Central Tendency

PSYC 2020-A01 / PSYC 6022-A01 | 2025-08-29 | Lab 2

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Outline

- Assignment 1 Review
- Extra Credit
- R Projects
- Central Tendency Review
- R Functions
- Central Tendency in R

Learning objectives:

R: Projects, functions

Statistics: Central tendency

Housekeeping

Grading Display Modification

Moving from 0–100% to 10 points each

Top 10 lab assignments * 10 points each = 100%

Does not change anything about the weight!

RStudio

On lab computer

COS-GPU-2023

Assignment 1 Review

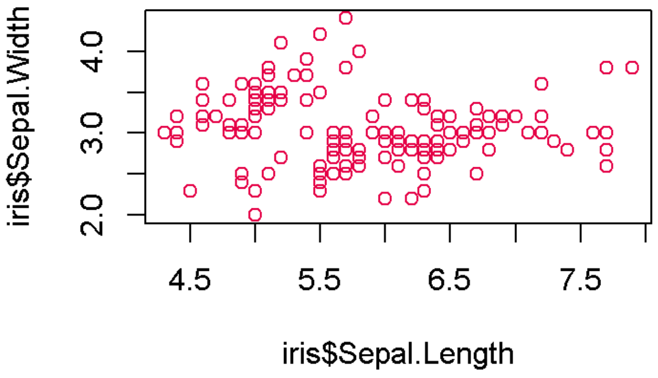
Check Working Directory

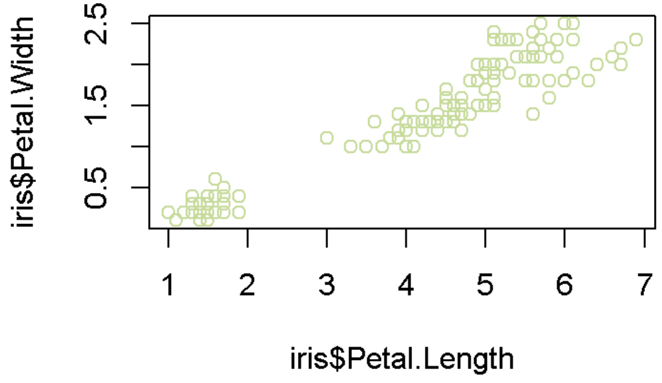
`getwd()`

Plotting

Make sure to select the right variable for plotting!

```r
plot(iris$Sepal.Length, iris$Sepal.Width,
       col = "#E50046")
plot(iris$Petal.Length, iris$Petal.Width,
       col = "#C7DB9C")
```





Extra Credit

posit::conf(2025)

R Projects

RStudio's way of helping organizing files, scripts, etc.

I strongly recommend this!!

- File > New Project
- If you don't already have a folder associated with this class, "New Directory"
- If you do, "Existing Directory"

All R Scripts under the same project share a *working directory*

- Location of files
- Default folder for reading or writing files

Setting Working Directory

`getwd()` tells us the location of our working directory

`setwd("C:/Users/Desktop/R Example")` sets the working directory

Or, `here::here()` lets us do relative directories (my favorite!)

- Just use the command at the top of the file to see where your directory is
- Do need to install the `here` package first

```r
install.packages("here")
```

Then, when you need a file, you can reference it relatively

```r
here::here()
```

```
[1] "C:/Users/jessi/OneDrive - Georgia Institute of Technology/Courses/GTA/PSYC 2020/PSYC 2020L
Site"
```

```r
here::here("lab 2", "cat.png")
```

```
[1] "C:/Users/jessi/OneDrive - Georgia Institute of Technology/Courses/GTA/PSYC 2020/PSYC 2020L
Site/lab 2/cat.png"
```

Review of Central Tendency!

Mean: Sum of all values divided by the total number of values

Median: When sorted lowest to highest, the middle value

Mode: The value that appears most often

Central Tendency Practice

Given this dataset:

```r
c(0, 2, 2, 4)
```

```
[1] 0 2 2 4
```

What is the mean? 2

What is the median? 2

What is the mode? 2

Central Tendency Practice

Given this dataset:

```r
c(0, 1, 2, 3)
```

```
[1] 0 1 2 3
```

What is the mean? 1.5

What is the median? 1.5

What is the mode? No mode!

R Functions

A *function* performs some operation on an *input* and produces some *output*

Saw this last week

```r
head(iris)
```

```
  Sepal.Length Sepal.Width Petal.Length Petal.Width Species
1          5.1         3.5          1.4         0.2  setosa
2          4.9         3.0          1.4         0.2  setosa
3          4.7         3.2          1.3         0.2  setosa
4          4.6         3.1          1.5         0.2  setosa
5          5.0         3.6          1.4         0.2  setosa
6          5.4         3.9          1.7         0.4  setosa
```

What is the function? Input? Output?

