# Eric Pitman Summer Workshop in Computational Science

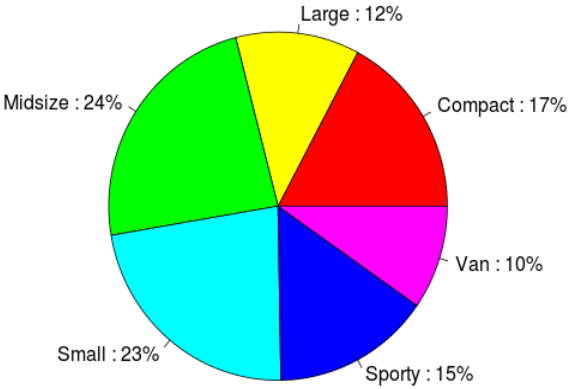

## 5. Visualizing Data

# Plotting Data


Plotting is another way to explore a dataset, visually:

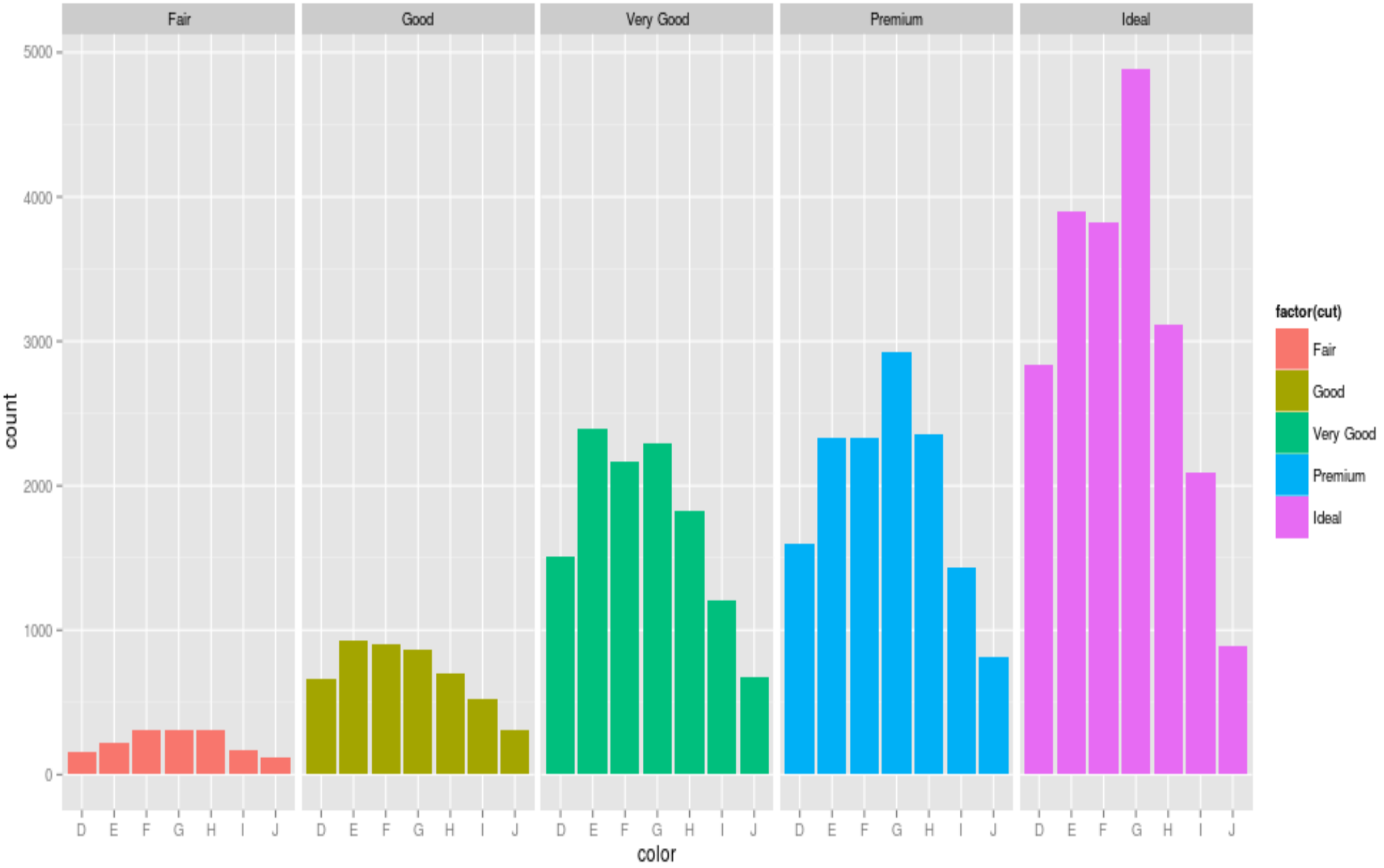
- What's in the dataset?
- What does it mean?
- What if there's *a lot* of it?

