



UNIVERSIDAD  
DE GRANADA

# INTRODUCCION A R

---

Dpt. Ciencias de la Computación e Inteligencia Artificial,  
Universidad de Granada

Dept. Molecular Biophysics, German Cancer Research Center Heidelberg, Alemania

# Index

- Introduction to R
  - Rstudio
  - Input Data with Rstudio
- Getting Started - R Console
- Data types and Structures
  - Vectors
  - Missing and special values
  - Matrices and Arrays
  - Factors
  - Lists
  - Data frames
- Tidyverse

# Statistic Software— why R ?

- Open Source Language version of S+ (<http://cran.R-project.org>)
- First announcement of R to the public in 1993
- R is an advance *statistical language.*
  - Syntax very similar to S
  - Cross-Plataform compatible: It runs on Windows, Unix and MacOS .
  - Frequent releases and active development community:
    - R-help
    - R-devel mailing lists
    - Stack Overflow mailing lists
    - **CRAN** or Comprehensive R Archive Network (4000 packages)

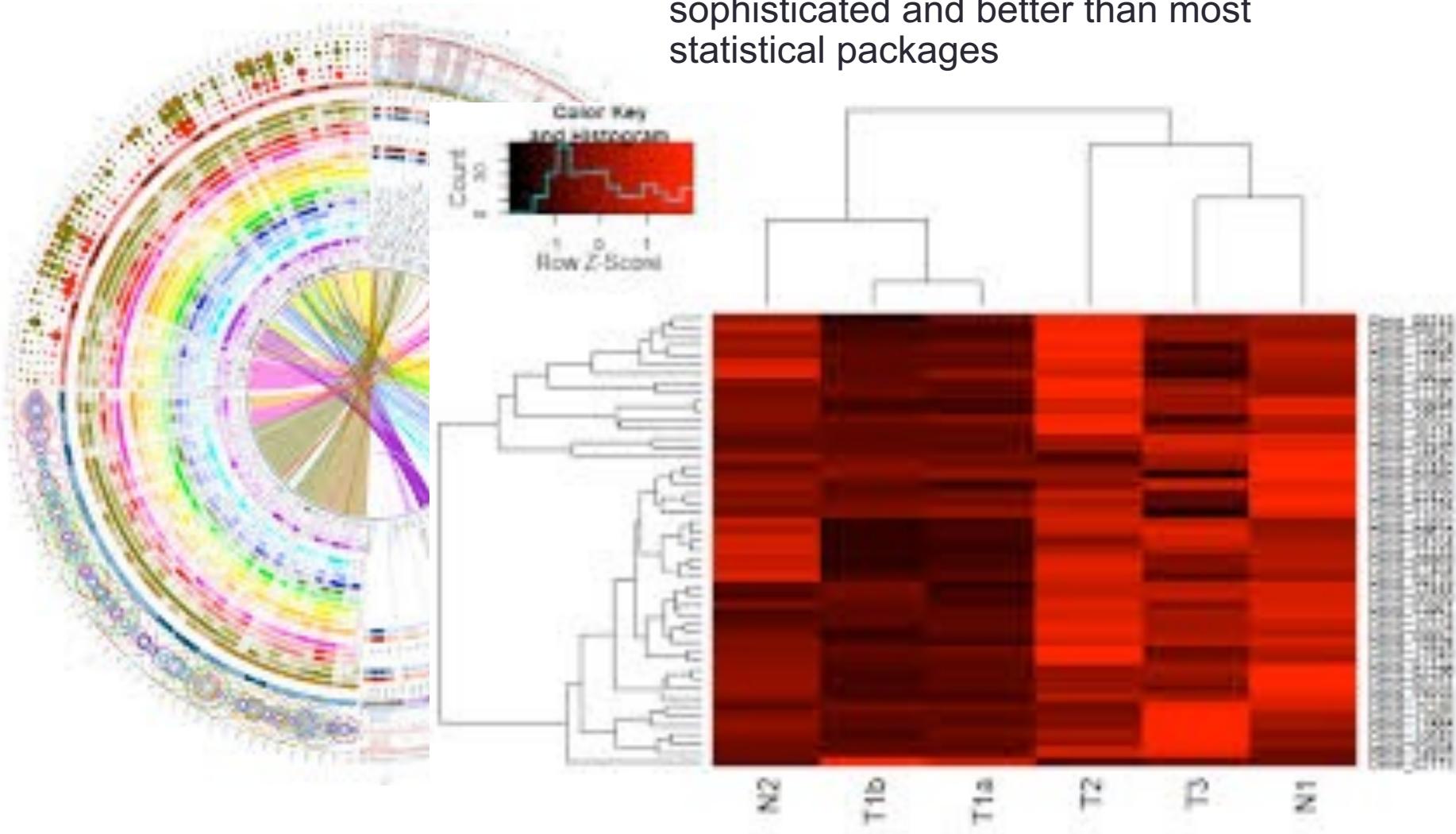
# Characteristics of the R language

- It can perform any common statistical functions and contains *advanced statistical* routines
- *Supports extensions*
- It provides an unparalleled platform for programming new statistical methods as libraries (parallel, OpenBLAS, Intel MKL, NVIDIA cuBLAS, Open MP multithreading, H2O.ai)
- R is an *interpreted language* and does not need a compiler. It generates a machine-independent code that is easy to debug and is highly portable.
- It supports *matrix arithmetic*.
- R is *compatible* with many other programming languages like C, C++, Java, Python, etc.
- It is *interactive*, web application package RShiny



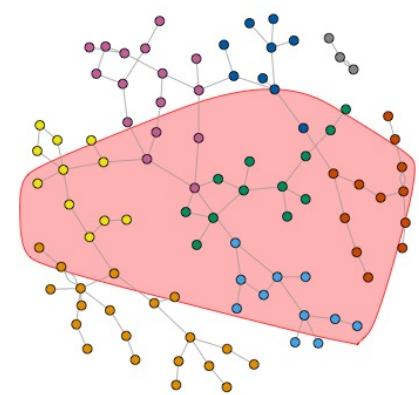
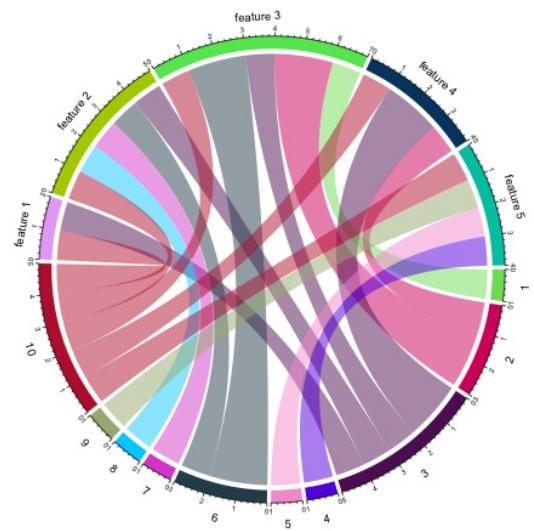
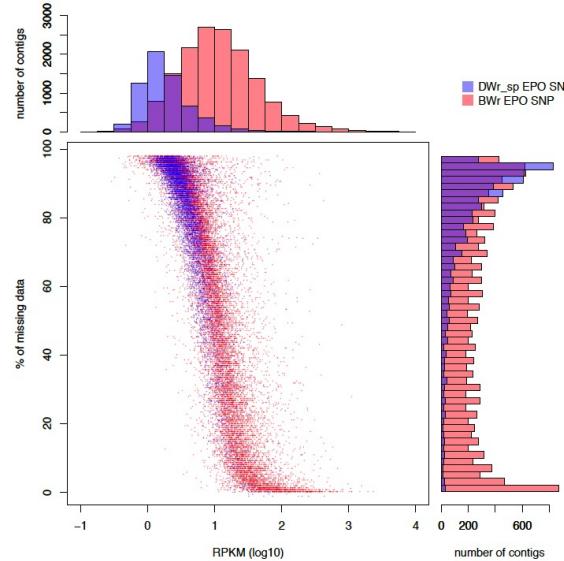
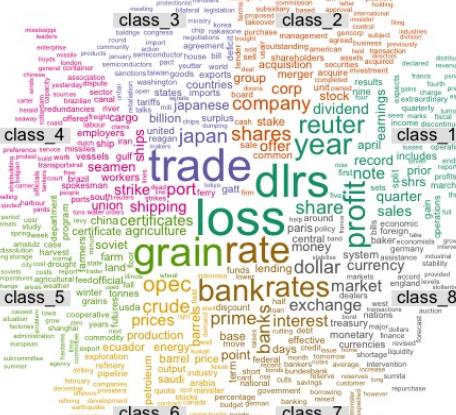
# Why R?

