

Introduction to R

Supplementary information
“Introduction to Multivariate Analysis with R”

What is R?

- According to Kabacoff (R in Action – Data Analysis and Graphics with R):
 - R is a programming language for statistical computation and the creation of high-quality graphics. R is open source and currently many researchers use R for both data analyses as well as scientific studies (for example, development of new packages)
 - <http://www.r-project.org>

Why R?

- 1) Open source software – free!
- 2) Comprehensive program for scientific studies and statistical analyses
- 3) Strong suite of graphical tools
- 4) Ability to handle data that come from a variety of sources :excel, .txt, SAS, SPSS...
- 5) In general, it offers us the most up-to-date statistical methods
- 6) Different platforms exist: Windows, Unix/Linux, Mac

Obtaining R

<http://www.r-project.org>

The R Project for Statistical Computing

PCA 3 steps
Clustering 4 groups
Factor 1 (41%)
Factor 3 (19%)

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:

- R version 2.15.1 (Roasted Marshmallows) has been released on 2012-06-22.
- The R Journal Vol.4/3 is available.
- useR! 2012 took place at Vanderbilt University, Nashville Tennessee, USA, June 12-15, 2012.
- useR! 2013 will take place at the University of Castilla-La Mancha, Albacete, Spain, July 10-12 2013.

This server is hosted by the [Institute for Statistics and Mathematics of the WU Wien](#).

Mirror sites



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CRAN MIRRORS

The Comprehensive R Archive Network is available at the following URLs, please choose a location close to you. Some statistics on the status of the mirrors can be found here: [main page](#), [windows release](#), [windows old release](#).

<p>Argentina http://mirror.facpa.unlp.edu.ar/CRAN/ http://mirror.mendoza-conicet.gov.ar/</p> <p>Australia http://mirror.csiro.au/ http://cra.au.unimelb.edu.au/</p> <p>Austria http://cra.at.r-project.org/</p> <p>Belgium http://www.froststatika.org/cran/</p> <p>Brazil http://cra.r.cbl.ufpe.br/ http://cra.focuz.br/ http://www.zen.demon.sp.br/CRAN/ http://bricger.mak.usp.br/CRAN/</p> <p>Canada http://cra.stat.utsa.ca/ http://mirror.its.dal.ca/cran/ http://probability.ca/cran/ http://cra.shahinfores.com/ http://cran.parovoxamerica.com/</p> <p>Chile http://dickbot.net/puc.cl/</p> <p>China http://ftp.oss.org/mirrors/CRAN/ http://cra.cnet.cn/ http://mirror.kdpu.edu.cn/cran/ http://cra.dongguan.cn/ http://mirrors.usc.edu.cn/CRAN/ http://mirrors.xmu.edu.cn/CRAN/</p> <p>Colombia http://www.ingeniaria.edu.co/CRAN/ http://www.icei.edu.co/CRAN/</p> <p>Denmark http://mirrors.dtu.dk/cran/</p> <p>Ecuador http://cra.espol.edu.ec/</p> <p>France http://cra.cict.fr/ http://cra.univ-bordeaux.fr/ http://mirror.bep.fr/pub/CRAN/</p> <p>Germany http://mirrors.sfb.tu-berlin.de/cran/ http://ftp5.gwdg.de/pub/mirrors/cran/ http://ftp.sbwv.org/cran/</p>	<p>Universidad Nacional de La Plata CONICET Mendoza</p> <p>CSIRO University of Melbourne</p> <p>Wirtschaftsuniversität Wien K.U. Leuven Association</p> <p>Universidade Federal do Paraná Oswaldo Cruz Foundation, Rio de Janeiro University of São Paulo, São Paulo University of São Paulo, Piracicaba</p> <p>Simon Fraser University, Burnaby Dalhousie University, Halifax University of Toronto PWeb, Montreal PWeb, Montreal</p> <p>Pontificia Universidad Católica de Chile, Santiago</p> <p>CTEX.ORG Computer Network Information Center, CAS, Beijing Beijing Jiaotong University, Beijing Tsinghua University, Beijing University of Science and Technology of China Xiamen University</p> <p>National University of Colombia Icei University</p> <p>dotnet.org, Aalborg</p> <p>Escuela Superior Politécnica del Litoral</p> <p>CICT, Toulouse Dept. of Botany & Evol. Biology, University of Lyon CNRS IBCP, Lyon</p> <p>Sfb340, Berlin GWDG Goettingen Yale CCRB, Wadsworth</p>
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Obtaining R – selecting system type



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The Comprehensive R Archive Network

download and install R

Precompiled binary distributions of the base system and contributed packages, **Windows** and **Mac** users most likely want one of these versions of R:

- Download R for Linux
- Download R for MacOS X
- Download R for Windows

Para: Linux, Mac y Windows

R is part of many Linux distributions, you should check with your Linux package management system in addition to the link above.

Source Code for all Platforms

Windows and Mac users most likely want to download the precompiled binaries listed in the upper box, not the source code. The sources have to be compiled before you can use them. If you do not know what this means, you probably do not want to do it!

- The latest release (2012-06-22, Roasted Marshmallows): [R 2.15.1 tar.gz](#), read [what's new](#) in the latest version.
- Sources of [R alpha](#) and [beta releases](#) (daily snapshots, created only in time periods before a planned release).
- Daily snapshots of current patched and development versions are [available here](#). Please read about [new features](#) and [bug fixes](#) before filing corresponding feature requests or bug reports.
- Source code of older versions of R is [available here](#).
- Contributed extension packages

Questions About R

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What are R and CRAN?

