The Basics of Plotting in R
R has a built-in Datasets Package:

- iris
- mtcars
- precip
- faithful
- state.x77
- USArrests
- presidents
- ToothGrowth
- USJudgeRatings

You can call built-in functions like `hist()` or `plot()` on a built-in data set to quickly produce a chart.
Basic plotting in R

```r
hist(nhtemp)
plot(nhtemp)
```
Basic plotting in R

```r
plot(iris$Petal.Length ~ iris$Petal.Width)
```
Basic plotting in R

plot(iris$Petal.Length ~ iris$Petal.Width, col = Species)
Basic plotting in R

```r
plot(iris$Petal.Length ~ iris$Petal.Width, col = Species, main = "Iris: Petal width vs. length")
```
Histograms

Histogram of waiting

Histogram of eruptions

hist(waiting)

hist(eruptions)
Histograms

hist(waiting, breaks = 5)  

hist(waiting, breaks = 20)
Histograms

```r
hist(faithful$waiting,
     main = "Old Faithful",
     cex.main = 1.75,
     xlab = "Waiting Time in Minutes",
     ylab = "Frequency",
     cex.lab = 1.25)
```
Histograms

```r
hist(faithful$waiting,
     main = "Old Faithful",
     cex.main = 1.75,
     xlab = "Waiting Time in Minutes",
     ylab = "Frequency",
     cex.lab = 1.25
     col = "blue",
     border = "orange")
```
Stem and leaf plot

> stem(faithful$waiting)

The decimal point is 1 digit(s) to the right of the | 

4 | 3
4 | 5556666677778888999999
5 | 0000111111222223333333444444444
5 | 555556666777888899999999
6 | 000000222233334444
6 | 555667899
7 | 0000111112333333344444
7 | 555555556666666667777777778888888888888888899999999999
8 | 0000000011111111111111112222222222223333333333333344444444444
8 | 55555566666778888888999
9 | 0000012334
9 | 6
> stem(faithful$eruptions)

The decimal point is 1 digit(s) to the left of the |

16 | 070355555588
18 | 000022233333355777777778888223357778888
20 | 000022233788000035778
22 | 002335578023578
24 | 00228
26 | 23
28 | 080
30 | 7
32 | 2337
34 | 250077
36 | 0000823577
38 | 233335582225577
40 | 000000335778888002233555577778
42 | 0333555778800233333555577778
44 | 0222335557780000000023333557778888
46 | 0000233357700000023578
48 | 0000022335800333
50 | 0370
Bar charts

> races_younger
[1] "Black"    "Hispanic"
"Other"    "White"

> population_in_millions_younger
[1] 10.76 19.03  7.76 40.50

barplot(population_in_millions_younger,
    names.arg = races,
    main = "Younger than 18, 2014",
    ylab = "Population in Millions")
Bar charts

> races_all
[1] "Native"  "Asian"   "Black"  
"Hispanic" "Two"      "White"

> population_in_millions_all
[1] 1.39 18.12 38.60 55.61 5.67 195.35

barplot(population_in_millions_all,
        names.arg = races_all,
        main = "All ages, 2014",
        ylab = "Population in Millions")
Bar charts

> races_all_other
[1] "Black"    "Hispanic" "White" "Other"

> population_in_millions_all_other
[1]  38.60  55.61 195.35  25.19

barplot(population_in_millions_all_other,
        names.arg = races_all_other,
        main = "All ages, 2014",
        ylab = "Population in Millions")
Stacked and grouped bar charts
Pie charts

```r
pie_labels_younger <- paste(races_younger, population_in_millions_younger, sep = "\n")
pie(population_in_millions_younger, main = "Younger than 18 Population in Millions", labels = pie_labels_younger)
```
Pie charts

```r
pie_labels_all_other <- paste(races_all_other, population_in_millions_all_other, sep = "\n")
pie(population_in_millions_all_other, main = "All Ages\nPopulation in Millions", labels = pie_labels_all_other)
```
Pie charts

Younger than 18 Population in Millions

- Hispanic: 19.03
- Black: 10.76
- Other: 7.76
- White: 40.5

All Ages Population in Millions

- Hispanic: 55.61
- Black: 38.6
- Other: 25.19
- White: 195.35
Dot plots

```r
states <- data.frame(state.x77)
sorted_states <- states[order(states$Income), ]
dotchart(sorted_states$Income, rownames(sorted_states), cex.lab = .25, main = "Income per capita")
```
Box plots

boxplot(Petal.Length ~ Species,
       main = "Iris Petal Length by Species",
       xlab = "Species",
       ylab = "Petal Length")
Notched Box plots

```r
boxplot(len ~ supp * dose,
data = Toothgrowth,
notch = TRUE,
col = c("gold", "darkgreen"),
main = "Tooth Growth",
xlab = "Supplement and Dose")
```

If the notches do not overlap, then the medians of the groups are different.
Simple Scatterplots

```r
plot(USJudgeRatings$RTEN ~ USJudgeRatings$FAMI,
     xlab = "Familiarity with Law",
     ylab = "Worthy of Retention",
     main = "Law Familiarity vs. Worthy of Retention",
     pch = "+")
```
CONT Number of contacts of lawyer with judge.
INTG Judicial integrity.
DMNR Demeanor.
DILG Diligence.

pairs(~USJudgeRatings$CONT +
    USJudgeRatings$INTG +
    USJudgeRatings$DMNR +
    USJudgeRatings$DILG,
    main = "US Judge Ratings")
Scatterplot Matrices

features <- c("Contacts", "Integrity", "Demeanor", "Diligence")

pairs(~USJudgeRatings$CONT + USJudgeRatings$INTG + USJudgeRatings$DMNR + USJudgeRatings$DILG, labels = features, main = "US Judge Ratings")
3D Scatterplots

library(scatterplot3d)

scatterplot3d(mtcars$wt, mtcars$disp, mtcars$mpg, main = "3D Scatterplot")
Graphical parameters

- **Text and symbol size** (`cex: .axis, .lab, .main`)
- **Fonts** (`font: .axis, .lab, .main`):
  - 1=plain, 2=bold, 3=italic, 4=bold italic, 5=symbol
- **Colors** (`col`): `colors`, and more `colors`

http://www.statmethods.net/advgraphs/parameters.html
Graphical parameters (cont’d)

Plotting symbols (pch)

Line type (lty)