- Graphical capabilities are very sophisticated and better than most statistical packages



# R-graph Gallery

- <http://www.r-graph-gallery.com/portfolio/ggplot2-package/>

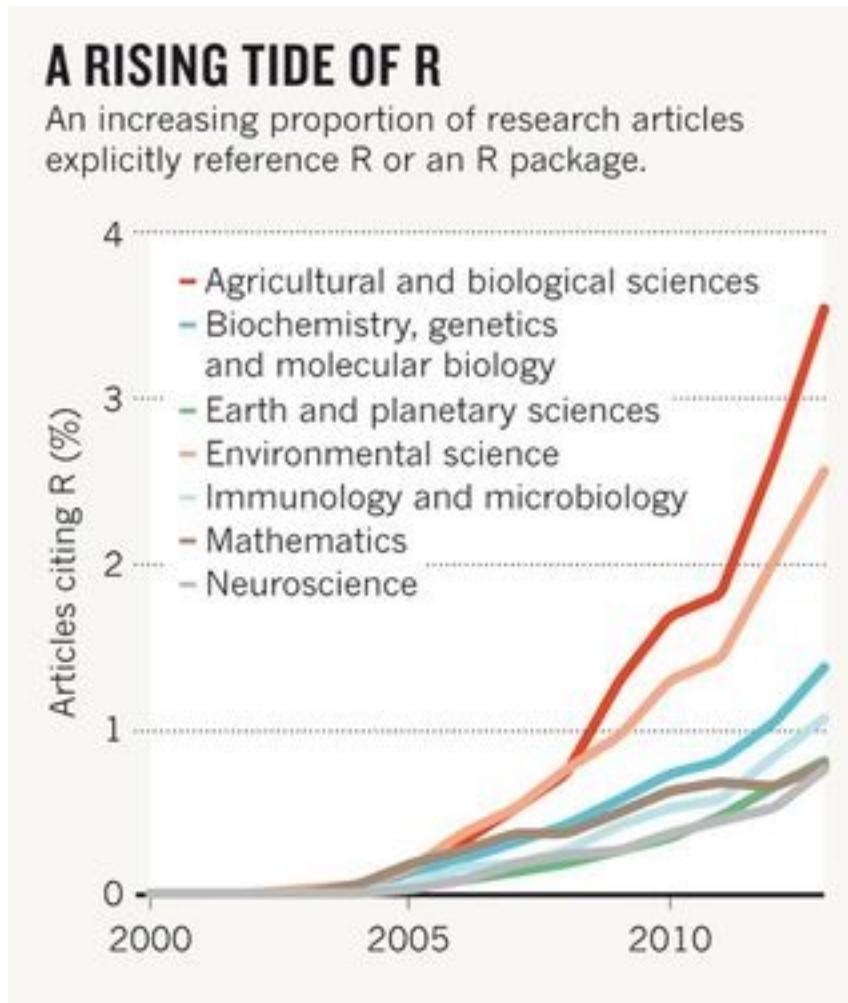


# A particular R strength: genetics

- Bioconductor (<http://bioconductor.org>)
- It is a suite of additional functions and more than 2042 packages dedicated to analysis, visualization, and management of genetic data

The screenshot shows the Bioconductor website homepage. At the top, there is a dark blue header bar with the Bioconductor logo (a stylized DNA helix icon) and the text "OPEN SOURCE SOFTWARE FOR BIOINFORMATICS". To the right of the logo are navigation links: Home (highlighted in yellow), Install, Help, Developers, and About. A search bar is located in the top right corner. Below the header, there are several sections: "About Bioconductor" (with a brief description and a link to the release schedule), "Install" (with links to software packages and Docker images), "Learn" (with links to courses, support sites, and videos), "News" (with a list of recent announcements), "Use" (with links to bioinformatic solutions, software packages, and developer resources), and "Develop" (with links to developer resources, package guidelines, and build reports). The main content area has a light gray background with white boxes for each section.

# Research areas where R had a greater grow in the last years



Article: <https://www.r-bloggers.com/2014/12/r-in-nature-mashable/>

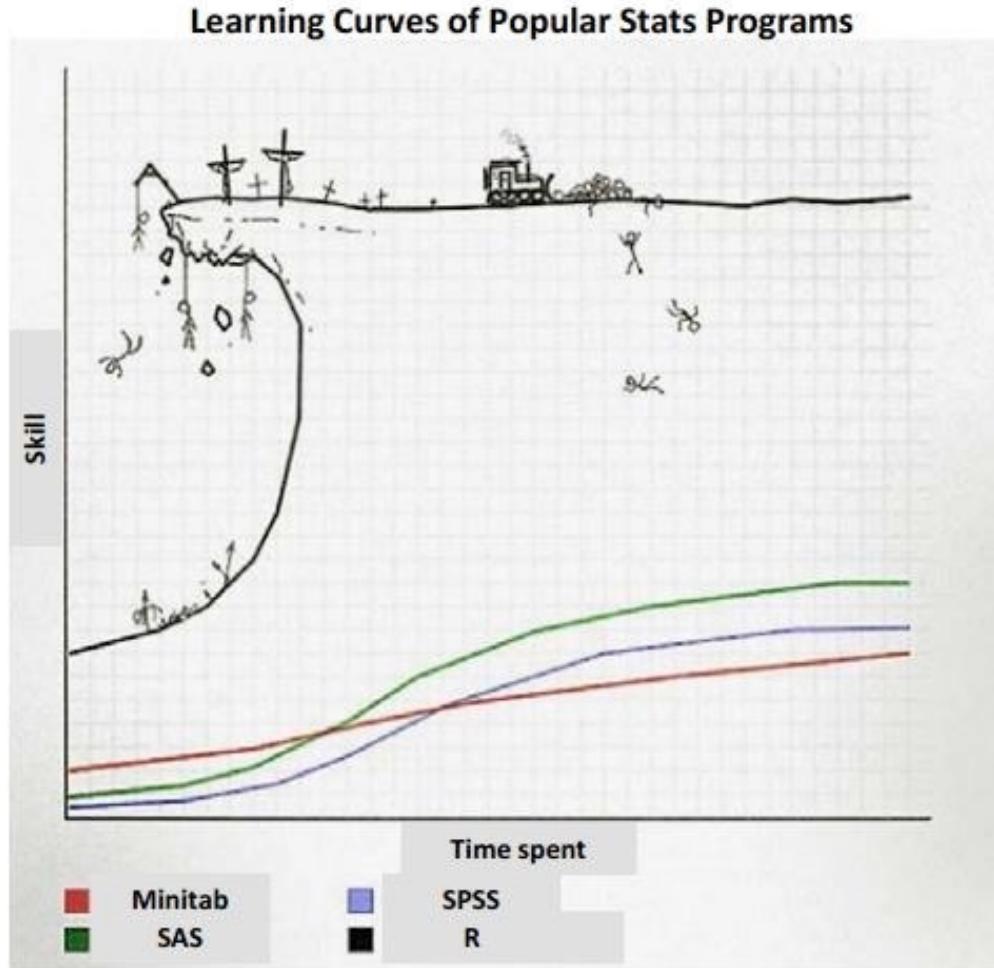


# Puntos débiles

- No es intuitivo ni fácil de usar al principio
- No tiene asistencia comercial
- La calidad de algunos paquetes y su mantenimiento deja que desear y hay muchas dependencias
- Bastante más lento que otros lenguajes de programación (e.g. Perl, Java, C++). No está diseñado para Big data
- Problemas de memoria (memory bound)



