

With the raise of bioinformatic and ecological tools, knowing some degree of programming languages is essential for any researcher in life sciences. R (<https://www.r-project.org/about.html>), a programming language and environment for statistical computing and graphics, is heavily used in biological and ecological sciences, and therefore, a must have in any researcher portfolio.

We welcome everyone to apply to the **R SESSIONS**. It consists in different short modules (sessions) focusing on a topic related with R. The sessions have the objective of introducing a given topic (materials will be provided for further study) and will be very practical with minimal focus on theory. Each participant can attend one or more sessions depending on what they wish to learn. There is a limit of 15 participants per session.

At the moment, 12 sessions are planned, but more sessions can be opened in the future. The dates and details of each session will be announced in due time.

Instructors:

Pedro Vieira: <https://cbma.uminho.pt/people-detail/?userid=49>

Bruno Bellisario: <https://cbma.uminho.pt/people-detail/?userid=267>

Cayetano Gutiérrez Cánovas: <https://cbma.uminho.pt/people-detail/?userid=256>

Rebeca Arias-Real: [https://www.researchgate.net/profile/Rebeca\\_Arias-Real](https://www.researchgate.net/profile/Rebeca_Arias-Real)

R Sessions will occur at the 5<sup>th</sup> floor of IBS (Institute of Science and Innovation for Sustainability) in Campus Gualtar, University of Minho, Braga. If interested, please send email to Pedro Vieira ([pedroefrvieira@gmail.com](mailto:pedroefrvieira@gmail.com)).

No prior knowledge of R is necessary to attend sessions 1 and 2, but for the remaining sessions, basic R knowledge is required.

All participants must bring their own laptop to the sessions with R and R studio installed.

R: <https://cran.r-project.org/>

R studio for desktop: <https://rstudio.com/products/rstudio/download/>

### R sessions:

#### Session 1: Introduction to programming languages and R basics

- Instructor: Pedro Vieira
- Date: 06 February 2020, at IBS
  - 1<sup>st</sup> group: 09:00-13:00 (full)
  - 2<sup>nd</sup> group: 14h30-18h30 (some places still left)
- Language: Portuguese

#### Session 2: Data manipulation

- Instructors: Cayetano Gutiérrez Cánovas and Rebeca Arias-Real
- Date: 10 February 2020, at IBS
  - 1<sup>st</sup> group: 09:00-13:00 (full)
  - 2<sup>nd</sup> group: 14h30-18h30 (some places still left)
- Language: Portuguese

#### Session 3: Introduction to plotting

- Instructor: Pedro Vieira
- Date: 13 February 2020, at IBS
  - 1<sup>st</sup> group: 09:00-13:00 (full)
  - 2<sup>nd</sup> group: 14h30-18h30 (some places still left)
- Language: Portuguese

#### Session 4: Writing basic functions and loops

- Instructors: Cayetano Gutiérrez Cánovas
- Date: 21 February 2020, at IBS
  - 1<sup>st</sup> group: 09:00-13:00 (full)
  - 2<sup>nd</sup> group: 14h30-18h30 (some places still left)
- Language: Portuguese

### Session 5: Introduction to statistics I

- Instructor: Bruno Bellisario
- Date: 28 February 2020, at IBS
  - 1st group: 09:00-13:00 (full)
  - 2nd group: 14h30-18h30 (some places still left)
- Language: English

### Session 6: Introduction to statistics II

- Instructor: Bruno Bellisario
- Date: 06 March 2020, at IBS
  - 1<sup>st</sup> group: 09:00-13:00 (full)
  - 2<sup>nd</sup> group: 14h30-18h30 (some places still left)
- Language: English

### Session 7: Ecological Modelling I

- Instructor: Cayetano Gutiérrez Cánovas and Rebeca Arias-Real
- Date: 12 March 2020, 09:00-13:00, at IBS
- Language: Portuguese

### Session 8: Ecological Modelling II

- Instructor: Cayetano Gutiérrez Cánovas and Rebeca Arias-Real
- Date: 13 March 2020, 09:00-13:00, at IBS
- Language: Portuguese

### Session 9: Trait-based methods

- Instructor: Cayetano Gutiérrez Cánovas and Rebeca Arias-Real
- Date: 17 April 2020, 09:00-13:00, at IBS
- Language: Portuguese

### Session 9: Regular expressions

- Instructor: Pedro Vieira
- Date: 24 April 2020, 09:00-13:00, at IBS
- Language: Portuguese

### Session 10: Work with molecular data

- Instructor: Pedro Vieira
- Date: 08 May 2020, 09:00-13:00, at IBS
- Language: Portuguese

### Session 11: Network analysis

- Instructor: Bruno Bellisario
- Date: 15 May 2020, 09:00-13:00, at IBS
- Language: English

### Session 12: What do you want to learn in R?

- Date: to be announced

## Details of the R sessions:

### Session 1: Introduction to programming languages and R basics

- What are programming languages
- Understand the differences between programming languages (syntax)
- Command line
- Programming languages and IDE
- File types
- Text Editor
- Understand R studio layout
- R packages
- First mathematical tests with R
- Comments
- Get and define directory, see content
- Variables, Logical, vectors, class
- Types of objects I
- Where can I learn more
- Where can I search information

### Session 2: Data manipulation

- Types of objects II
- Import & export files
- Subsetting datasets
- Dataset basic operations using apply family
- Dataset queries using `sqlf()` and `intersect()`
- Dataset complex operations using `dplyr()`

### Session 3: Introduction to plotting

- Package graphics
- Package lattice
- Package ggplot

### Session 4: Writing basic functions and loops

- Functions
- If-else
- Loops
- Other important tools

### Session 5: Introduction to statistics I

- Working with data - Descriptive statistics: Measures of central tendency, Measures of variability, Skew and kurtosis
- Getting an overall summary of a variable
- Descriptive statistics separately for each group
- Standard scores
- Correlations
- Handling missing values
- Drawing graphs: Histograms, Stem and leaf plots, Boxplots, Scatterplots, Bar graphs
- Linear regression: What is a linear regression model, Estimating a linear regression model, Multiple linear regression, Quantifying the fit of the regression model, Hypothesis tests for regression models, Testing the significance of a correlation, Regarding regression coefficients, Assumptions of regression, Model checking & Model selection

### Session 6: Introduction to statistics II

- Multivariate analyses I: Distance matrices, Clustering, Mantel and partial Mantel
- Multivariate analyses II: Between and within group analyses, One-way, two-way ANOVAs, PERMANOVA
- Multivariate analyses III: Ordinations (CCA, PCA, PCoA, NMDS)

Sessions 7-12: to be announced soon