An introduction to R:
Getting started with R

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Contents

What is R?

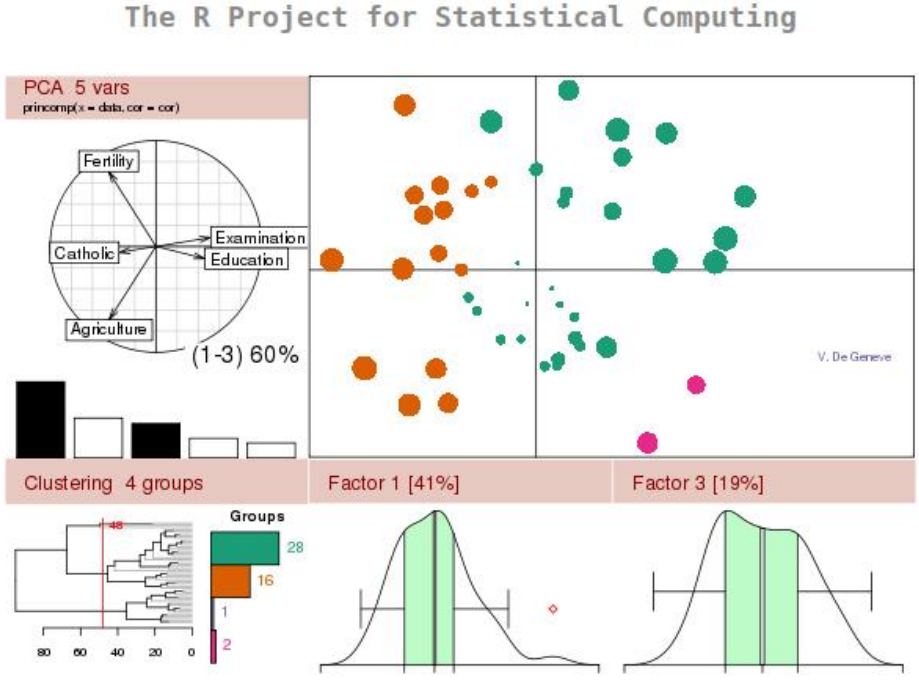
- R is a comprehensive statistical environment and programming language for professional data analysis and graphical display.
- It is a GNU project which is similar to the S language and environment which was developed at Bell Laboratories.
- Webpage: http://www.r-project.org

Advantages:

- R is free.
- New statistical methods are usually first implemented in R.
- Lots of help due to collaborative project.

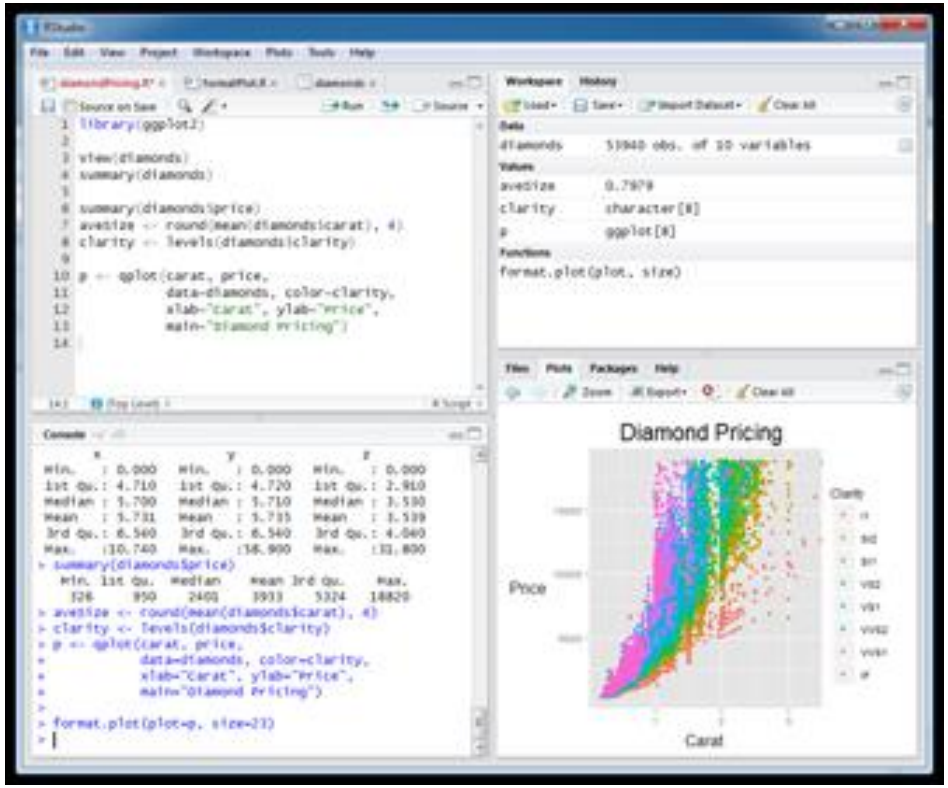
Disdvantages:

- R has a long learning phase.
- No UNDO button



Rstudio

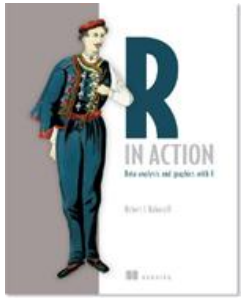
- Powerful IDE for R
- Its free and open source, and works on Windows, Mac, and Linux and over the web.
- Webpage: https://www.rstudio.com/



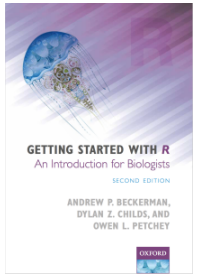
Literature

- **R in Action** - Data Analysis and Graphics with R
  Robert I Kabacoff. 2nd edition (2011)
  https://www.manning.com/books/r-in-action-second-edition

Homework: read sample Chapter 1 (pdf)



- **Getting started with R** - An Introduction for Biologists
  Andrew P. Beckerman, Dylan Z Childs & Owen L. Petchey. 2nd edition (2017)



- Webpage: http://www.statmethods.net/
- and many many more (also online tutorials)

Contents

Organize your R session

- Open Rstudio or open an R console
- Open a new or pre-existing script in text editor or Rstudio (extension .R)
- Set working directory in Rstudio (Session) or with
  `setwd("path2directory")`
  Check with `getwd()`
- Load (and install) required libraries
  Install with `install.packages("name")` - only once
  need to specify CRAN mirror
  Load with `library(name)` - each session if required
- Comment your script with **# really important**
- Write and execute your commands (with button in Rstudio)
- Outputs saved in your working directory (if folder unspecified)
- Quit your session and save workspace if required (`q()`)

Contents

Basic operations

```
2 + 3
7 - 4
3 * 5
7/3
5^2
```

Caution: integer versus modulo division

```
5 %/% 3      # 5 divided by 3 without decimal positions --> 1
5 %% 3      # rest of division of 5 by 3 --> 2
```

Caution: Decimal notation with . and not ,

```
1,2      --> Error:  unexpected ',' in "1,"
1.2      # correct notation
```

Important mathematical functions

```
exp(1)
exp(log(5))
sin(pi/2)
cos(pi/2)
max(4,2,5,1)
min(4,2,5,1)
sum(4,2,5,1)
prod(4,2,5,1)
sqrt(16)
factorial(4)      # "4 factorial", 4!  --> 1*2*3*4
choose(5,2)      # "5 choose 2"
```

$$\binom{n}{k} = \frac{n!}{k! \cdot (n-k)!}.$$

Further functions

log10(), log2(), tan(), asin(), acos(), atan(), sinh(), cosh(), tanh(), asinh(), acosh(), atanh(), abs(), round(), floor(), ceiling(), trunc(), signif()...

And many many more.

- Look at help pages
- Write your own functions - Next week

Contents

Help!

```
help(solve)      #help page for command solve
?solve      #same as help(solve)
help("exp")
help.start()
help.search("solve")      #list of commands which could be
                             related to string solve
??solve      # same as help.search(solve)
example(exp)      #examples for the usage of 'exp'
example("*")      #special characters in quotation marks
```