# Curva de aprendizaje de R

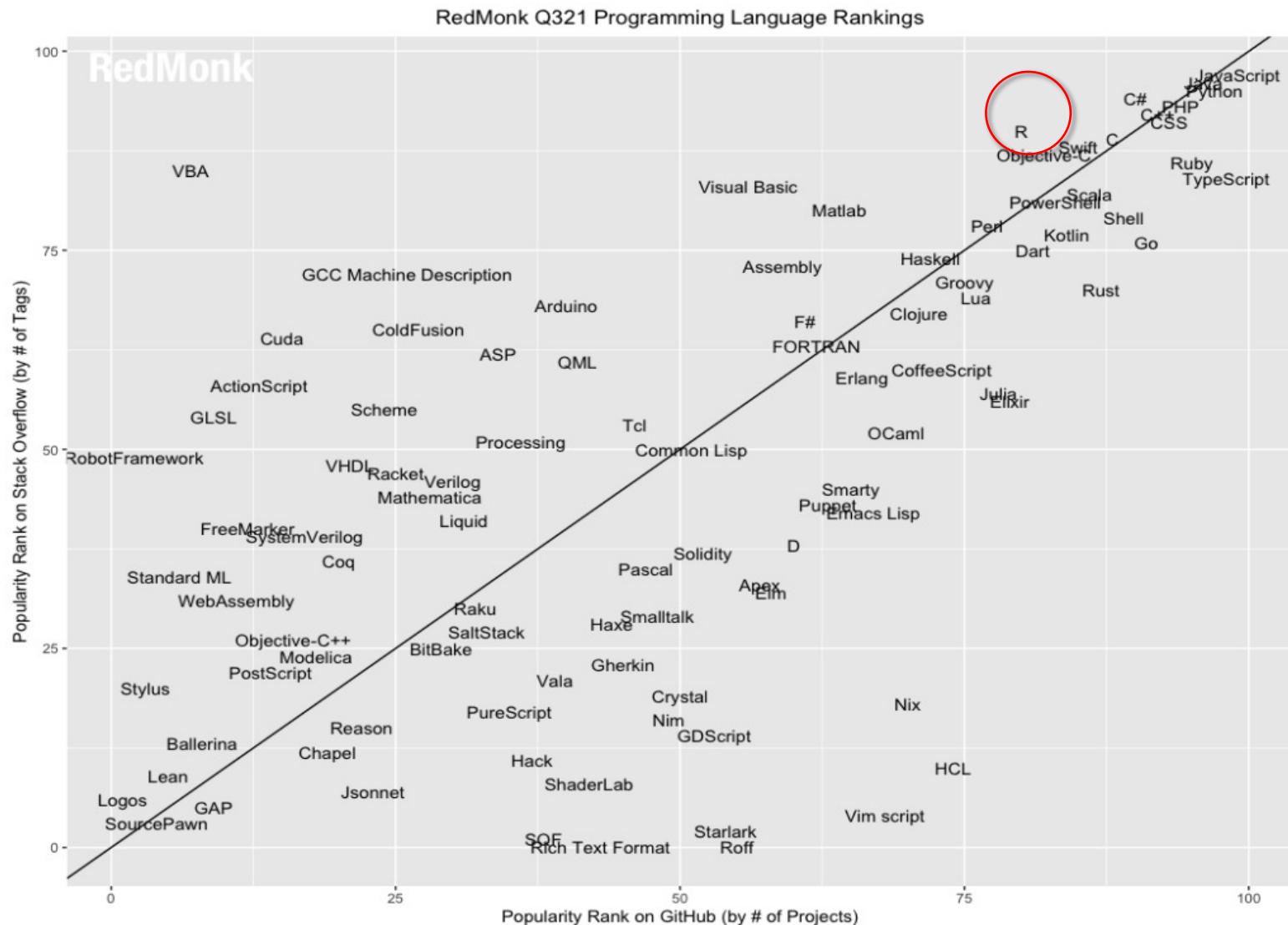


<https://mobile.twitter.com/rogierK/status/730863729420701697/photo/1>

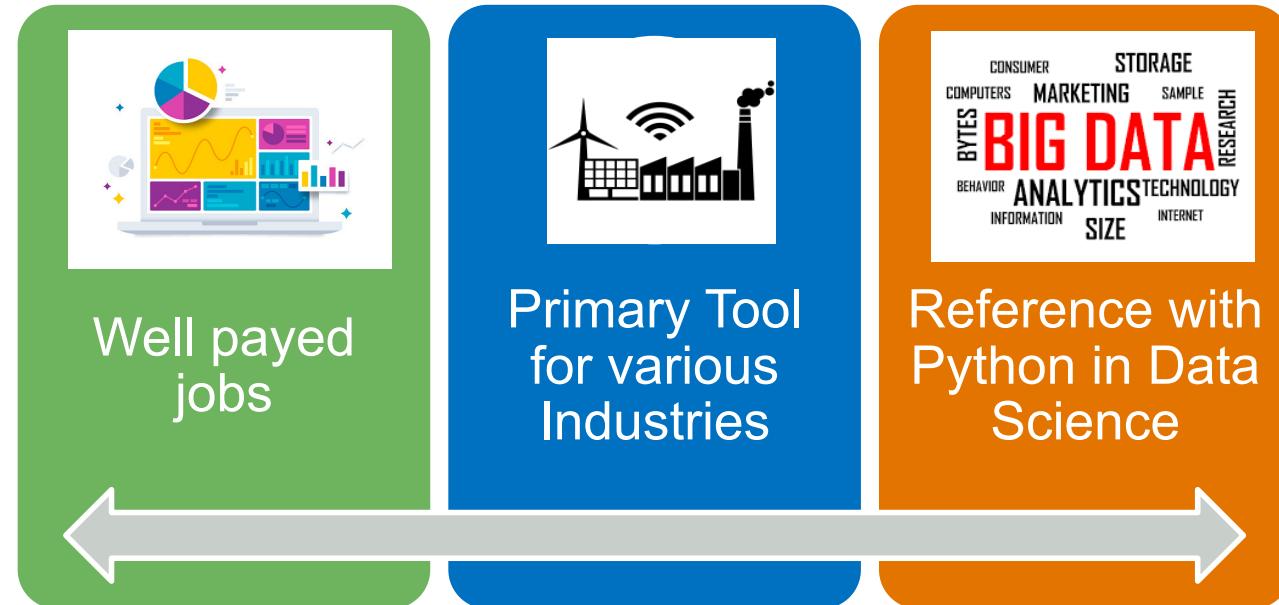
<http://www.vayapotra.es/wordpress/wp-content/uploads/2009/02/2rmqi6o.gif>

<http://redmonk.com/sogrady/2017/06/08/language-rankings-2021/>

# Use of R



# Why R ?



Data scientist  
Data Analyst  
Business Analyst

Healthcare  
Finance  
Manufacturing  
IT, E-commerce  
Academic research  
Banking  
Energy sector

Machine Learning  
Data Science  
Data Visualization

Pero todo esfuerzo tiene su premio:



## Companies that use R for Analytics



BANK OF AMERICA



From:  
<https://www.quora.com/Is-the-R-programming-language-useful>

# R <https://www.r-project.org/>



[Home]

## Download

[CRAN](#)

## R Project

[About R](#)

[Logo](#)

[Contributors](#)

[What's New?](#)

[Reporting Bugs](#)

[Development Site](#)

[Conferences](#)

[Search](#)

## R Foundation

[Foundation](#)

[Board](#)

[Members](#)

[Donors](#)

[Donate](#)

Documentation:  
Manuals

## Help With R

[Getting Help](#)

# 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 8/1](#) is available.
- The [useR! 2017](#) conference will take place in Brussels, July 4 - 7, 2017, and details will appear here in due course.
- [R version 3.3.1 \(Bug in Your Hair\)](#) has been released on Tuesday 2016-06-21.
- [R version 3.2.5 \(Very, Very Secure Dishes\)](#) has been released on 2016-04-14. This is a rebadging of the quick-fix release 3.2.4-revised.
- **Notice XQuartz users (Mac OS X)** A security issue has been detected with the Sparkle update mechanism used by XQuartz. Avoid updating over insecure channels.
- The [R Logo](#) is available for download in high-resolution PNG or SVG formats.

# Manuales de R

## The R Manuals

edited by the R Development Core Team.

The following manuals for R were created on Debian Linux and may differ from the manuals for Mac or Windows on platform-specific pages, but most parts will be identical for all platforms. The correct version of the manuals for each platform are part of the respective R installations. The manuals change with R, hence we provide versions for the most recent released R version (R-release), a very current version for the patched release version (R-patched) and finally a version for the forthcoming R version that is still in development (R-devel).

Here they can be downloaded as PDF files, EPUB files, or directly browsed as HTML:

### Manual

**An Introduction to R** is based on the former "Notes on R", gives an introduction to the language and how to use R for doing statistical analysis and graphics.

**R Data Import/Export** describes the import and export facilities available either in R itself or via packages which are available from CRAN.

### R Installation and Administration

**Writing R Extensions** covers how to create your own packages, write R help files, and the foreign language (C, C++, Fortran, ...) interfaces.

A draft of **The R language definition** documents the language *per se*. That is, the objects that it works on, and the details of the expression evaluation process, which are useful to know when programming R functions.

**R Internals**: a guide to the internal structures of R and coding standards for the core team working on R itself.

### R-release

[HTML](#) | [PDF](#) | [EPUB](#)    [HTML](#) | [PDF](#) | [EPUB](#)    [HTML](#) | [PDF](#) | [EPUB](#)

### R-patched

[HTML](#) | [PDF](#) | [EPUB](#)    [HTML](#) | [PDF](#) | [EPUB](#)    [HTML](#) | [PDF](#) | [EPUB](#)

### R-devel

[HTML](#) | [PDF](#) | [EPUB](#)    [HTML](#) | [PDF](#) | [EPUB](#)    [HTML](#) | [PDF](#) | [EPUB](#)

[HTML](#) | [PDF](#) | [EPUB](#)    [HTML](#) | [PDF](#) | [EPUB](#)    [HTML](#) | [PDF](#) | [EPUB](#)

[HTML](#) | [PDF](#) | [EPUB](#)    [HTML](#) | [PDF](#) | [EPUB](#)    [HTML](#) | [PDF](#) | [EPUB](#)

[HTML](#) | [PDF](#) | [EPUB](#)    [HTML](#) | [PDF](#) | [EPUB](#)    [HTML](#) | [PDF](#) | [EPUB](#)

# R <https://www.r-project.org/>



[Home]

## Download

[CRAN](#)

## R Project

[About R](#)

[Logo](#)

[Contributors](#)

[What's New?](#)

[Reporting Bugs](#)

[Development Site](#)

[Conferences](#)

[Search](#)

## R Foundation

[Foundation](#)

[Board](#)

[Members](#)

[Donors](#)

[Donate](#)

## Help With R

[Getting Help](#)

# 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 8/1](#) is available.
- The [useR! 2017](#) conference will take place in Brussels, July 4 - 7, 2017, and details will appear here in due course.
- [R version 3.3.1 \(Bug in Your Hair\)](#) has been released on Tuesday 2016-06-21.
- [R version 3.2.5 \(Very, Very Secure Dishes\)](#) has been released on 2016-04-14. This is a rebadging of the quick-fix release 3.2.4-revised.
- **Notice XQuartz users (Mac OS X)** A security issue has been detected with the Sparkle update mechanism used by XQuartz. Avoid updating over insecure channels.
- The [R Logo](#) is available for download in high-resolution PNG or SVG formats.

