The R Software Environment

a (very) short introduction

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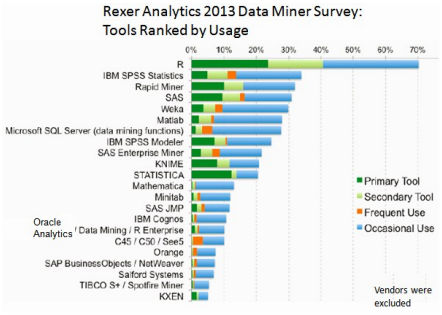
The R Project (http://www.R-project.org)

What is R?

- R is a programming language and environment for data analysis.
- It is a free and open source software tool.
  - Trustable software; reproducible and adaptable analysis
- One of the most used data analysis tools.
- Strong impact on both academia and industry



The R Project (cont.)

- Available for Windows, several Unix/Linux variants and Mac OS X.
- Command line interface
  - interactive data analysis
  - user writes R commands, hits ENTER and gets back the results
- Base installation comes with an impressive set of functionalities - can be extended by installing extra packages freely available at R site (currently more than 10000!)

R Origins

- The S language
  - Developed in the late 70's by John Chambers and collaborators at Bell Labs.
  - Went through several changes having stabilized around the mid 90's.
- Implementations of the S language
  - *S-Plus* - a commercial version of S.
  - *R* - a free and open source version of the S language created at the University of Auckland and currently developped by several researchers across the world.

Installation

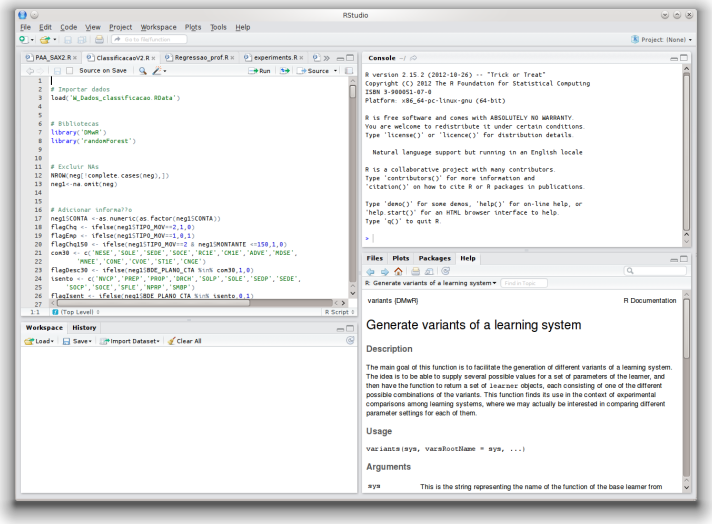
- Dependent on the host operating system
- Pre-compiled binaries available in R central repository (CRAN)
  - `http://cran.at.r-project.org/`
- Standard installation process similar to any other software

