Data Science (CDA)

Getting Started with R

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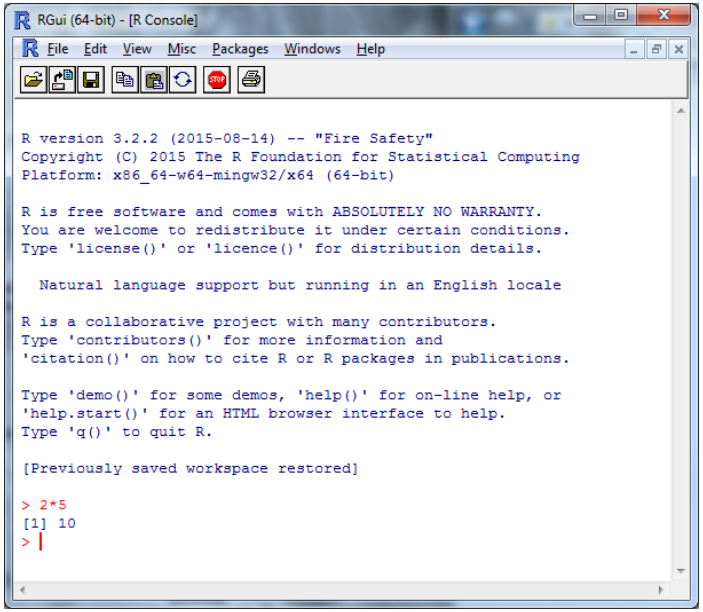
Introduction

- R is a powerful environment for statistical computing which runs on several platforms (Windows, Mac OS X, and Linux).
- R is available free of charge and is distributed under the terms of the Free Software Foundation's GNU General Public License. You can download the program from the Comprehensive R Archive Network (CRAN).
- R is an interpreted object oriented language.

The console

- To start R in the the Windows environment double click on the R icon.
  - The symbol '>' indicates that R is expecting a command.



- To quit R, close the window or type **q()** followed by enter at the prompt. Note the parentheses after the q: in R you don't type commands but rather call functions.

Interacting with the Interpreter

- The R Console can be used like a calculator:

```
> 3 * 5
[1] 15
> sqrt(100)
[1] 10
> log(100)
[1] 4.605
```

- The + prompt is used to indicate that R is waiting for more input. This allows you to break commands over
- ↑↓: navigate through your history with arrow keys.
- <ESC>: If things get messed up, press the escape key and try again.
- Ctrl-C: to stop execution or edition.

The Working Directory

- The working directory (wd) is where R find all files for reading and writing.

```
>getwd()   #get the current wd
```

- We can change the wd via the menu (depending on the platform)
  - *Misc→ Change Working Directory* (Mac)
  - *File →Change Working Directory* (Windows)
- Or using the function

```
>setwd()   #set the current wd
```


The Help in R

- To obtain information about a function, use the **help()** function.
- An alternative is to use the equivalent **?** operator, followed by the name of the function.
- Help can be displayed in a help window as a plain-text file, or as an HTML page in a web browser by using the command **help.start()**.
- A novel feature of the R help system is the facility it provides to execute most examples in the help pages via the **example** command. For instance, example(max), example(plot), …
- Other sources of help: R manuals, frequently-asked-questions (FAQ) lists, forums or mailing lists, …(https://stat.ethz.ch/mailman/listinfo/r-help, http://tolstoy.newcastle.edu.au/R/)

Save and Load Sessions

- User-defined variables and functions exist in R in a region of memory called the workspace. The R workspace can be saved during the session
  - *Workspace→ Save Workspace File* (Mac)
  - *File →Save Workspace File* (Windows)

  or even at the end of a session (when the quit() command is executed you will be asked whether you want to save the data from your R session).

- Data which is saved will be available in future R sessions:
  - *Workspace→ Load Workspace File* (Mac)
  - *File →Load Workspace File* (Windows)

- For convention, the saved files have the extension or file type .txt or .RData.

Editing and executing R files

- The Windows and Mac OS X implementations of R include basic programming or script editors to write our functions.
- You can open a new R script in the Windows *RGui* via the *File* → *New script* menu, or an existing script file via *File* → *Open script*. Similar *New Document* and *Open Document* selections are available under the Mac OS X *R.app File* menu.
- By convention, R script files have names that end with the extension or file type .R.
- An R script is executed by using the **source()** command (also available from the menu).