Central Tendency in R: Mean

We can calculate central tendencies in two ways:

Given this dataset, calculate the mean

```r
c(2, 3, 12, 4, 4)
```

```
[1]  2  3 12  4  4
```

By hand (computer)

With the `mean(x)` function

- `x` = vector of data

Central Tendency in R: Median

Given this dataset, calculate the median

```r
c(2, 3, 12, 4, 4)
```

```
[1]  2  3 12  4  4
```

By hand (computer)

With the `median(x)` function

- `x` = vector of data

Central Tendency in R: Mode

Given this dataset, calculate the mode

```r
c(2, 3, 12, 4, 4)
```

```
[1]  2  3 12  4  4
```

With the `mode()` function

Doesn’t work :(

Have to create our own

R Functions

We’ve seen some built-in R functions (e.g., `mean()`, `median()`), but we can also make our own

```
function_name <- function(argument) {
  do some stuff
  return(this stuff)
}
```

ⓘ Don’t actually need to call `return()`; R will automatically return the last expression

Then, you can call the function

```
function_name(specific_argument)
```

To keep the results, make sure to assign them to some variable

```
very_important_results <- function_name(specific_argument)
```

R Functions

Let’s go back to finding the mode

Central Tendency in R: Mode

Given this dataset, calculate the mode

```r
# note from jess: considering switching to just showing table()

c(2, 3, 12, 4, 4)
```

```
[1]  2  3 12  4  4
```

```r
mode_func <- function(x) {
  sort(table(x), decreasing = T)[1]
}
```

How does this work?

Descriptive Statistics in R

Takes time to look at all these for a lot of variables, even with functions

The `summary(object)` function provides us a quick overview of this information

- `object` = for our purposes, a dataframe

What all do we get?

- Minimum and maximum
- 1st quantile, median, 3rd quantile
- Mean

Visualizations!

Summary statistics are great, but don’t trust them alone!

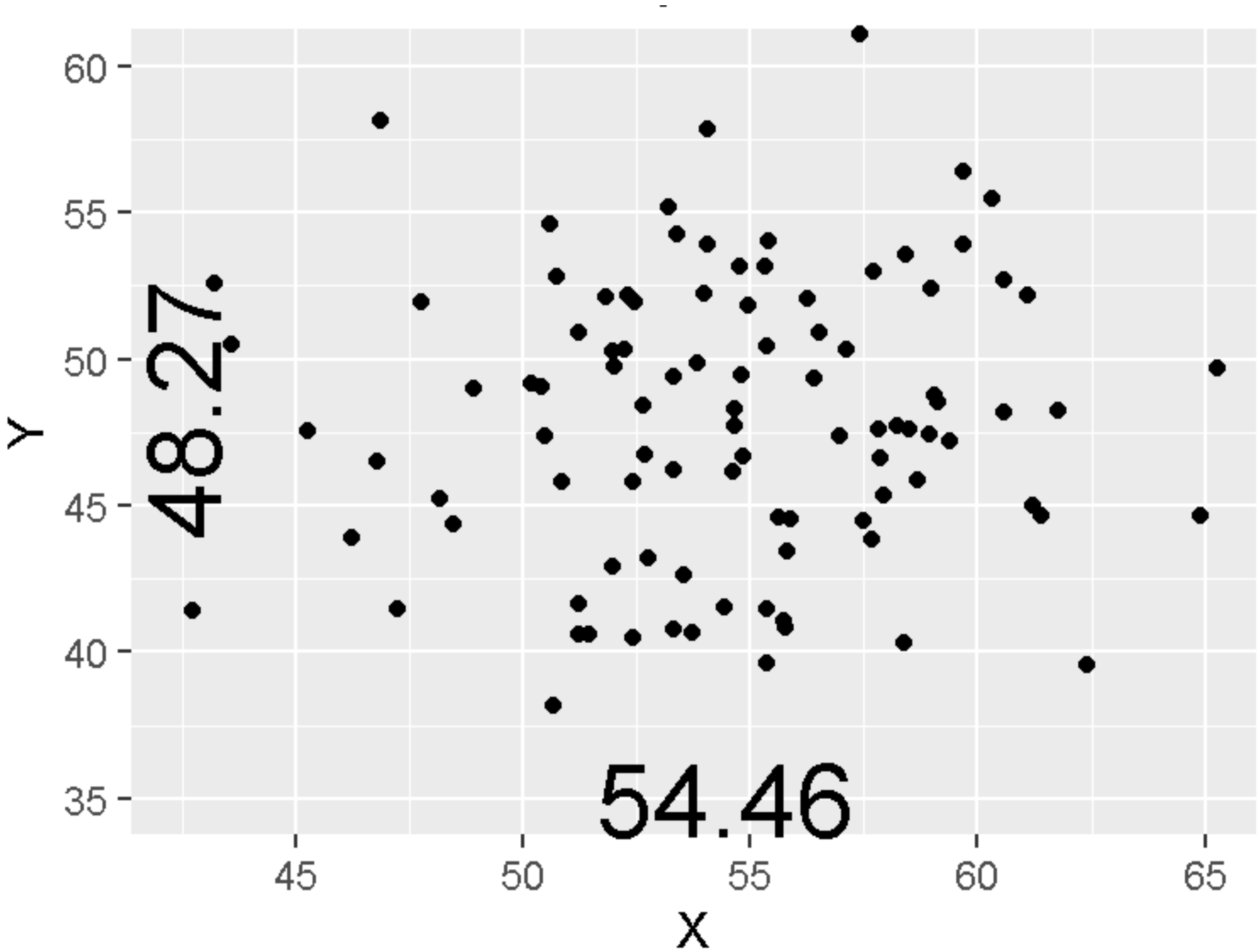
What do you think a dataset with these descriptives would look like?

```r
X_mean <- 54.26
Y_mean <- 47.83

X_sd <- 16.76
Y_sd <- 26.93

cor <- -0.06
```