# How to install R? Unix sources, binaries and documentation for R can be obtained via CRAN,



[About R](#)  
[What is R?](#)  
[Contributors](#)  
[Screenshots](#)  
[What's new?](#)

[Download, Packages](#)  
[CRAN](#)  
  
[R Project Foundation](#)  
[Members & Donors](#)  
[Mailing Lists](#)  
[Bug Tracking](#)  
[Developer Page](#)  
[Conferences](#)  
[Search](#)

[Documentation Manuals](#)  
[FAQs](#)  
[The R Journal](#)  
[Wiki](#)  
[Books](#)  
[Certification](#)  
[Other](#)

[Misc](#)  
[Bioconductor](#)  
[Related Projects](#)  
[User Groups](#)  
[Links](#)

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](#).

## Argentina

<http://mirror.fcaglp.unlp.edu.ar/CRAN/>  
<http://r.mirror.mendoza-conicet.gob.ar/>

## CRAN Mirrors

Universidad Nacional de La Plata  
CONICET Mendoza

## Australia

<http://cran.csiro.au/>  
<http://cran.ms.unimelb.edu.au/>

CSIRO

## Austria

<http://cran.at.r-project.org/>

## Belgium

<http://www.fr.ac.nz/CRAN/>

## Brazil

<http://cran-r.c3sl.ufpr.br/>  
<http://cran.fiocruz.br/>  
<http://www.vps.fmvz.usp.br/CRAN/>  
<http://brieger.esalq.usp.br/CRAN/>

Universidade Federal do Parana  
Oswaldo Cruz Foundation, Rio de Janeiro  
University of Sao Paulo, Sao Paulo  
University of Sao Paulo, Piracicaba

## Canada

<http://cran.stat.sfu.ca/>  
<http://mirror.its.dal.ca/cran/>  
<http://probability.ca/cran/>  
<http://cran.skazkaforyou.com/>  
<http://cran.parentingamerica.com/>

Simon Fraser University, Burnaby  
Dalhousie University, Halifax  
University of Toronto  
iWeb, Montreal  
iWeb, Montreal

## Chile

<http://dirichlet.mat.puc.cl/>

Pontificia Universidad Catolica de Chile, Santiago

## China

<http://ftp.ctex.org/mirrors/CRAN/>  
<http://cran.csdb.cn/>  
<http://mirrors.ustc.edu.cn/CRAN/>  
<http://mirrors.geoexpat.com/cran/>  
<http://mirrors.xmu.edu.cn/CRAN/>

CTEX.ORG  
Computer Network Information Center, CAS, Beijing  
University of Science and Technology of China  
GeoExpat.Com  
Xiamen University

## Colombia

<http://www.laqee.unal.edu.co/CRAN/>

National University of Colombia

## Denmark

<http://mirrors.dotsrc.org/cran/>

dotsrc.org, Aalborg

## France

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

Selecciona un servidor



Windows and Mac OS. To  
[s to frequently asked](#)

RAN. Binaries will arrive in



The CRAN logo features a large blue 'R' inside a grey circle.

<https://ftp.cixug.es/CRAN/>

[r-project](#)

## 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 \(Mac\) OS X](#)
- [Download R for 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 (Thursday 2017-09-28, Short Summer) [R-3.4.2.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

- 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.

# Instalación de R para windows

<https://cran.r-project.org/doc/manuals/R-admin.html#Installing-R-under-Windows>

## 3 Installing R under Windows

The `bin/windows` directory of a CRAN site contains binaries for a base distribution and a large number of add-on packages from CRAN to run on 32- or 64-bit Windows (XP or later) on ‘`ix86`’ and ‘`x86_64`’ CPUs.

Your file system must allow long file names (as is likely except perhaps for some network-mounted systems). If it doesn’t also support conversion to short name equivalents (a.k.a. DOS 8.3 names), then R *must* be installed in a path that does not contain spaces.

Installation is *via* the installer `r-3.3.1-win.exe`. Just double-click on the icon and follow the instructions. When installing on a 64-bit version of Windows the options will include 32- or 64-bit versions of R (and the default is to install both). You can uninstall R from the Control Panel.

Note that you will be asked to choose a language for installation, and that choice applies to both installation and un-installation but not to running R itself.

See the [R Windows FAQ](#) for more details on the binary installer.

- [Building from source](#):
- [Testing a Windows Installation](#):

---

Next: [Testing a Windows Installation](#), Previous: [Installing R under Windows](#), Up: [Installing R under Windows](#) [\[Contents\]](#) [\[Index\]](#)

### 3.1 Building from source

R can be built as either a 32-bit or 64-bit application on Windows: to build the 64-bit application you need a 64-bit edition of Windows: such an OS can also be used to build 32-bit R.

The standard installer combines 32-bit and 64-bit builds into a single executable which can then be installed into the same location and share all the files except the `.exe` and `.dll` files and some configuration files in the `etc` directory.

Building is only tested in a 8-bit locale: using a multi-byte locale (as used for CJK languages) is unsupported and may not work (the scripts do try to select a ‘c’ locale; Windows may not honour this).

**NB:** The build process is currently being changed to require external binary distributions of third-party software. Their location is set using macro `EXT_LIBS` with default setting `$(LOCAL_SOFT)`; the `$(LOCAL_SOFT)` macro defaults to `$(R_HOME)/extsoft`. This directory can be populated using `make rsync-extsoft`. The location can be overridden by setting `EXT_LIBS` to a different path in `src/gnuwin32/MkRules.local`. A suitable collection of files can also be obtained from <https://CRAN.R-project.org/bin/windows/extsoft> or <https://www.stats.ox.ac.uk/pub/Rtools/libs.html>.

- [Getting the tools](#):

# Instalacion de R para MacOS X

- <https://cran.r-project.org/doc/manuals/R-admin.html#Installing-R-under-OS-X>

## 4 Installing R under OS X

The front page of a CRAN site has a link ‘Download R for OS X’. Click on that, then download the file `r-3.3.1.pkg` and install it. This runs on OS X 10.9 and later (Mavericks, Yosemite, El Capitan, ...).

Installers for R-patched and R-devel are usually available from <https://r.research.att.com>.

For some older versions of the OS you can in principle (it is little tested) install R from the sources.

It is important that if you use a binary installer package that your OS is fully updated: look at ‘Updates’ from the ‘App Store’ to be sure. (If using XQuartz, check that is current.)

To install, just double-click on the icon of the file you downloaded. At the ‘Installation Type’ stage, note the option to ‘Customize’. This currently shows four components: everyone will need the ‘R Framework’ component: the remaining components are optional. (The ‘Tcl/Tk’ component is needed to use package `tcltk`. The ‘Texinfo’ component is only needed by those installing source packages.)

This is an Apple Installer package. If you encounter any problem during the installation, please check the Installer log by clicking on the “Window” menu and item “Installer Log”. The full output (select “Show All Log”) is useful for tracking down problems. Note the the installer is clever enough to try to upgrade the last-installed version of the application where you installed it (which may not be where you want this time ...).

Various parts of the build require XQuartz to be installed: : see <https://xquartz.macosforge.org/>. These include the `tcltk` package and the `x11` device: attempting to use these without XQuartz will remind you.

If you update your OS X version, you should re-install R (and perhaps XQuartz): the installer tailors the installation to the current version of the OS.

For building R from source, see [OS X](#).

- [Running R under OS X](#):
- [Uninstalling under OS X](#):
- [Multiple versions](#):

Next: [Uninstalling under OS X](#), Previous: [Installing R under OS X](#), Up: [Installing R under OS X](#) [[Contents](#)][[Index](#)]

### 4.1 Running R under OS X

There are two ways to run R on OS X from a CRAN binary distribution.

# How to become a useR



R  
[www.r-project.org](http://www.r-project.org)

The engine\*

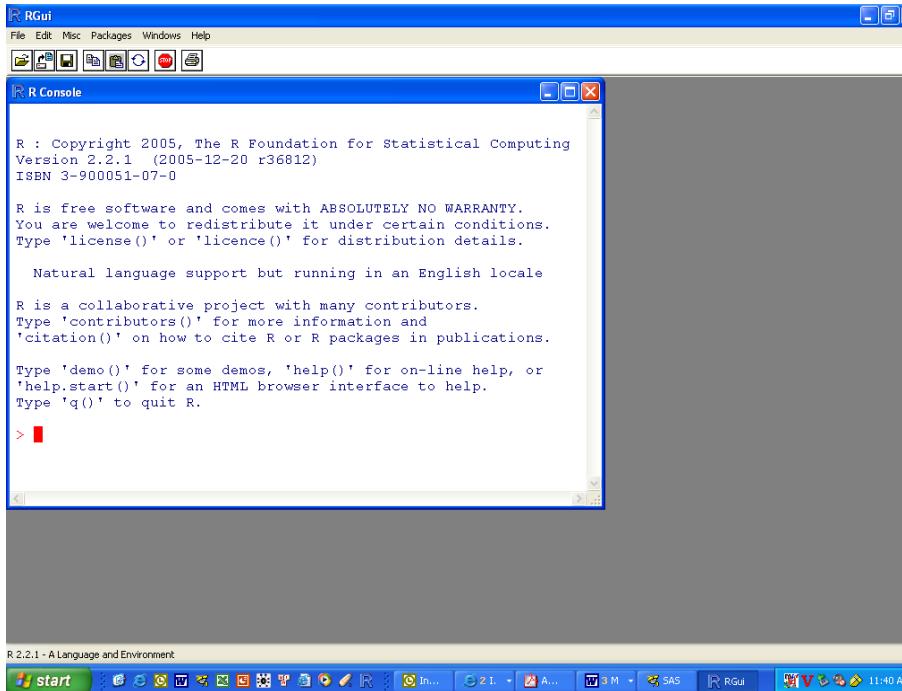


Rstudio  
[www.rstudio.org](http://www.rstudio.org)

