



IAVS-LAC

The Workshop

This Session

R

RMarkdown

TNRS

From the field to the desk

[Session 1]

Miguel Alvarez

21st April 2023



The Workshop

IAVS-LAC

Welcome!

The Workshop

This Session

R

RMarkdown

TNRS

- ▶ 21-04-2023 **Session 1**
- ▶ 28-04-2023 **Session 2**
- ▶ 05-05-2023 **Session 3**
- ▶ 12-05-2023 **Session 4**
- ▶ 19-05-2023 **Session 5**

<https://kamapu.github.io/r-vegetation/>
detailed program

FROM THE FIELD TO THE DESK:

What you need to do with your
vegetation data before statistics.

**April &
May
2023**

Each Friday (five sessions)
18 - 20 UTC +2 CEST

Limit: 30 participants
Five fee waivers.

ABOUT

Save time learning to
prepare your data for
analyses

Using "Vegetable"
package to understand
your data





The Workshop

IAVS-LAC

The Workshop

This Session

R

RMarkdown

TNRS

▶ Time Slots

- ▶ 18:00 to 19:00 Course
- ▶ 19:00 to 19:10 Break
- ▶ 19:10 to 20:00 Course

▶ Style

- ▶ Slides for Introductions
- ▶ Life Code
- ▶ Exercises / Homeworks

Time Conversions

- ▶ 18:00 to 20:30 in **UTC**
- ▶ 13:00 to 15:30 in **COT**
- ▶ 20:00 to 22:30 in **CEST**



The Workshop

IAVS-LAC

Intro to the trainers

The Workshop

This Session

R

RMarkdown

TNRS



The Workshop

IAVS-LAC

The Workshop

This Session

R

RMarkdown

TNRS

Motivation

- ▶ Collaborative work
- ▶ Reproducible data assessment
- ▶ Literate Programming



The Workshop

IAVS-LAC

The Workshop

This Session

R

RMarkdown

TNRS

- ▶ Installing instructions
- ▶ Data sets



The Workshop

IAVS-LAC

Thanks!

A collage with avatars and logos.

The Workshop

This Session

R

RMarkdown

TNRS



IAVS-LAC

The Workshop

This Session

R

RMarkdown

TNRS



This Session

IAVS-LAC

The Workshop

This Session

R

RMarkdown

TNRS

- ▶ Refreshing R
- ▶ Introduction to RMarkdown
- ▶ Taxonomic Resolution



R

IAVS-LAC

The Workshop

This Session

R

RMarkdown

TNRS

- ▶ Console
- ▶ Workspace (Global environment)
- ▶ History
- ▶ Script
- ▶ Working directory

- ▶ Graphic devices
- ▶ Packages (extensions)



R

IAVS-LAC

The Workshop

This Session

R

RMarkdown

TNRS

Vector

The fundamental data structure in **R**

- ▶ `length()`
- ▶ `class()`
- ▶ `names()` (optional)

```
c(1:10)
## [1] 1 2 3 4 5 6 7 8 9 10
rep(5, times = 10)
## [1] 5 5 5 5 5 5 5 5 5 5
LETTERS[1:5]
## [1] "A" "B" "C" "D" "E"
```



R

IAVS-LAC

Type of data

The Workshop

This Session

R

RMarkdown

TNRS

- ▶ integer
- ▶ numeric
- ▶ logical
- ▶ factor
- ▶ character

```
A <- c(1:10)
is.numeric(A)
## [1] TRUE
```

```
B <- as.character(A)
B
## [1] "1" "2" "3" "4" "5" "6" "7" "8"
is.numeric(B)
## [1] FALSE
```



Index



Index

- ▶ integer
- ▶ logical (condition)
- ▶ character (names)

```
# index as integer
```

```
letters[15]
```

```
## [1] "o"
```

```
# index as logical
```

```
letters[!letters %in% c("a", "b", "c")]
```

```
## [1] "d" "e" "f" "g" "h" "i" "j" "k" "l" "m"
```

```
## [20] "w" "x" "y" "z"
```

```
# index as character
```

```
names(letters) <- letters
```

```
letters["m"]
```

```
## m
```

```
## "m"
```



Special Values

- ▶ NA
- ▶ NaN
- ▶ NULL
- ▶ Inf
- ▶ -Inf

5/0

```
## [1] Inf
```

```
log(0)
```

```
## [1] -Inf
```

```
sqrt(-1)
```

```
## Warning in sqrt(-1): NaNs produced
```

```
## [1] NaN
```



IAVS-LAC

The Workshop

This Session

R

RMarkdown

TNRS



R

IAVS-LAC

The Workshop

This Session

R

RMarkdown

TNRS

Lists

A listing of objects.

