Introduction to Biostatistics Class Guidance

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Contents of the lecture

In this course, students will learn the basics of statistics by using R and RStudio.

The content covered in the lecture is as follows.

1. visualizing data with R (April 9)
2. regression and analysis of variance (April 16)
3. principal component analysis, multidimensional scaling constructs (April 23)
4. hierarchical and non-hierarchical cluster analysis (April 30)

Lecture format

Please download required files before the class

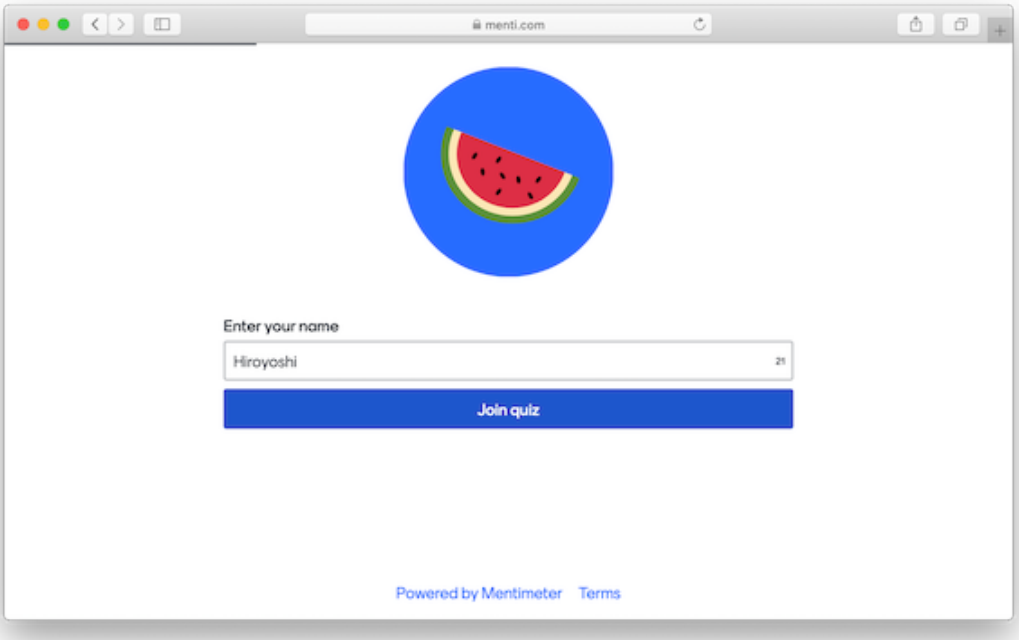
Each lecture is taught in a hands-on format using text (PDF, HTML, Google Docs), R code (R), and data (CSV) files. All files should be available for download from the AgriBio website and ITC-LMS at least one day before the lecture. Please make sure to download the book before the lecture.

There will be quizzes sometimes in the lecture

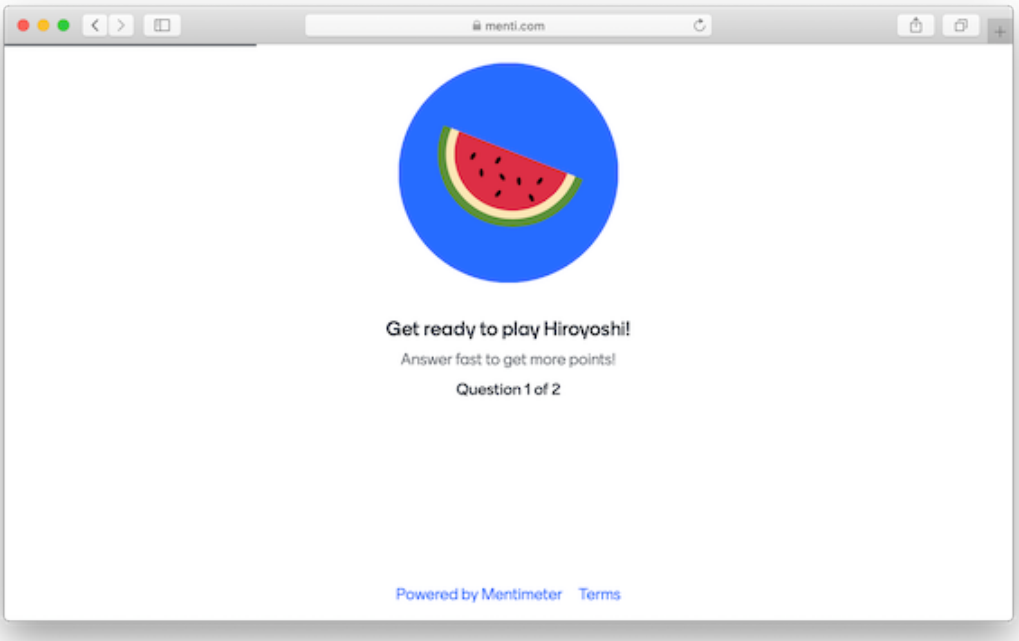
In order to add a kind of game-like play in the lecture, we will have quizzes in the lecture. Let's do a little practice here.

1. First, go to https://www.menti.com/95twm188to

2. Next, enter your nickname and click on "Join quiz".



3. Then it goes into a standby state. After a while, the quiz will start. I wish you all the best in your endeavors.



Please note that these quizzes are just a kind of game and do not affect your grades. Have fun and work on it.

Grades

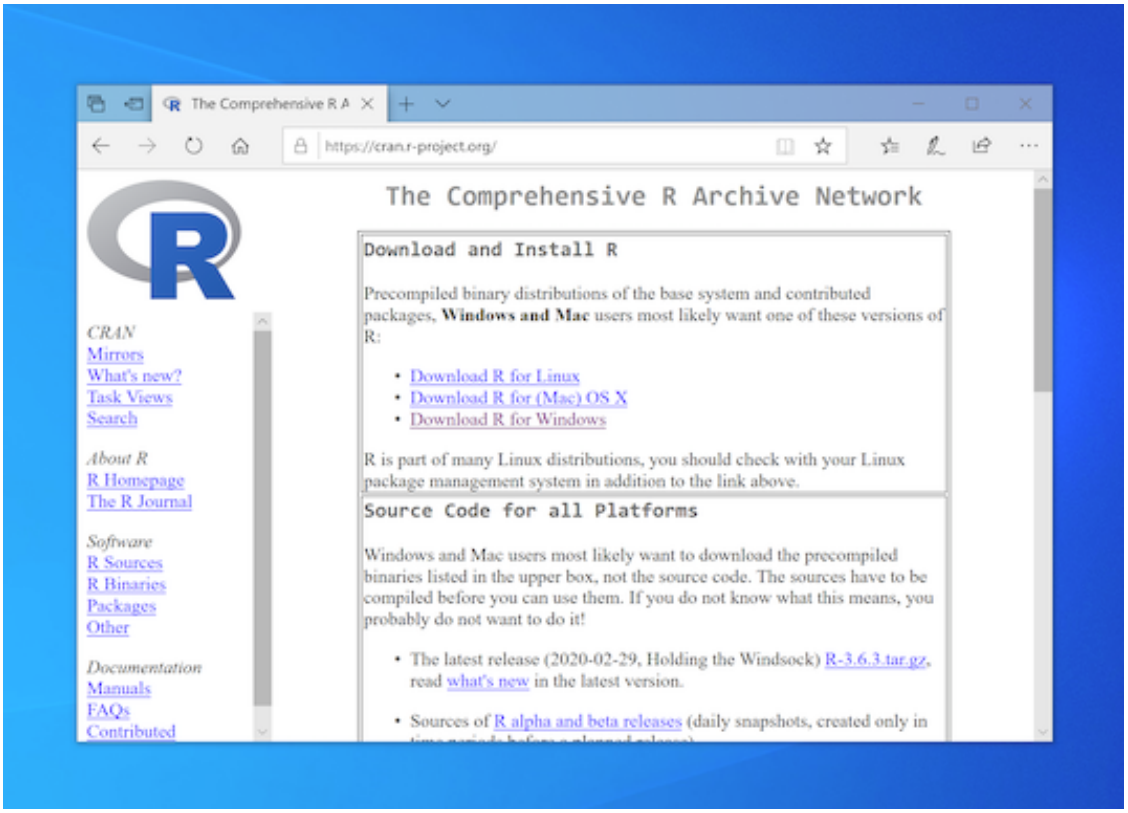
Grades will be based on attendance (which will be taken using the ITC-LMS) and reports (which will be submitted using the ITC-LMS).