The pretty face\*\*

# R Interfaz

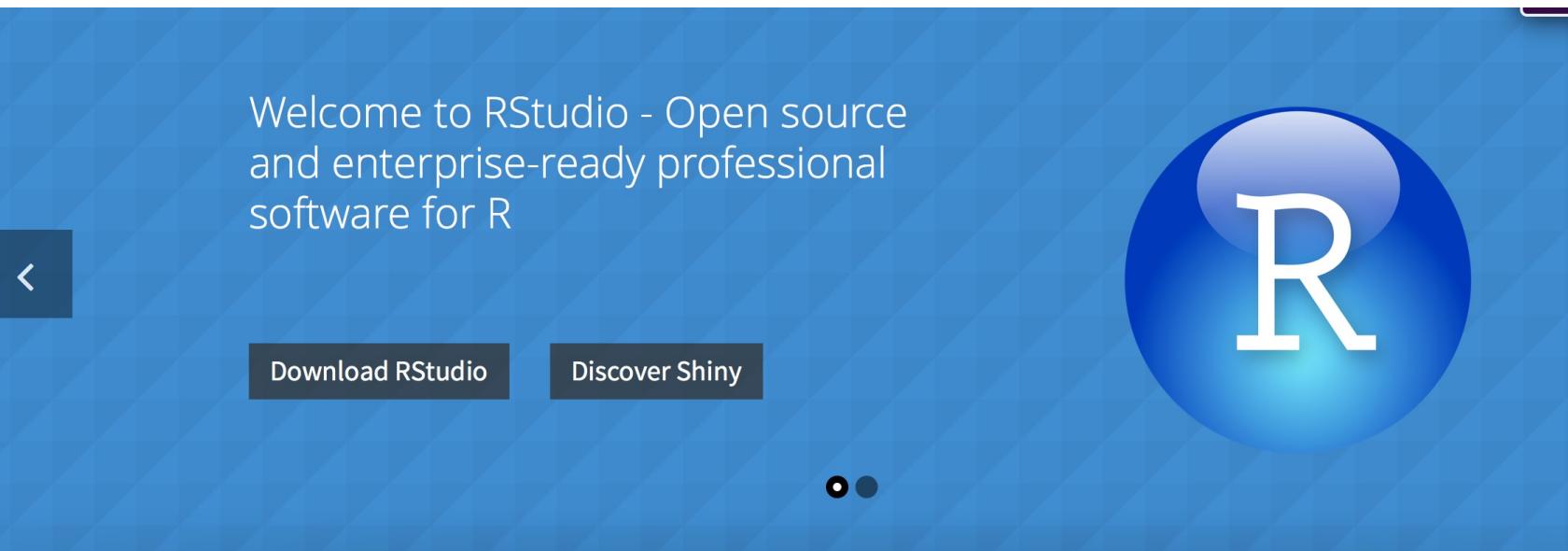
- Arranca el sistema de R, y la ventana principal (RGui) aparecerá con una subventana (R Console)
- En la ventana 'Console' el cursor estará esperando para que introduzcas comandos de R



# IDE for R: RStudio

- “RStudio es el entorno de desarrollo (IDE) para R”

<http://www.rstudio.org/download/>



Welcome to RStudio - Open source  
and enterprise-ready professional  
software for R

Download RStudio

Discover Shiny



# Instala R-Studio

<https://www.rstudio.com/products/rstudio/download/#download>

The screenshot shows the top navigation bar of the RStudio website. It includes the R Studio logo, a search icon, and links for DOWNLOAD, SUPPORT, DOCS, and COMMUNITY. Below the main menu are secondary dropdown menus for Products, Solutions, Customers, Resources, About, and Pricing.

## RStudio

Take control of your R code

RStudio is an integrated development environment (IDE) for R. It includes a console, syntax-highlighting editor that supports direct code execution, as well as tools for plotting, history, debugging and workspace management.

RStudio is available in **open source** and **commercial** editions and runs on the desktop (Windows, Mac, and Linux) or in a browser connected to RStudio Server or RStudio Workbench (Debian/Ubuntu, Red Hat/CentOS, and SUSE Linux).

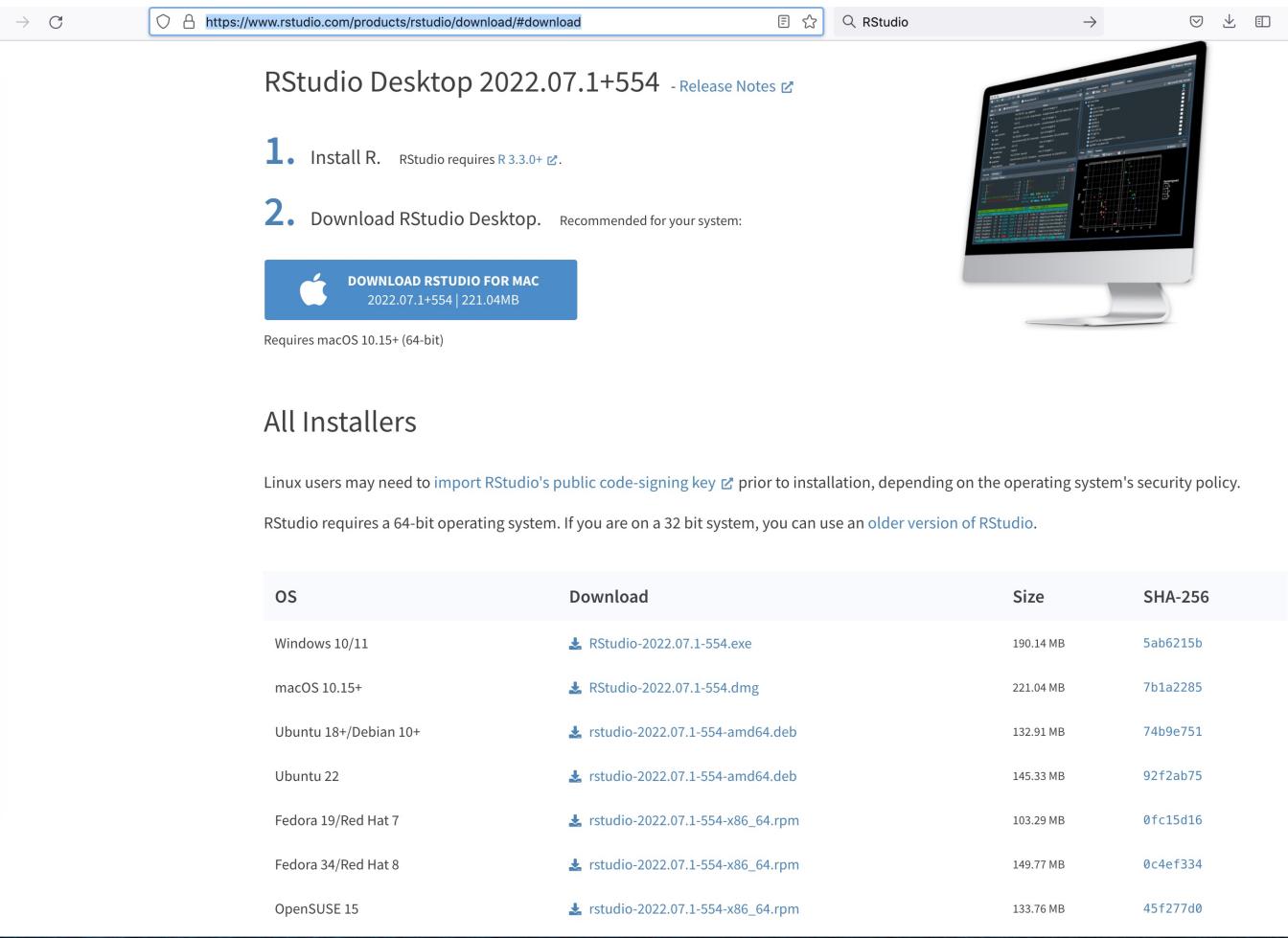
There are two versions of RStudio:



- Access RStudio locally
- Syntax highlighting, code completion, and smart indentation
- Execute R code directly from the source editor
- Quickly jump to function definitions
- View content changes in real-time with the Visual Markdown Editor
- Easily manage multiple working directories using projects
- Integrated R help and documentation
- Interactive debugger to diagnose and fix errors
- Extensive package development tools

# Instala R-Studio

Go to: <https://www.rstudio.com/products/rstudio/download/>



The screenshot shows the RStudio Desktop 2022.07.1+554 download page. At the top, there's a navigation bar with a back button, a refresh button, a search bar containing 'RStudio', and other browser controls. Below the navigation is the title 'RStudio Desktop 2022.07.1+554 - [Release Notes](#)'. To the right of the title is a small image of a Mac desktop with multiple windows open, including RStudio.