# Some Plot Types

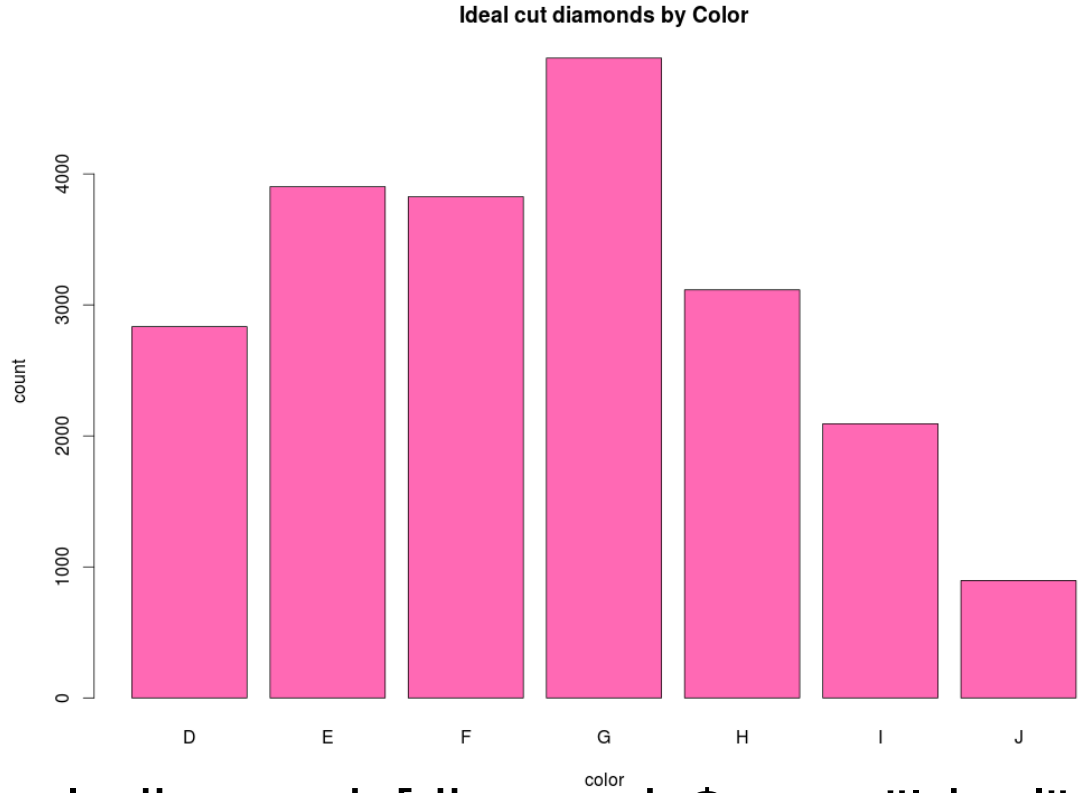



- Pie Chart
  - Display proportions of different values for a variable
- Bar Plot
  - Display counts of values for a categorical variable
- Histogram, Density Plot
  - Display counts of values for a binned, numeric variable
- Scatter Plot
  - y vs. x
- Box Plot
  - Display distributions over different values of a variable

