R software for statistical computing

Pros and Cons

- PRO
  - it's open source
  - offers all types of analyses available in other software, and more!
  - endless graphic options
  - always up to date
  - great community
  - you can write your own functions
  - can load large amounts of data
- CONTRA
  - you need to invest some time in the beginning

Pros and Cons

- PRO
  - it’s open source
  - offers all types of analyses available in other software, and more!
  - endless graphic options
  - always up to date
  - great community
  - you can write your own functions
  - can load large amounts of data
- CONTRA
  - Patience

Use your own resources

R-software

Robert Gentleman **R**oss Ihaka

Statistics Department University of Auckland, New Zealand

Martin Mächler

ETH Zürich,
Switzerland

R-software

Board and Auditors

Presidents: Simon Urbanek & Martyn Plummer

Secretary General: Martin Mächler

Treasurer: Torsten Hothorn

RF Representative in R Consortium: Michael Lawrence

Members at Large:

- John Chambers
- Dirk Eddelbuettel
- Heather Turner

In addition, Peter Dalgaard and Roger Bivand were elected as auditors.

Martyn Plummer

WHO, Infections and Cancer Epidemiology Group

Simon Urbanek

AT&T Research Labs

R-software

- core-group (1997):
  - Douglas Bates, John Chambers, Peter Dalgaard, Seth Falcon, Robert Gentleman, Kurt Hornik, Stefano Iacus, Ross Ihaka, Friedrich Leisch, Thomas Lumley, Martin Maechler, Duncan Murdoch, Paul Murrell, Martyn Plummer, Brian Ripley, Deepayan Sarkar, Duncan Temple Lang, Luke Tierney, Simon Urbanek

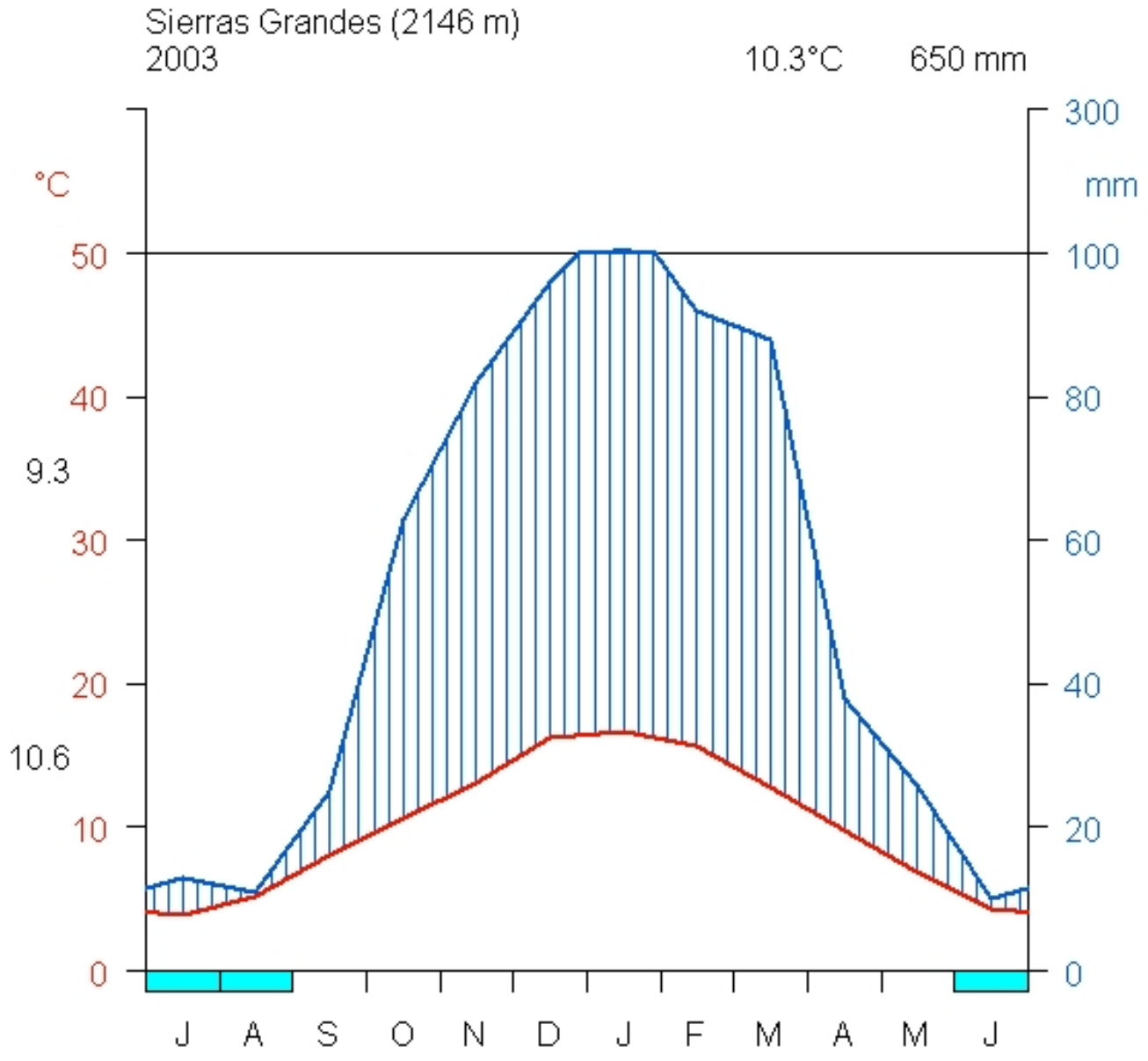
- contributers:
  - Valerio Aimale, Thomas Baier, Roger Bivand, Ben Bolker, David Brahm, Göran Broström, Patrick Burns, Vince Carey, Saikat DebRoy, Brian D'Urso, Lyndon Drake, Dirk Eddelbuettel, John Fox, Paul Gilbert, Torsten Hothorn, Robert King, Kjetil Kjernsmo, Philippe Lambert, Jan de Leeuw, Uwe Ligges, Jim Lindsey, Patrick Lindsey, Catherine Loader, Gordon Maclean, John Maindonald, David Meyer, Jens Oehlschägel, Steve Oncley, Richard O'Keefe, Hubert Palme, José C. Pinheiro, Anthony Rossini, Jonathan Rougier, Günther Sawitzki, Bill Simpson, Gordon Smyth, Adrian Trapletti, Terry Therneau, Bill Venables, Gregory R. Warnes, Andreas Weingessel, Morten Welinder,