R is 'GNU S', a freely available language and environment for statistical computing and graphics which provides a wide variety of statistical and graphical techniques: linear and nonlinear modelling, statistical tests, time series analysis, classification, clustering, etc. Please consult the [R project homepage](#) for further information.

CRAN is a network of ftp and web servers around the world that store identical, up-to-date, versions of code and documentation for R. Please use the CRAN mirror nearest to you to minimize network load.

Submitting to CRAN

To "submit" to CRAN, check that your submission meets the [CRAN Repository Policy](#), upload to <ftp://CRAN.R-project.org/incoming> and send email to CRAN@R-project.org. Please do not attach submissions to emails, because this will clutter up the mailboxes of half a dozen people.

Note that we generally do not accept submissions of precompiled binaries due to security reasons. All binary distribution listed above are compiled by selected maintainers, who are in charge for all binaries of their platform, respectively.

Functions

It is possible to examine a function, and if you wish, modify the function to realize the desired analysis

Example from the package, *agricolae* (Source: Centro Internacional de la Papa (CIP))

```
> audpc
function (evaluation, dates, type = "absolute")
{
  n <- length(dates)
  k <- ncol(evaluation)
  if (n != k) {
    cat("Error:\nThe number of dates of evaluation \nmust agree with the number of evaluations\n")
    return()
  }
  audpc <- 0
  area.total <- 100 * (dates[n] - dates[1])
  for (i in 1:(n - 1)) {
    audpc <- audpc + (evaluation[, i] + evaluation[, i + 1]) * (dates[i + 1] - dates[i])/2
  }
  if (type == "relative")
    audpc <- audpc/area.total
  if (type == "absolute" | type == "relative") {
    return(audpc)
  }
  else cat("Error: type is 'absolute' or 'relative'\n\n")
}
<environment: namespace:agricolae>
```

“Help”

When you would like to learn more about a function, or simply are stuck!

help()

For example, considering the mean:

help(mean)

?mean

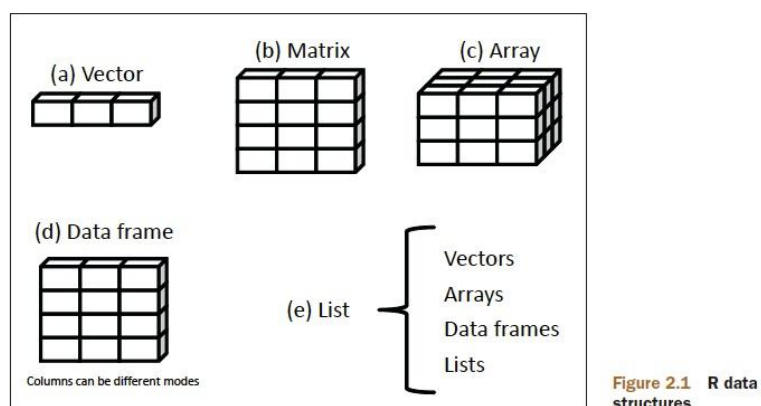
help.search("mean")

Libraries (packages)

<http://cran.r-project.org/web/packages>

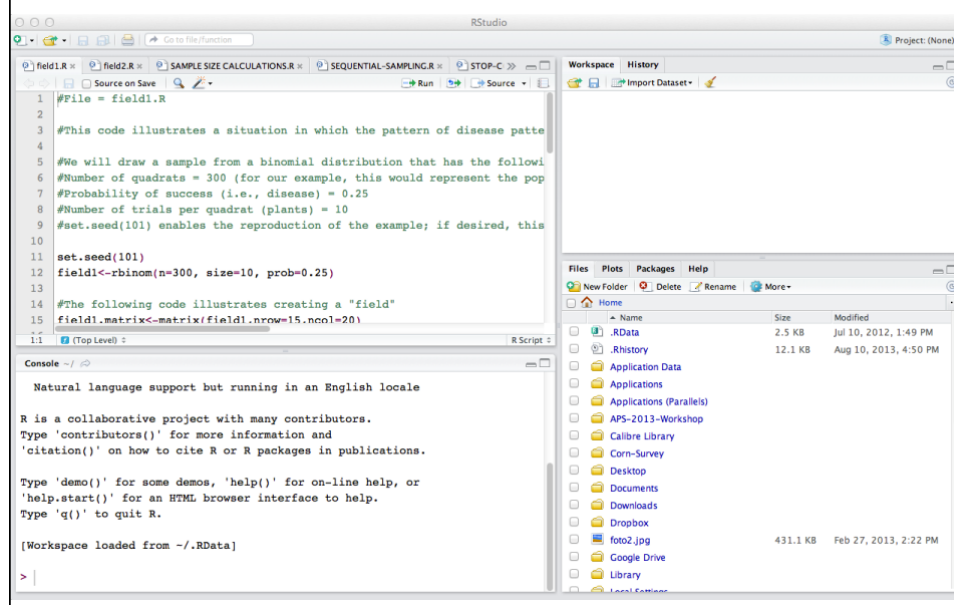
Here you can find a collection of functions, example datasets, and code provided by different researchers and authors

Data structures - R



Fuente. Kabacoff, R in Action - Data Analysis and Graphics with R

Rstudio: <http://www.rstudio.com>



Why Rstudio?

- 1) General version = free
- 2) Interactively works with R and graphical tools
- 3) Enables on to organize commands and code, and maintain multiple projects
- 4) Provides a mechanism for reproducible research
- 5) Allows you obtain and maintain packages of interest
- 6) Develop and share reports (documents, presentations, web-based)

General resources

- <http://www.statmethods.net>
- <http://journal.r-project.org>
- <http://www.ats.ucla.edu/stat/r/>
- Github, for example:
 - <https://github.com/trending?l=R>