# Barplot: Counts of Categorical Values

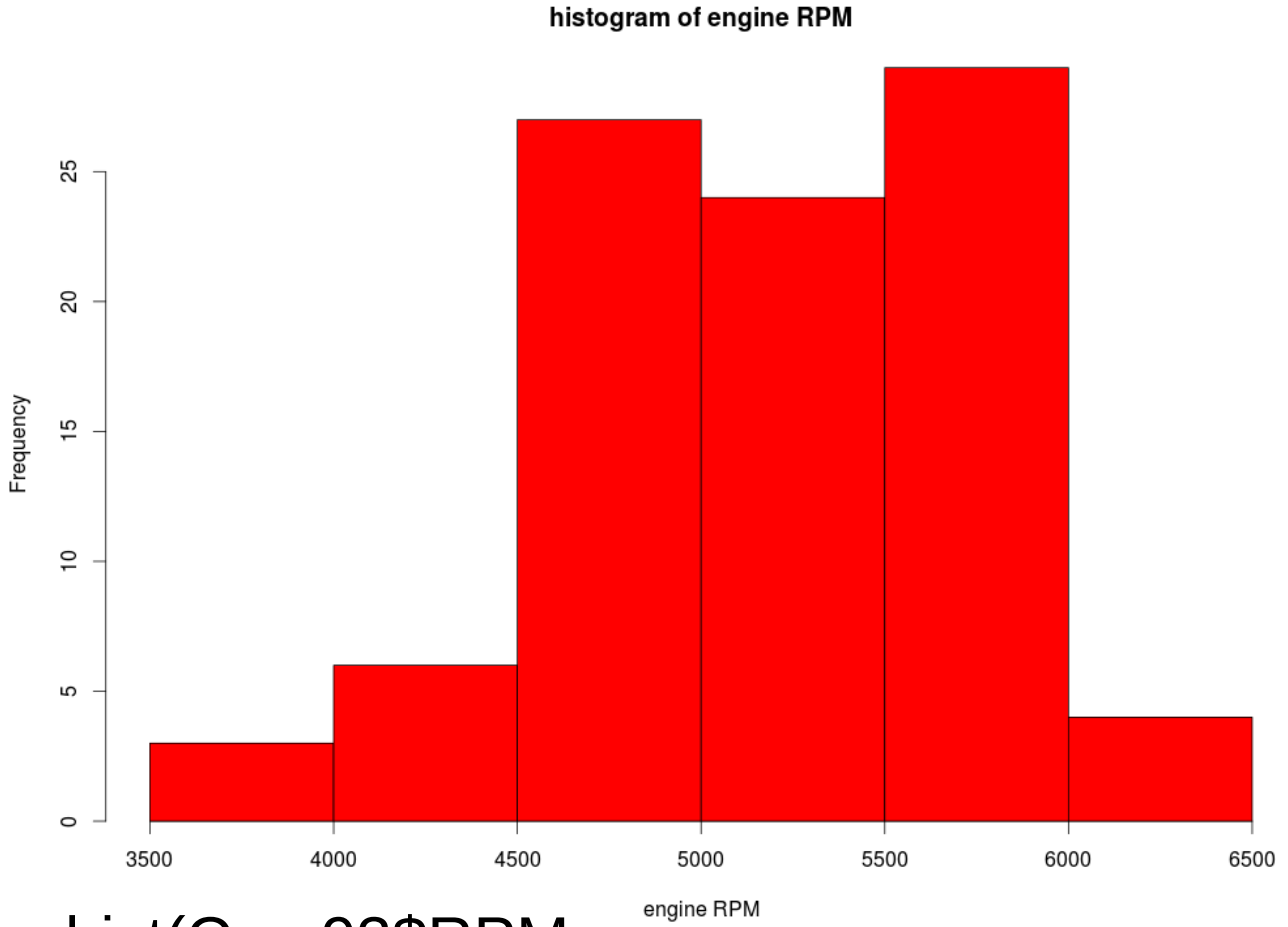


# Barplot: Counts of Categorical Values



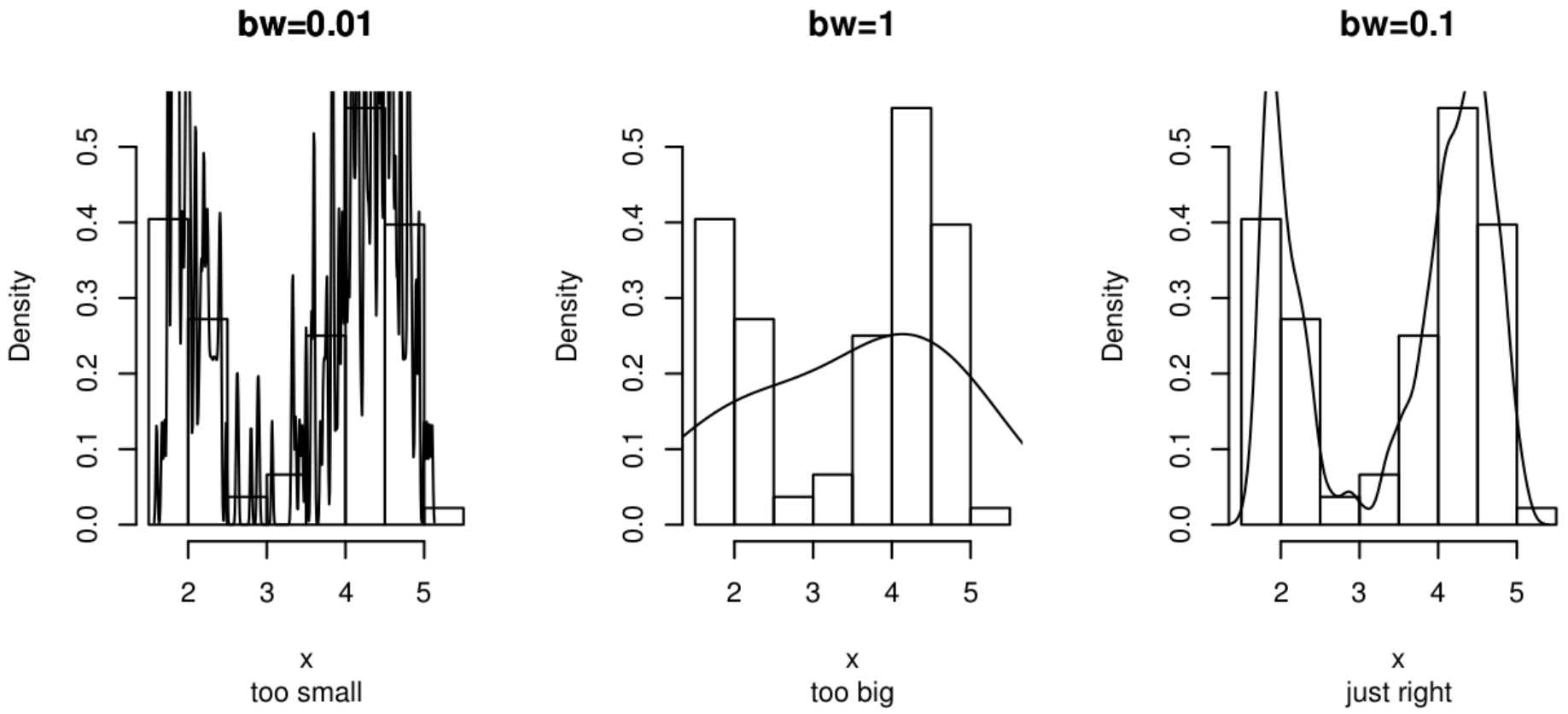

```
ideal=diamonds[diamonds$cut=="Ideal","color"]

barplot(table(ideal),
        xlab="color",
        ylab="count",
        main="Ideal cut diamonds by Color",
        col="hotpink")
```

# Histogram: Frequencies of Numeric Values

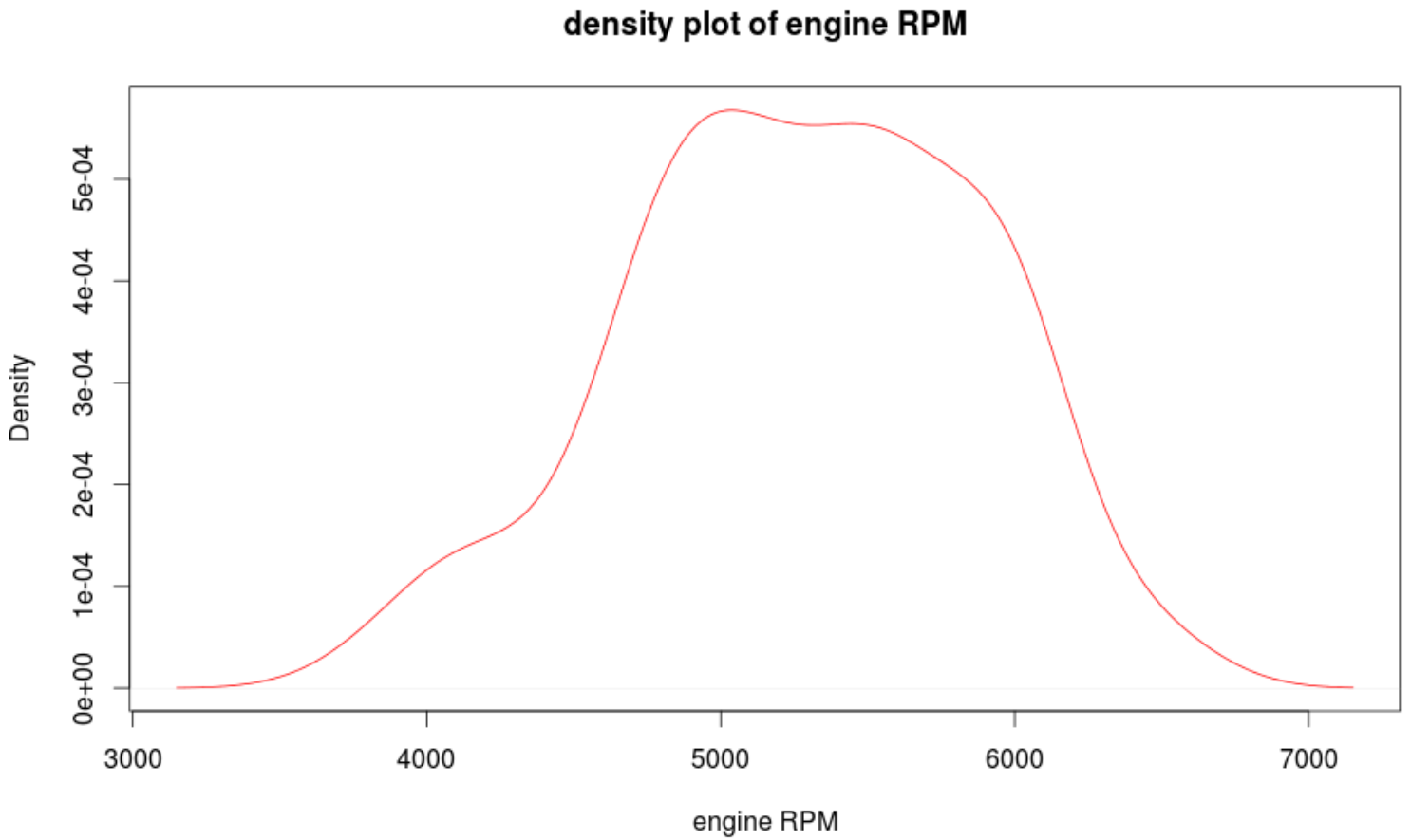



```
hist(Cars93$RPM,
     xlab="engine RPM",
     main="histogram of engine RPM",
     col="red")
```

