

The >eR-Biostat initiative
Making R based education materials in
statistics accessible for all



We >eR a community: the >eR-Biostat initiative

Development of a robust E-learning system in (Bio)Statistics
using the >eR-BioStat platform

Ziv Shkedy
Hasselt University, Belgium
09/09/2021



<https://erbiostat.wixsite.com/erbiostat>

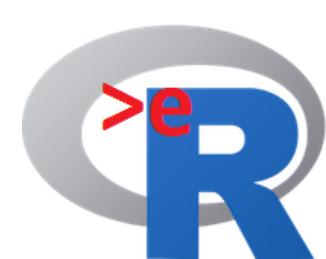


ER-BioStat

Email: erbiostat@gmail.com

 <https://github.com/eR-Biostat>

 @erbiostat



The >eR-Biostat Initiative

- >eR-Biostat = E-learning system using R ((bio)statistics)
- Leading team:
 - Ziv Shkedy (Hasselt University, Belgium).
 - Khangelani Zuma (HSRC, South Africa).
 - Adetayo Kasim (Durham University, UK).
 - Tadesse Awoke Ayele (Gondar University, Ethiopia).

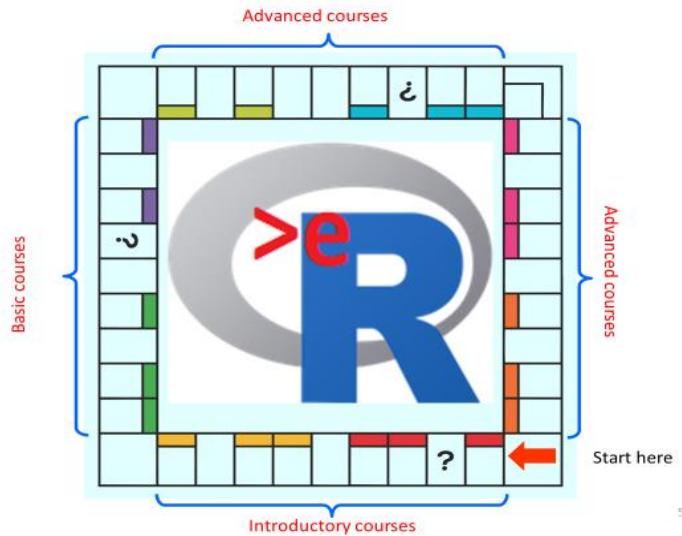
The >eR-Biostat initiative is a part of a past and an ongoing VLIR-UOS project.