- ▶ class list
- ▶ length()
- ▶ index
 - ▶ []
 - ▶ [[]]
 - ▶ \$

```
my_list <- list(  
  A = 1:10,  
  B = matrix(1:10, nrow = 2),  
  C = "This is a list")  
my_list  
  
## $A  
## [1] 1 2 3 4 5 6 7 8 9 10  
##  
## $B  
##      [,1] [,2] [,3] [,4] [,5]  
## [1,] 1    3    5    7    9  
## [2,] 2    4    6    8   10  
##  
## $C  
## [1] "This is a list"
```




R

IAVS-LAC

The Workshop

This Session

R

RMarkdown

TNRS

Data Frame

Column-oriented Table

- ▶ `class list`
- ▶ `length()`
- ▶ `index`
 - ▶ `[]`
 - ▶ `[[]]`
 - ▶ `$`

A special case of list!

```
head(iris)
```

```
##      Sepal.Length Sepal.Width Petal.Length Petal.Width Species
## 1           5.1         3.5         1.4         0.4      setosa
## 2           4.9         3.0         1.4         0.4      setosa
## 3           4.7         3.2         1.3         0.5      setosa
## 4           4.6         3.1         1.5         0.4      setosa
## 5           5.0         3.6         1.4         0.5      setosa
## 6           5.4         3.9         1.7         0.5      setosa
```

```
str(iris)
```

```
## 'data.frame':    150 obs. of  5 variables:
##  $ Sepal.Length: num  5.1 4.9 4.7 4.6 5 5.4
##  $ Sepal.Width : num  3.5 3 3.2 3.1 3.6 3.9
##  $ Petal.Length: num  1.4 1.4 1.3 1.5 1.4 1.7
##  $ Petal.Width : num  0.2 0.2 0.2 0.2 0.2 0.4
##  $ Species     : Factor w/ 3 levels "setosa"
```



R

IAVS-LAC

S4 Objects

The Workshop

This Session

R

RMarkdown

TNRS

► Structured in slots

► slotNames()

► @

► Validation

► validObject()

► Prototype

► new()

There is also **S3** and **R6**

```
library(taxlist)
str(Easplst)
```

```
## Formal class 'taxlist' [package "taxlist"] w
## ..@ taxonNames      : 'data.frame':  5393 ob
## .. ..$ TaxonUsageID  : int [1:5393] 1 5231
## .. ..$ TaxonConceptID: int [1:5393] 1 1 2
## .. ..$ TaxonName     : chr [1:5393] "Abelm
## .. ..$ AuthorName    : chr [1:5393] "(L.)
## ..@ taxonRelations: 'data.frame':  3887 ob
## .. ..$ TaxonConceptID: int [1:3887] 1 2 3
## .. ..$ AcceptedName  : int [1:3887] 1 2 3
## .. ..$ Basionym      : logi [1:3887] NA NA
## .. ..$ Parent        : int [1:3887] 54753
## .. ..$ Level         : Factor w/ 7 levels
## .. ..$ ViewID        : int [1:3887] 1 1 1
## ..@ taxonViews      : 'data.frame':  3 obs.
## .. ..$ ViewID        : int [1:3] 1 2 3
## .. ..$ secundum      : chr [1:3] "African
## .. ..$ view_bibtexkey: chr [1:3] "CJBGSANB
## ..@ taxonTraits     : 'data.frame':  311 ob
```



Functions and Methods

`foo(par1 = arg1, ..., parn = argn)`

- Parameters (par)
- Arguments (arg)
- Output or Action

Methods are defined for an specific object class.

```
A <- c(1, NA, 3, 5)
```

```
mean(A)
```

```
## [1] NA
```

```
mean(A, na.rm = TRUE)
```

```
## [1] 3
```

```
summary(iris$Species)
```

```
##      setosa versicolor  virginica
```

```
##           50           50           50
```

```
summary(iris$Petal.Length)
```

```
##      Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
```

```
##      1.000   1.600   4.350   3.758   5.100   6.900
```