# Histogram and Density Binning

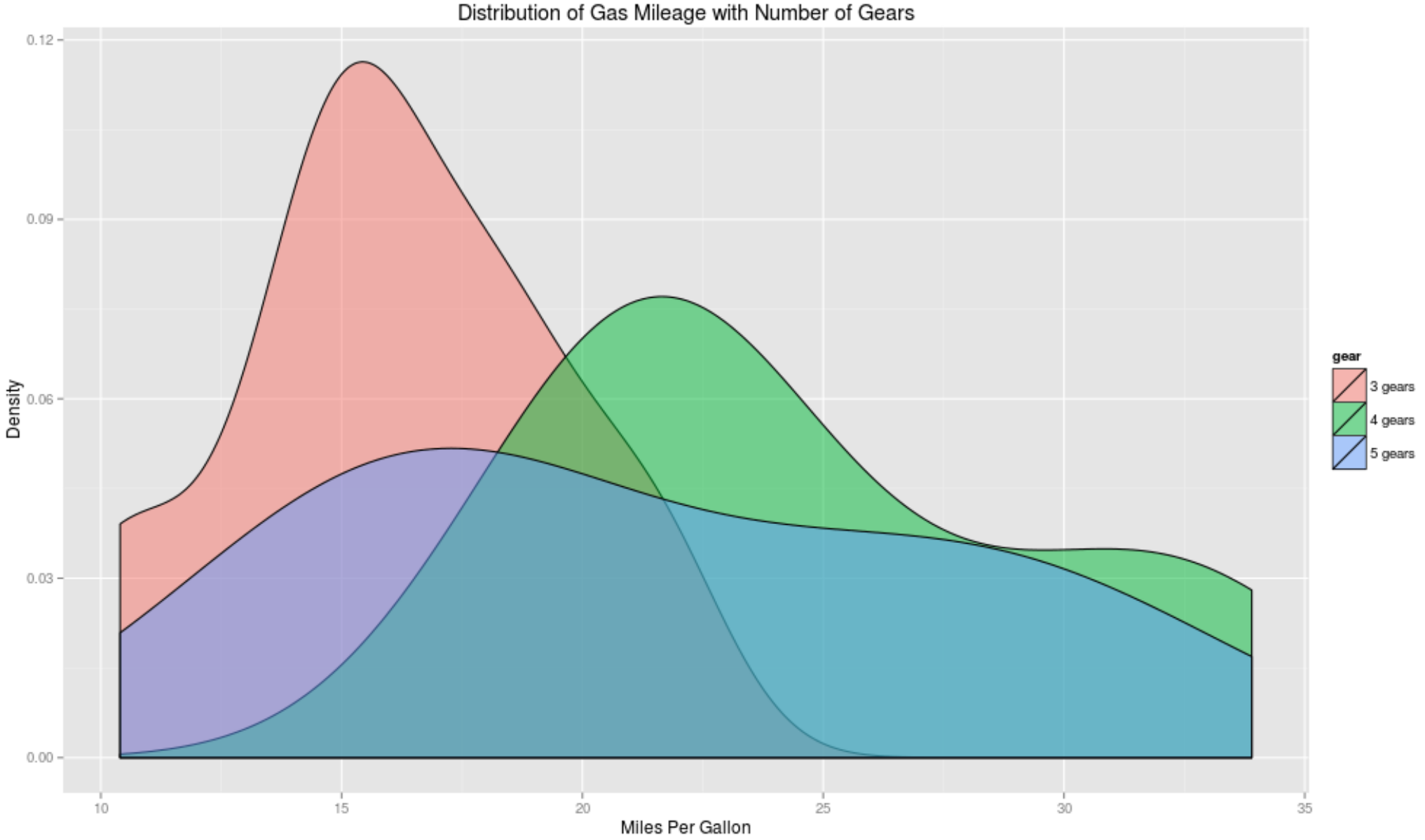


# Kernel Density Plot

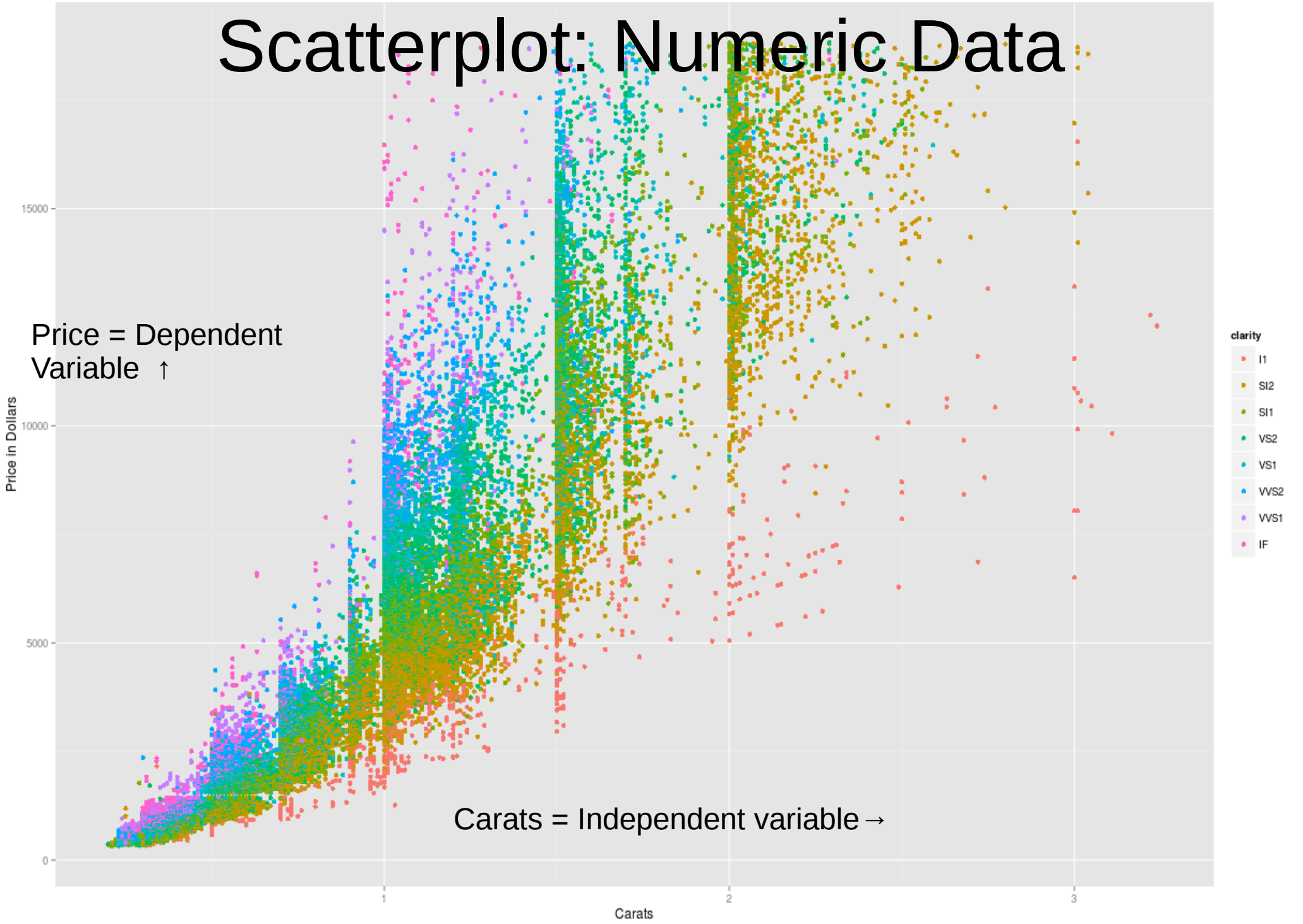



```
plot(density(Cars93$RPM),
     xlab="engine RPM",
     main="density plot of engine RPM",
     col="red")
```