**1.** Install R. RStudio requires [R 3.3.0+](#).

**2.** Download RStudio Desktop. Recommended for your system:

[DOWNLOAD RSTUDIO FOR MAC](#)  
2022.07.1+554 | 221.04MB

Requires macOS 10.15+ (64-bit)

**All Installers**

Linux users may need to import RStudio's public code-signing key prior to installation, depending on the operating system's security policy.

RStudio requires a 64-bit operating system. If you are on a 32 bit system, you can use an [older version of RStudio](#).

OS	Download	Size	SHA-256
Windows 10/11	<a href="#"> RStudio-2022.07.1-554.exe</a>	190.14 MB	5ab6215b
macOS 10.15+	<a href="#"> RStudio-2022.07.1-554.dmg</a>	221.04 MB	7b1a2285
Ubuntu 18+/Debian 10+	<a href="#"> rstudio-2022.07.1-554-amd64.deb</a>	132.91 MB	74b9e751
Ubuntu 22	<a href="#"> rstudio-2022.07.1-554-amd64.deb</a>	145.33 MB	92f2ab75
Fedor 19/Red Hat 7	<a href="#"> rstudio-2022.07.1-554-x86_64.rpm</a>	103.29 MB	0fc15d16
Fedor 34/Red Hat 8	<a href="#"> rstudio-2022.07.1-554-x86_64.rpm</a>	149.77 MB	0c4ef334
OpenSUSE 15	<a href="#"> rstudio-2022.07.1-554-x86_64.rpm</a>	133.76 MB	45f277d0

Follow the instructions for installation for your particular platform (i.e., Mac, Windows, Linux)

# RStudio



The screenshot shows the RStudio interface with several red boxes highlighting different components:

- Editor:** A red box surrounds the top-left pane where R code is written. A teal speech bubble points to it from below.
- Console:** A red box surrounds the bottom-left pane where R code is run and its output is displayed. A teal speech bubble points to it from below.
- Workspace:** A red box surrounds the top-right pane showing an interactive list of loaded R objects. A dark grey speech bubble points to it from above.
- Help/Plots/Packages:** A red box surrounds the bottom-right pane providing help documentation for the 'complex' function. A teal speech bubble points to it from below.

**Editor:**

```
x=matrix(1:9,nrow=3)
# plot(x[,1]-x[,2])
plot(x[,3]-x[,2])
# apply(x,1,function(x){
#   sum(x,na.rm=T)
# })
y=matrix(1:21,nrow=3)
?
z=as.data.frame(y)
?mean
?sqr
?factorial
mean(5,6,55,4,27)
sqrt(c(9,16))
length(paste("hello","you"))
length(c("hello","you"))
b=1:6
```

**Console:**

```
> length(c("hello","","you",sep ""))
[1] 3
> length(paste("hello","you"))
[1] 1
> paste("hello","you")
[1] "hello,you"
> length(c("hello","","you"))
[1] 2
> length(c("hello","you"))
[1] 2
> b=1:6
> fix(b)
fix(b)
> fix(b)
> view(y)
>
```

**Workspace:**

Data	Type
x	3x3 integer matrix
y	7x3 integer matrix
Values	integer [6]

**Help/Plots/Packages:**

**complex** {base}

**Complex Vectors**

**Description**

Basic functions which support complex arithmetic in R.

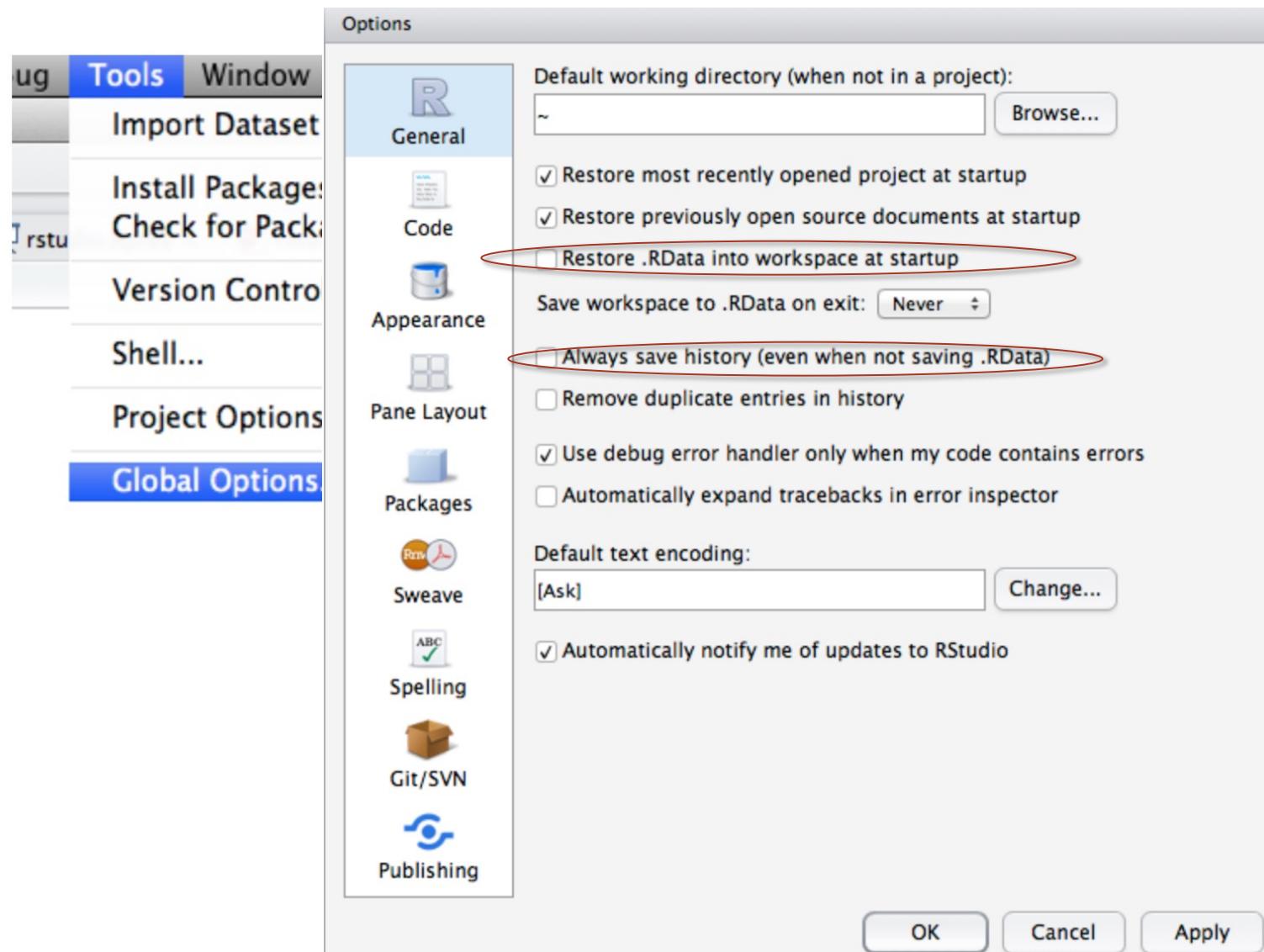
**Usage**

```
complex(length.out = 0, real = numeric(), imaginary = numeric(),
        modulus = 1, argument = 0)
as.complex(x, ...)
is.complex(x)
```

**Arguments**

```
length.out numeric. Desired length of the output vector, inputs being recycled as
needed.
real numeric vector.
```