R-software

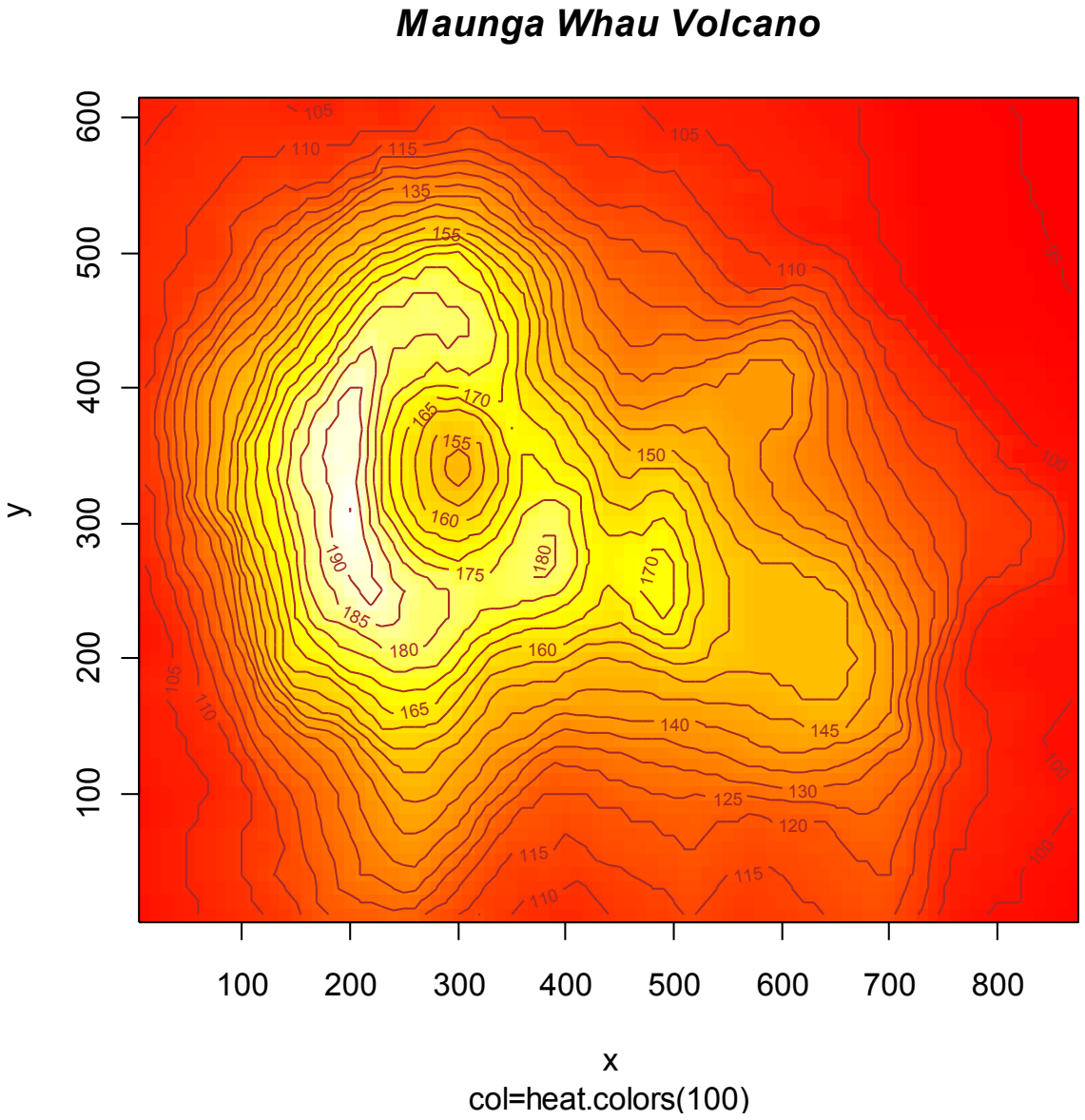
- univariate statistics:
  - t-Test, χ^2-Test, correlations (Pearson, Kendall τ, Spearman ρ), Kolmogorov-Smirnow-test, Mann-Whitney-U-test, Kruskal-Wallis-test, Wilcoxon-test, Fisher-test, Mantel-Haenszel- χ^2-test, Binomial-test, Mixed Models, ANOVAs…….