Installing R and RStudio

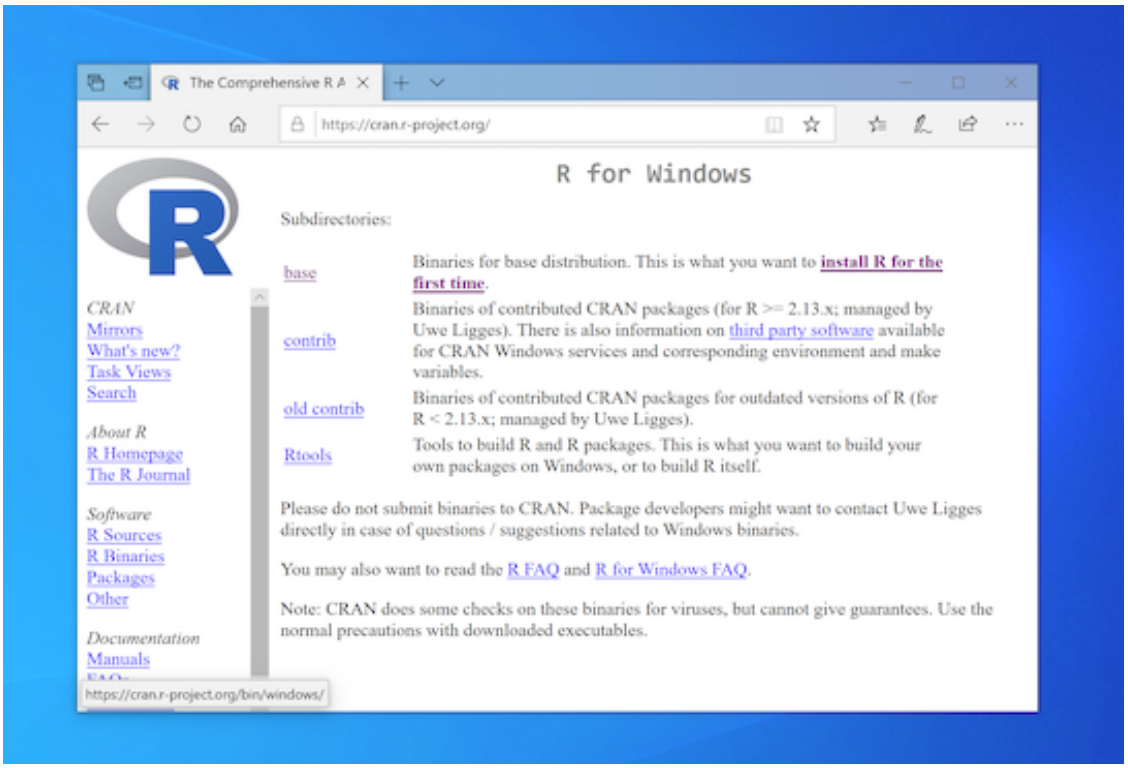
In the case of Windows

Installing R

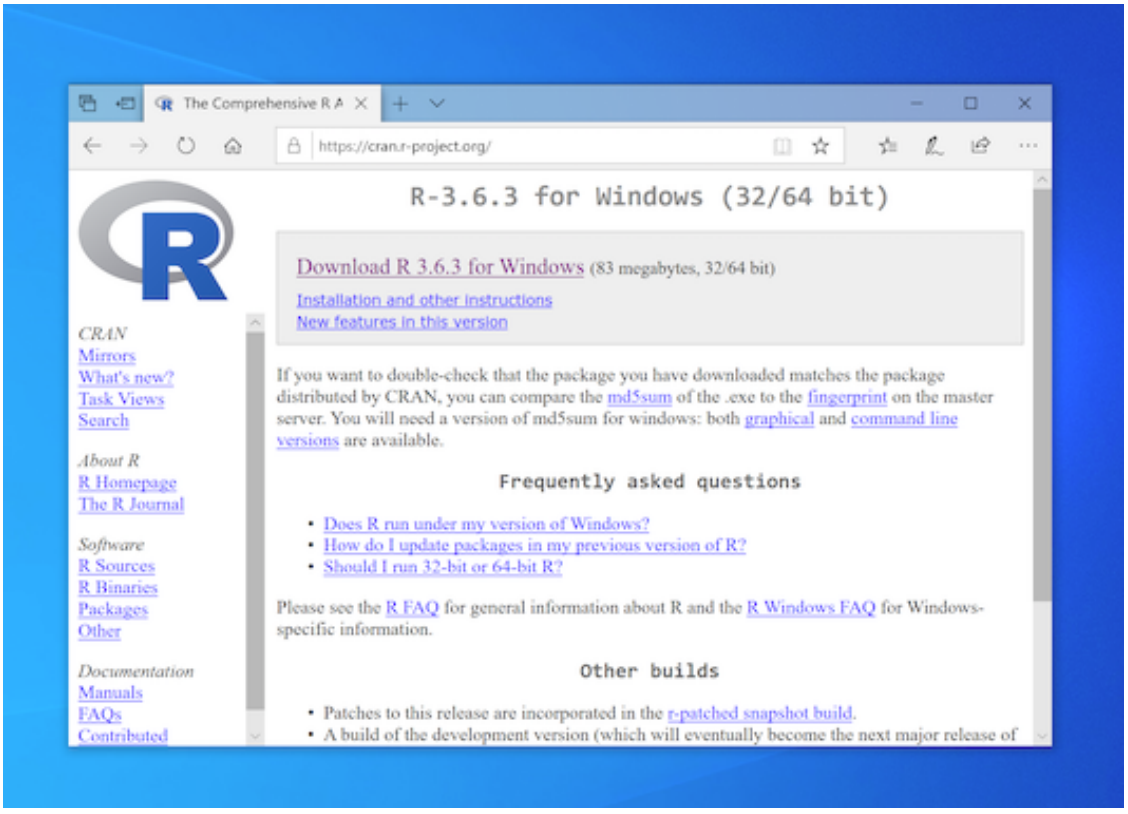
1. First, go to the CRAN site https://cran.ism.ac.jp/.
2. Click “Download R for Windows”.



