

---

# Introduction of R

---

**Kai Yao**

**Apr, 2016**



---

# Outline

---

- ❖ Introduction
- ❖ The R Environment
- ❖ Common Data Structures
- ❖ Mode and Attributes
- ❖ Assignment
- ❖ Basic Functions
- ❖ Conditional Execution and Loops
- ❖ Conclusion



---

# Introduction

---

- ❖ Objective of this course
  - ❖ Fundamental methods for data process
  - ❖ Learn the way for DIY
- ❖ Requirements
  - ❖ Be Interactive
  - ❖ No plagiarism
  - ❖ No Absence



---

# Introduction

---

- ❖ Contact

- ❖ [jasonyaopku@gmail.com](mailto:jasonyaopku@gmail.com)

- ❖ Materials

- ❖ <https://github.com/jasonyaopku/Data-Processing-in-R.git>

- ❖ <https://cran.r-project.org>



---

# Outline

---

- ❖ Introduction
- ❖ The R Environment
- ❖ Common Data Structures
- ❖ Mode and Attributes
- ❖ Assignment
- ❖ Basic Functions
- ❖ Conditional Execution and Loops
- ❖ Conclusion



---

# The R Environment

---

- ❖ Why do we choose R ?
  - ❖ Free
  - ❖ Cross platform
  - ❖ Rich resource
- ❖ What do we use?
  - ❖ R software
  - ❖ RStudio



