CDS

Cornell Data Science

Data Science Training Program

About Me

Name: Dae Won Kim

Position: President (Supreme Leader) of CDS

Major: Operations Research

Fun Facts:

1) I was a freshman in 2010
2) I was in the Korean army but used VBA

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Teaching Associates

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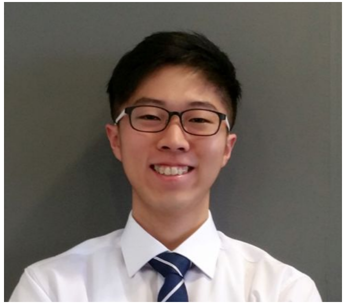

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Goals

Comfort In Using R

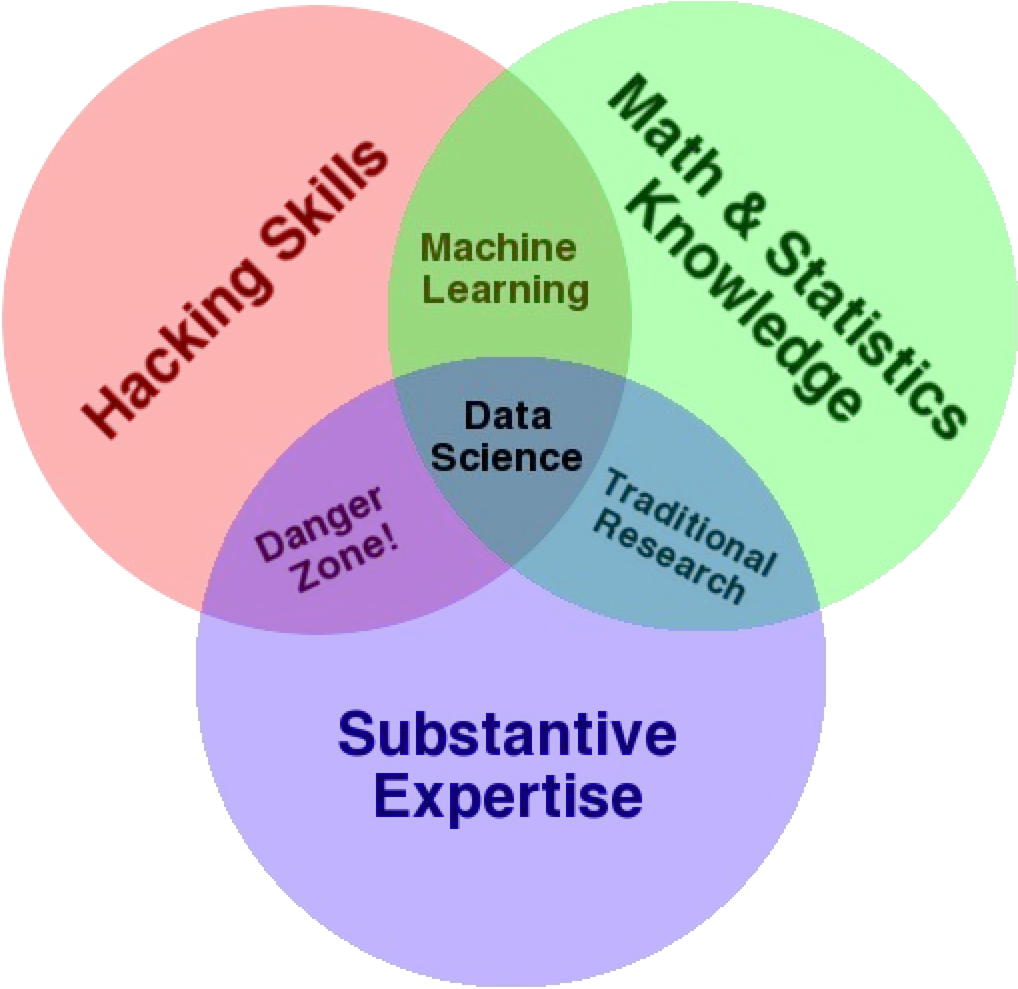
Data Manipulation

Data Visualization

ML Implementation

Model Optimization

Ensemble Implementation


Hacking Skills
Math & Statistics Knowledge
Machine Learning
Data Science
Danger Zone!
Traditional Research
Substantive Expertise

Data can be…

LARGE	**V**olume
fast	**V**elocity
unStRUcTUReD	**V**ariety

Language Wars

R: The Good

R has powerful **visual** tools.

Most used data science language.