3. Select “base”.

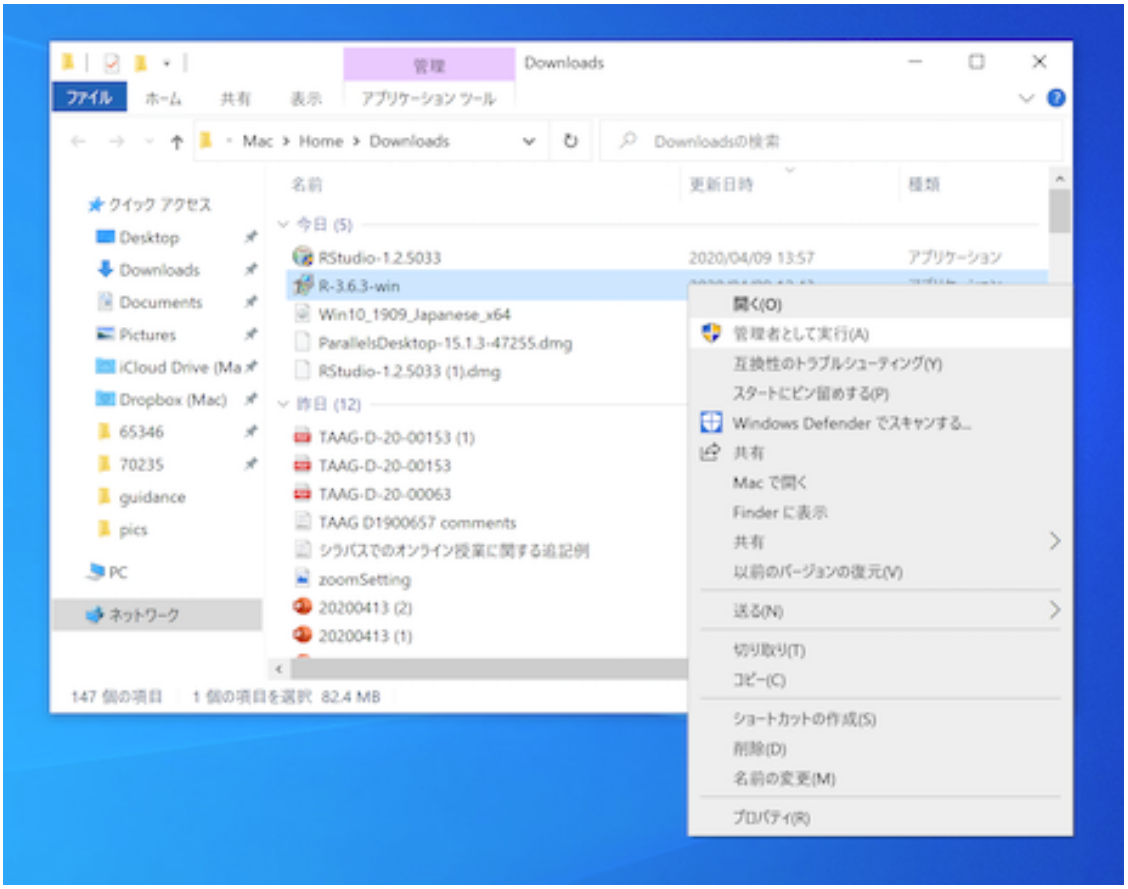


4. Click “Download R 4.0.5 for Windows”. The latest version will vary depending on the time.



5. When you download, please “save” instead of “run”.

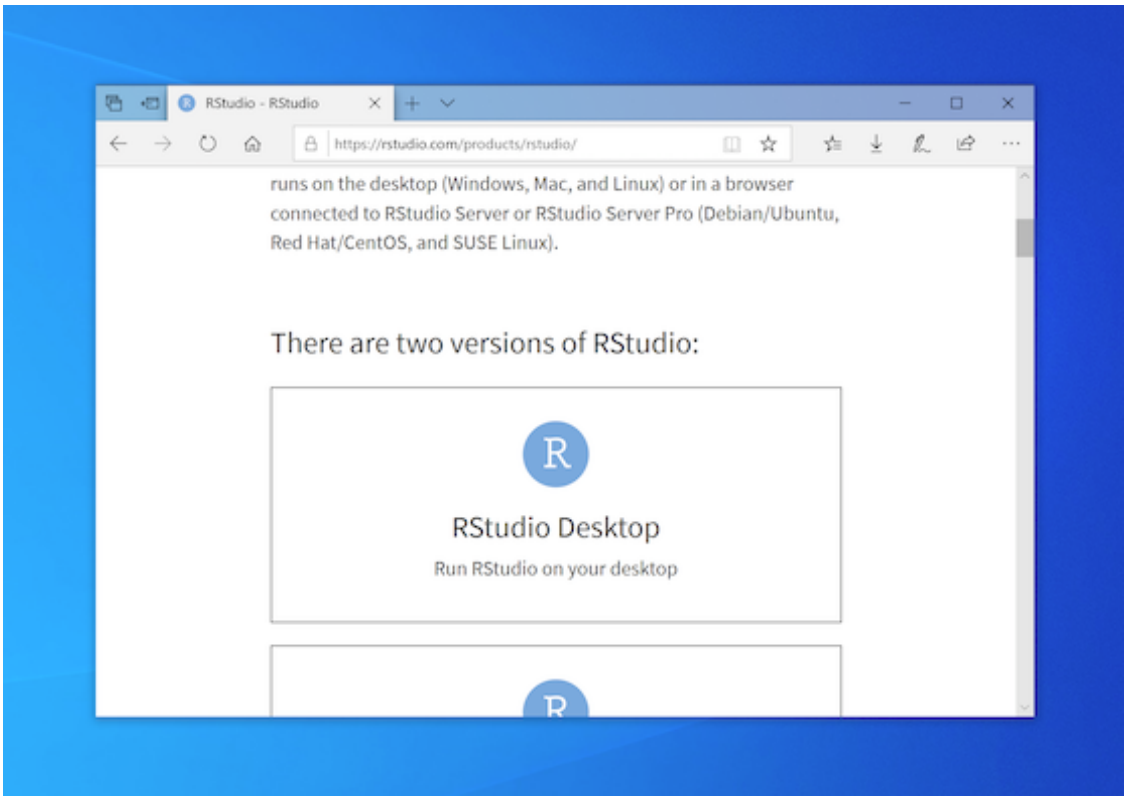
6. Click on the downloaded and file to install R. Please be sure to “Run as an administrator” (install with administrative privileges).



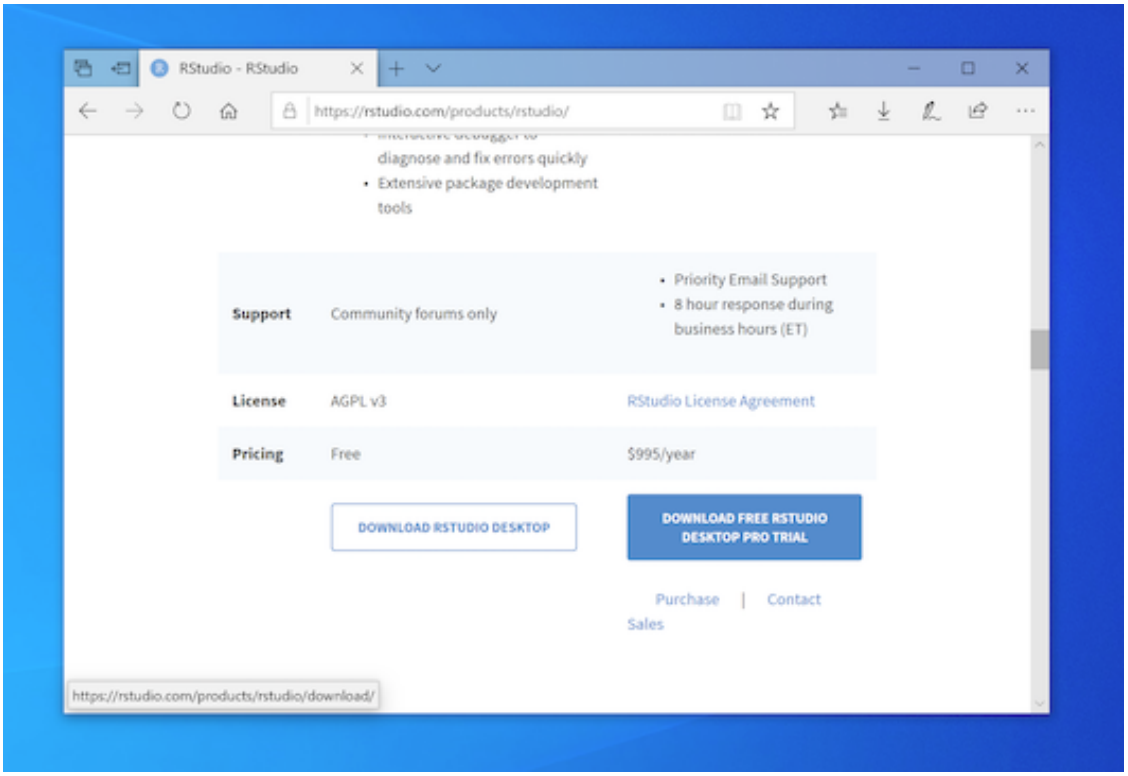
7. You do not need to change any of the installation options. You can proceed with the installation with the default settings.

Installing R Studio

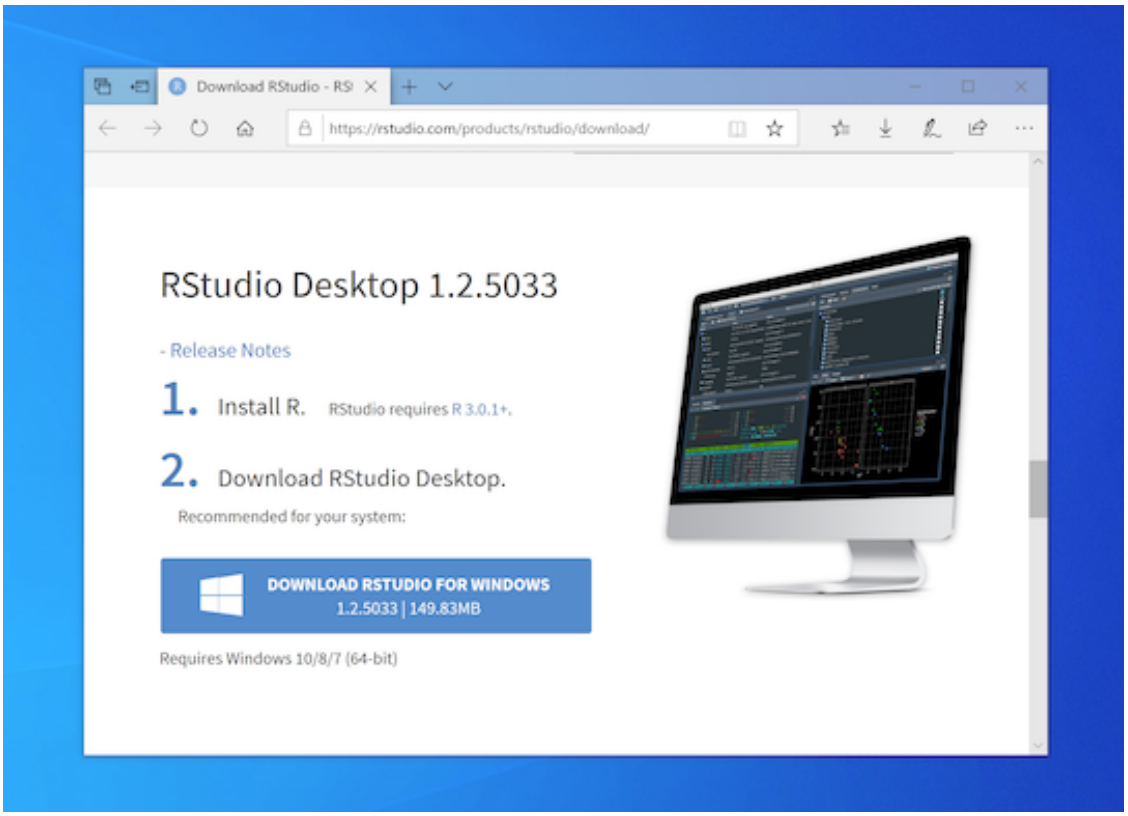
1. Go to the RStudio download site: https://rstudio.com/products/rstudio/.
2. Next, click “RStudio Desktop”.