R

IAVS-LAC

The Workshop

This Session

R

RMarkdown

TNRS

Packages

- ▶ `install.packages()`
- ▶ Load Package to session
 - ▶ `library()`
 - ▶ `require()`
- ▶ `update.packages()`

```
install.packages("ade4")  
update.packages(ask = FALSE)
```

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

Available CRAN Packages By Name

ABCDEFGHIJKLMNOPQRSTUVWXYZ

A3
AATools
ABACUS
abbreviate
abbyyR
abc
abc.data
ABC.RAP
abcADM
ABCAnalysis
abclass
ABCOptim
ABCp2
abcrf
abcrlda
abctools
abd
abdiv
abe
abess
abjlasso
ABHgenotypeR
abind
abjData
abjutils
abmR
abn
abnormality
abodOutlier
ABPS
abstr
abstractr
abtest
abundant
Ac3net
ACA
academictwitter

Accurate, Adaptable, and Accessible Error Metrics for Predictive Models
Reliability and Scoring Routines for the Approach-Avoidance Task
Apps Based Activities for Communicating and Understanding Statistics
Readable String Abbreviation
Access to Abbyy Optical Character Recognition (OCR) API
Tools for Approximate Bayesian Computation (ABC)
Data Only: Tools for Approximate Bayesian Computation (ABC)
Array Based CpG Region Analysis Pipeline
Fit Accumulated Damage Models and Estimate Reliability using ABC
Computed ABC Analysis
Angle-Based Large-Margin Classifiers
Implementation of Artificial Bee Colony (ABC) Optimization
Approximate Bayesian Computational Model for Estimating P2
Approximate Bayesian Computation via Random Forests
Asymptotically Bias-Corrected Regularized Linear Discriminant Analysis
Tools for ABC Analyses
The Analysis of Biological Data
Alpha and Beta Diversity Measures
Augmented Backward Elimination
Fast Best Subset Selection
Adaptive Bayesian Graphical Lasso
Easy Visualization of ABH Genotypes
Combine Multidimensional Arrays
Databases Used Routinely by the Brazilian Jurimetrics Association
Useful Tools for Jurimetrics Analysis Used by the Brazilian Jurimetrics Association
Agent-Based Models in R
Modelling Multivariate Data with Additive Bayesian Networks
Measure a Subject's Abnormality with Respect to a Reference Population
Angle-Based Outlier Detection
The Abnormal Blood Profile Score to Detect Blood Doping
R Interface to the A/B Street Transport System Simulation Software
An R-Shiny Application for Creating Visual Abstracts
Bayesian A/B Testing
High-Dimensional Principal Fitted Components and Abundant Regression
Inferring Directional Conservative Causal Core Gene Networks
Abrupt Change-Point or Aberration Detection in Point Series
Access the Twitter Academic Research Product Track V2 API Endpoint



R

IAVS-LAC

The Workshop

This Session

R

RMarkdown

TNRS

devtools

- ▶ `install()`
- ▶ `install_github()`

For instance...

```
library(devtools)
install_github("ropensci/taxlist")
install_github("kamapu/vegtable")
```

devtools 2.4.5 Reference Articles ▼ News ▼



devtools

The aim of devtools is to make package development easier by providing R functions that simplify and expedite common tasks. [R Packages](#) is a book based around this workflow.

Installation

```
# Install devtools from CRAN
install.packages("devtools")

# Or the development version from GitHub:
install.packages("devtools")
devtools::install_github("r-lib/devtools")
```



IAVS-LAC

The Workshop

This Session

R

RMarkdown

TNRS



Example of self-contained HTML as notebook.



IAVS-LAC

The Workshop

This Session

R

RMarkdown

TNRS



TNRS

IAVS-LAC

Taxonomic Names Resolution.

The Workshop

This Session

R

RMarkdown

TNRS



IAVS-LAC

Thank You!

The Workshop

This Session

R

RMarkdown

TNRS