---

# The R Environment

---

- ❖ Where to program?
  - ❖ Terminal
  - ❖ R software
  - ❖ RStudio



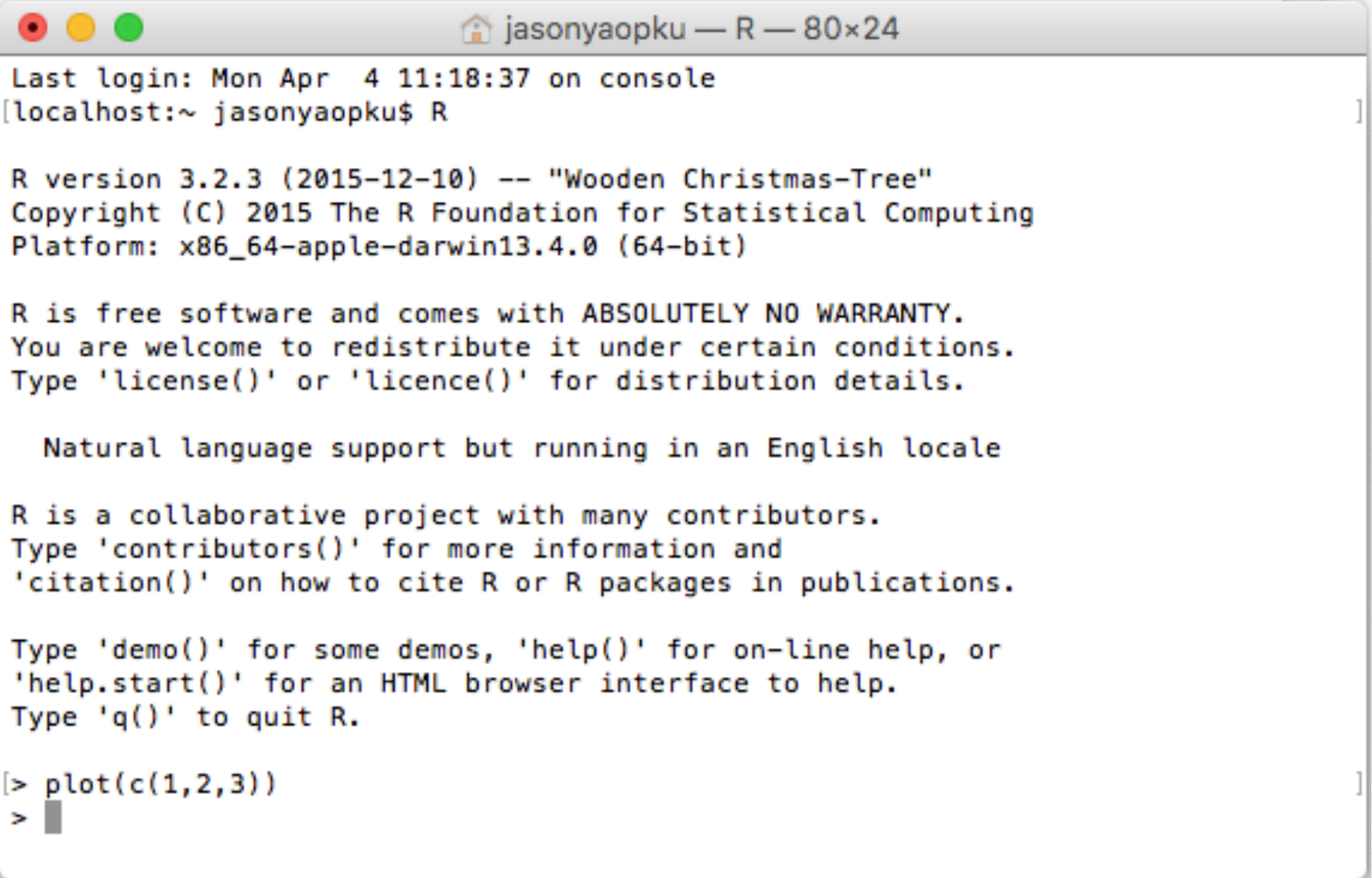
# The R Environment

- ❖ Where to program?

- ❖ Terminal

- ❖ R software

- ❖ RStudio



```
jasonyaopku — R — 80x24
Last login: Mon Apr  4 11:18:37 on console
[localhost:~ jasonyaopku$ R

R version 3.2.3 (2015-12-10) -- "Wooden Christmas-Tree"
Copyright (C) 2015 The R Foundation for Statistical Computing
Platform: x86_64-apple-darwin13.4.0 (64-bit)

R is free software and comes with ABSOLUTELY NO WARRANTY.
You are welcome to redistribute it under certain conditions.
Type 'license()' or 'licence()' for distribution details.

Natural language support but running in an English locale

R is a collaborative project with many contributors.
Type 'contributors()' for more information and
'citation()' on how to cite R or R packages in publications.

Type 'demo()' for some demos, 'help()' for on-line help, or
'help.start()' for an HTML browser interface to help.
Type 'q()' to quit R.

[> plot(c(1,2,3))
>
```