3. Click the “DOWNLOAD RSTUDIO DESKTOP”.

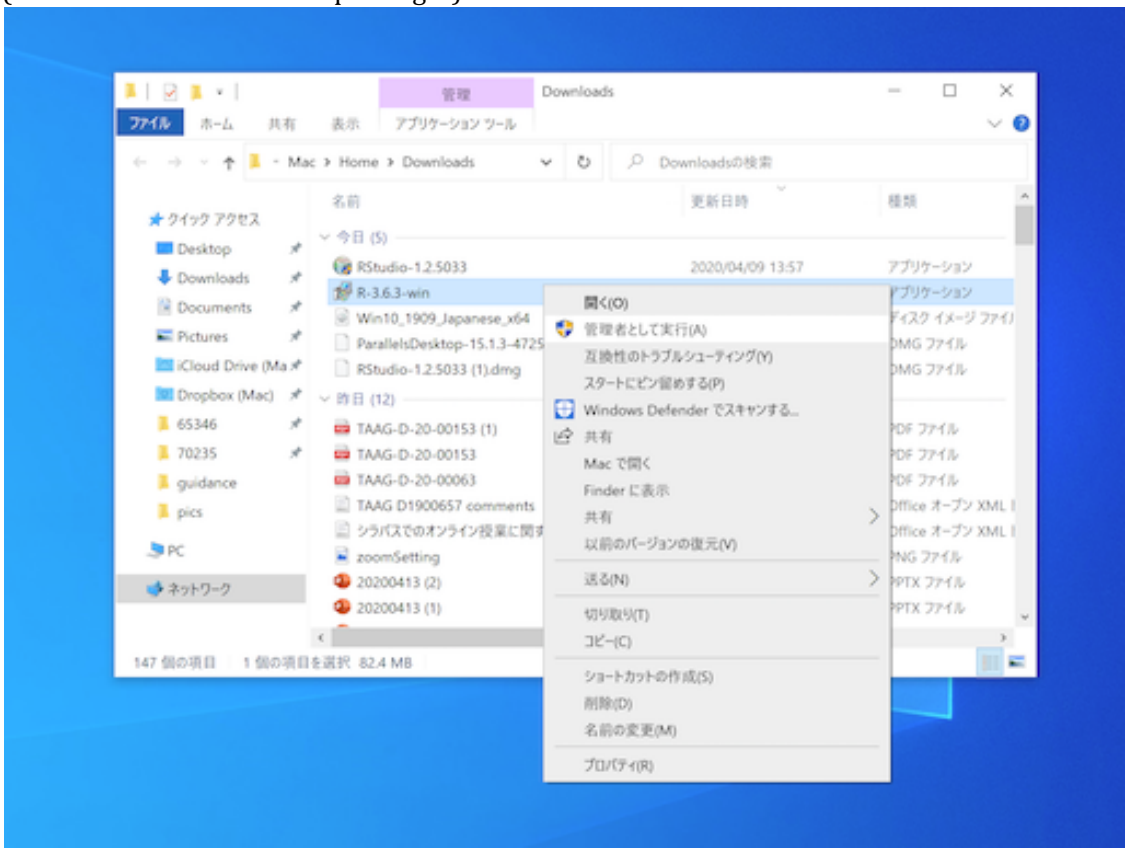


4. Click the “DOWNLOAD” button on the left side (free version of RStudio Desktop).



5. When you download, please “save” instead of “run”.

6. Click on the downloaded file to install RStudio. Please be sure to “Run as an administrator” (install with administrative privileges).



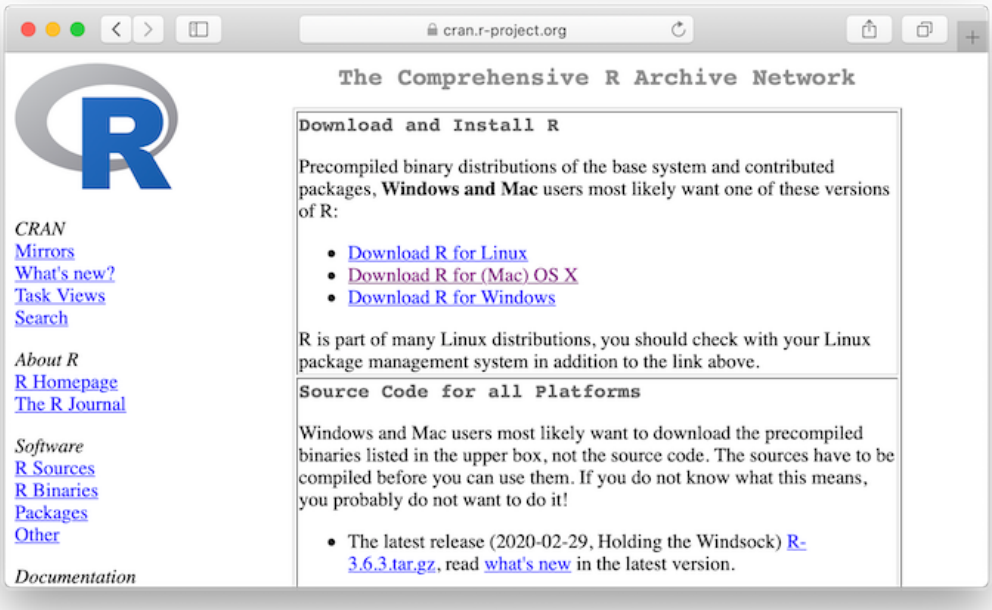
7. You do not need to change any of the installation options. You can proceed with the installation with the default settings.

In the case of Mac OS

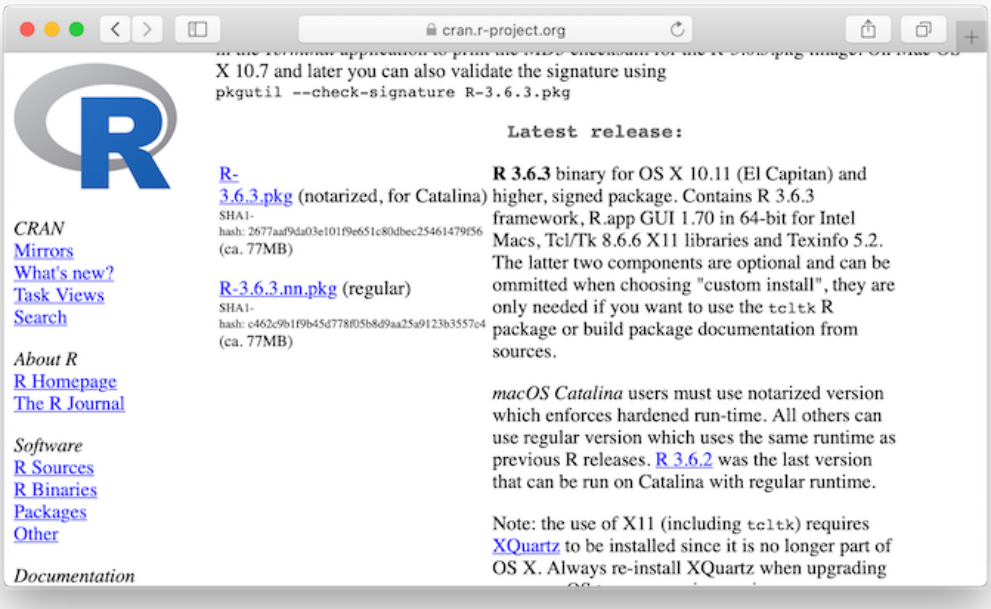
Installing R

1. First, go to the CRAN site https://cran.ism.ac.jp/.

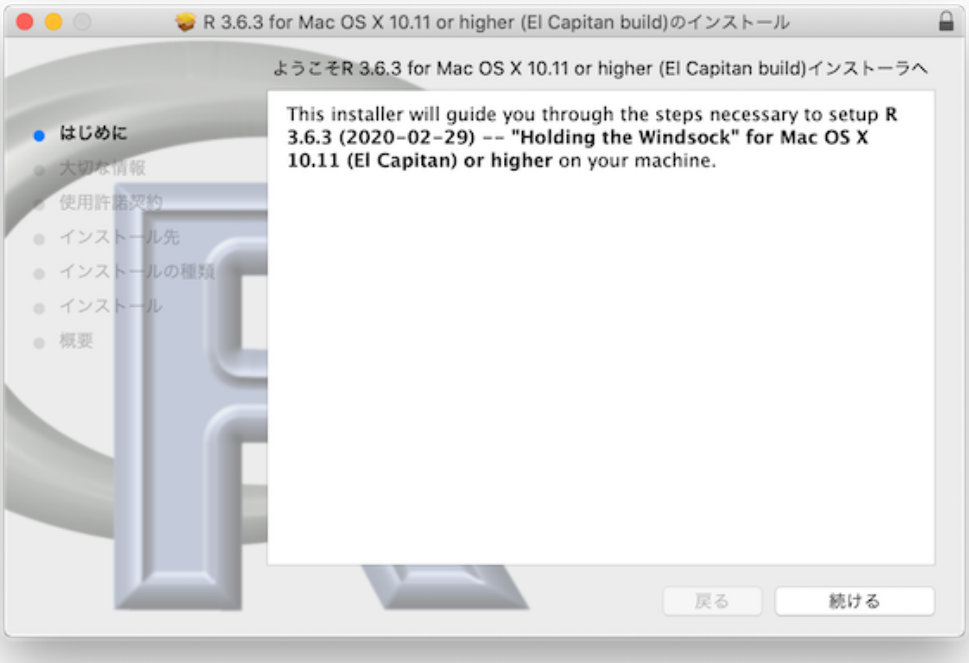
2. Click “Download R for (MAC) OS X”.