Concise and powerful.

Functional-programming oriented.

R: The Bad

1-indexed language.

Hard to write fast code.

Many ways of doing the same thing.

The learning curve is *a cliff*.

R: The Ugly

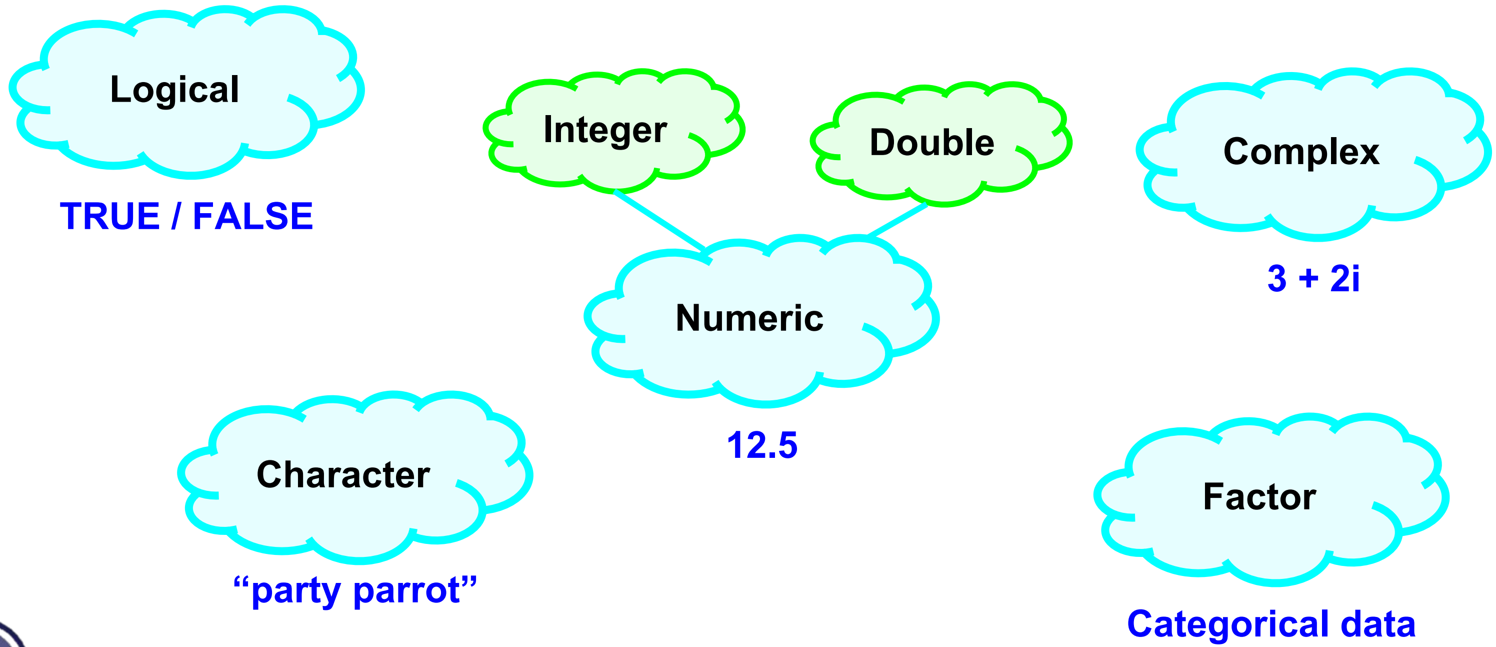
R objects are mostly **immutable**

R is a high-level language, and **slow**

R relies primarily on memory.

Difficult to escape
“**spreadsheet mentality**”.

R Data Types



Logical

TRUE / FALSE

Integer

Double

Numeric

12.5

Complex

3 + 2i

Character

“party parrot”

Factor

Categorical data

Question:

What is the difference between categorical and continuous data?

New Data Type: Factor

Used for handling **categorical variables**.

Factors take on only a limited number of values. Think `enum`.

Stored as a numeric, displayed as a character.

```
> gender <- c("male" "male" "male" "male" "female" "female")
> gender <- as.factor(gender)
```

Internally, 1→female, 2→male (stores `gender` as two 1s, four 2s)

Alphabetically determined: ‘f’ before ‘m’.

Vector

```
> a <- c(1,2,5.3,6,-2,4) # numeric vector

> b <- c("one","two","three") # character vector

> c <- c(TRUE,TRUE,TRUE,FALSE,TRUE,FALSE) # logical vector
```

R Data Structures

"Everything is a vector."