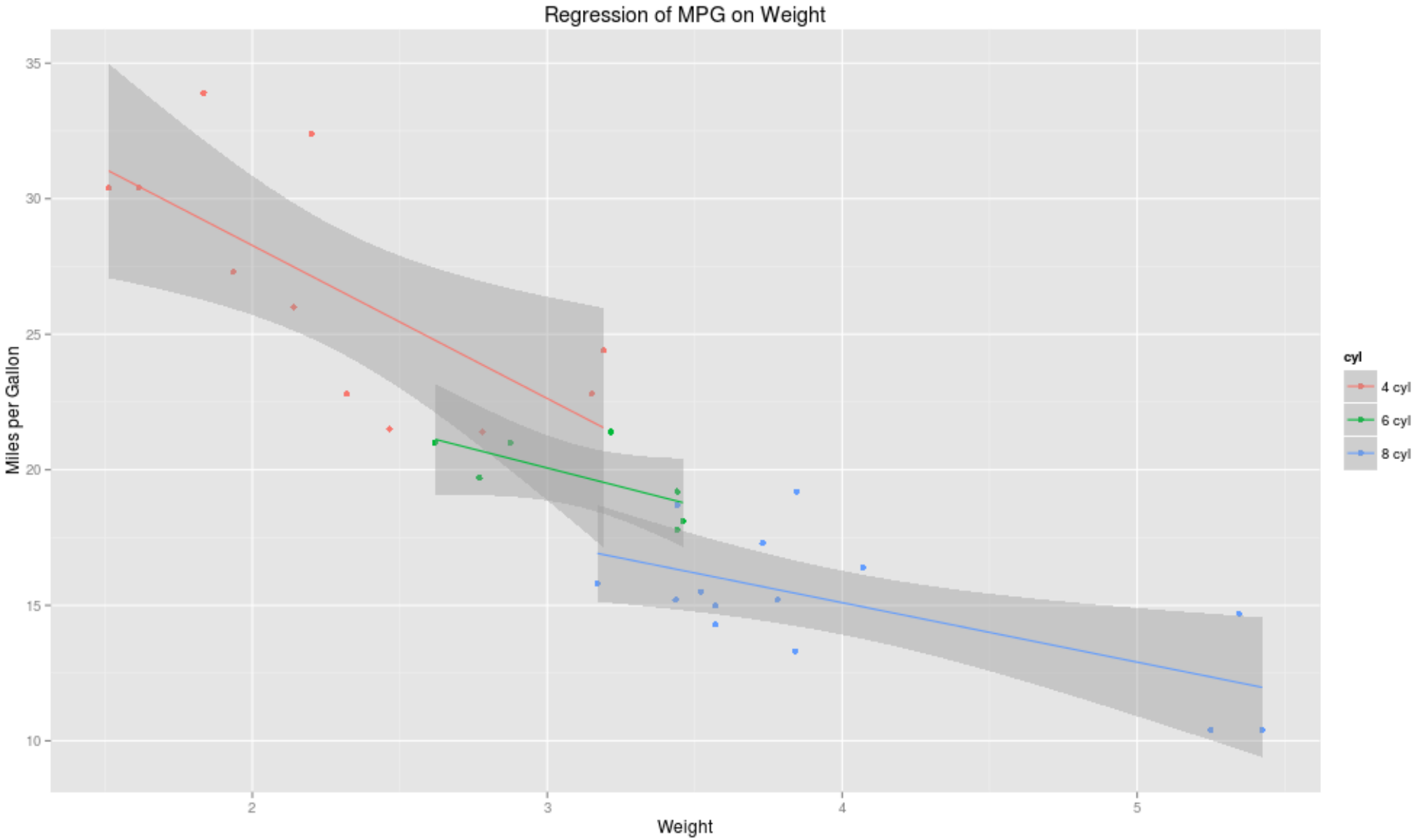
# Density Plot



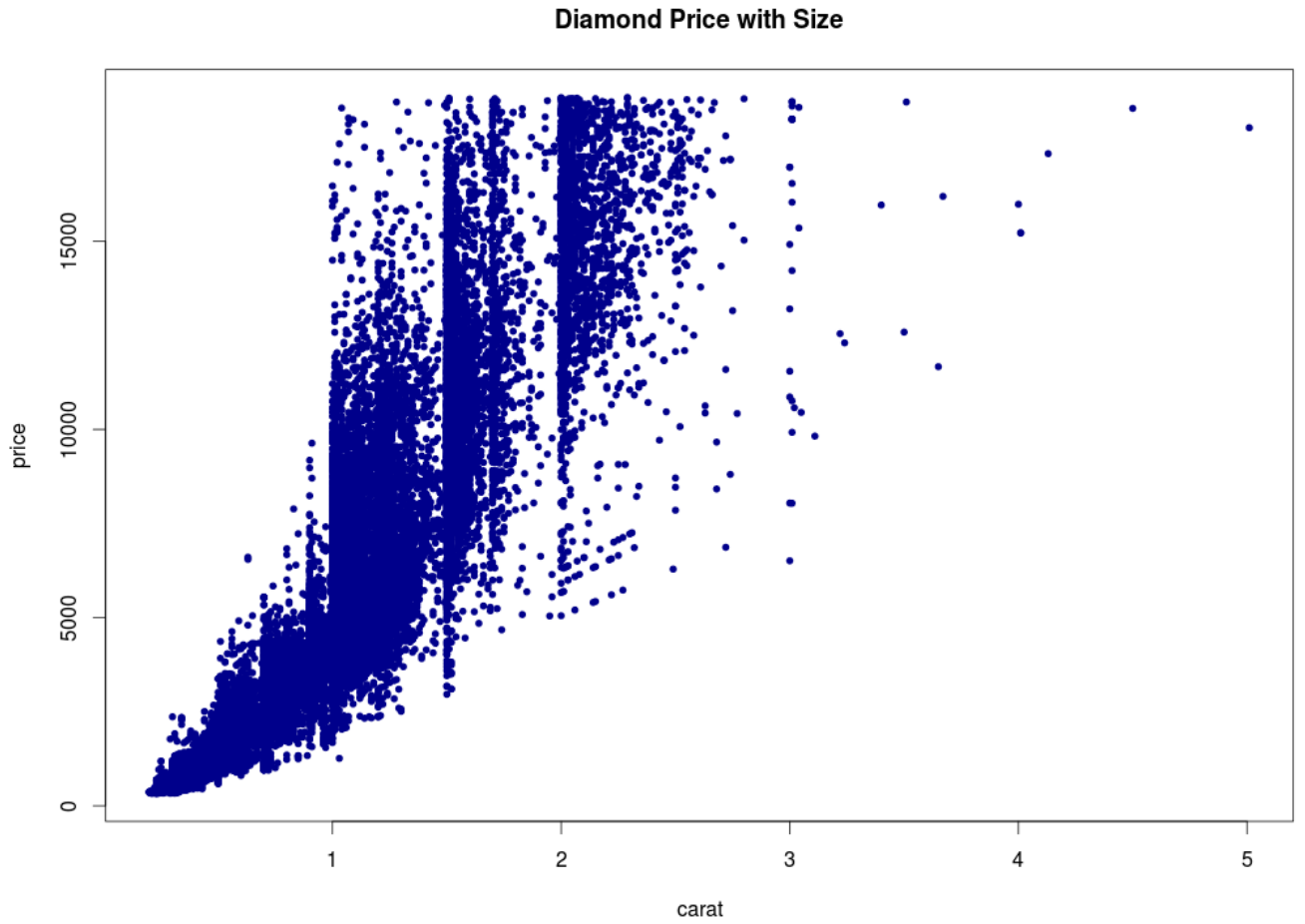
# Scatterplot: Numeric Data



# Scatterplot with Regression Lines

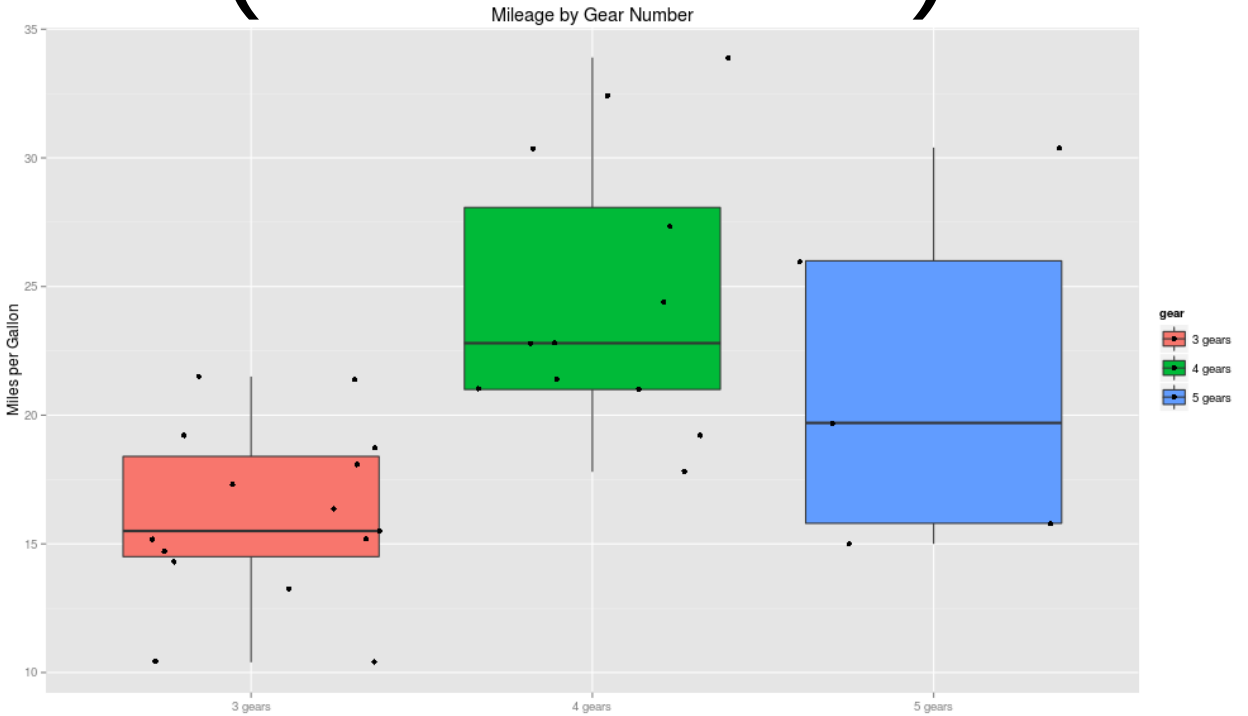