3. Click “R-4.0.5.pkg”. The latest version will vary depending on the time.



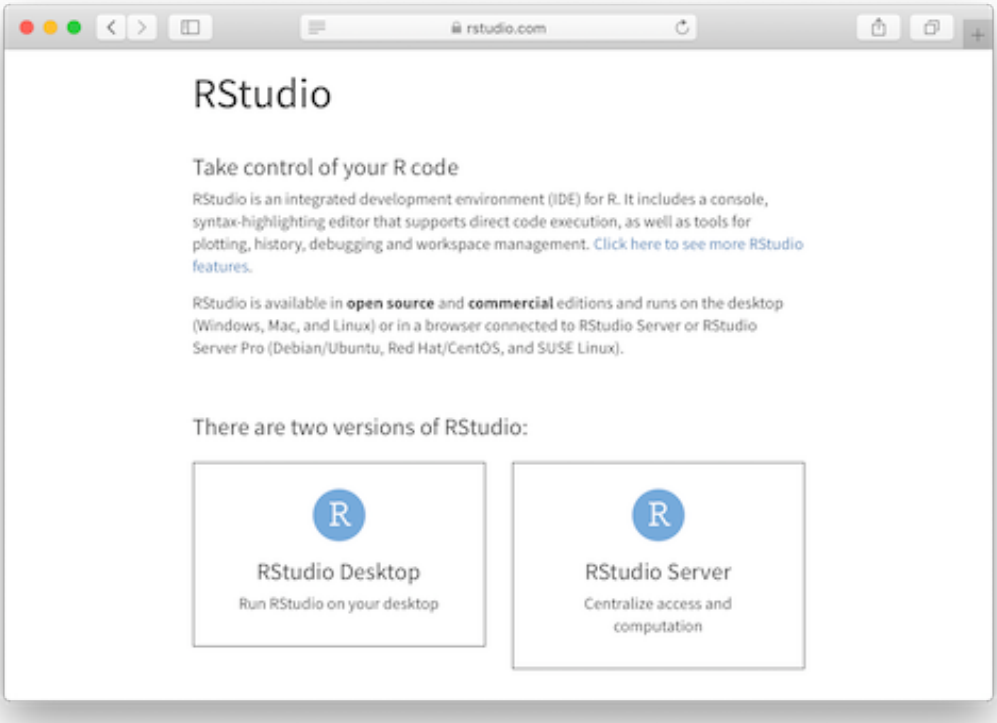
4. Click on the downloaded file to install R.



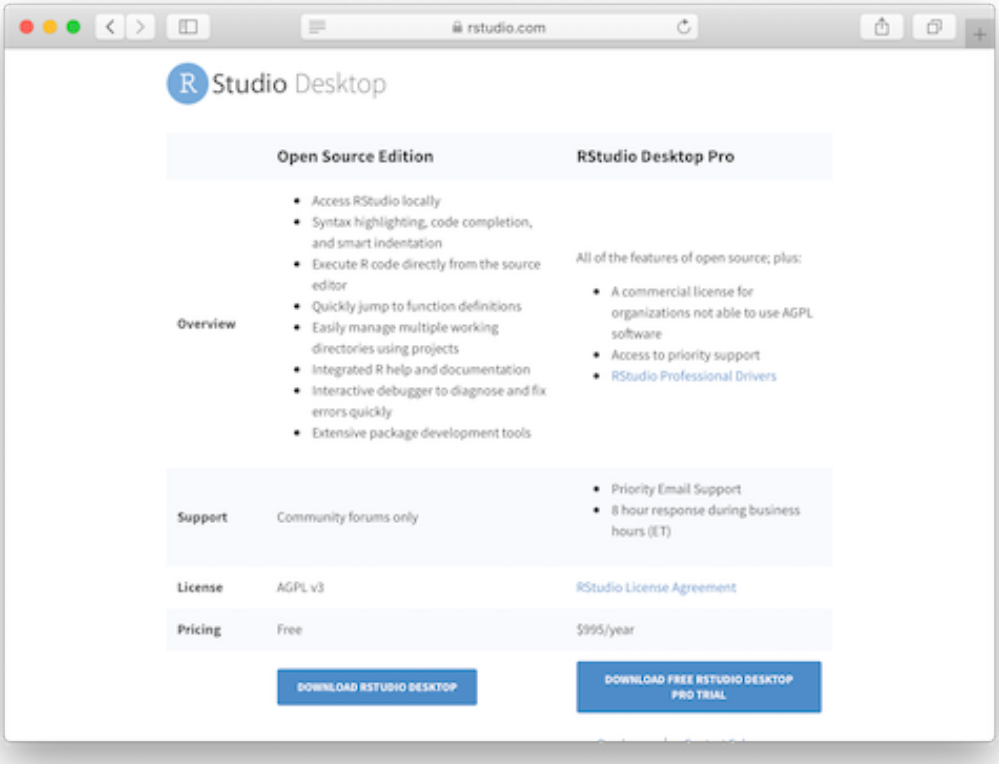
5. You do not need to change any of the installation options. You can proceed with the installation with the default settings.

Installing R Studio

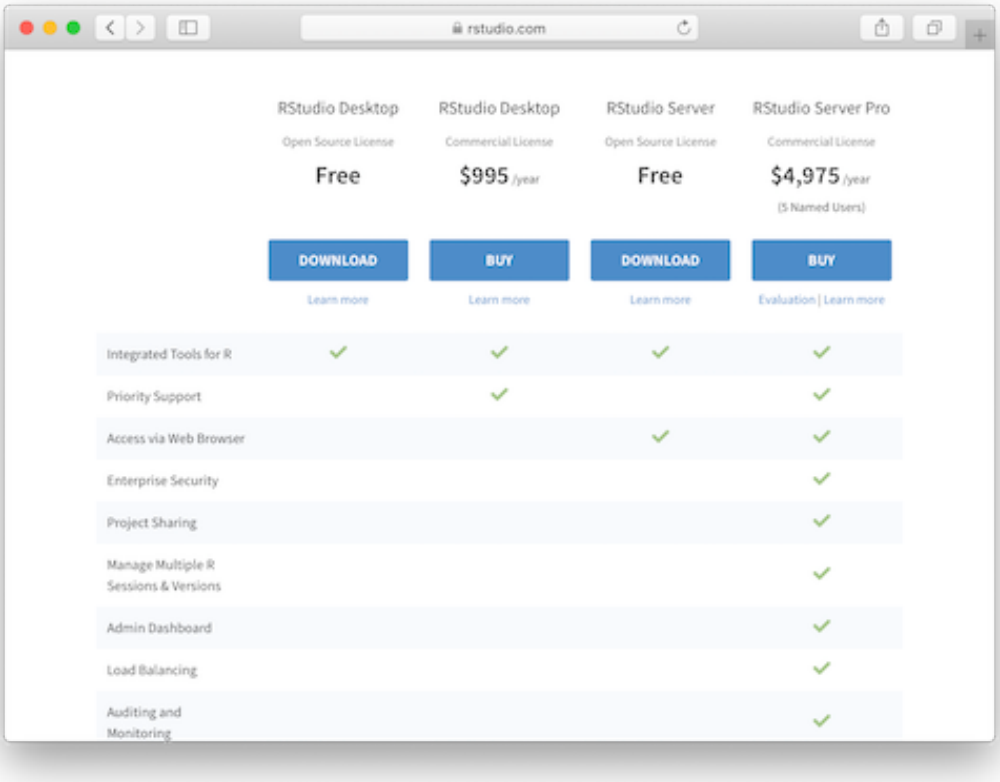
1. Go to the RStudio download site: https://rstudio.com/products/rstudio/.
2. Next, click “RStudio Desktop”.



3. Click the “DOWNLOAD RSTUDIO DESKTOP”.


rstudio.com
Studio Desktop
Open Source Edition
RStudio Desktop Pro
Overview
Access RStudio locally
Syntax highlighting, code completion, and smart indentation
Execute R code directly from the source editor
Quickly jump to function definitions
Easily manage multiple working directories using projects
Integrated R help and documentation
Interactive debugger to diagnose and fix errors quickly
Extensive package development tools
All of the features of open source; plus:
A commercial license for organizations not able to use AGPL software
Access to priority support
RStudio Professional Drivers
Support
Community forums only
Priority Email Support
8 hour response during business hours (ET)
License
AGPL v3
RStudio License Agreement
Pricing
Free
$995/year
DOWNLOAD RSTUDIO DESKTOP
DOWNLOAD FREE RSTUDIO DESKTOP PRO TRIAL

4. Click the “DOWNLOAD” button on the left side (free version of RStudio Desktop).



5. When you click on the downloaded file, a window will be displayed as follows. All that’s left to do is to drag RStudio and drop it on top of Applications.

!

