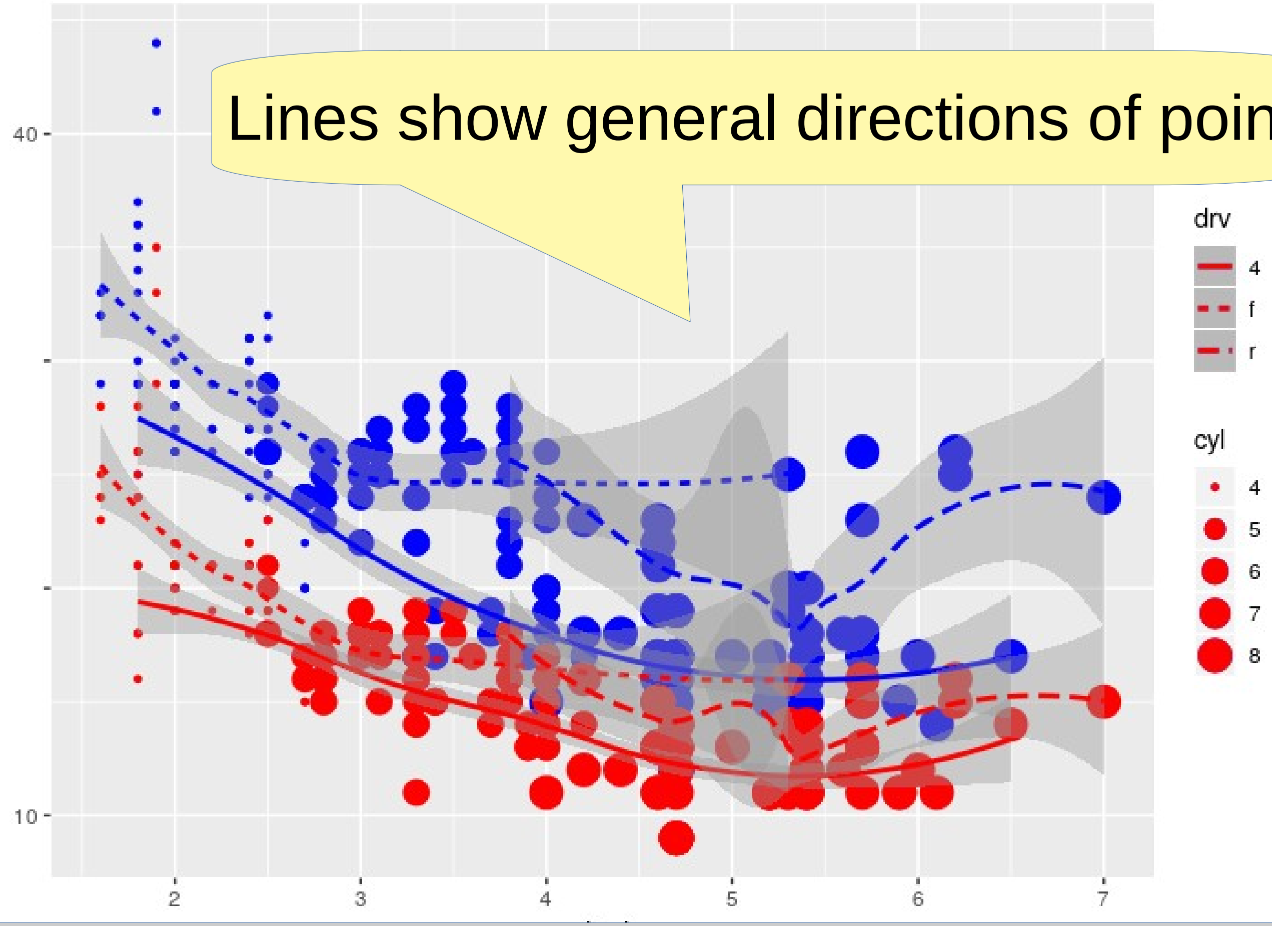


Similar spread of points in each group

City

```
ggplot(mpg) +
  geom_point(mapping = aes(x = displ, y = hwy, size = cyl), color = "blue") +
  geom_point(mapping = aes(x = displ, y = cty, size = cyl), color= "red")
```