Visualizations!



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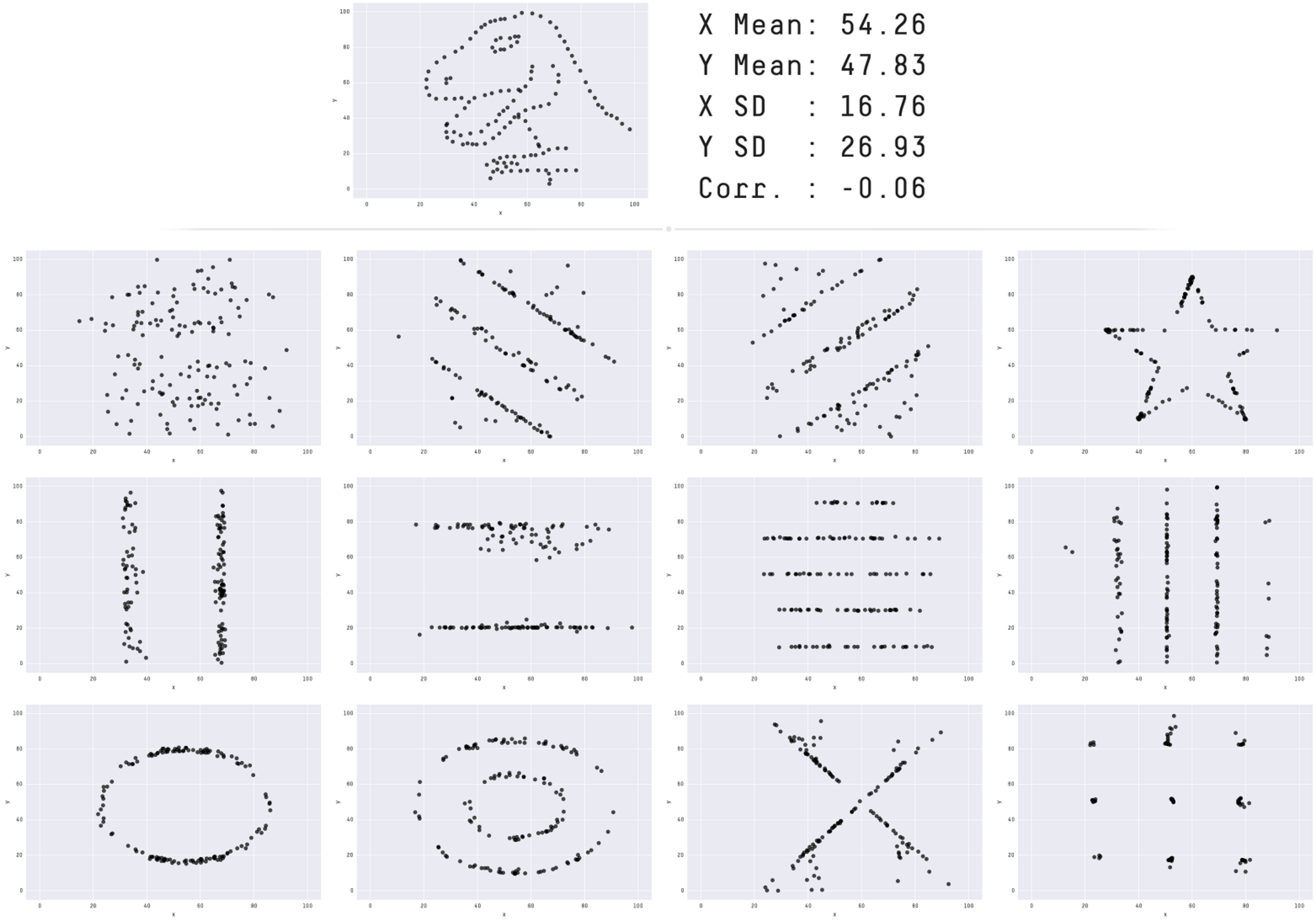
Visualizations!



Datasaurus Dozen

Visualizations

Don’t rush: graph your data!

