SDSC3006 Lab
1-Introduction to R

Langming LIU langmiliu2-c@my.cityu.edu.hk

School of Data Science
City University of Hong Kong

Outline

1. Install R and Data packeges

2. Basic commands

3. Preliminary data analysis

Install R and Data packeges

[Home]

Download

CRAN

R Project

About R
Contributors
What's New?
Mailing Lists
Bug Tracking
Conferences
Search

R Foundation

Foundation
Board
Members
Donors
Donate

Documentation

Manuals
FAQs
The R Journal
Books
Certification
Other

Links

Bioconductor
Related Projects

The R Project for Statistical Computing

Getting Started

R is a free software environment for statistical computing and graphics. It compiles and runs on a wide variety of UNIX platforms, Windows and MacOS. To **download R**, please choose your preferred CRAN mirror.

If you have questions about R like how to download and install the software, or what the license terms are, please read our answers to frequently asked questions before you send an email.

News

- **The R Journal Volume 7/2** is available.
- **R version 3.2.3 (Wooden Christmas-Tree)** has been released on 2015-12-10.>
- **R version 3.1.3 (Smooth Sidewalk)** has been released on 2015-03-09.
- **useR! 2015**, took place at the University of Aalborg, Denmark, June 30 - July 3, 2015.

Install R

R: The R Project for Statistical Computing

↓

download R

↓

choose a location

↓

choose the system

↓

install R for the first time

↓

choose the version and follow instruction

Data Sets of R

- The ISLR2 package

(Data for an introduction to statistical learning with applications in R version)

- The MASS library

(Modern applied statistics with S)