# Scatterplot: Numeric Data, y vs. x



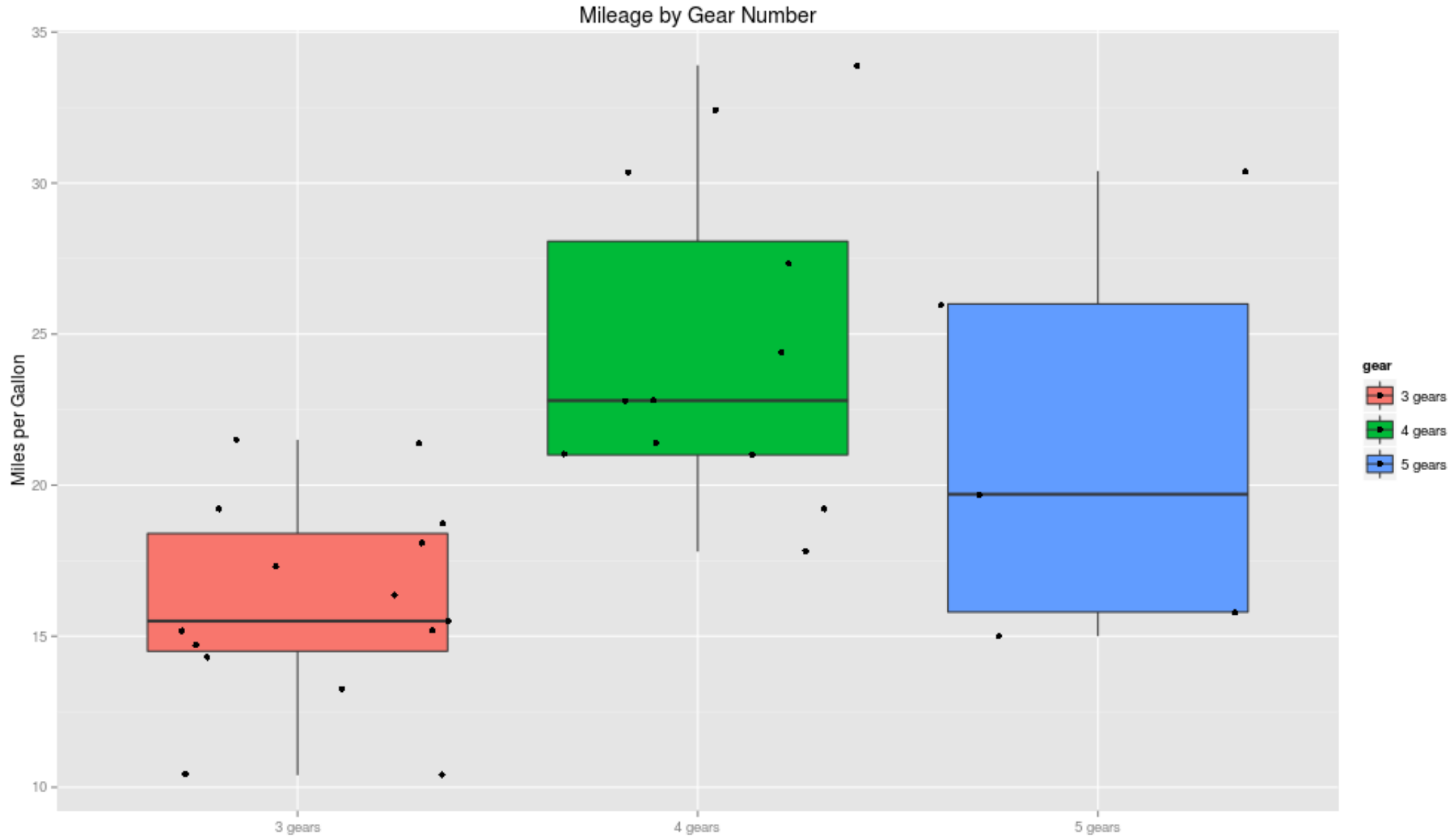

```
plot(formula=price~carat,
     data=diamonds,
     col="darkblue",
     pch=20,
     main="Diamond Price with Size")
```

# Box (and Whisker) Plot

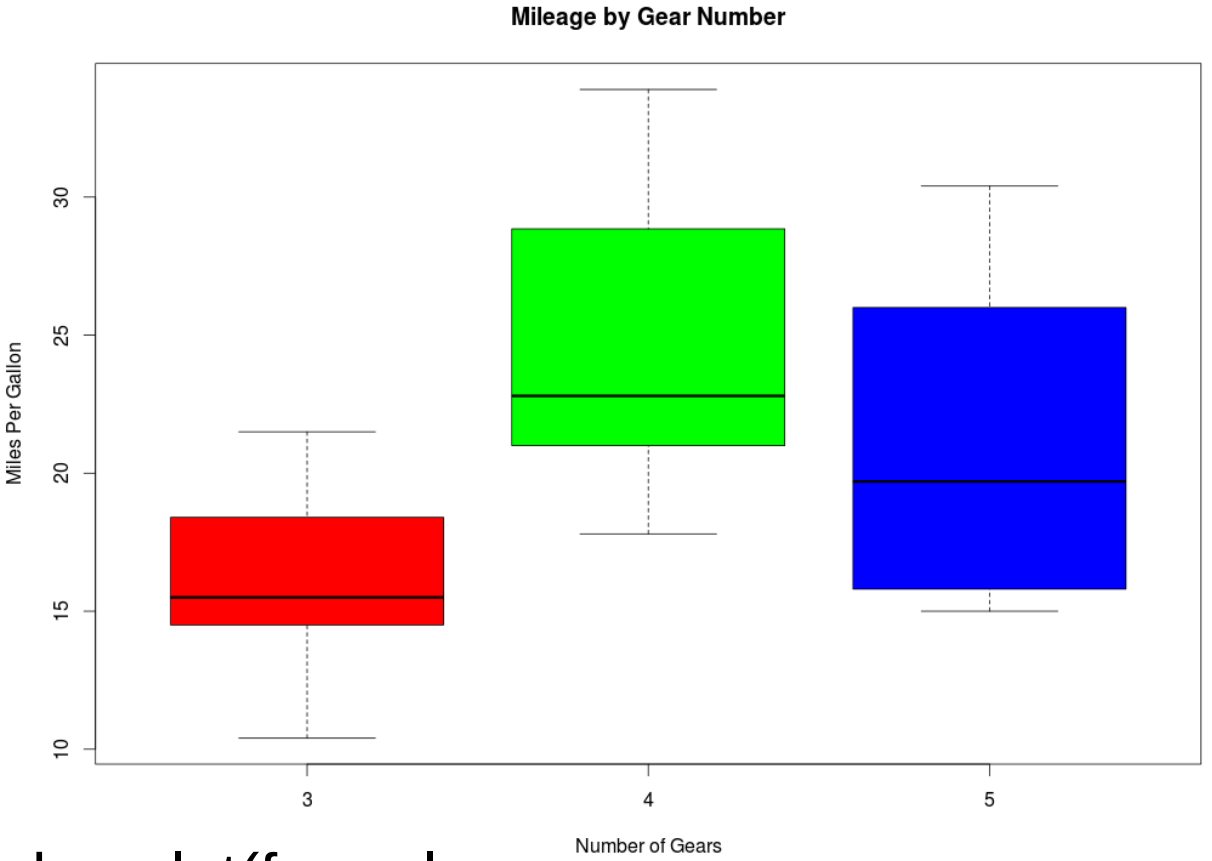



- The *box* extends from Q1 to Q3
- The *median*, Q2, is marked inside the box
- The *whiskers* extend to the min and max
  - Whiskers: required to lie within 1.5×(IQR)
  - *Outliers*: beyond 1.5×(IQR)