What should graphs do?

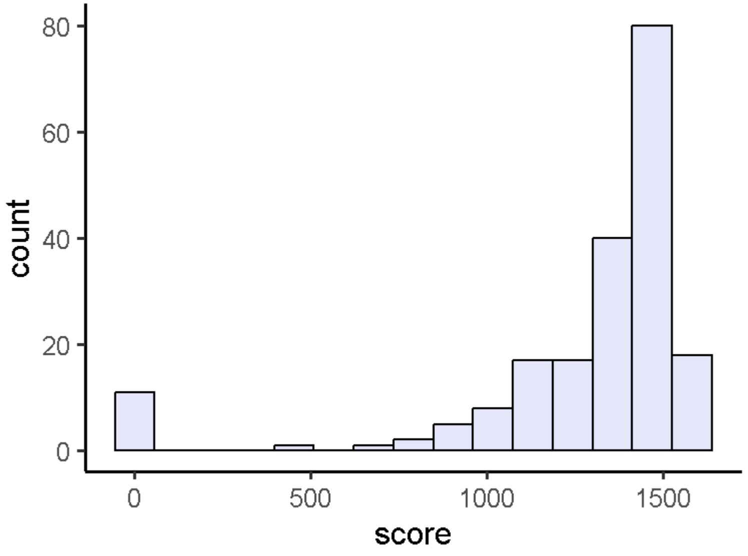
- Show the data
- Draw the reader primarily to the data (not the graphical effects)
- Avoid distorting the data
- Present many numbers with minimum ink
- Make large data sets coherent
- Encourage the reader to compare different pieces of data

Visualizations: Histograms

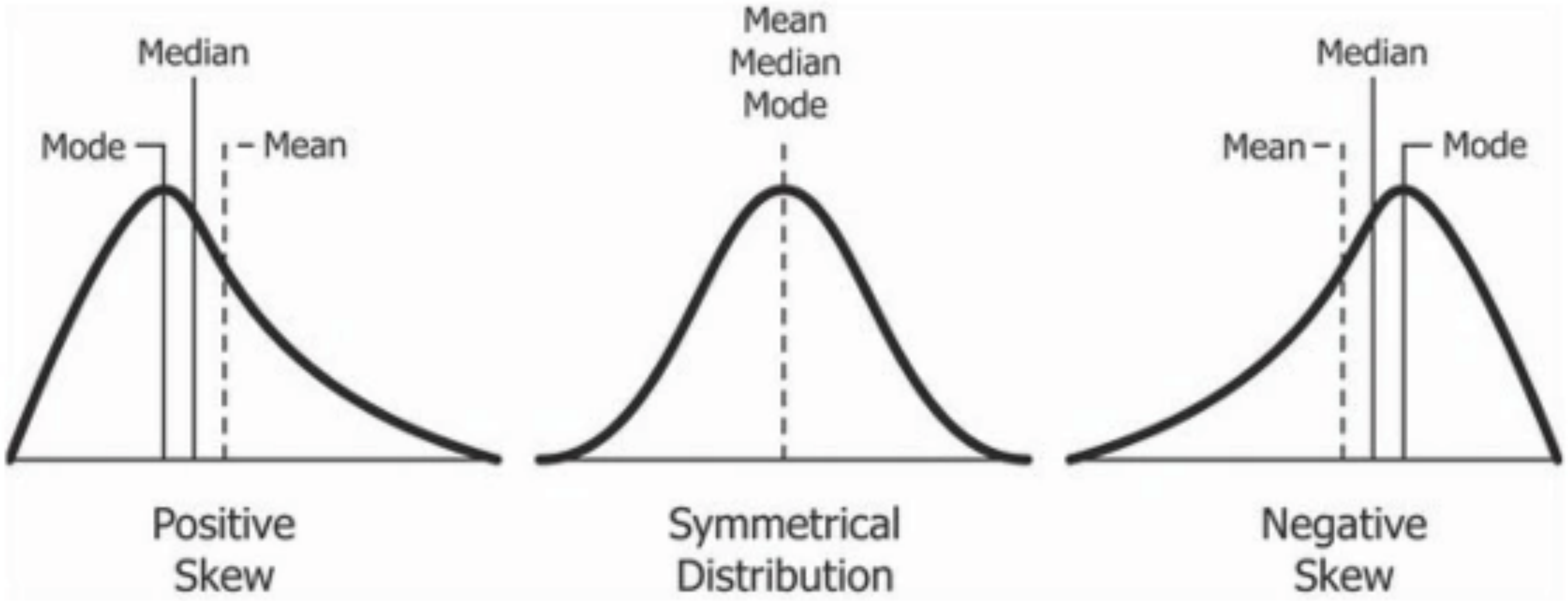
An example of (simulated) SAT scores

What do we see here?