Trying to use R and RStudio

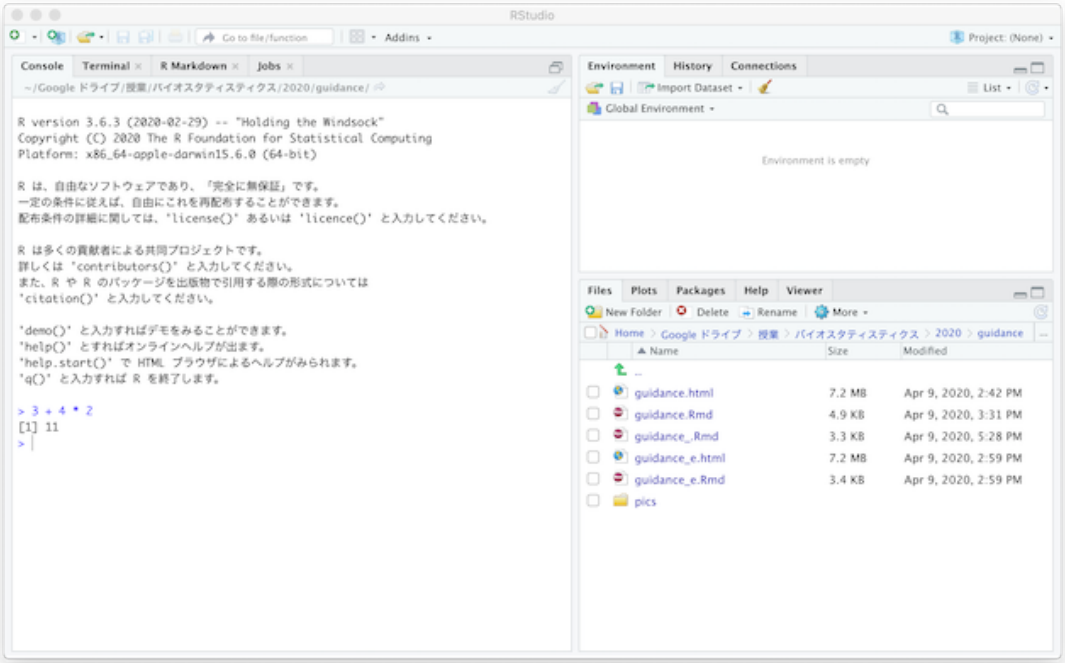
Make sure that R and RStudio are working

From here, I will explain how to use R and RStudio for Windows and Mac OS users together, because RStudio has the same interface in Windows and Mac OS versions.

Let’s start by typing the following into the “Console” on the left of the window.

```
3 + 4 * 2
```

```
## [1] 11
```



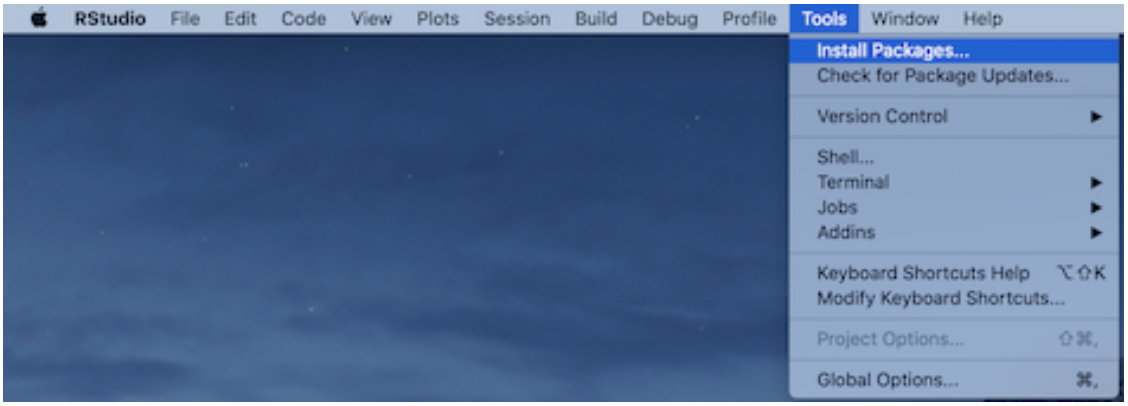
The calculation is performed and the result is shown. I will explain how to use R in detail in next week's lecture.

Preparing to use R and RStudio for the lecture

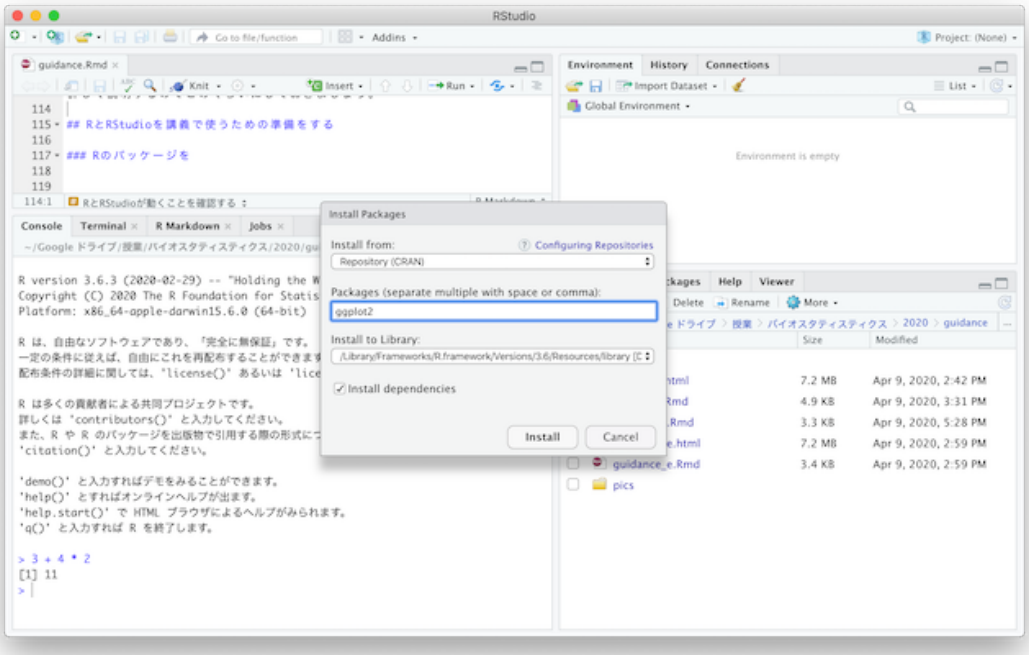
Install R packages.

R can perform a variety of statistical analyses even as it is, but if you install an "extended set" called a package, the number of available analytical methods can be largely expanded. This section explains how to install a package. Please note that your computer must be connected to the Internet in order to perform the installation of a package.

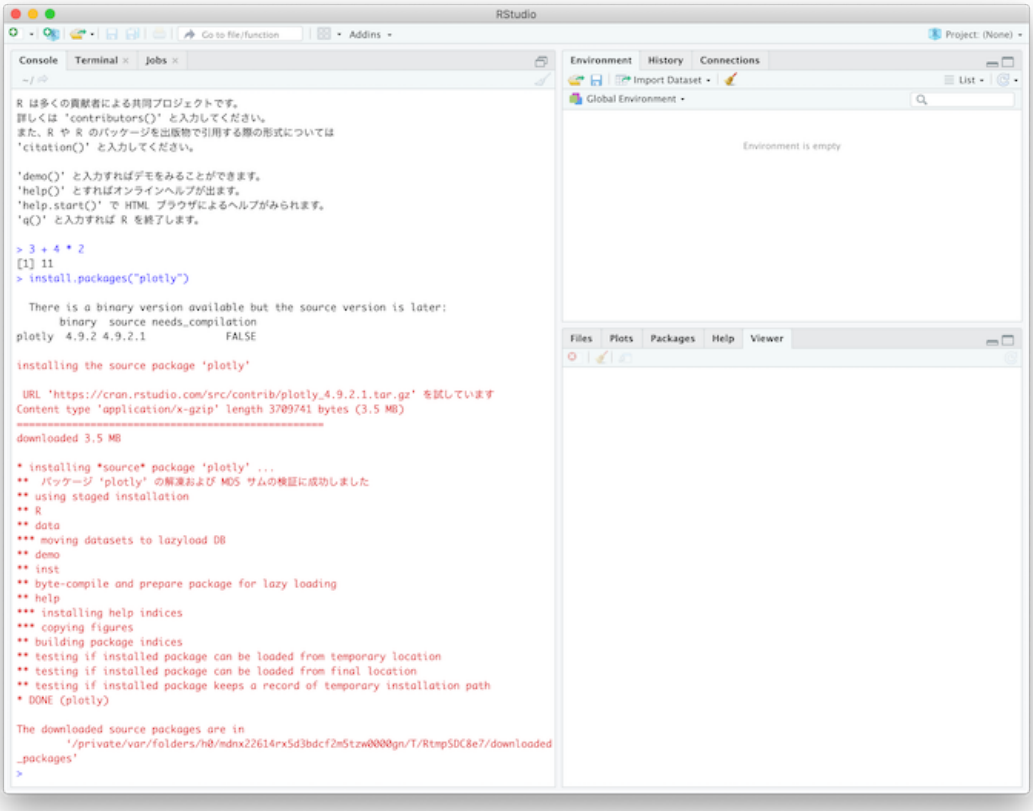
1. Select "Install Packages" from the Tools menu in RStudio.



2. Enter the name of the package you want to install in the dialog box shown in the middle of the figure below. In this section, we will install the package called plotly.



