



Statistical Computing R Programming

Course information sheet 2022-23

Full course, 11 weeks



The course introduces learners to data visualisation, data management and programming in the statistical software environment R.

Prerequisite Knowledge

Learners require a basic understanding of matrix algebra. The course is suitable for learners with no prior experience of programming, however learners with no prior

experience in programming should expect a larger time commitment in order to fully benefit from the course.

Intended Learning Outcomes

By the end of this course learners will be able to:

- recognise and make appropriate use of different types of data structures;
- manipulate data sets in R;
- use R to create figures and graphs;
- identify and implement appropriate control structures to solve a particular programming problem;
- design and write functions in R and implement simple iterative algorithms;
- structure complex programming problems into functional units and implement these;
- carry out extended programming tasks and produce clearly annotated listing of their code;
- author reports with embedded code using technologies such as Sweave or knitr;
- develop and deploy R Shiny apps.

Syllabus

Week 1

- Installing R and RStudio
- Accessing R in the cloud
- Basics of scientific computing
- Variables and R as a calculator

Week 2

- Logical operators
- Vectors, lists and matrices
- Other common data types

Week 3

- Data frames
- Transforming, subsetting and merging data frames
- Reading/writing data from/to files

Week 4

- Efficient data management using tidyverse
- tibbles
- Transforming, subsetting and merging data frames using dplyr
- Reshaping data using tidyr

Week 5

- R graphics
- Data visualisation in R

Mid-term week break

Week 6 (sample material)

- Advanced graphics using ggplot2

Week 7

- if statements and ifelse
- Using loops (for and while) for iterative and repeated computations

Week 8

- Writing R functions
- Structuring your code efficiently using functions
- Debugging

Week 9

- Basics of object-oriented programming
- Creating classes ("S3") in R
- Creating R6 classes

Week 10

- Authoring data-driven interactive webapps using shiny

Week 11

- Authoring automatic reports using knitr and rmarkdown
- Reproducible data science

"I really enjoyed the course and believe that the content goes into the perfect amount of detail with examples and everything is clearly explained. I like the videos that show the code in practice."

Online Learning

- Weekly live sessions with tutor(s)
- Weekly learning material (reading material, videos, exercises with model answers)
- Bookable one-to-one sessions with tutor(s)

Textbooks

G. Golemund, H. Wickham. R for Data Science. O'Reilly Media.

<https://r4ds.had.co.nz/>

H. Wickham. Advanced R. CRC Press.

<http://adv-r.had.co.nz/>

W. J. Brown, D. J. Murdoch. A First Course in Statistical Programming with R. Cambridge University Press. P. Daalgard. Introductory Statistics with R. Springer

Assessment

(for credit only)

This will typically be made up of 5 pieces of assessment, including programming assignments, an individual project.

Software

To take our courses please use an up-to-date version of a standard browser (such as Google Chrome, Firefox, Safari, Internet Explorer or Microsoft Edge) and a PDF reader (such as Acrobat Reader). Learning material will be distributed through Moodle. We encourage all learners to install R and RStudio and we provide detailed installation instructions, but learners can also use free cloud-based services (RStudio Cloud). Learners need to install Zoom for participating in video conferencing sessions. We recommend the use of a head set for video conferencing sessions.

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