

# R COURSE

## *Syllabus*

*Flavio Santi · flavio.santi@univr.it*

### 1 OBJECTIVES

The course aims at introducing the participants to R and to some of its most powerful innovations which has recently reshaped the way the R code is designed. The approach of the course is mainly applicative, and particular attention is devoted to some topics which are becoming more and more relevant in research, and typically entails highly time-consuming activities, such as data manipulation and code documentation. A unified conceptual framework is provided on model fitting, in order to make participants able to cope with different (and new) regression models autonomously and efficiently.

### 2 CONTENT OF THE COURSE

The course consists of five lectures. In the first part of each lecture, the topics are illustrated and discussed, whereas in the second part participants can practise the implementation of the techniques taught previously.

- I - INTRODUCTION TO R. An introduction to R; R and RStudio; working directory and workspace; special values; types and R objects: scalars, vectors, matrices, data.frame, lists; indexes; matrix operations; define new functions; the function `str` and the help of R.
- II - BASIC STATISTICS. `factor` variables and the `cut` function; basic statistical functions; frequency tables and basic statistical tests; probability distributions; (pseudo)-random number generators and seeds; introduction to Monte Carlo simulations.
- III - STANDARD GRAPHICS, ADVANCED GRAPHICS AND AUTOMATED REPORTS. R package management; standard R graphics and the grammar of graphics implemented in `ggplot2`; RMarkdown and an introduction to automated reports.
- IV - DATA MANIPULATION AND COMPLEX PROJECTS the `tidyverse` (world); the pipe operator `%>%`; read and write data; data manipulation with `tidyverse`; handling complex projects: how to keep your code, data, and analysis well organised, transparent, and replicable.
- V - CROSS-SECTION, PANEL AND TIME SERIES MODELS: A UNIFIED APPROACH. OLS regression and residual analysis; GLM; time series analysis; a review of some useful R packages.

### 3 REFERENCES

Wickham H., G. Grolemund (2016) *R for Data Science*, O'Reilly. — Available on Hadley Wickham's website for free.