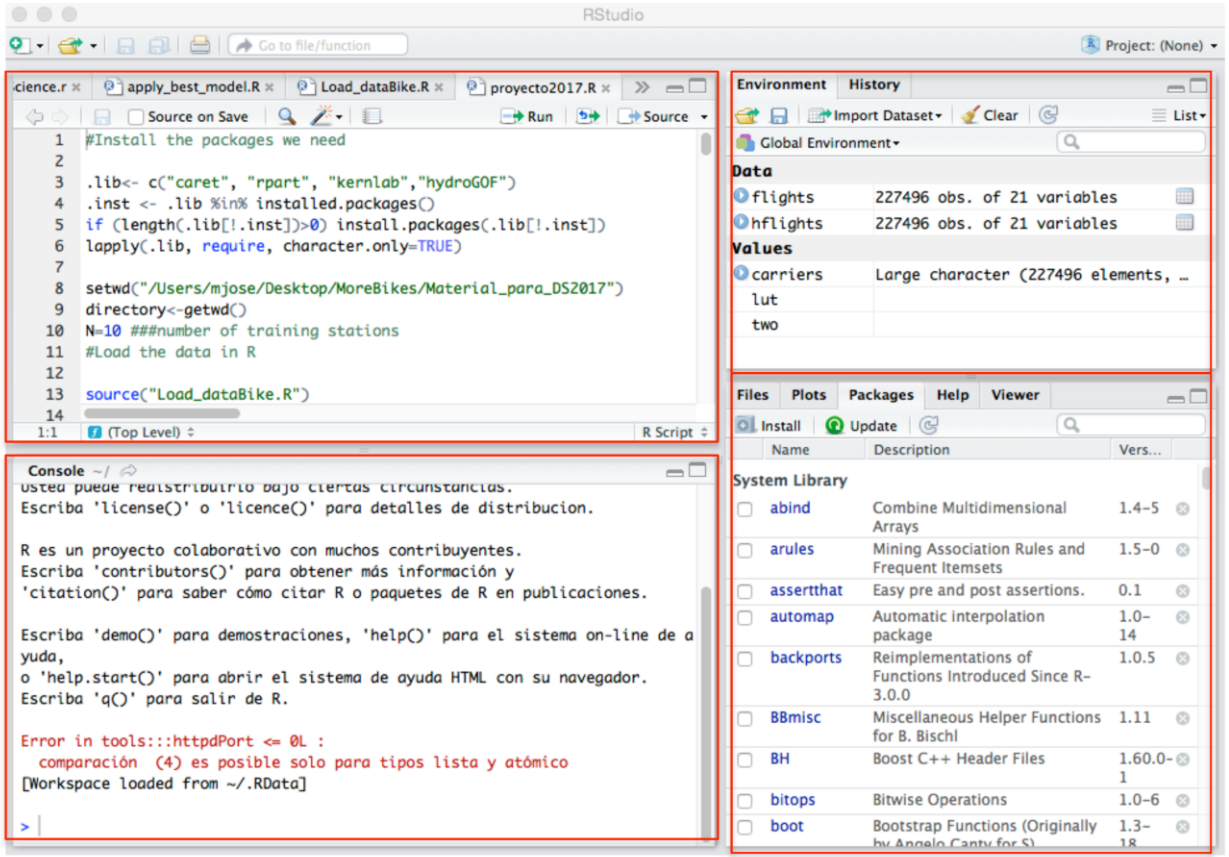
Packages

- Much of the power of R comes from the thousands of R packages containing code and data for specialised situations.
- The standard R installation comes with 8 packages.
- Probably, you will have to install the packages available at CRAN: http://cran.es.r-project.org/. It can be done
  - from the command line: **install.packages()**
  - from the menu: *Packages&Data →Package installer* (first the CRAN mirror is selected and then the package to be installed).
- To access the installed packages use the **library()** command

RStudio

- Rstudio is an integrated development environment (IDE) for R.
  - Rstudio is organised into four panes, some with multiple tabs.
  - Some of the important tabs include
    - Console: This is where you can execute R commands interactively.
    - Source Editor: for editing functions and files.
    - History: A record of past commands (can be saved, reloaded, etc.)
    - Workspace: A listing of the objects available in your R session
    - Plots: Where plots show up
    - Help: Where documentation files appear when you ask for them
    - Files: A file manager for locating, loading, moving, renaming, files.
    - Packages: Install and load packages here.
    - Open Files: Open files have a tab labeled with the file name.

RStudio



1

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4

1.View files and data (editor)

2. Workspace and history

3. Console

4. Files, plots, packages, help

Some facilities provided by RStudio

- You can inspect the installed packages in the **Packages tab**.
  - Check marks indicate that the package is loaded (i.e., usable).
  - Click on the install packages icon to search for packages and install them.
- In the **Workspace/Environment tab** you find tools to help you import data.
- The **Files tab** provides a simple interface for finding, opening, moving, renaming files.

- Version of Rstudio on the cloud: https://rstudio.cloud/

R Bibliography and references

There are many, many excellent resources for newcomers to R:

- On-Line Introductions, e-Books and Tutorials
  - http://cran.r-project.org/doc/manuals/R-intro.pdf
  - http://cran.r-project.org/doc/contrib/usingR.pdf
  - http://www.burns-stat.com/
  - http://en.wikibooks.org/wiki/R_Programming

- Books
  - R.D. Peng https://bookdown.org/rdpeng/rprogdatascience/ , 2020
  - L. Torgo. Data Mining with R. 2n Edition, 2017
- More references in Quick-R (http://www.statmethods.net/about/books.html)

R Bibliography and references

- More references:
  - Randall Pruim. Getting Started with Rstudio. http://www.calvin.edu/~rpruim/talks/Rminis/RStartingUp.pdf
  - John Verzani. Getting Started with Rstudio. O'Really 2011.
  - D.V. Conesa Guillén. Curso Introducción R: Sesión 1.
  - https://en.wikibooks.org/wiki/R_Programming

R Bibliography and references

- Interactive on-line courses
  - *swirl* is a software package that turns the R console into an interactive learning environment. Follow the instructions at http://swirlstats.com/students.html (Learn menu item) to install the swirl package and the interactive course of R.
  - Another introductory course of R can be found at https://www.datacamp.com/courses/free-introduction-to-r .

Through any of these courses (or both of them), you will become familiar with the R syntax, the different kinds of data (types) supported by R and how R programs are executed.