Types:

- **Matrix** - A vector with "row markers", allows only one element type
- **List** - variable type, variable length
- **Data Frame** - variable type, same length

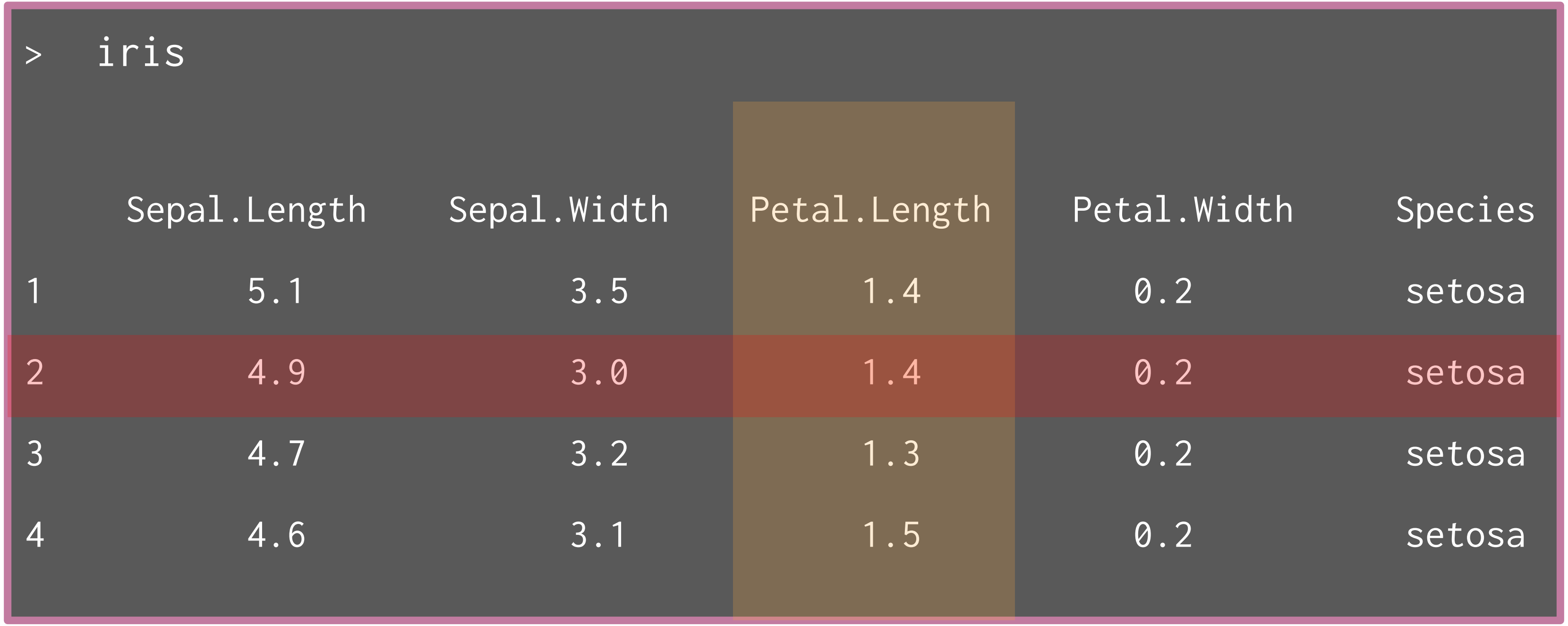
Matrix

```
> matrix (data = c(1:10), nrow = 2)

      [, 1] [, 2] [, 3] [, 4] [, 5]
[1 ,]    1     2     3     4     5
[2 ,]    6     7     8     9    10
```

Lists

```
> a <- list(1,”two”,5.3,FALSE,-2,4)
```

Data Frame



```
>  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
```

Packages

Installation: Use the `install.packages` function.

Usage: can use `library` or `require` (they are different!)