Add a *Smooth-Line*



Lines show general directions of points

Hwy

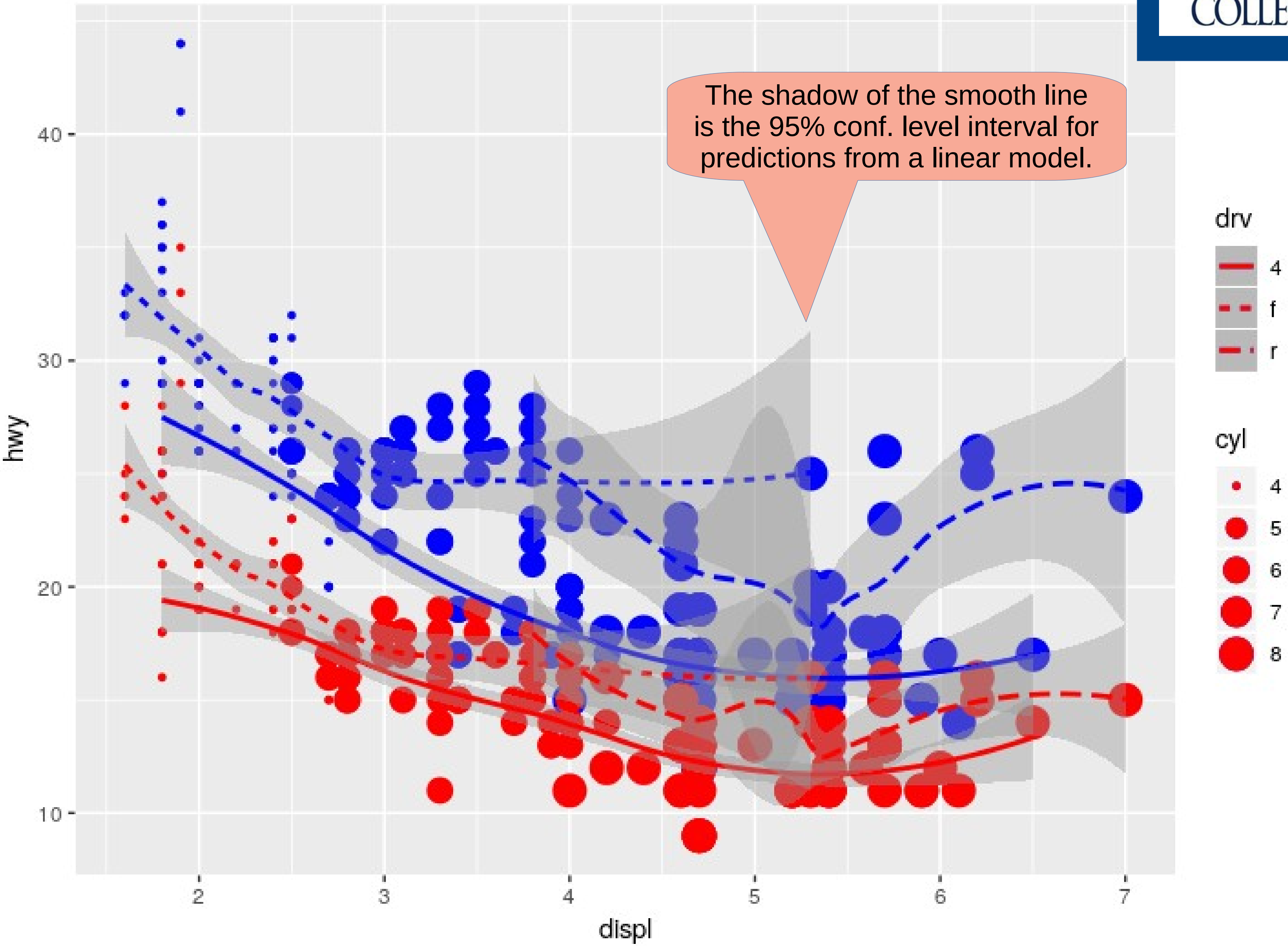
City

Line:
Drv
type

Size:
Cyl
type

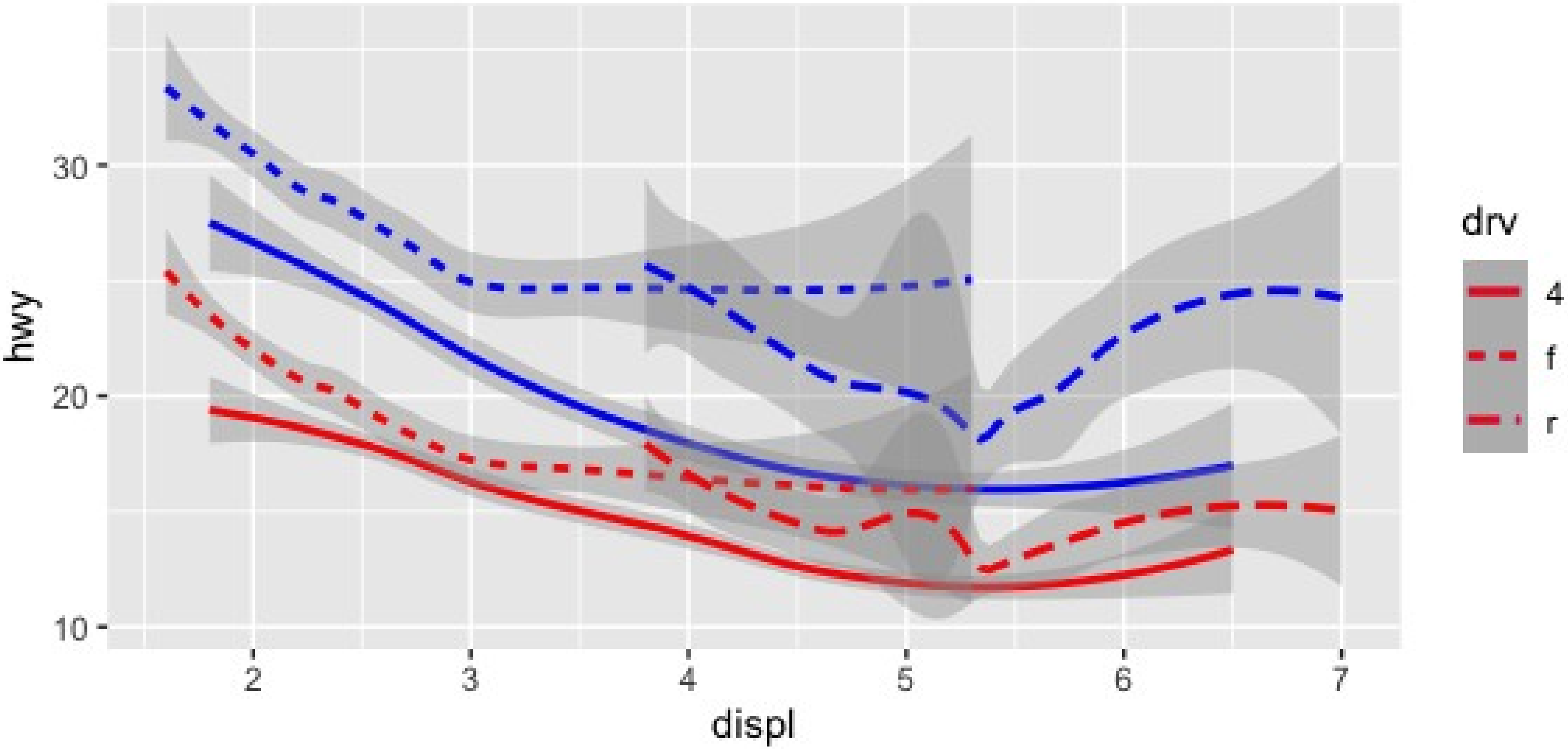
```
ggplot(mpg) +
geom_point(mapping = aes(x = displ, y = hwy, size = cyl), color = "blue") +
geom_point(mapping = aes(x = displ, y = cty, size = cyl), color="red") +
geom_smooth(mapping = aes(x = displ, y = hwy, linetype = drv), color = "blue") +
geom_smooth(mapping = aes(x = displ, y = cty, linetype = drv), color = "red")
```

Bigger Image of the Previous Plot



The shadow of the smooth line is the 95% conf. level interval for predictions from a linear model.