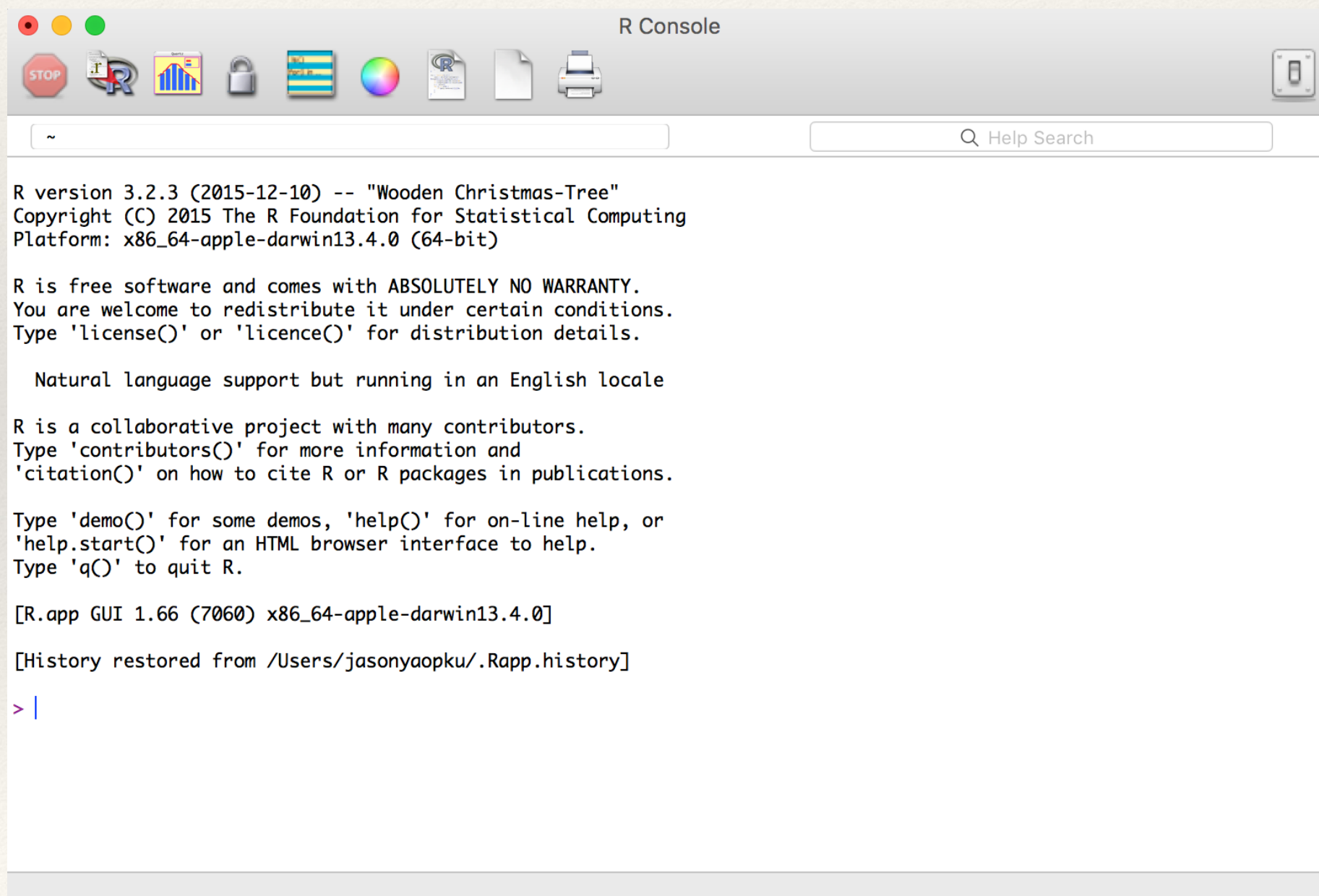
# The R Environment

## ❖ Where to program?

❖ Terminal

❖ R software

❖ RStudio



The screenshot shows the R Console window. The title bar is labeled "R Console". The window has a standard macOS-style title bar with red, yellow, and green window control buttons. Below the title bar is a toolbar with icons for a stop sign, R logo, bar chart, lock, flag, color wheel, R logo, document, and printer. The main content area displays the R startup message and help text. At the bottom, there is a prompt character ">" followed by a vertical bar.

```
R version 3.2.3 (2015-12-10) -- "Wooden Christmas-Tree"
Copyright (C) 2015 The R Foundation for Statistical Computing
Platform: x86_64-apple-darwin13.4.0 (64-bit)

R is free software and comes with ABSOLUTELY NO WARRANTY.
You are welcome to redistribute it under certain conditions.
Type 'license()' or 'licence()' for distribution details.

Natural language support but running in an English locale

R is a collaborative project with many contributors.
Type 'contributors()' for more information and
'citation()' on how to cite R or R packages in publications.

Type 'demo()' for some demos, 'help()' for on-line help, or
'help.start()' for an HTML browser interface to help.
Type 'q()' to quit R.

[R.app GUI 1.66 (7060) x86_64-apple-darwin13.4.0]

[History restored from /Users/jasonyaopku/.Rapp.history]

> |
```