- ○ Outliers at zero! Not a possible SAT score
- ○ Negatively skewed: more data on the left than on the right



Skew



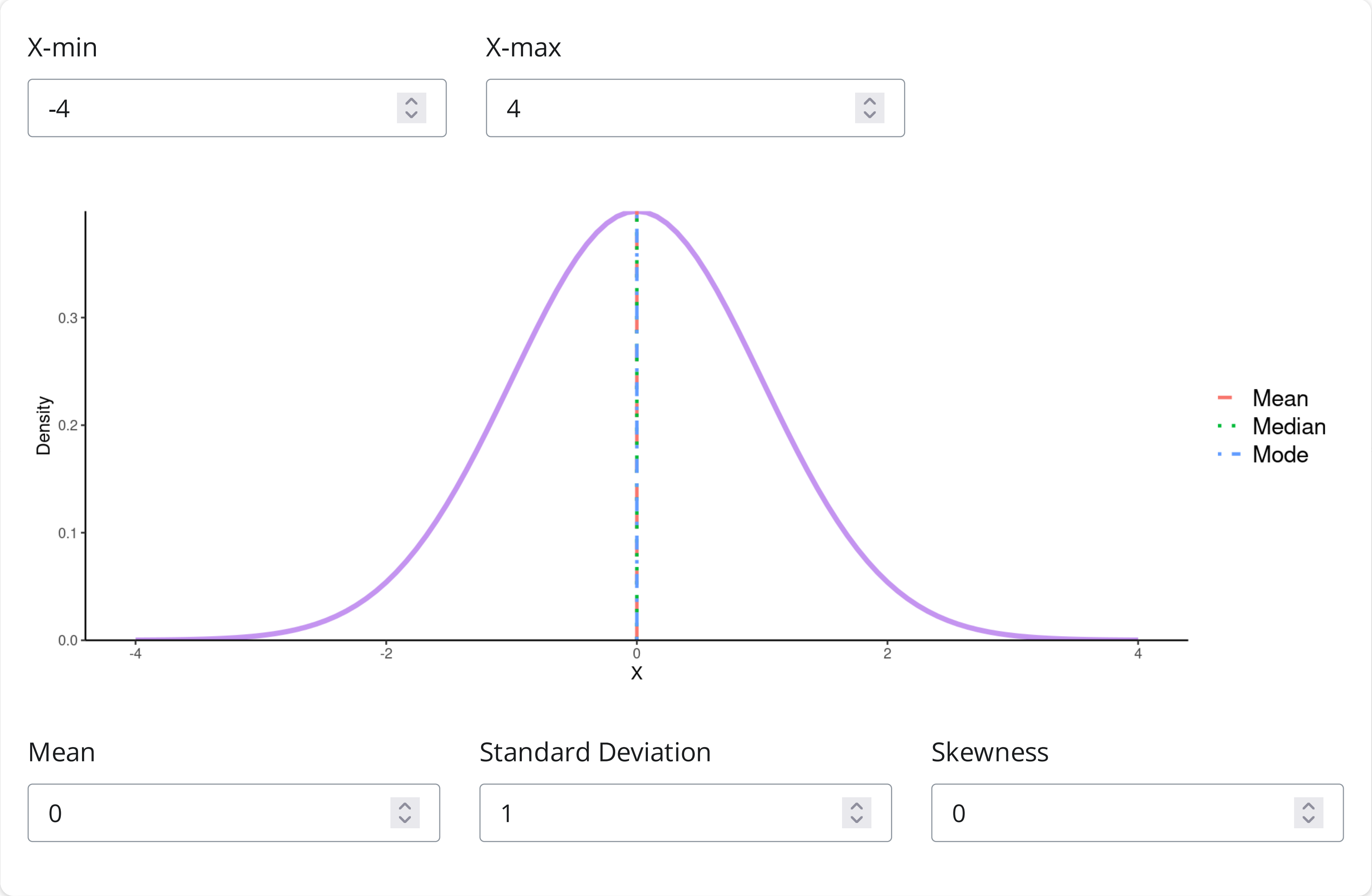
Positive skew, right-tailed

The mass of the distribution is concentrated on the left of the figure

Negative skew, left-tailed

The mass of the distribution is concentrated on the right of the figure

Skewness Demonstration



X-min: -4

X-max: 4

Mean: 0

Standard Deviation: 1

Skewness: 0

Full screen version here

Skewness demonstration!