- multivariate Statistik:
  - PCA, CCA, DCA, NMDS, multivariate regression splines, ……..

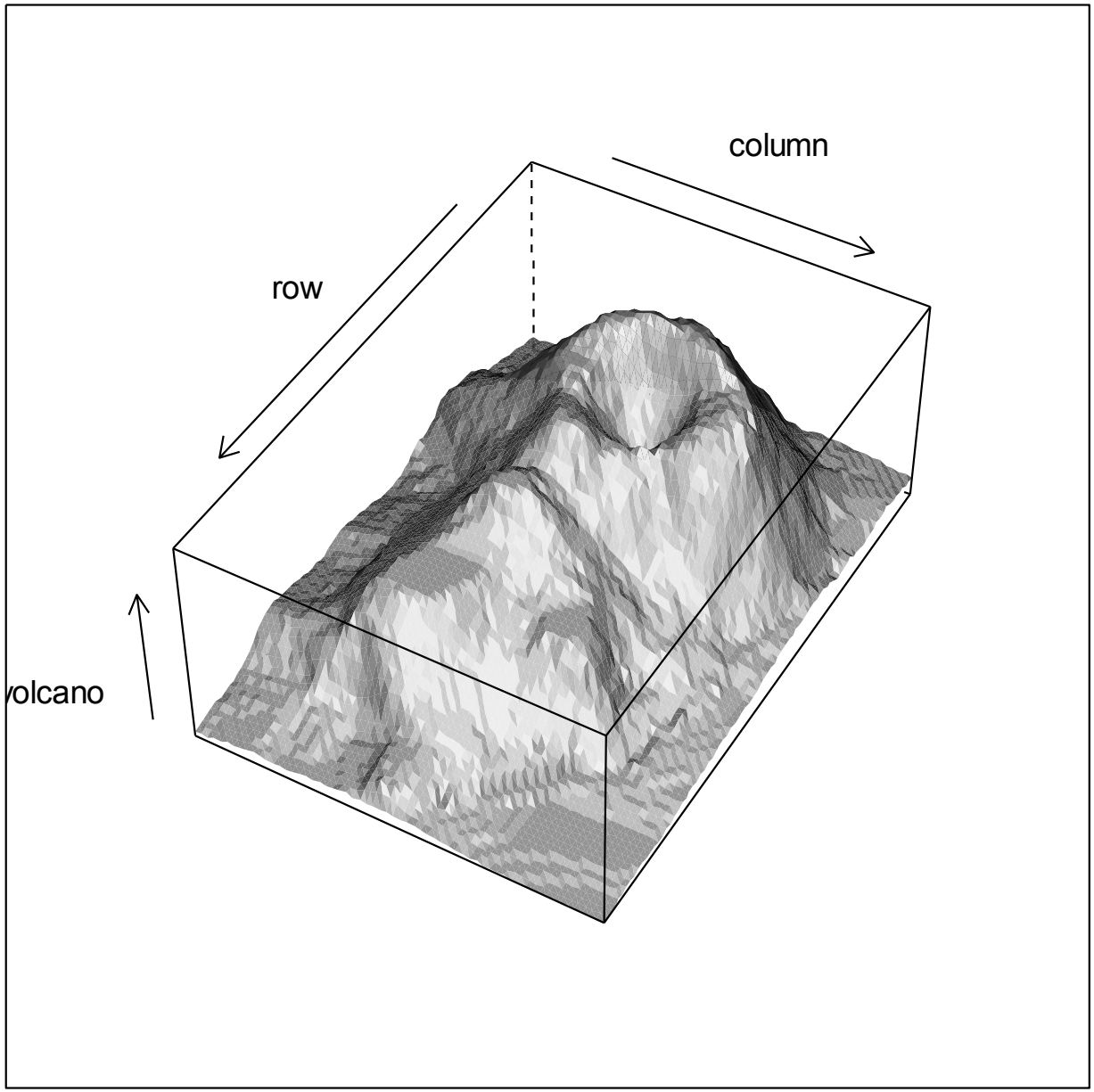
R-software


Sierras Grandes (2146 m)
2003
10.3°C
650 mm
°C
mm
300
100
80
60
40
20
0
50
40
9.3
30
20
10.6
10
0
J
A
S
O
N
D
J
F
M
A
M
J