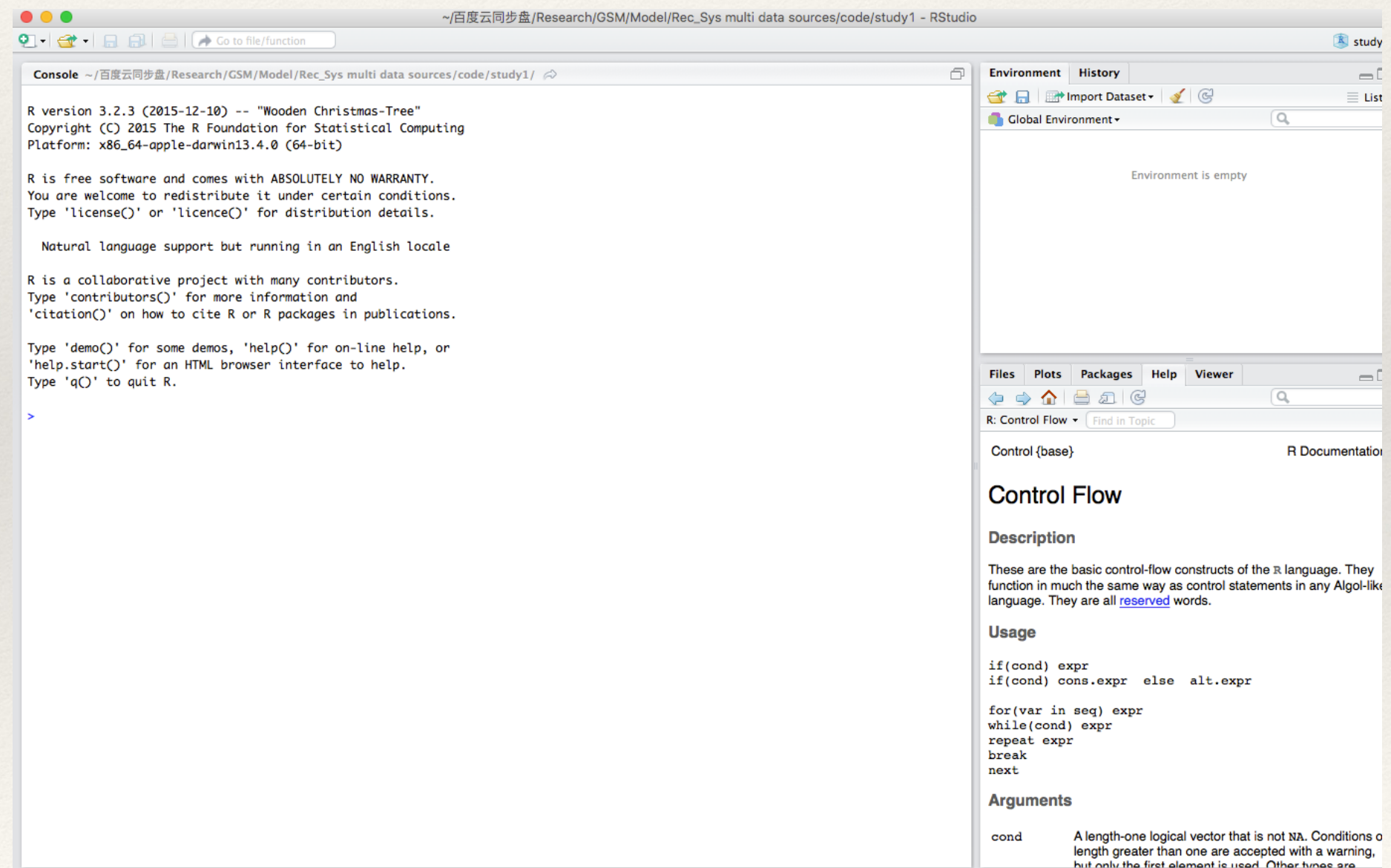
# The R Environment

❖ Where to program?

❖ Terminal

❖ R software

❖ RStudio





---

# The R Environment

---

- ❖ Where to program?
  - ❖ Terminal
  - ❖ R software
  - ❖ RStudio
- ❖ Learn how to use help and search information is the most important thing!!!



---

# Outline

---

- ❖ Introduction
- ❖ The R Environment
- ❖ Common Data Structures
- ❖ Mode and Attributes
- ❖ Assignment
- ❖ Basic Functions
- ❖ Conditional Execution and Loops
- ❖ Conclusion



---

# Common Data Structures

---

- ❖ R is OO (object-oriented) language
- ❖ Everything in R can be considered as an object
- ❖ Example!
  - ❖ Car
- ❖ How to define variables in R?



