

Einführung in R und RStudio

[Termine 5 & 6]

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▶ Termin 1 & 2

- ▶ Grundlagen
- ▶ Datentypen

▶ Termin 3 & 4

- ▶ Objekten
- ▶ Lesen und Schreiben

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- ▶ Statistiken
- ▶ Grafiken

▶ Termin 7 & 8

- ▶ Fortgeschrittenes Programmieren
- ▶ Erstellen von Dokumenten
- ▶ Abschluss

Funktion

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

Funktionen und Argumente (Parameter)
werden dokumentiert.
Achte auf Standardeinstellungen (default
values).

```
A <- c(1, NA, 3, 5)  
mean(A)  
## [1] NA  
mean(A, na.rm = TRUE)  
## [1] 3
```

Matrix

- ▶ Typ von Inhalt (mode()).
- ▶ Zwei Dimensionen.

```
M <- matrix(1:20, nrow = 4)
```

```
M
```

```
##      [,1] [,2] [,3] [,4] [,5]  
## [1,]    1    5    9   13   17  
## [2,]    2    6   10   14   18  
## [3,]    3    7   11   15   19  
## [4,]    4    8   12   16   20
```

```
class(M)
```

```
## [1] "matrix" "array"
```

```
mode(M)
```

```
## [1] "numeric"
```

```
length(M)
```

```
## [1] 20
```

```
dim(M)
```

```
## [1] 4 5
```

Datensatz

Spaltenorientierte Tabelle
(data.frame)

```
head(iris)
```

```
##   Sepal.Length Sepal.Width Petal.Length Petal.Width Species
## 1         5.1         3.5         1.4         0.2   setosa
## 2         4.9         3.0         1.4         0.2   setosa
## 3         4.7         3.2         1.3         0.2   setosa
## 4         4.6         3.1         1.5         0.2   setosa
## 5         5.0         3.6         1.4         0.2   setosa
## 6         5.4         3.9         1.7         0.2   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"
```

Liste

Liste (Sammlung) von Objekten, inklusive Listen.

Achte, dass `data.frame` eine spezielle Form von `list` ist.

```
MeineListe <- list(  
  A = 1:10,  
  B = matrix(1:10, nrow = 2),  
  C = "Dies ist eine Liste")  
MeineListe  
  
## $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] "Dies ist eine Liste"
```

CRAN

(Comprehensive R Archive Network)

▶ `install.packages()`

▶ `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
abglasso
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

devtools

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

<https://ropensci.org/>

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")
```


- ▶ readLines()
- ▶ read.table()
 - ▶ read.csv()
 - ▶ read.csv2()

```
Bonn2021 <- read.csv("Bevoelkerung-2021.csv")  
str(Bonn2021)
```

```
## 'data.frame':    67 obs. of  13 variables:  
## $ BezirkNr      : int  110 111 112 113 114 115 1  
## $ BezirkName    : chr  "Zentrum-Rheinviertel" "Z  
## $ Gesamt        : int  2343 3161 6768 8906 5157 6  
## $ DichteKm2     : int  6508 6585 11874 16193 433  
## $ Maenner       : int  1166 1537 3189 4575 2481 3  
## $ MaennerProzent : num  49.8 48.6 47.1 51.4 48.1 4  
## $ Frauen        : int  1177 1624 3579 4331 2675 3  
## $ FrauenProzent  : num  50.2 51.4 52.9 48.6 51.9 5  
## $ Zuwanderer    : int  753 1092 1762 2732 1873 2  
## $ ZuwandererProzent : num  32.1 34.5 26 30.7 36.3 35  
## $ Auslaender    : int  494 813 1145 2010 1235 12  
## $ AuslaenderProzent : num  65.6 74.5 65 73.6 65.9 55  
## $ AuslaenderProzent2: logi  NA NA NA NA NA NA ...
```

- ▶ readLines()
- ▶ read.table()
 - ▶ read.csv()
 - ▶ read.csv2()
- ▶ write.table()
 - ▶ write.csv()
 - ▶ write.csv2()

```
write.csv(iris, file = "iris.csv")  
write.csv2(iris, file = "iris2.csv")
```

Pakete können eigene Funktionen für Importieren und Exportieren anbieten.

▶ **xlsx**

- ▶ `read.xlsx()`
- ▶ `write.xlsx()`

▶ **readODS**

- ▶ `read_ods()`
- ▶ `write_ods()`

R Data Import/Export

This is a guide to importing and exporting data to and from R.

This manual is for R, version 4.3.0 Under development (2022-10-23).

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R-Images

- ▶ Workspace
 - ▶ `save()`
 - ▶ `load()`
 - ▶ Dateierweiterung **.rda** oder **.RData**
- ▶ Einzelnes Objekt
 - ▶ `saveRDS()`
 - ▶ `readRDS()`
 - ▶ Dateierweiterung **.rds**

Vielen Dank!

```
library(fortunes)  
fortune(10)
```

```
##  
## Overall, SAS is about 11 years behind R and S-Plus in statistical capabilities  
## (last year it was about 10 years behind) in my estimation.  
## -- Frank Harrell (SAS User, 1969-1991)  
## R-help (September 2003)
```