# Rstudio: opciones básicas recomendadas

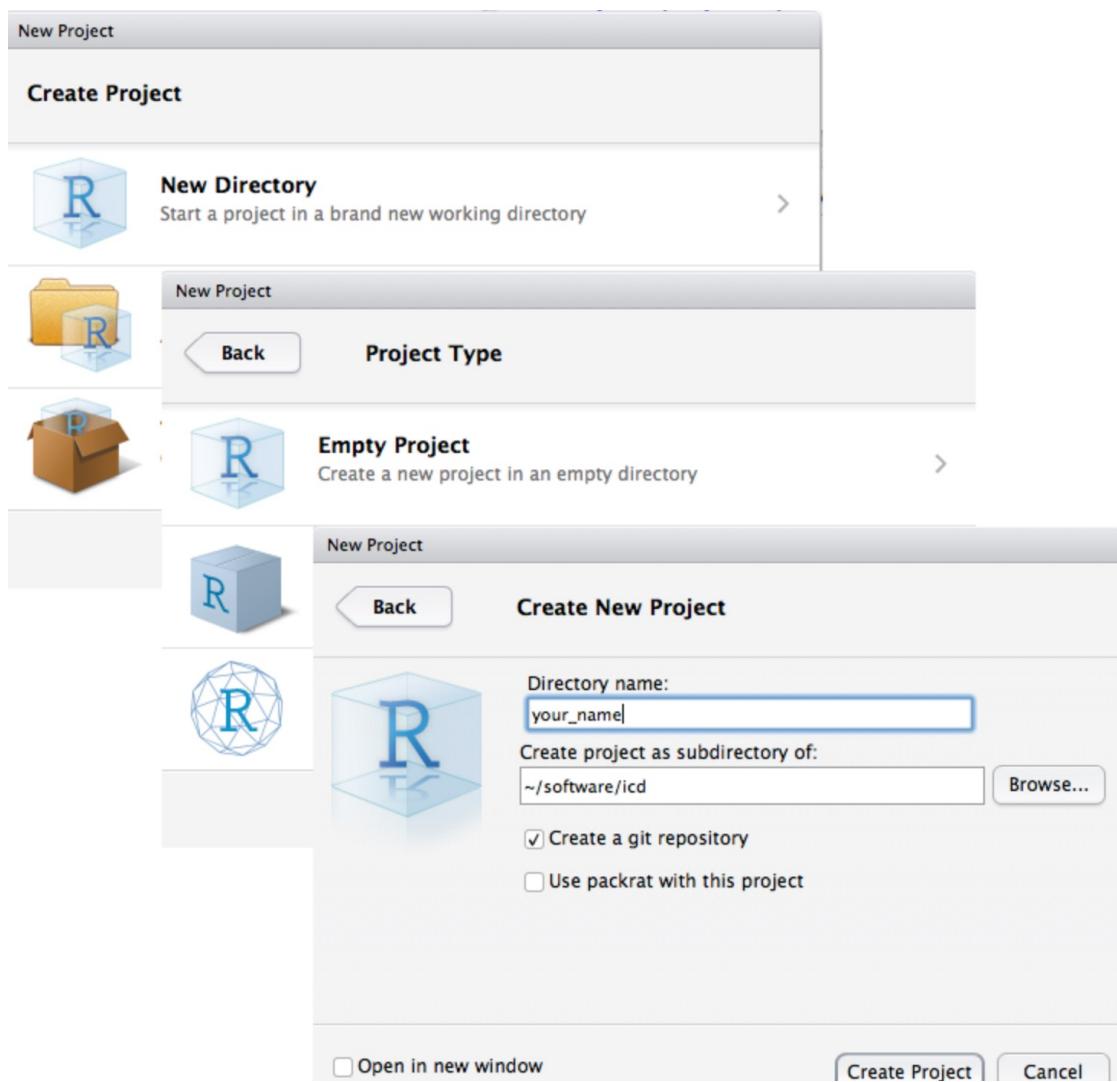


# Project management in RStudio

- Using projects in RStudio is a powerful way of working on several projects at the same time. Each of the projects has its own:
  - Working directory
  - history
  - R source code files
  - Version control repository

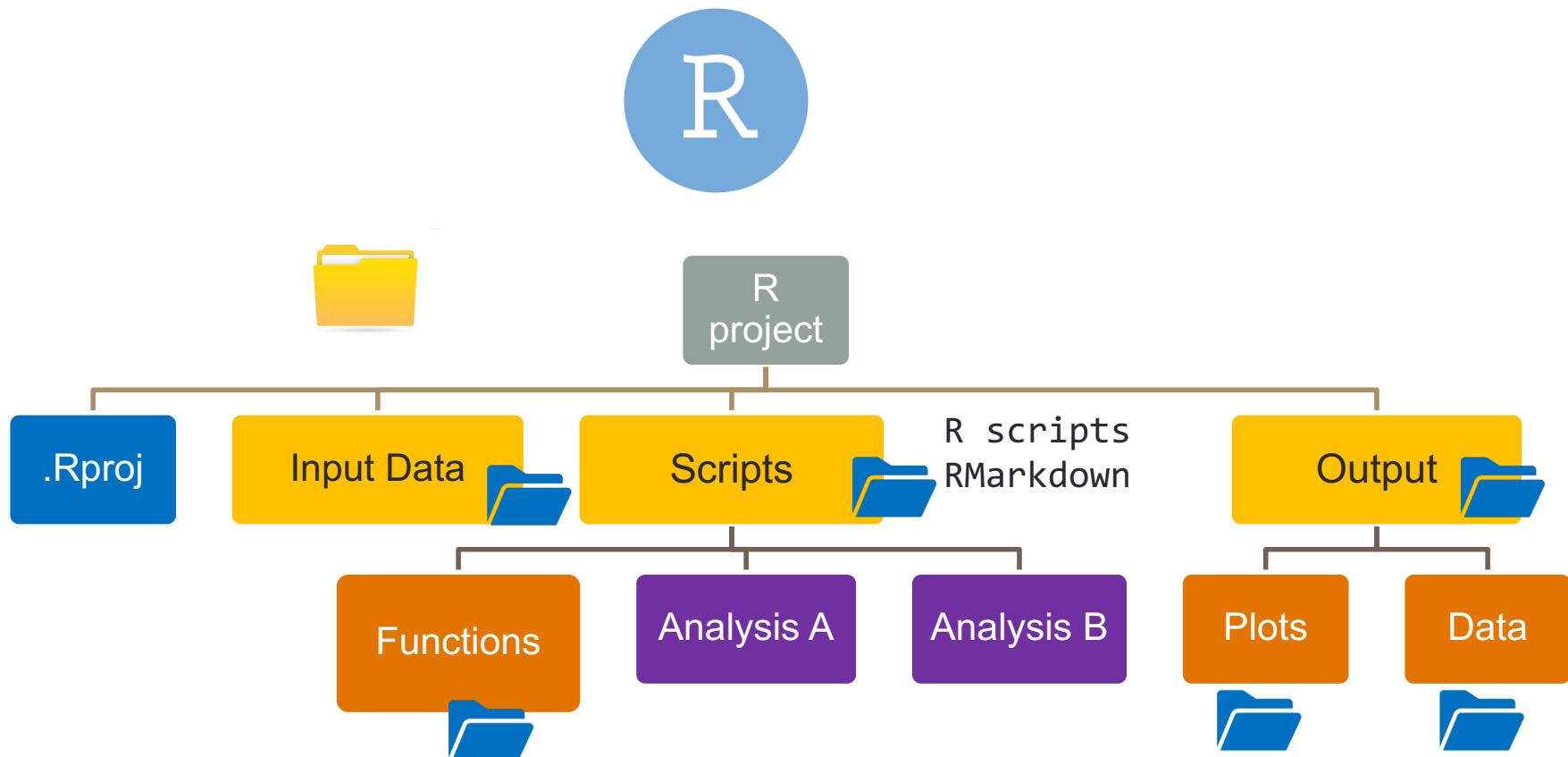
Create a RStudio project for each of your projects.

# Project management in RStudio



- Select File > New project
- Select New Directory
- Select Empty project
- Select a name and sub directory of your project.

# Basic Project Setup



# Rproject options: General

Project Options

**R** General

Code Editing

Sweave

Build Tools

Git/SVN

Packrat

*Use (Default) to inherit the global default setting*

Restore .RData into workspace at startup

Save workspace to .RData on exit

Always save history (even if not saving .RData)

Disable .Rprofile execution on session start/resume

Quit child processes on exit

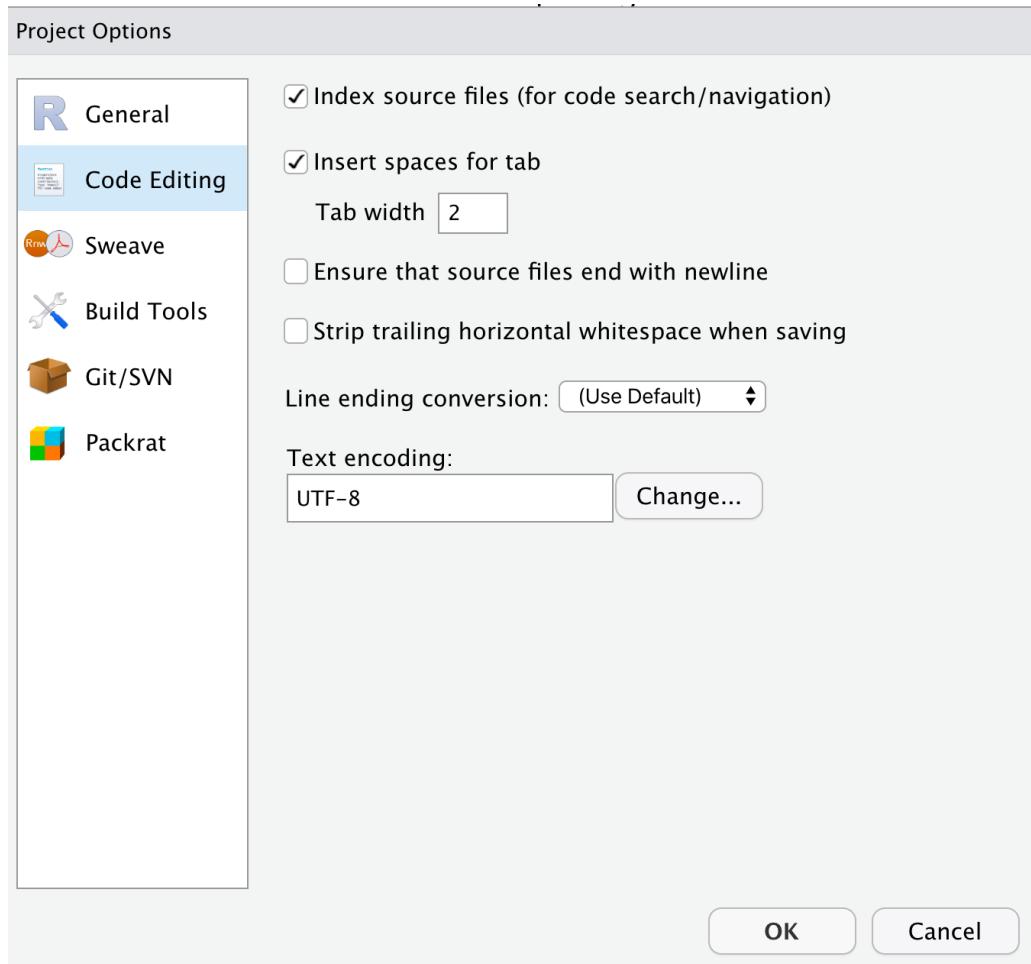
**OK** **Cancel**

**Restore .Rdata:** Load the .RData file in the initial working directory at startup. **Uncheck this option for large files**