---

# Common Data Structures

---

- ❖ Basic DS
  - ❖ numeric
  - ❖ character
  - ❖ logical
- ❖ Special DS: NA, Inf, -Inf



---

# Common Data Structures

---

- ❖ Complex DS
  - ❖ Vector
  - ❖ Factor
  - ❖ Dataframe
  - ❖ Matrix
- ❖ Optional
  - ❖ Array
  - ❖ List



---

# Common Data Structures

---

Object	Type	Multi Type?
Vector	num, char, logical	NO
Factor	num, char	NO
Matrix	num, char, logical	NO
Dataframe	num, char, logical	YES
Array	num, char, logical	NO
List	All	YES



---

# Outline

---

- ❖ Introduction
- ❖ The R Environment
- ❖ Common Data Structures
- ❖ Mode and Attributes
- ❖ Assignment
- ❖ Basic Functions
- ❖ Conditional Execution and Loops
- ❖ Conclusion



---

# Mode and Attribute

---

- ❖ Mode
  - ❖ type of the object
- ❖ Attribute
  - ❖ type
  - ❖ length
  - ❖ dimension
  - ❖ ...
- ❖ we can change the attributes of object



---

# Outline

---

- ❖ Introduction
- ❖ The R Environment
- ❖ Common Data Structures
- ❖ Mode and Attributes
- ❖ **Assignment**
- ❖ Basic Functions
- ❖ Conditional Execution and Loops
- ❖ Conclusion



---

# Operators

---

❖ +

❖ -

❖ \*

❖ /

❖ %\*%



---

# Assignment

---

❖ `->`

❖ `5->n`

❖ `<-`

❖ `n<-5`

❖ `=`

❖ `n=5`



---

# Indexing

---

- ❖ Start from 1 to n
  - ❖ Vector
  - ❖ Dataframe
  - ❖ Matrix
  - ❖ Array
  - ❖ List



---

# Lifetime of Variables

---

## ❖ Assignment

- ❖ replace the original variable
- ❖ new value can be any type

## ❖ Revise

- ❖ just change the value of elements
- ❖ new value must be the same type as the original one



---

# Outline

---

- ❖ Introduction
- ❖ The R Environment
- ❖ Common Data Structures
- ❖ Mode and Attributes
- ❖ Assignment
- ❖ **Basic Functions**
- ❖ Conditional Execution and Loops
- ❖ Conclusion



---

# Basic Functions

---

- ❖ `ls.str()`
- ❖ `rm()`
- ❖ `print()`
- ❖ `message()`
- ❖ `seq()`
- ❖ `rep()`



---

# Outline

---

- ❖ Introduction
- ❖ The R Environment
- ❖ Common Data Structures
- ❖ Mode and Attributes
- ❖ Assignment
- ❖ Basic Functions
- ❖ Conditional Execution and Loops
- ❖ Conclusion



---

# Conditional Execution

---

- ❖  $>$ ,  $<$ ,  $==$ ,  $>=$ ,  $<=$ ,  $!=$
- ❖ functions which return TRUE or FALSE
- ❖ if (condition)
  - {
  - .....
  - }else
  - {
  - .....
  - }



---

# Loop

---

❖ for (variable in vector)

{

}

❖ while (condition)

{

...

break

}



---

# Conclusion

---

- ❖ Introduction
  - ❖ Requirements
- ❖ The R Environment
  - ❖ WWW
- ❖ Common Data Structures
  - ❖ NCL: (numeric, character, logical)
  - ❖ VDFM: (vector, factor, dataframe, matrix)



---

# Conclusion

---

- ❖ Mode and Attributes
  - ❖ Every object has its attributes
  - ❖ We can change its attributes
- ❖ Assignment
  - ❖ Operators, Indexing for different data structures
- ❖ Basic Functions
  - ❖ Very useful during programming
- ❖ Conditional Execution and Loops
  - ❖ If, for, while



---

# Homework 1

---

- ❖ Download the document of Homework from <https://github.com/jasonyaopku/Data-Processing-in-R.git>



---

# Next Class

---

- ❖ In class test
- ❖ Read and write data files
- ❖ Brief description analysis
- ❖ Advanced statistic functions
- ❖ How to write own function