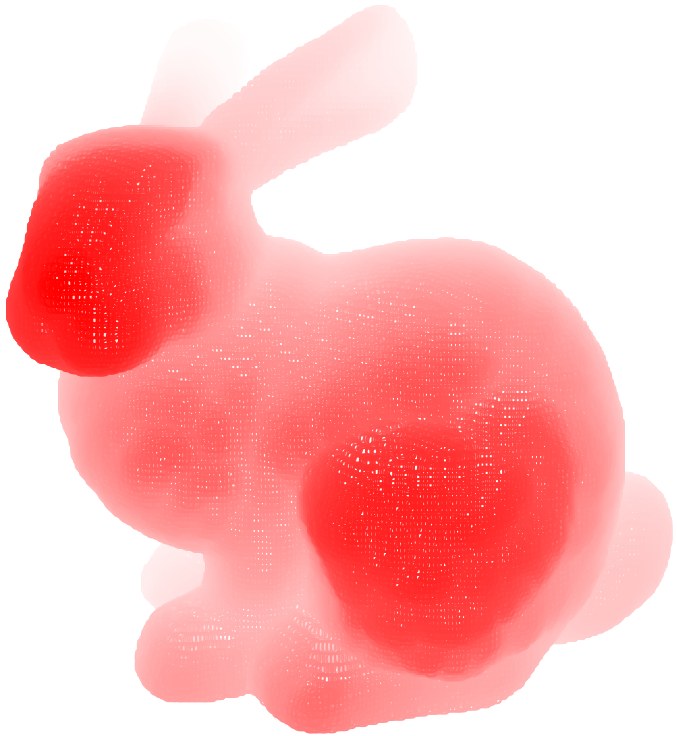
R-software


Maunga Whau Volcano
y
x
col=heat.colors(100)
100
200
300
400
500
600
700
800

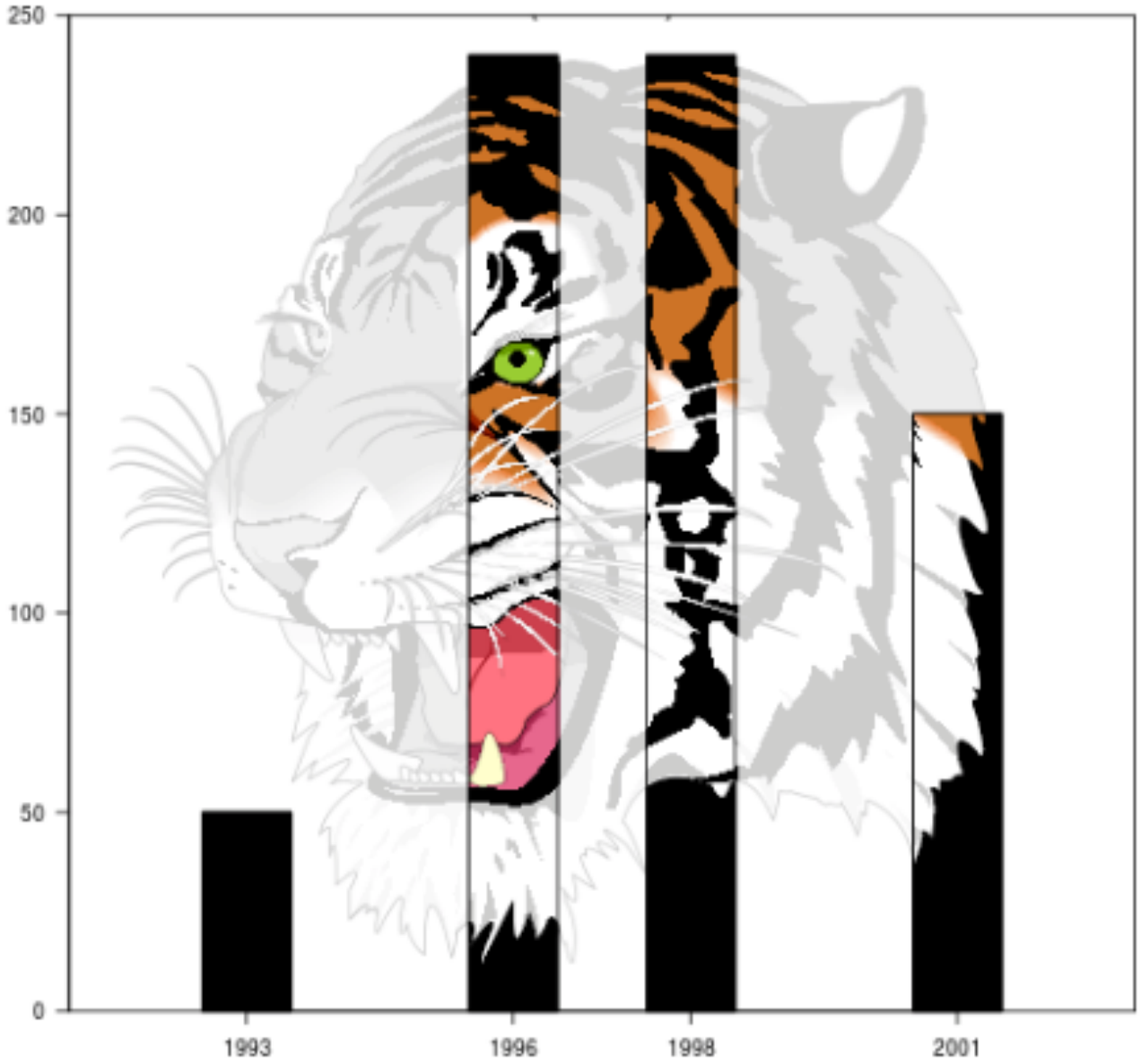
R-software



R-software



R-software



R-software

[Home]