**Save workspace to .RData on exit never save it.** On the long run much better

**Always save history (even when not saving .RData)** –even if you choose not to save the .RData file when exiting.

# Rproject options: Editing



- **Index R source files –** Normally this should remain enabled. If a project has too many files disable indexing here.
- **Insert spaces for tab –** Determine whether the tab key inserts multiple spaces rather than a tab character (soft tabs).
- **Text encoding –** Specify the default text encoding for source files.

# Rproject options

Project Options

The screenshot shows the 'Project Options' dialog with the 'General' tab selected. On the left is a sidebar with icons for General, Code Editing, Sweave, Build Tools, Git/SVN, and Packrat. The 'General' tab is highlighted. The main area contains the following settings:

- Use (Default) to inherit the global default setting**
- Restore .RData into workspace at startup**: (Default) button
- Save workspace to .RData on exit**: (Default) button
- Always save history (even if not saving .RData)**: (Default) button
- Disable .Rprofile execution on session start/resume**
- Quit child processes on exit**

At the bottom are 'OK' and 'Cancel' buttons.

• **Version control system –** RStudio automatically detects the presence of version control for projects (scans for a .git or .svn directory). **Only change this option when:**

- You have both a .git and .svn and is necessary to indicate RStudio which control version should bind to.
- There is no version control setup for the project and you want to add a local git repository (equivalent to executing git init from the project root directory).

# R Workspace

- Objects that you create during an R session are held in memory
- The collection of objects that you currently have is called the workspace.
- This workspace is not saved on disk unless R is told to do so.
- Objects are lost when R is closed

# R packages

- Los paquetes de R son colecciones de funciones y conjuntos de datos que se pueden instalar y usar en el entorno R.
- Mejoran las capacidades existentes de R e incluso proporcionan otras nuevas.

# Como instalar librerias y paquetes con Rstudio

R version 2.15.0 (2012-03-30)  
Copyright (C) 2012 The R Foundation for statistical computing  
ISBN 3-900051-07-0  
Platform: x86\_64-pc-mingw32/x64 (64-bit)

R is free software and comes with ABSOLUTELY NO WARRANTY.  
You are welcome to redistribute it under certain conditions.  
Type 'license()' or 'licence()' for distribution details.

Natural language support but running in an English locale

R is a collaborative project with many contributors.  
Type 'contributors()' for more information and  
'citation()' on how to cite R or R packages in publications.

Type 'demo()' for some demos, 'help()' for on-line help, or  
'help.start()' for an HTML browser interface to help.

Workspace | History

Load Save Import Dataset Clear All

load\_all\_ixns()  
selectNodeType(graph = gMM, attribute = "nodeType", filter = "gene")  
test.selectNodeType()

Packages Tab



```
install.packages ("samr")
library(samr)
```

```
trying URL 'http://cran.fhcrc.org/bin/windows/contrib/2.15/igraph0_0.5.5-2.zip'
Content type 'application/zip' length 5098030 bytes (4.9 Mb)
opened URL
downloaded 4.9 Mb

trying URL 'http://cran.fhcrc.org/bin/windows/contrib/2.15/gosim_1.2.7.2.zip'
Content type 'application/zip' length 492477 bytes (480 kb)
opened URL
downloaded 480 kb

package 'igraph0' successfully unpacked and MD5 sums checked
package 'gosim' successfully unpacked and MD5 sums checked

The downloaded binary packages are in
C:\users\cplaisie\AppData\Local\Temp\RtmpqyehJM\downloaded_packages
```

Package	Description
biomaRt	Interface to BioMart databases (e.g. Ensembl, COSMIC, Wormbase and Gramene)
bitops	Functions for Bitwise operations
boot	Bootstrap Functions (originally by Angelo Canty for S)
class	Functions for Classification
cluster	Cluster Analysis Extended Rousseeuw et al.
codetools	Code Analysis Tools for R
compiler	The R Compiler Package
corpcor	Efficient Estimation of Covariance and (Partial) Correlation
datasets	The R Datasets Package
DBI	R Database Interface
flexmix	Flexible Mixture Modeling
foreign	Read Data Stored by Minitab, S, SAS, SPSS, Stata, Systat, dBase, ...
GO.db	A set of annotation maps describing the entire Gene Ontology
GOSim	Computation of functional similarities between GO terms and gene products; GO enrichment analysis
graph	graph: A package to handle graph data structures
graphics	The R Graphics Package
grDevices	The R Graphics Devices and Support for Colours and Fonts



R-code for loading  
packages

# Paquetes en R por defecto

- Seven packages are distributed with R . The others need to be downloaded and installed separately.
  - use the function search to see a list of packages

```
> search()  
[1] ".GlobalEnv" "package:stats" "package:graphics"  
[4] "package:grDevices" "package:datasets"  
     "package:utils"
```

- use this function to see which packages are installed
  - `installed.packages()`
- use this function to update packages

```
update.packages(<package_name>)
```



# R Help

Once R is installed, there is a comprehensive built-in help system.

- Inside of R

```
help.start()      # general help
help(sqrt)        # help about function foo
?foo              # same thing
apropos("str")   # list all function containing string foo
example(foo)     # show an example of function foo
# search for foo in help manuals and archived mailing lists
RSiteSearch("foo")
# get vignettes on using installed packages
vignette("foo")  # show specific vignette
```

- On the web

- [www.rseek.org](http://www.rseek.org) and R only search engine
- CRAN
- Google topic with CRAN

# R Help

- Una vez que se instala R, hay un completo sistema de ayuda integrado.
  - **Rstudio:** pestaña help en la ventana inferior izquierda
  - **Consola de R**

```
help.start()      # general help
help(sqrt)        # help about function foo
?foo              # same thing
apropos("str")   # list all function containing string foo
example(foo)     # show an example of function foo
# search for foo in help manuals and archived mailing lists
RSiteSearch("foo")
# get vignettes on using installed packages
vignette("foo")  # show specific vignette
```

- **En la web**
  - [www.rseek.org](http://www.rseek.org) and R only search engine
  - CRAN
  - Google topic with CRAN

# R Help

## Examples

Muchas funciones y conjuntos de datos en R incluyen código de ejemplo que demuestra los usos típicos.

Teclea el siguiente comando en la consola

```
>example(hist)
```

genera una serie de diagramas de ejemplo (y proporciona los comandos utilizados para crearlos)

## Demos

- Las demostraciones son código R ejecutable mediante el comando `demo()` con el nombre de la demostración.
- Están destinados a ilustrar un concepto o un método o algo así, y son independientes de cualquier función o conjunto de datos en particular.
- Puede obtener una lista de demostraciones disponibles usando

```
demo() # all demos
Demo(graphics)
demo(package='mosaic') # just demos from mosaic package
```

# Vignettes

- Algunos paquetes tienen vignettes
  - Las viñetas son un ejemplo de cómo ejecutar el código y una gran cantidad de texto adicional que explica mucho más de lo que quizás desee saber.
- List all available vignettes:

```
vignette()
```

- Display the vignette as a pdf by executing in the console

```
vignette('<topic>')
vignette("grid")
```

- In Rstudio they are available through the help panel
- To play with the vignette code

```
vig = vignette('<topic>')
edit(vig)
```

# Ready to Code!

- The working directory is where Rstudio will look first for scripts
- Keeping everything in a self contained directory helps organize code and analyses
- Check you current working directory with

`getwd()`

# R Workspace, tips

- Commands are entered interactively at the R user prompt.
- **Up** and **down** arrow keys scroll through your command history.
- In R you can save your entire workspace, variables and all in its current state
- Then you can reload this at a later time or can provide this to collaborators
- Workspace data files are saved with the extension '**.Rdata**'

# R Tips

- R is **case-sensitive**
- Comment your code so you remember what it does; comments are preceded with **#**
- R scripts are simply text files with a **.R extension**
- Use Ctrl + R to submit code
- Use the Tab key to let R/R Studio finish typing commands for you
- Use Shift + down arrow to highlight lines or blocks of code
- In R Studio: Ctrl + 1 and Ctrl + 2 switches between script and console
- Use **up and down arrows** to cycle through previous commands in console
- Don't be afraid of errors; you won't break R
- If you get stuck, Google is your friend