Use Lines From Points For Comparison

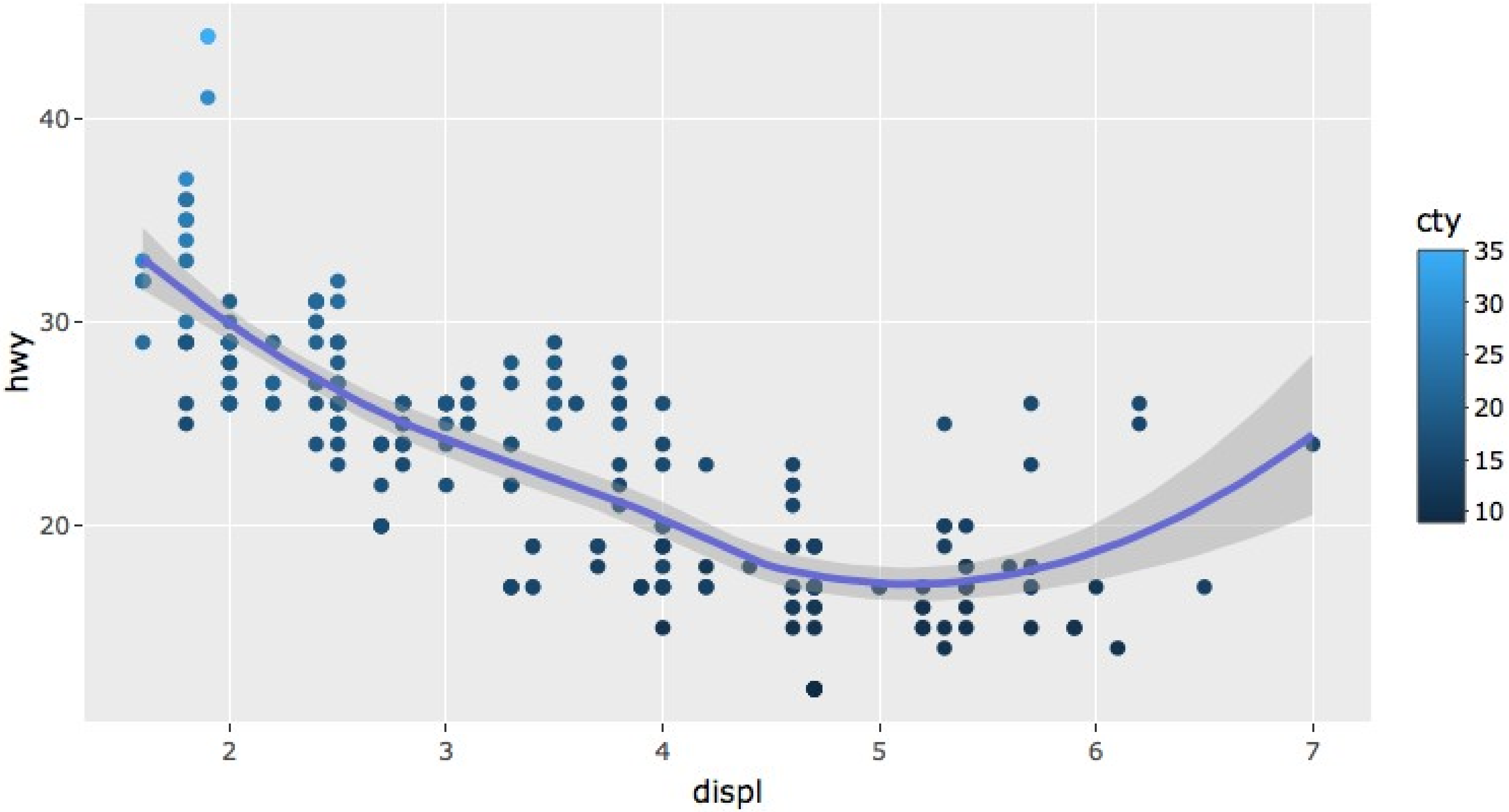


```
ggplot(mpg) +
  geom_smooth(mapping = aes(x = displ, y = hwy, linetype = drv), color = "blue") +
  geom_smooth(mapping = aes(x = displ, y = cty, linetype = drv), color = "red")
```

Add Plotly For Interaction

```
# ref: https://plot.ly/ggplot2/stat_smooth/
#install.packages("plotly")

library(plotly)

p <- ggplot(mpg, aes(displ, hwy, color = cty))
p <- p + geom_point() + stat_smooth()

p <- ggplotly(p)

p
```