Download

CRAN

R Project

About R
Contributors
What's New?
Mailing Lists
Bug Tracking
Conferences
Search

R Foundation

Foundation
Board
Members
Donors
Donate

Documentation

The R Project for Statistical Computing

Getting Started

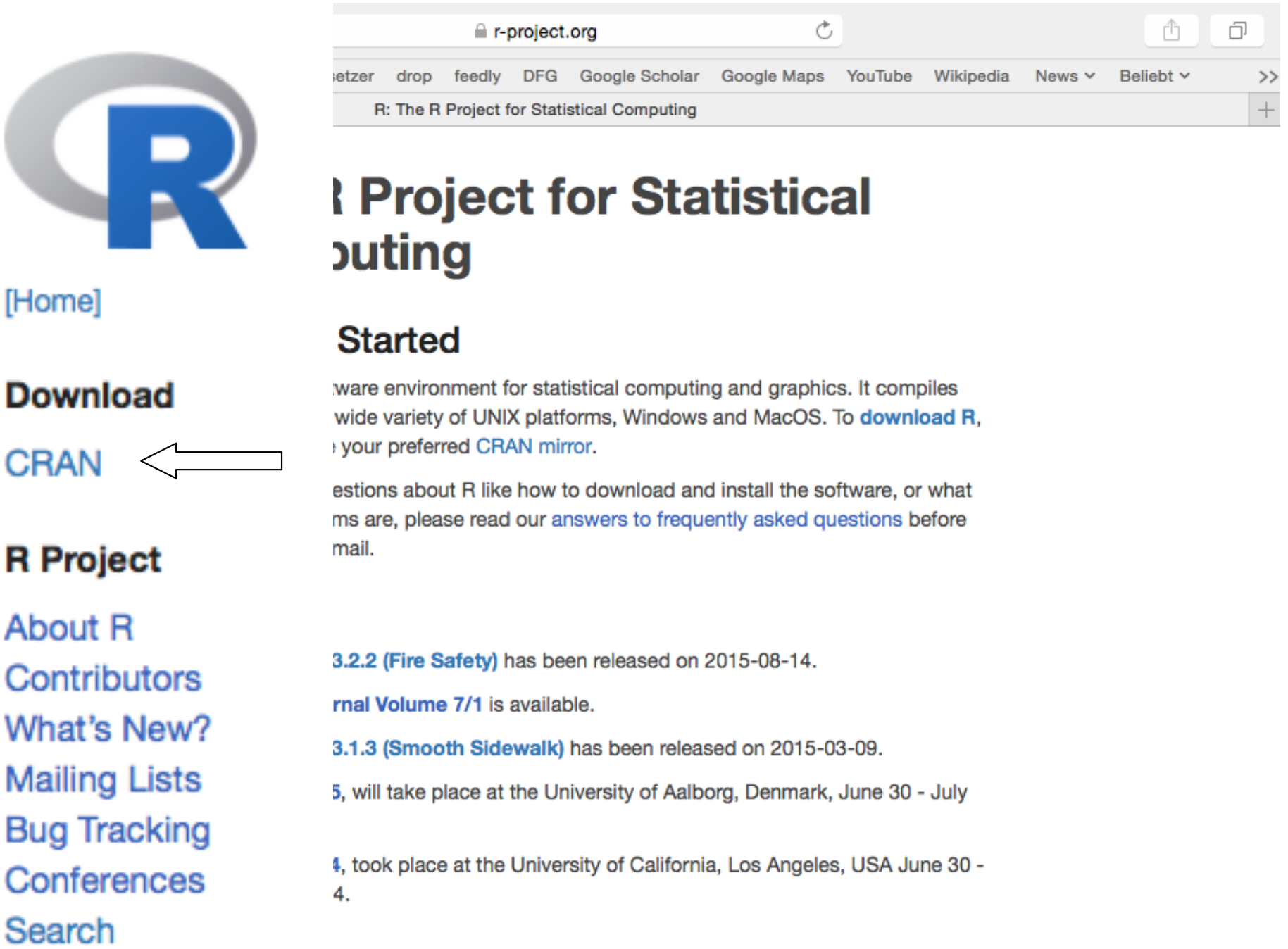
R is a free software environment for statistical computing and graphics. It compiles and runs on a wide variety of UNIX platforms, Windows and MacOS. To **download R**, please choose your preferred CRAN mirror.

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

- **R version 3.2.2 (Fire Safety)** has been released on 2015-08-14.
- **The R Journal Volume 7/1** is available.
- **R version 3.1.3 (Smooth Sidewalk)** has been released on 2015-03-09.
- **useR! 2015**, will take place at the University of Aalborg, Denmark, June 30 - July 3, 2015.
- **useR! 2014**, took place at the University of California, Los Angeles, USA June 30 - July 3, 2014.