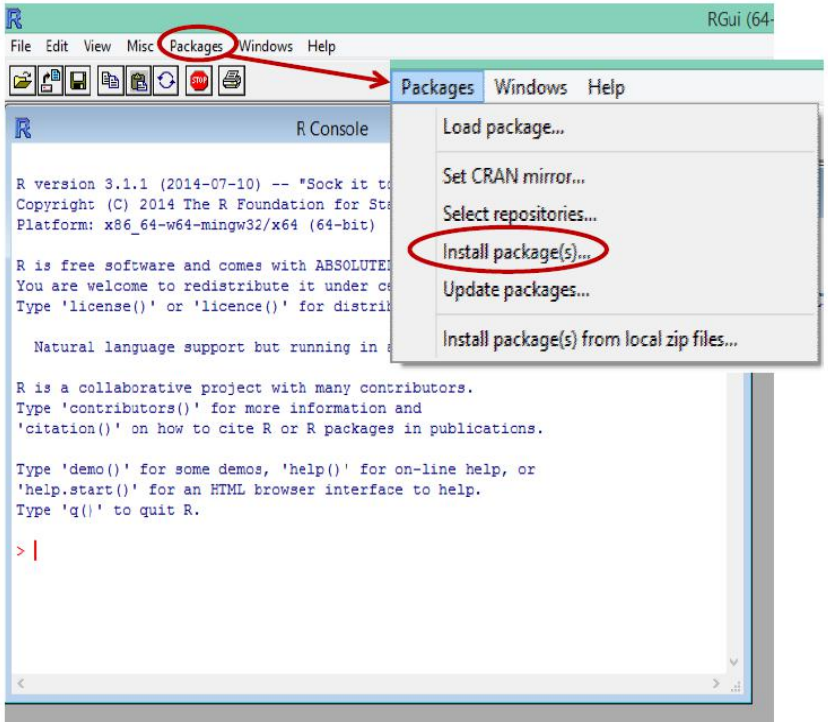
- Base R

Data Sets of R

- The ISLR2 package

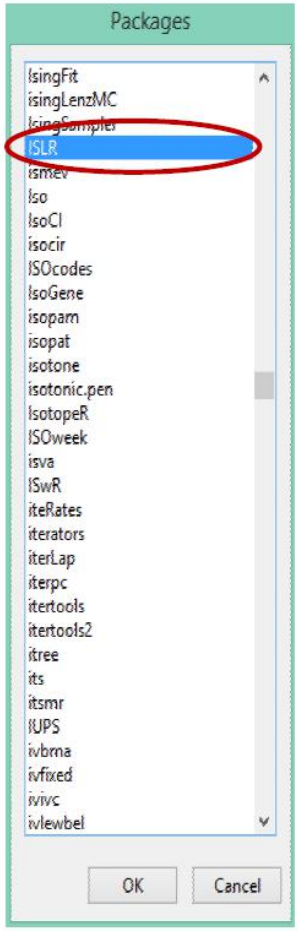
Name	Description
Auto	Gas mileage, horsepower, and other information for cars.
Boston	Housing values and other information about Boston suburbs.
Caravan	Information about individuals offered caravan insurance.
Carseats	Information about car seat sales in 400 stores.
College	Demographic characteristics, tuition, and more for USA colleges.
Default	Customer default records for a credit card company.
Hitters	Records and salaries for baseball players.
Khan	Gene expression measurements for four cancer types.
NCI60	Gene expression measurements for 64 cancer cell lines.
OJ	Sales information for Citrus Hill and Minute Maid orange juice.
Portfolio	Past values of financial assets, for use in portfolio allocation.
Smarket	Daily percentage returns for S&P 500 over a 5-year period.
USArrests	Crime statistics per 100,000 residents in 50 states of USA.
Wage	Income survey data for males in central Atlantic region of USA.
Weekly	1,089 weekly stock market returns for 21 years.

Install ISLR2 package



Or just type in console:
install.packages('ISLR2')

Choose CRAN mirror spot



Select **ISLR** package for installation

Basic commands

Vector

- Save things: “<-” or “=”
- Define a vector
  - use function c(): x=c(1,2,3,4)
  - use function seq() for arithmetic sequence:
    x=seq(from=a,to=b,by=c) or x=a:b
- Find a component by index i: a=x[i]
- The length of vector: length(x)
- Delete vector: rm(x)

Vector

- Generate random vector:

  y=rnorm(20) (standard normal)

  y=3*rnorm(20)+2 (non-standard normal)

  y=runif(n=20,min=-1,max=1) (uniform)

Set Seed To reproduce the same random vector:

  set.seed(1)

  rnorm(5)

- Statistics calculation of vectors:

  apply function “sqrt()”, “mean()”, “var()”, “sd()”, “cor(,)”, “cov(,)” and so on

Matrix

- Define a matrix using function “matrix()”:

  A=matrix(1:20,nrow=5,ncol=4)

notice: default order of filling the matrix is by column
we can change the order:

  A=matrix(1:20,nrow=5,ncol=4,byrow=TRUE)

- Some calculations of matrix is the same:

  sqrt(A), mean(A), sum(A)

- dimension of matrix: dim(A)

Matrix

- Indexing of Matrix:
  - obtain a component: A[2,3]
  - obtain a row or column: “A[3,]” for row, “A[,2]” for column
  - obtain a section:

    A[2:4,2:4]

    A[c(2,4),c(2,4)] for selecting particular rows and columns

    A[-c(2,4),-c(2,4)] for deleting particular rows and columns

Preliminary data analysis

Load Dataset

- To load a data set in the ISLR2 package or other packages/libraries:

  library(ISLR2)

- To load an external data set, first specify the directory:

  "File" → "Change directory"

  - If the data are saved as a text file:

    Auto=read.table('Auto.data',header=T,na.strings='?')

  - If the data are saved as a csv file (Excel):

    stock=read.csv('0001.HK.csv',na.strings='?')

Basic operations of Dataset

- Type “names(datasetname)” to list all attributes (column names): names(stock)

- Dimension of Dataset: dim(stock)

- Access one attribute:

  method 1: stock$Low

  method 2: “attach(stock)” then “Low”

- obtain numerical summaries: summary(stock)

Basic operations of Dataset

- generate figures of single variables using “plot()”:

```
attach(stock)
plot(High,type='l',xlab='date index',ylab='High price',main='Figure 1')
```

- generate plots of two variables:

```
attach(stock)
plot(Open,High,xlab='Open prcie',ylab='High price',main='Figure 2')
```