Credits to Fabio Setti

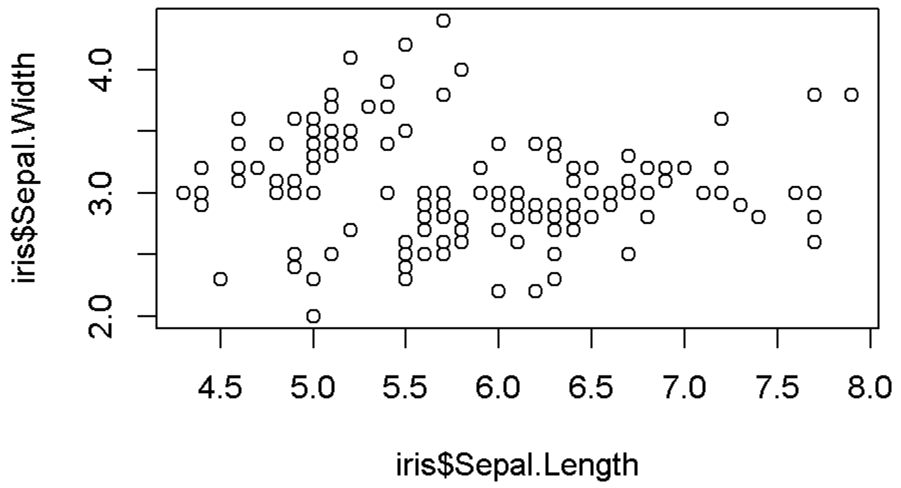
Let’s Do Some Visualization

Base R Graphics

R has some plotting features built in—we saw this last week

```r
plot(iris$Sepal.Length, iris$Sepal.Width)
```

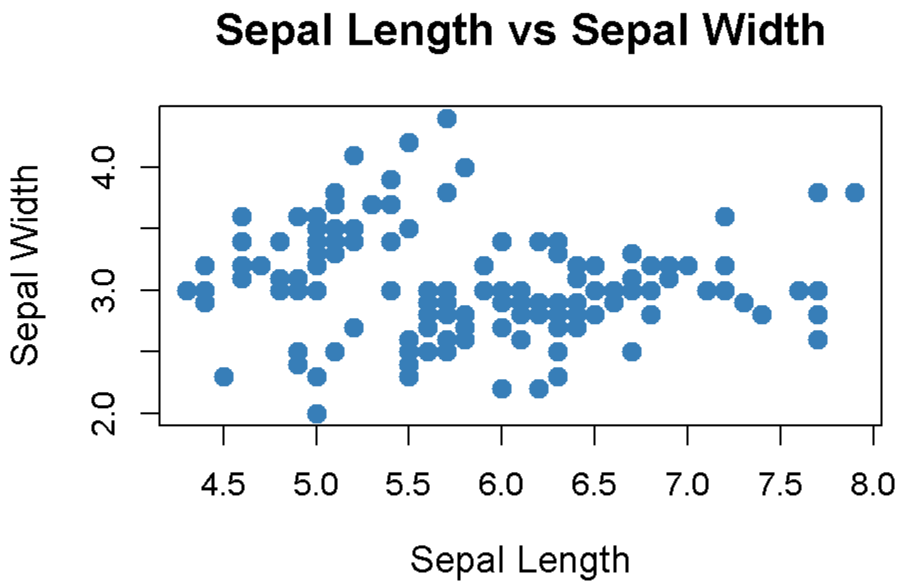
What do we think about this?



Base R Graphics

Better… (thanks, ChatGPT)

Plot Code



We will learn a few plots in base R plotting, and then we will learn a *better* way of making plots: `ggplot2`

R Graph Gallery

Let’s Do Some Visualization

Base R Graphics: Histogram

`hist()` function

Required arguments:

○ `x` = vector (variable) you want to plot (remember the $ function!)

Optional arguments:

○ `breaks` = bin count

○ `main` = title

○ `xlab` = label for x-axis

○ `ylab` = label for y-axis

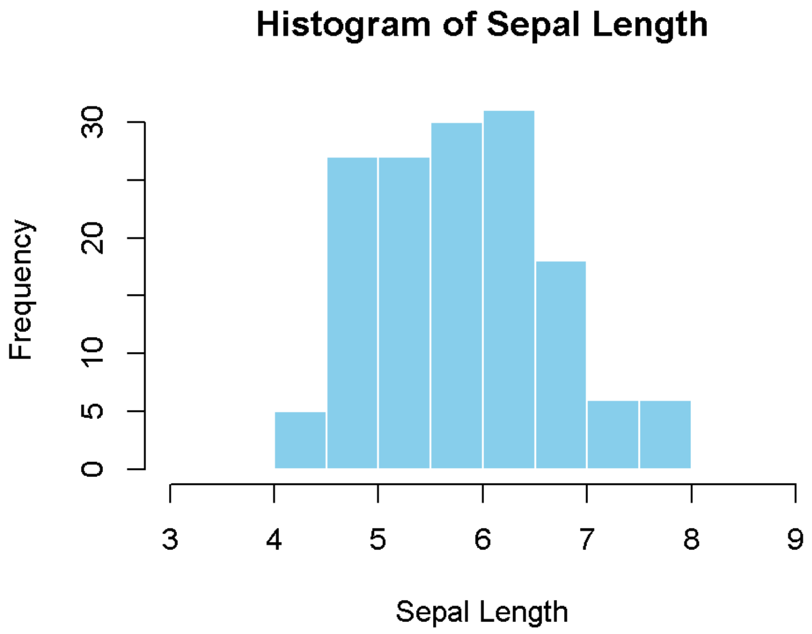
○ `col` = color for bars

○ `xlim` = range for x-axis

○ `ylim` = range for y-axis

○ `prob` = `T`/`F`, proportion instead of

Plot Code

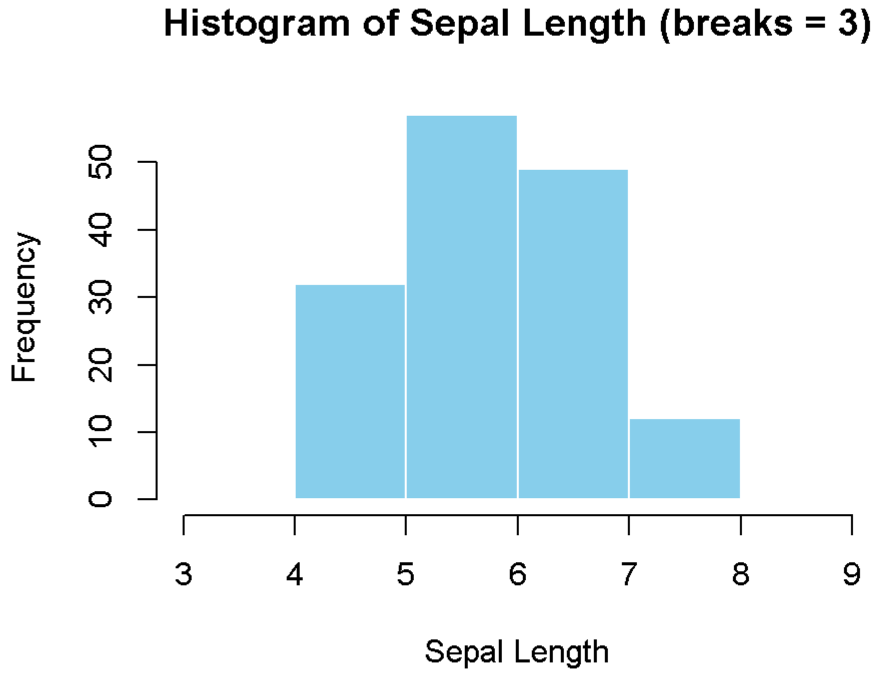


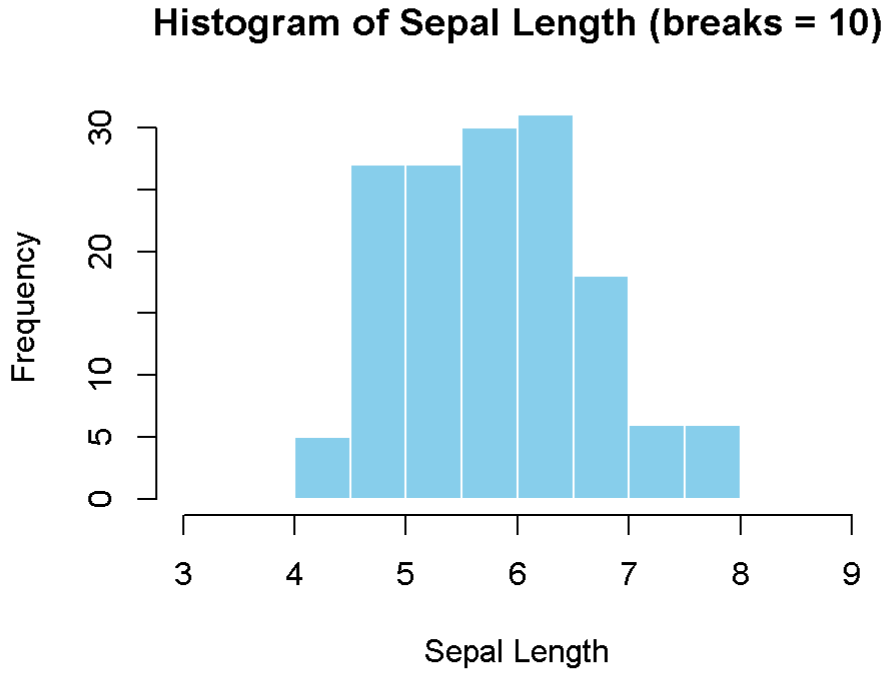
Let’s Do Some Visualization

Base R Graphics: Histogram

An important decision for histograms is this number (or width) of bins

Specified with the `breaks` argument





Let’s Do Some Visualization