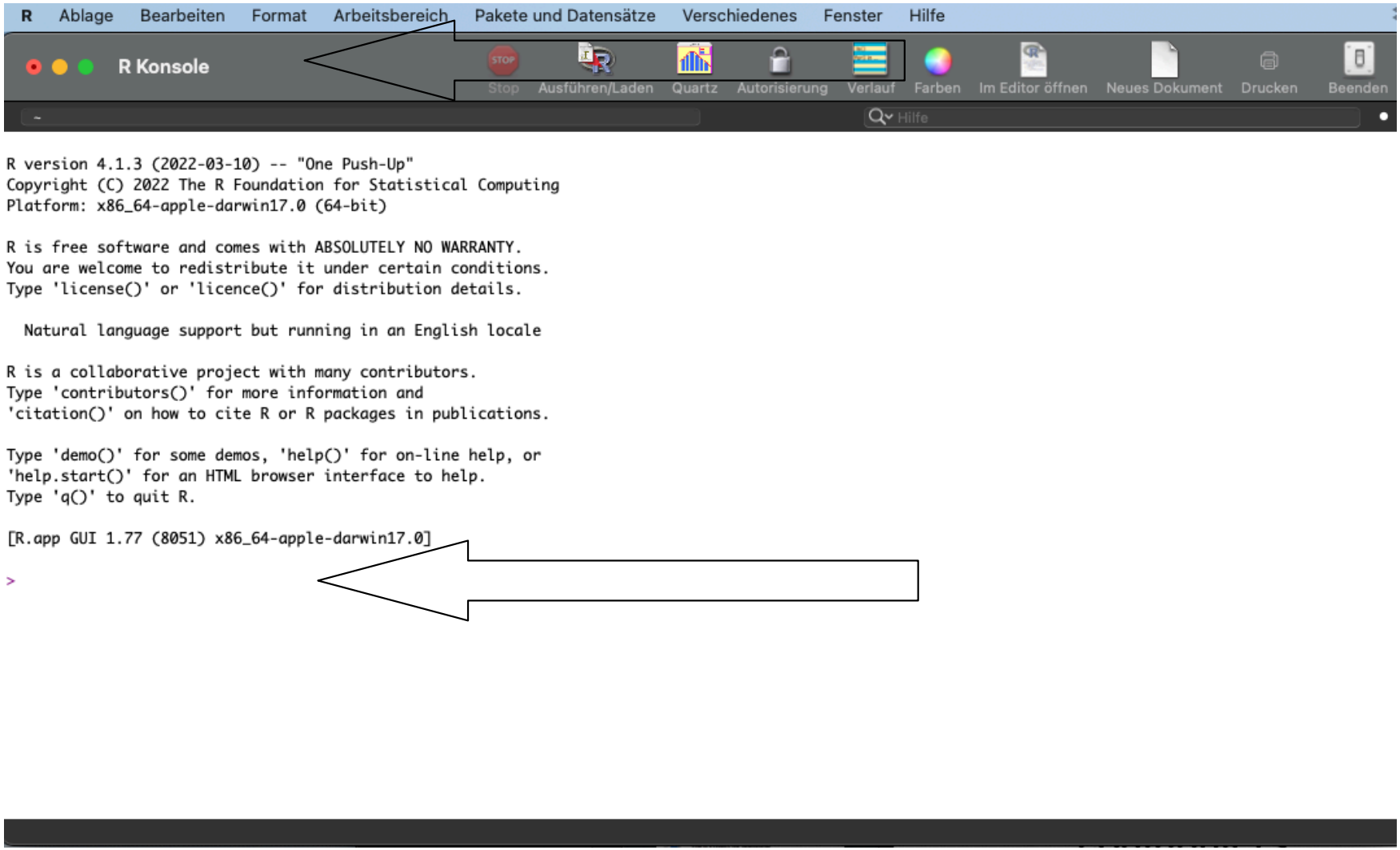
R-software


r-project.org
drop
feedly
DFG
Google Scholar
Google Maps
YouTube
Wikipedia
News
Beliebt
R: The R Project for Statistical Computing
[Home]
Download
CRAN
R Project
About R
Contributors
What's New?
Mailing Lists
Bug Tracking
Conferences
Search
Started
download R,
your preferred CRAN mirror.
answers to frequently asked questions
mail.
3.2.2 (Fire Safety) has been released on 2015-08-14.
rnal Volume 7/1 is available.
3.1.3 (Smooth Sidewalk) has been released on 2015-03-09.
, will take place at the University of Aalborg, Denmark, June 30 - July
, took place at the University of California, Los Angeles, USA June 30 -
4.

R-software

- Download:
  - www.r-project.org
  - CRAN (*Comprehensive R Archive Network*)
  - CRAN mirror: Germany (e.g. Göttingen)

R surface


R Ablage Bearbeiten Format Arbeitsbereich Pakete und Datensätze Verschiedenes Fenster Hilfe
R Konsole
Stop
Ausführen/Laden
Quartz
Autorisierung
Verlauf
Farben
Im Editor öffnen
Neues Dokument
Drucken
Beenden
Hilfe
R version 4.1.3 (2022-03-10) -- "One Push-Up"
Copyright (C) 2022 The R Foundation for Statistical Computing
Platform: x86_64-apple-darwin17.0 (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.
Type 'q()' to quit R.
[R.app GUI 1.77 (8051) x86_64-apple-darwin17.0]
>