Installing R

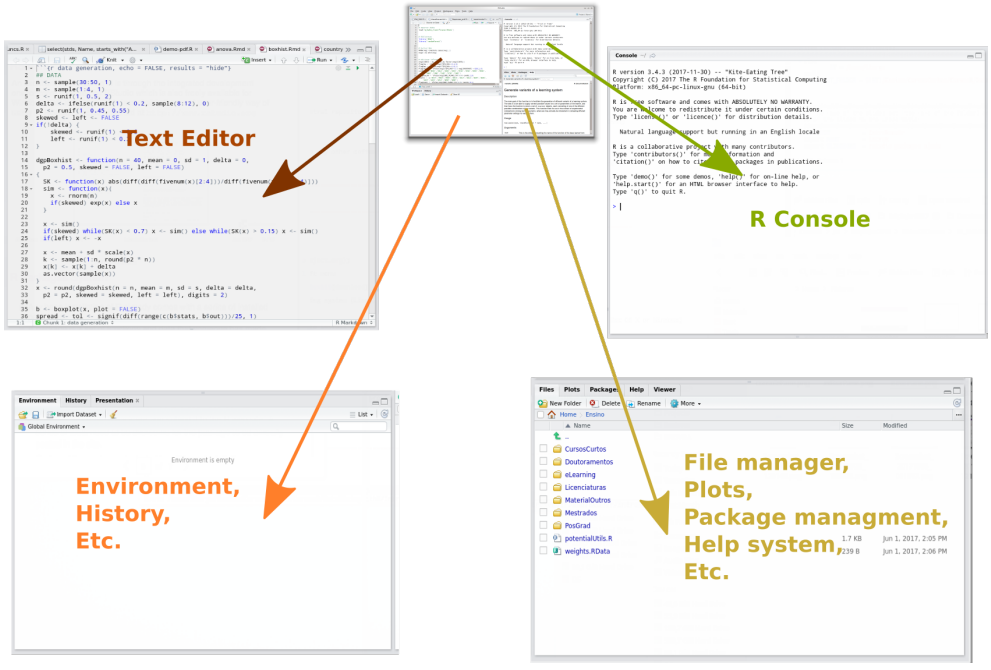
1. Go the R Web Site (`http://www.r-project.org`)
2. Follow the link **CRAN** on the left menu
3. Choose a repository to carry out the *download*
4. Click the *link* of your operating system (Linux, Mac OS X or Windows)
5. Follow the provided instructions
   - Note: on Linux it may be even easier to install directly from the repositories, though sometimes to get the latest version you do need to follow the instructions provided at CRAN

RStudio

An excellent way of using R is through the integrated development environment provided by RStudio which is also freely available for Windows, OS X e Linux. This is probably the most user-friendly way of using R. RStudio can be obtained at `http://www.rstudio.org`



RStudio Interface



RStudio Cheat Sheet: `https://github.com/rstudio/cheatsheets/raw/master/rstudio-ide.pdf`

R Packages System

- Any base installation of R already comes with a series of installed packages.
- A package is a set of functions and data that someone has made available to the community in a free and open source way.
- Anyone can create a package and submit it to the R web site. A series of tests need to be overcome for the package to be officially posted in the site.
- On top of the packages included in a R base installation you may install many other extra packages
- After this installation (done once), whenever you wish to use these extra packages you must tell that to R, which is done by *loading* the package.

R Packages System (cont.)

- Installation of new packages is done through the function *install.packages* as illustrated in the following example:

```
install.packages("DMwR")
```

- To start using the functionalities of a package which is *already installed in our computer* we may use the function `library`, e.g.

```
library("DMwR")
```

- In some environments menu entries may exist to help in these tasks

Obtaining Help in R

- At the command line:
  - Typing `? commandName` at the command line
  - Typing `help(commandName)` at the command line
  - Typing `help.search(subject)` at the command line
  - Typing `RSiteSearch(subject)` at the command line
- Using the HTML help system coming with R
  - You start it typing `help.start()`
  - In RStudio this is embedded in the integrated environment
- Reading some of the freely available books available at the R web site
- Asking a question in the R-help mailing list

Important: Do read the posting guide before asking questions
`http://www.r-project.org/posting-guide.html`

Some Books about R

- Adler, J. (2010): R in a nutshell. O'Reilly.
- Chambers, J. (2008): Software for Data Analysis, programming in R. Springer.
- Grolemund, G. ; Wickham, H. (2016): R for Data Science. O'Reilly. `http://r4ds.had.co.nz/`
- Peng, R. (2016): R Programming for Data Science. `https://bookdown.org/rdpeng/rprogdatascience/`
- Kuhn,M. and Johnson,K. (2013): Applied Predictive Modeling. Springer.
- Torgo, L. (2017): Data Mining with R, learning with case studies, 2nd edition. CRC Press.
- Wickham,H. (2014): Advanced R. The R Series. CRC Press. `http://adv-r.had.co.nz/`
- Book Series on R from major publishers
  - *Use R!* - Springer
  - *The R Series* - CRC press