Base R Graphics: Histogram

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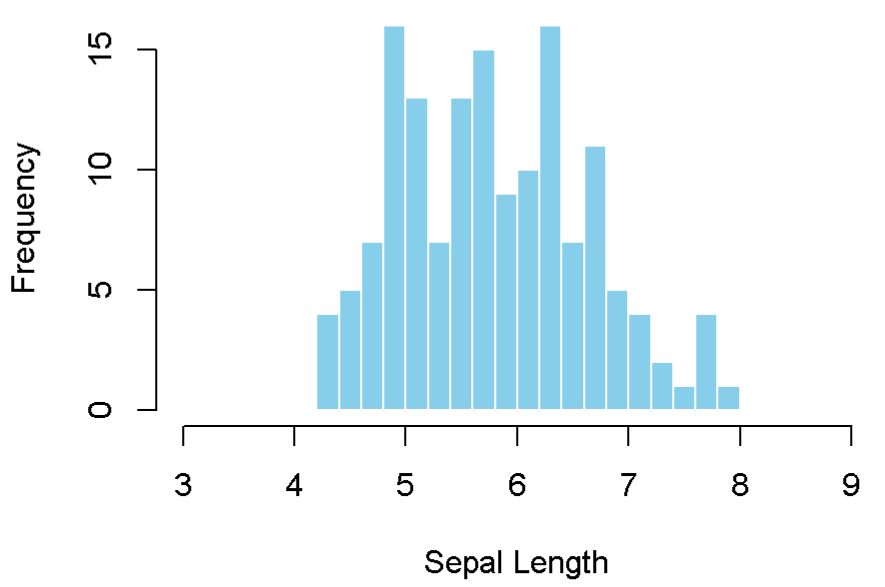
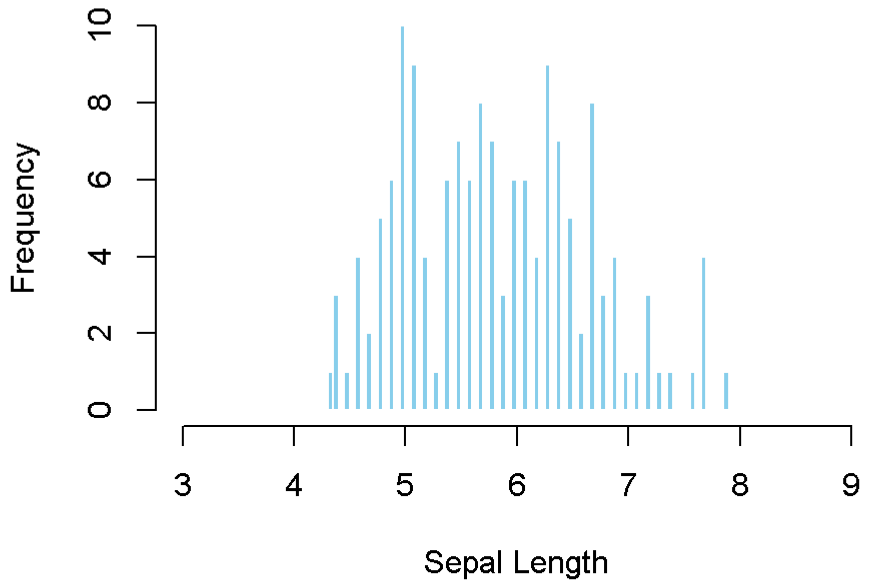
Specified with the `breaks` argument



Histogram of Sepal Length (breaks = 20)



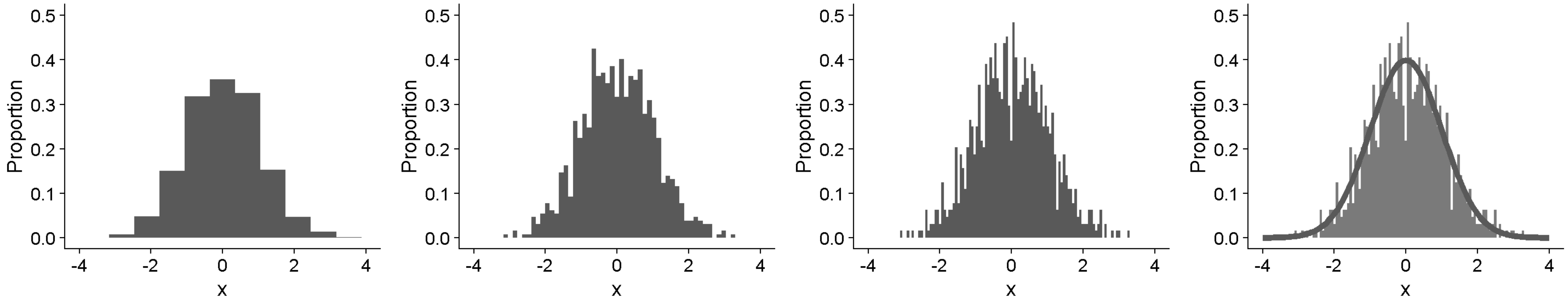
Histogram of Sepal Length (breaks = 100)

Let’s Do Some Visualization

Base R Graphics: Histogram

If we could make the bins infinitesimally small, we could get a probability density function (PDF)

Plot Code



Assignment 2

- Basic R functions
- Descriptive statistics