R surface

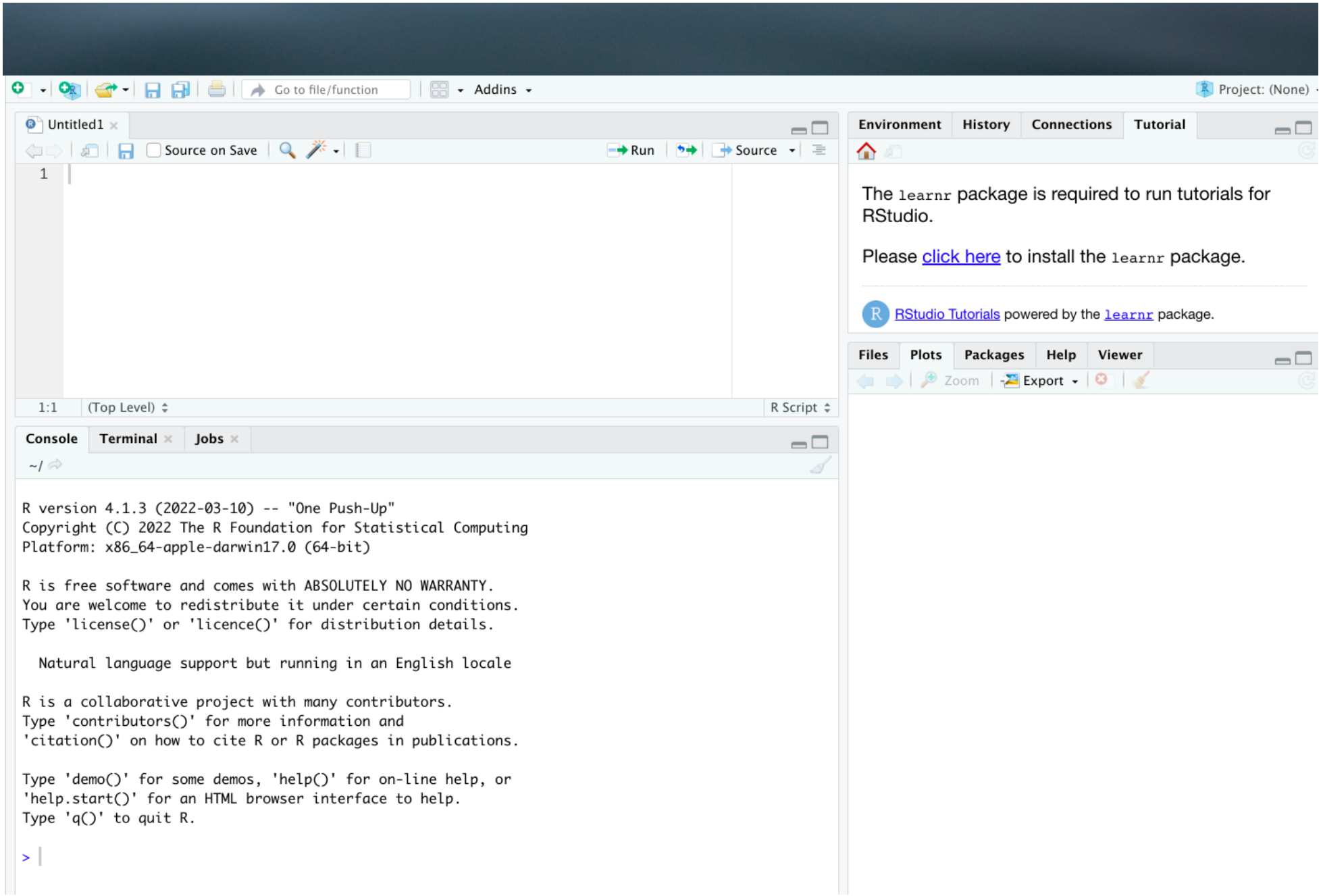
- **R Console** = to type your commands and inspect results
- **R documents** (script) = to type your commands and save them for later
- graphic window
- help window

» **4 active windows**

R surface

R studio??

R studio


Go to file/function
Addins
Project: (None)
Untitled1
Source on Save
Run
Source
1
1:1
(Top Level)
R Script
Console
Terminal
Jobs
~/
R version 4.1.3 (2022-03-10) -- "One Push-Up"
Copyright (C) 2022 The R Foundation for Statistical Computing
Platform: x86_64-apple-darwin17.0 (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.
Type 'q()' to quit R.
>
Environment
History
Connections
Tutorial
The learnr package is required to run tutorials for RStudio.
Please click here to install the learnr package.
RStudio Tutorials powered by the learnr package.
Files
Plots
Packages
Help
Viewer
Zoom
Export

R surface

- R is text based
- you type what you want to do
- English
- upper vs. lower case sensitive

Prepare data for R

- English type setting (0.1)
- simple column names
  - ~~vegation cover~~
  - vegc
- no “UMLAUTE”
- NO SPACES, NO EMPTY FIELDS!!!!!
  - ~~veg c~~
  - vegc, veg-c, veg_c
  - fill empty fields with NA (non available)
- ALL COLUMNS MUST HAVE SAME LENGTH!

online help

- Manuals:
  - An Introduction to R (94 pages)
  - Einführung in R (170 pages)
  - R Reader (69 pages),

    - Translations into other languages than English are available from the contributed documentation section.

online help

- SEARCH function and MAILING LISTS on r-project.org
- stackoverflow.com
- put [r] in brackets before your search request

Literature

by Michael J. Crawley published at Wiley:

Statistics: An Introduction using R (2015), 2nd edition 38.50 €

PDF: http://www.bio.ic.ac.uk/research/crawley/statistics/

The R Book,(2013) 2nd edition 77.90 €

homepage: http://eu.wiley.com/WileyCDA/WileyTitle/productCd-0470973927.html

*** first edition available as PDF online! ***

help functions in R

- help for a specific command

```
?plot
```

- searching for a specific test

```
help.search("Chi Square")
```

help functions in R

R Help

< > Print Help Search

plot {graphics} R Documentation

Generic X-Y Plotting

Description

Generic function for plotting of R objects. For more details about the graphical parameter arguments, see par.

For simple scatter plots, plot.default will be used. However, there are plot methods for many R objects, including functions, data.frames, density objects, etc. Use methods(plot) and the documentation for these.