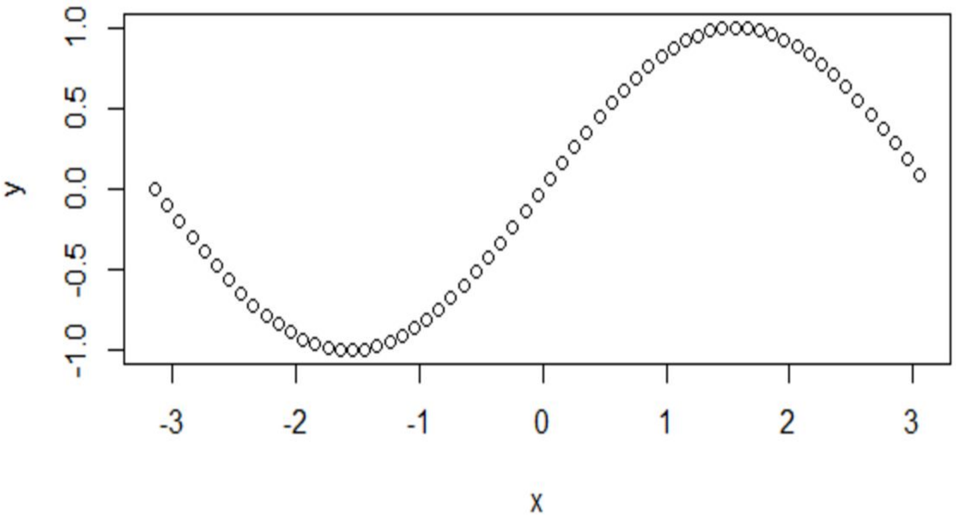
Google

stack overflow

Basic plotting functions

plot is the most used plotting function. Highly generic.

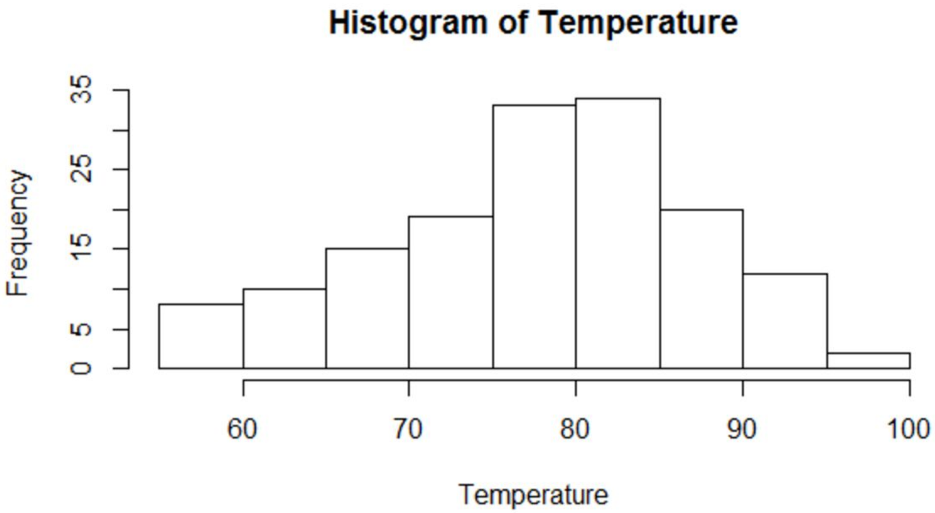
```
> x <- seq(-pi,pi,0.1)

> plot(x, sin(x))
```



Basic plotting functions

hist makes a histogram of the vector you pass in.

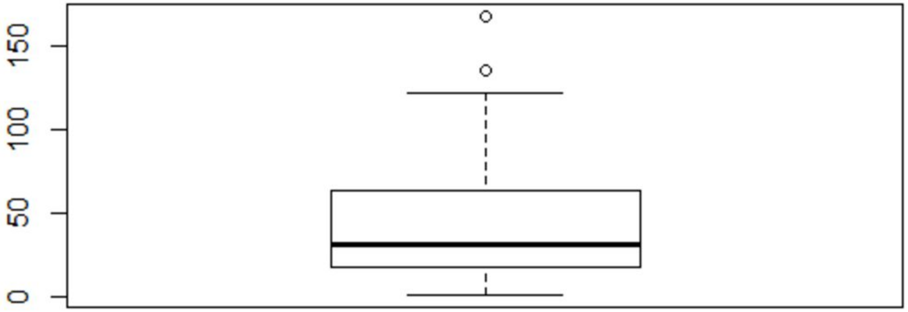
```
> temperature <- airquality$Temp

> hist(temperature)
```



Basic plotting functions

boxplot makes a box plot and can take list of numeric vectors.

```
> boxplot(airquality$Ozone)
```



Coming Up

Your assignment: Assignment 1

Next week: Becoming data manipulation masters

CDS

Cornell Data Science

Helpful Links

Sign up for CMS here! bit.ly/cornellcdscms

^you must do this before submitting assignments^

Course website: datascienceis.life

See you next week!