3. The plotly package will be downloaded and installed.

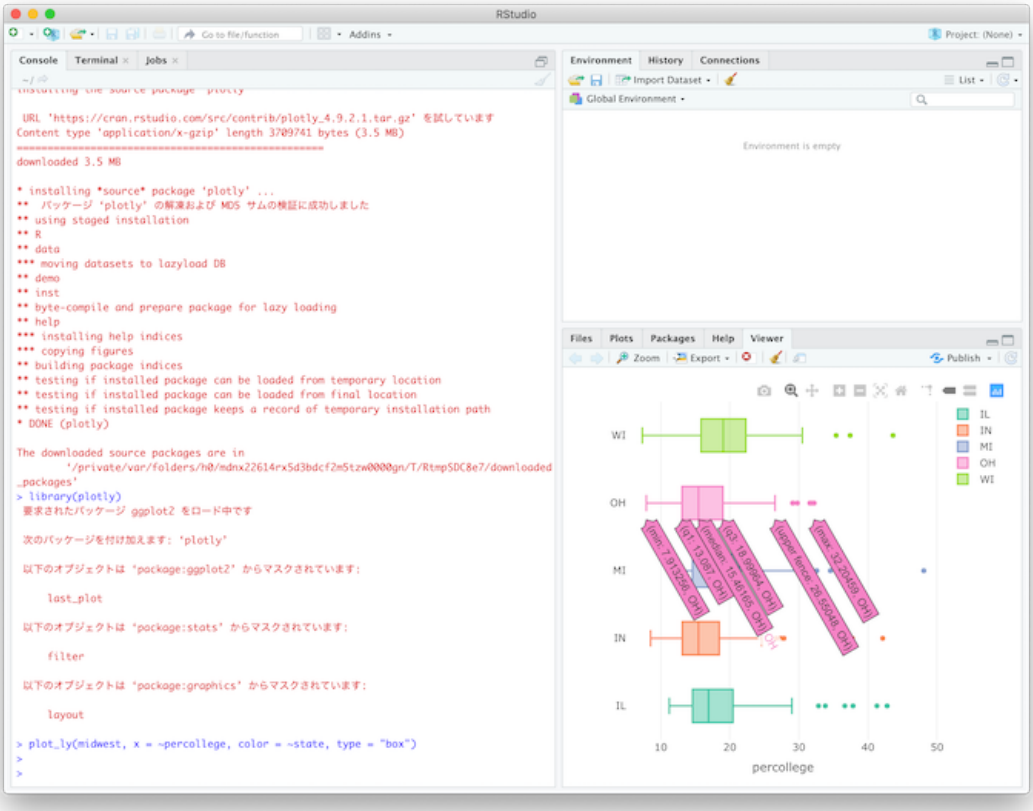


4. Type the following commands to the “Console” to draw an interactive figure.

library(plotly)

plot_ly(midwest, x = ~percollege, color = ~state, type = “box”)

It will be shown in RStudio as follow.



Configuring the R Working Directory

In R, it is often necessary to specify a “working directory” to run R. This enables R find R codes and data to use. Here, let’s use RStudio to specify a working directory.

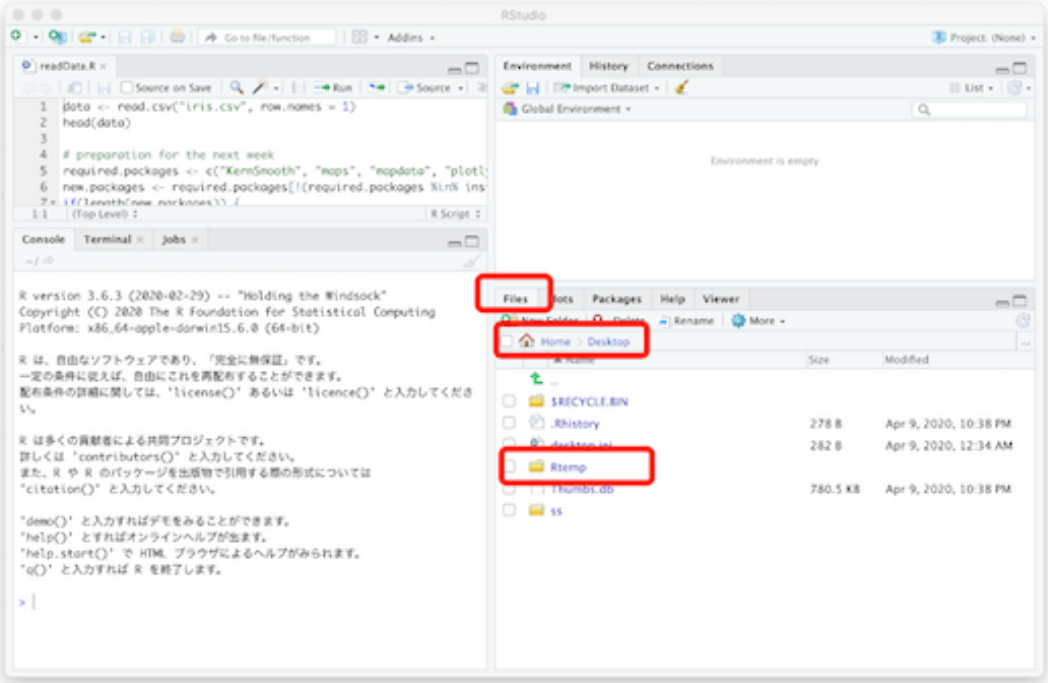
First, download the R code (readData.R) and data (iris.csv) from Google Drive below.

https://drive.google.com/drive/u/2/folders/160TTfRf0Lz9qxm8vLdciiaYZmSOZr9BL

Next, move these files somewhere in a folder (directory) that is easy to work with for you. Here, I assume that you create a folder called Rtemp on your desktop and saved the files in the folder.

You can designate this folder as a “Working Directory” in RStudio as follows:

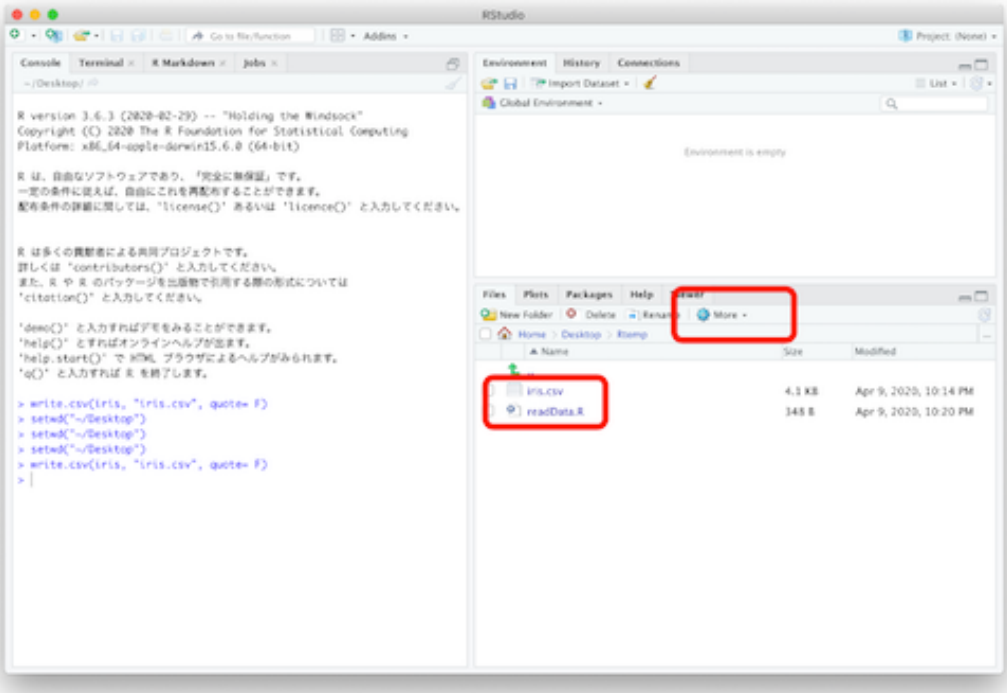
1. Click on the tab called “Files” in the lower right-hand corner of RStudio.