Usage

```
plot(x, y, ...)
```

Arguments

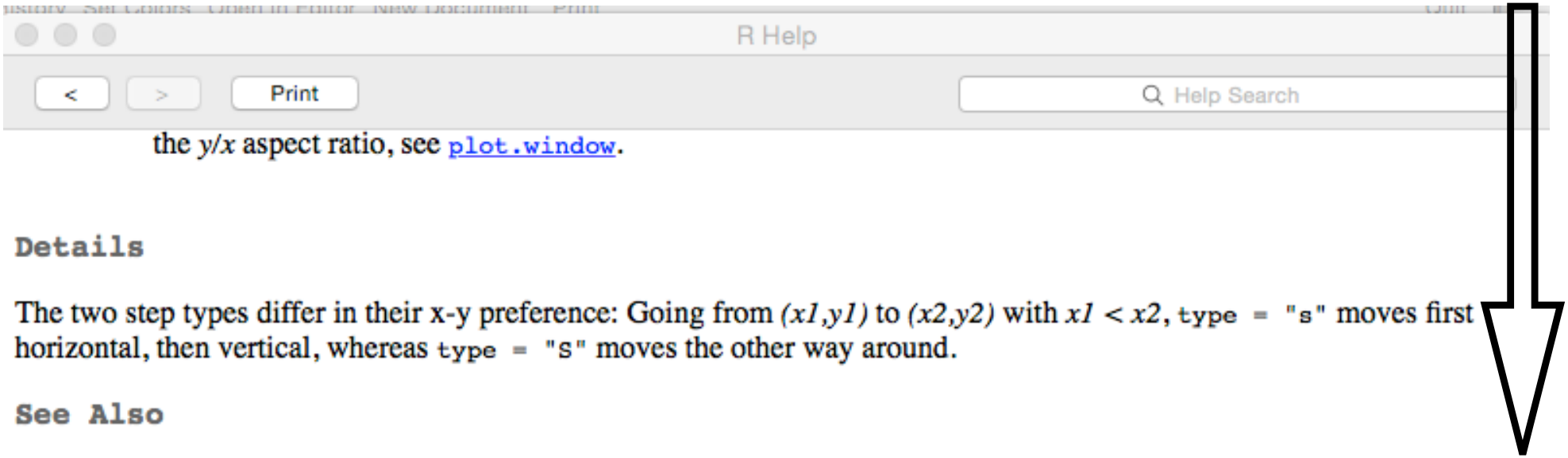
x	the coordinates of points in the plot. Alternatively, a single plotting structure, function or *any R object with a plot method* can be provided.
y	the y coordinates of points in the plot, *optional* if x is an appropriate structure.
...	Arguments to be passed to methods, such as graphical parameters (see par). Many methods will accept the following arguments:

type

what type of plot should be drawn. Possible types are

- "p" for points,

help function in R



the *y*/*x* aspect ratio, see plot.window.

Details

The two step types differ in their x-y preference: Going from *(x1,y1)* to *(x2,y2)* with *x1* < *x2*, `type = "s"` moves first horizontal, then vertical, whereas `type = "S"` moves the other way around.

See Also

plot.default, plot.formula and other methods; points, lines, par.

For X-Y-Z plotting see contour, persp and image.

Examples

```
require(stats)
plot(cars)
lines(lowess(cars))

plot(sin, -pi, 2*pi) # see ?plot.function

## Discrete Distribution Plot:
plot(table(rpois(100, 5)), type = "h", col = "red", lwd = 10,
     main = "rpois(100, lambda = 5)")

## Simple quantiles/ECDF, see ecdf() {library(stats)} for a better one:
plot(x <- sort(rnorm(47)), type = "s", main = "plot(x, type = \"s\")")
points(x, cex = .5, col = "dark red")
```

R surface

- **R Console** = to type your commands and inspect results
- **R documents** (script) = to type your commands and save them for later
- graphic window
- help window

» **4 active windows**

R language

- you can type directly into R Console
  OR
- FILE —> New File: type in document and save document
- hot key to send command line:
- MAC **cmd ENTER**
- Windows **crtl (strg) r**

packages

- some functions require extra packages
- packages are stored in the library
- Packages & Data for managing and downloading

R Language

```
nums = 1:10
nums
nums<-1:10
nums + 1
```

```
 [1]  2  3  4  5  6  7  8  9 10 11
```

R Language

- **if you send line and you see nothing but > in the next line EVERYTHING IS OK!**
- **if you send line and you see this: + in the next line YOU NEED TO CLOSE BRACKETS, PARENTHESIS OR QUOTATION MARKS!!!!**

R Language

```
nums = 1:10
```

```
nums + c(1,2)
```

```
 [1]  2  4  4  6  6  8  8 10 10 12
```

R Language

```
1:10

seq(1,10)

seq(10,100,5)

seq(10,by=5,length=10)

numbers from 4 to 760 in steps of 4?
```

R Language

```
nums <- c(12,9,8,14,7,16,3,2,9)

nums > 10

nums > 10 & nums < 16
```

R Language

```
which(nums>10)

nums[nums > 10] = 0

nums
```

R language

?plot

copy & paste last example into R Console

```
## Simple quantiles/ECDF, see ecdf() {library(stats)} for a better one:
plot(x <- sort(rnorm(47)), type = "s", main = "plot(x, type = \"s\")")
points(x, cex = .5, col = "dark red")
```

R Language

```
?where is my data?
set working directory
setwd
Mac setwd(“/Users/folder”)
Windows setwd(“C:\\folder")
or Rstudio (“C:/folder”)

?how to load data into R?
Read data table
namen<-
  read.table(“name.txt”,header=T)
```

Never save the workspace!!!! only save the script!