# Boxplot: Data Symmetry?

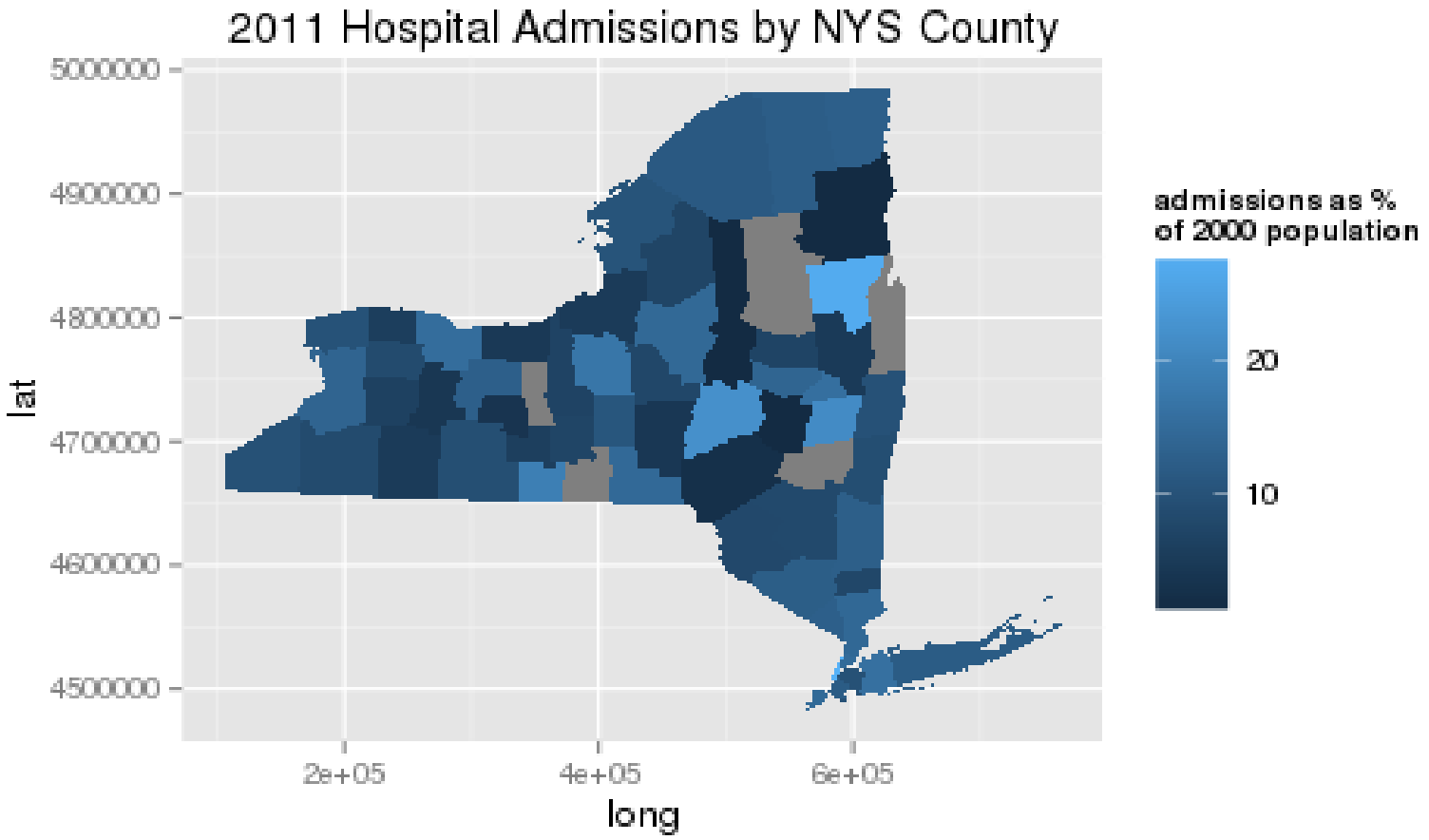


# Box (and Whisker) Plot



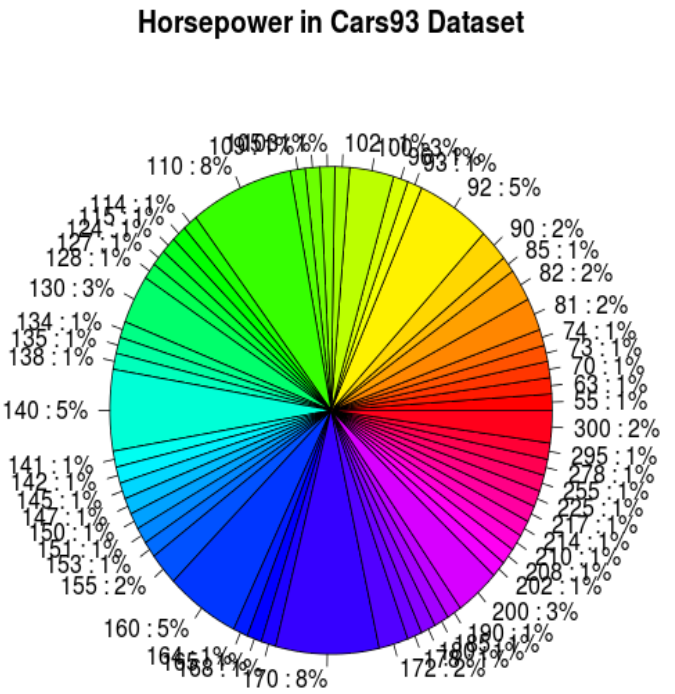

```
boxplot(formula=mpg~gear,
        data=mtcars,
        main="Mileage by Gear Number",
        xlab="Number of Gears",
        ylab="Miles Per Gallon",
        col=c("red","green","blue"))
```

# GIS plot


2011 Hospital Admissions by NYS County
5000000
4900000
4800000
4700000
4600000
4500000
lat
2e+05
4e+05
6e+05
long
admissions as %
of 2000 population
20
10

# Approach to Plotting

- Remember, you're getting to know your data.
- Don't be afraid to tinker and play.
- Sometimes the outcomes are silly (make sure you learn something!)




pie(table(Cars93$Horsepower))

# Interlude

Complete plotting exercises.

Open in the RStudio source editor:

<workshop>/exercises/5-exercises-plotting-basic.R

# Interlude++

When you have done your plotting exercises...

Read flowing-data's "Rules not to Break"

http://flowingdata.com/2015/08/11/real-chart-rules-to-follow

# ...is free

If you want to experiment further with R and RStudio, you can install them on your favorite operating system at home.

First, install R:

http://cran.r-project.org/

Then, install the Rstudio IDE:

http://www.rstudio.com/ide/