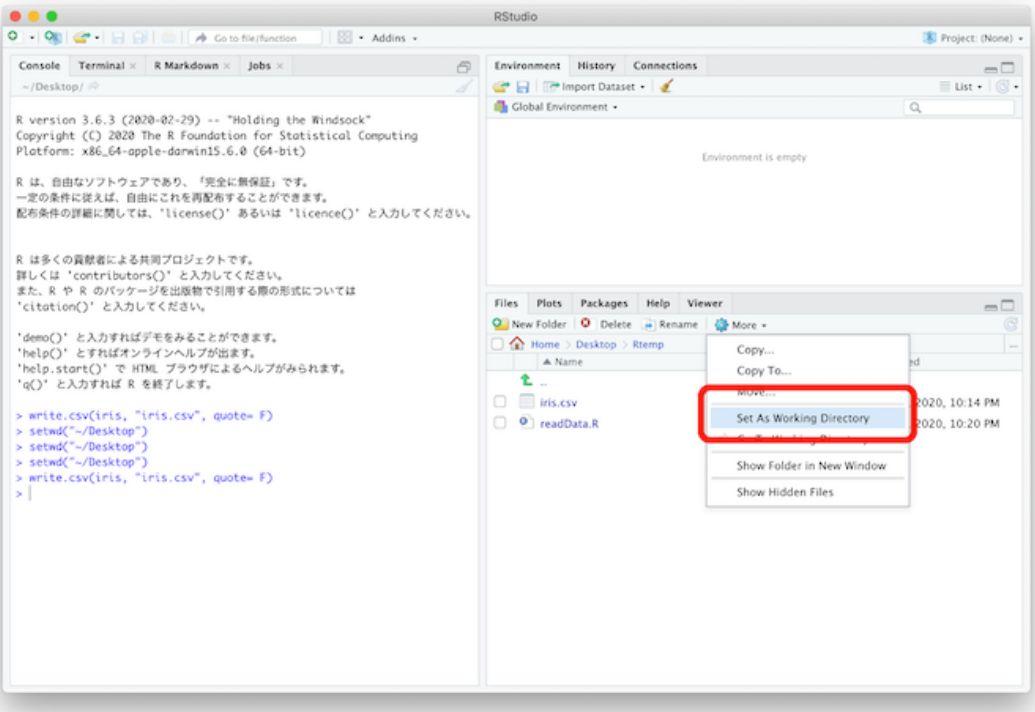
2. You can navigate to the various folders on your computer by clicking on a file path (here it is shown as “Home > Desktop”) or folders shown in the “Files” window.

3. Here we want to move to “Rtemp”, so click on “Rtemp”. You can see that there is the files of R-code and data that you have saved there.

4. Once you have moved to the location where the R-code or data exist, click on “More” (next to the gear-shaped icon).



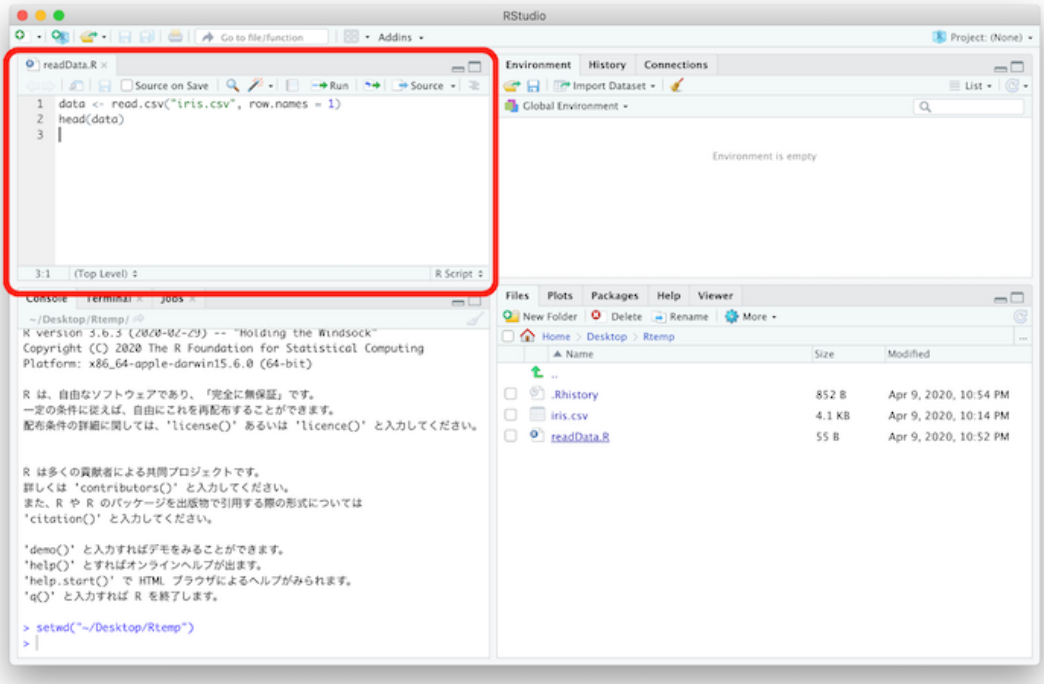
5. A drop down menu will then appear and select ‘Set As Working Directory’.



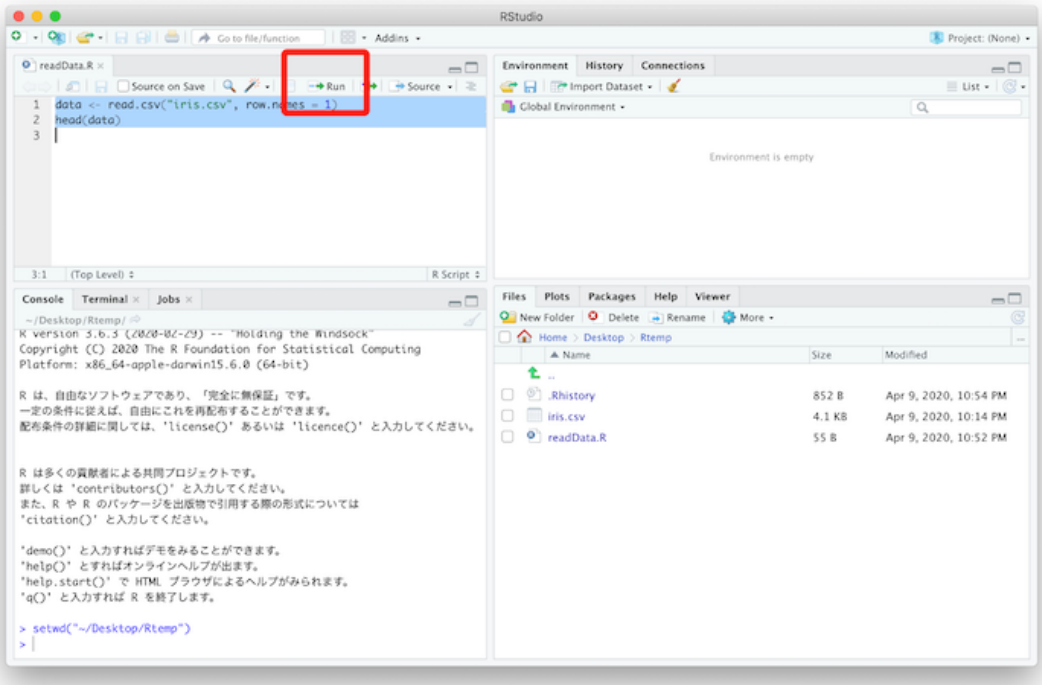
6. Now you designate a “Working Directory” to the “Rtemp” folder on your desktop.

This makes it easy to load data files to R.

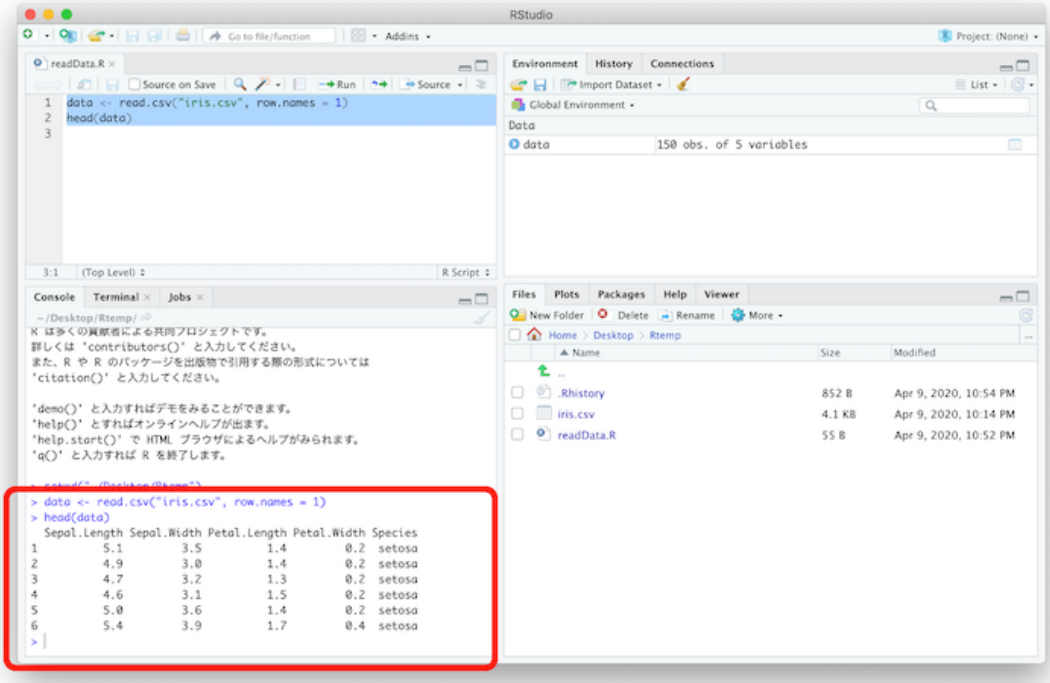
First, let's open the R code. If you click on the file "readData.R" in the "Files" window, you will see the code in the top left window.



Let's select the first two lines of this and run them. To run, click on "Run". Alternatively, you can use "command + return (enter)" on Mac OS and "cntl + enter (return)" on Windows.



If it runs successfully, you'll see the following result.



If you can do this far, there will be few issues in the class.