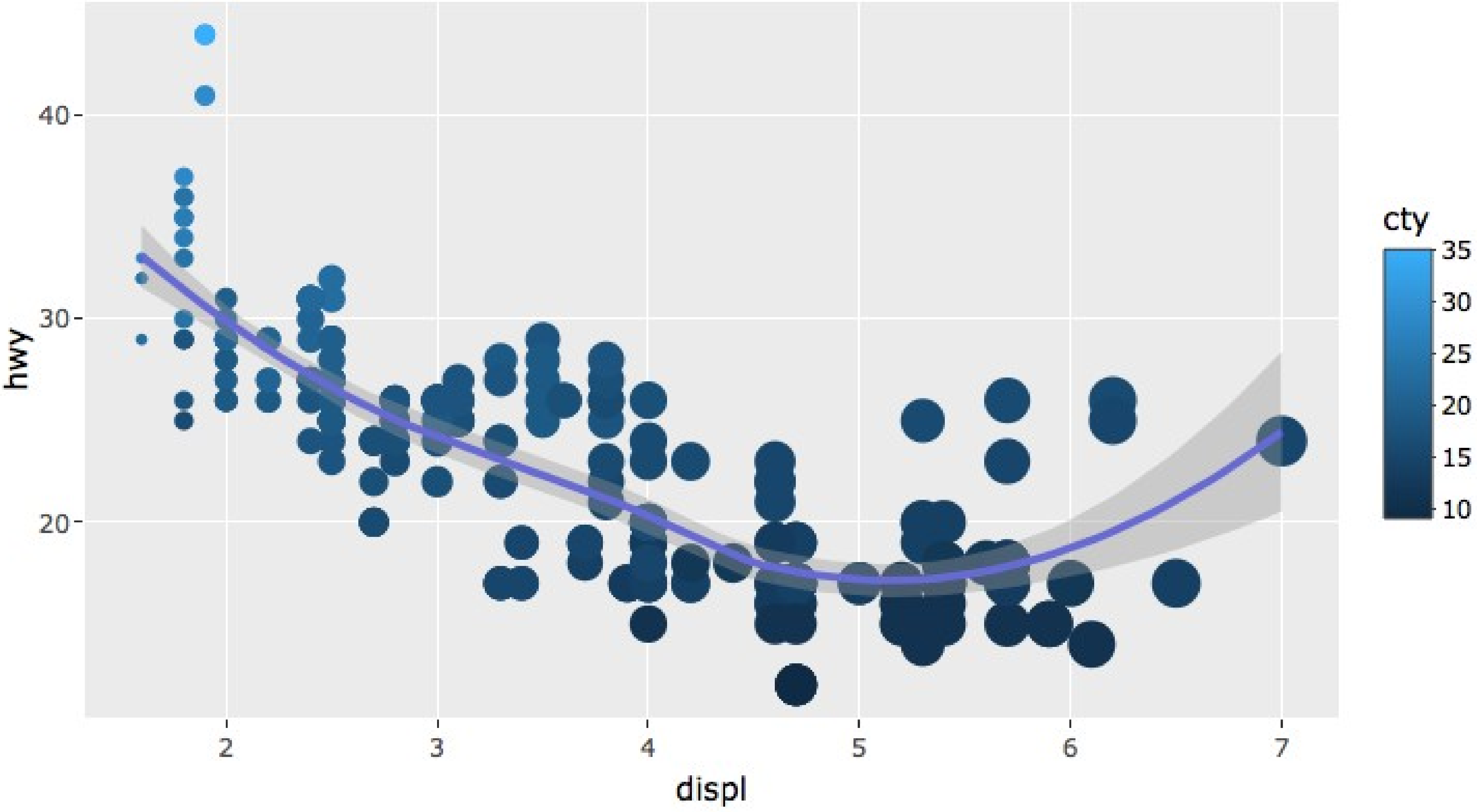
Interact With Plots



Add Plotly For Interaction

```
# ref: https://plot.ly/ggplot2/stat_smooth/
#install.packages("plotly")

library(plotly)

p <- ggplot(mpg, aes(displ, hwy, color = cty, size = displ))
p <- p + geom_point() + stat_smooth()

p <- ggplotly(p)

p
```

Interact With Plots


hwy
displ
cty