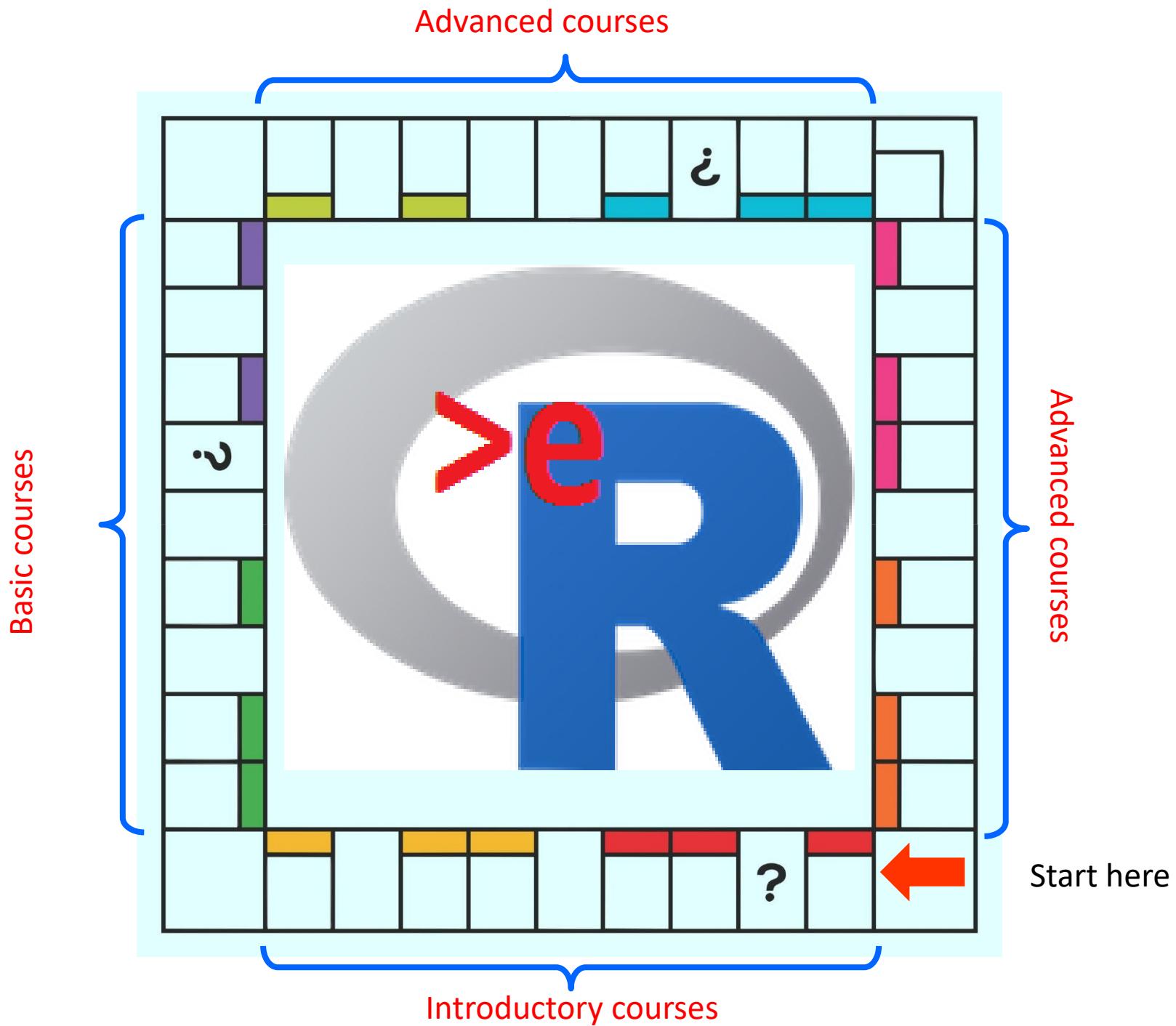
The >eR-BioStat platform

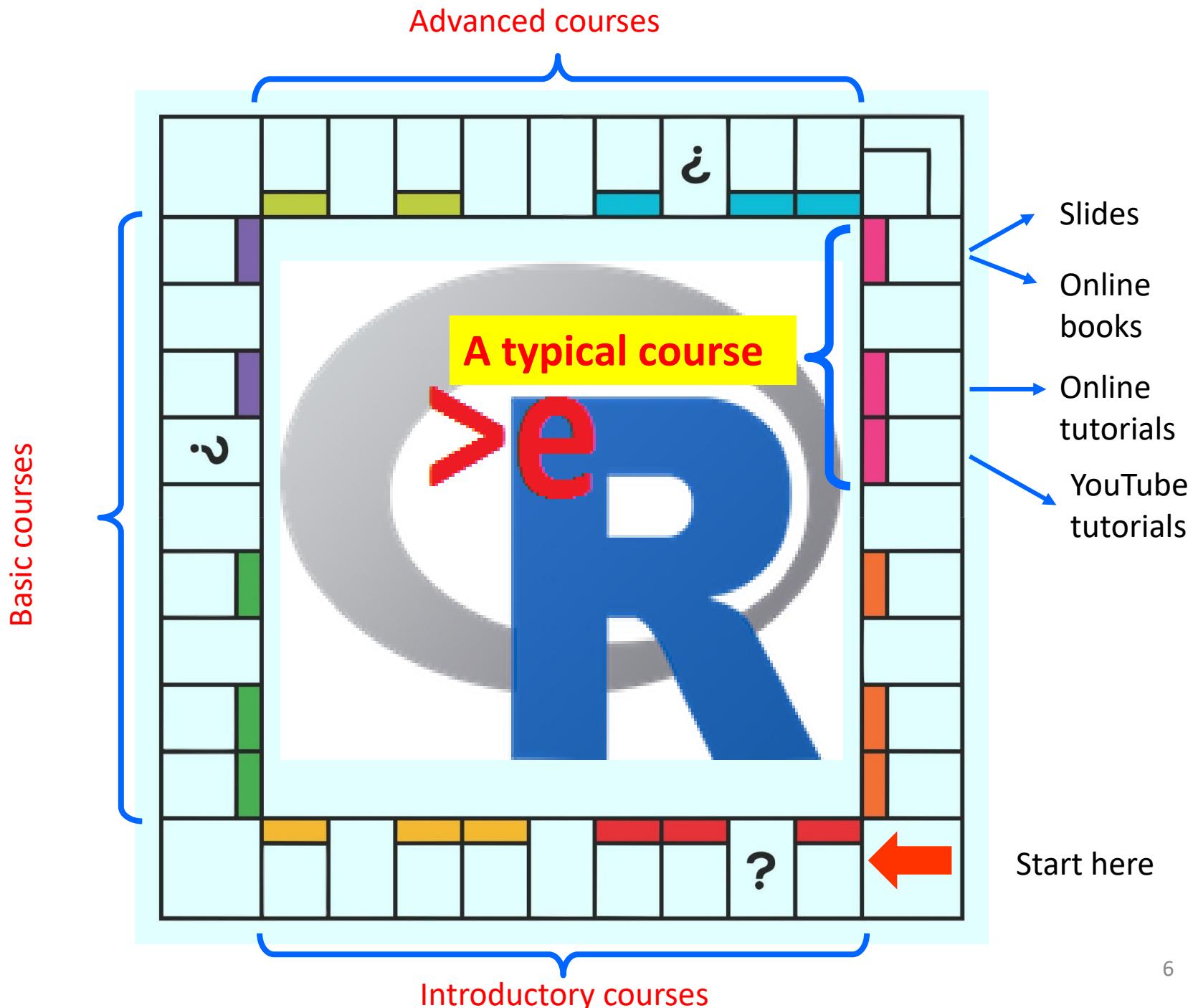
Very short introduction

The >eR-BioStat platform



- A collection of courses online.
- Developed for both teachers & students.
- Ready to be given in class.





Development of a robust E-learning system in (Bio)Statistics

General concepts

Concepts

- The E-learning system consists of few components:
 1. All course materials are available to the students/teachers online to download.
 2. Selected courses were developed.
 3. Courses will are either a complete course or a part of a course.

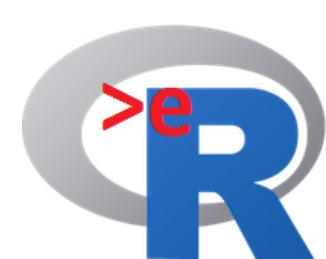
Few points to think about

- Communication:
 - How to deliver the course ?
 - Online/Offline ?
- Where to store the course materials ?
- How to get the course materials: a website ?
- For data analysis: which software ?
- Who will pay for the platform ?
- Who will develop a course ?

Our approach: free and publically available

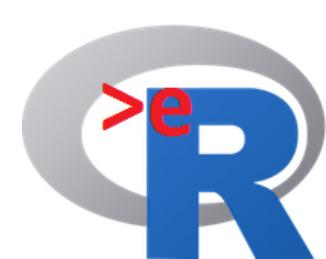
- Reduce costs to zero !!!
 - Storage course materials: GitHub (<https://github.com/>).
 - Website: WIX (<https://www.wix.com/>).
 - Software: R (<https://www.r-project.org/>).
 - Free for users:
 - No password needed.
 - No registration.
- 
- All publically available products.

The >eR-BioStat system for robust E-learning



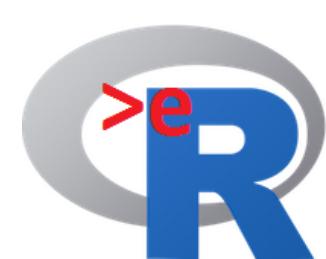
Motivation

- Low capacity in some developing countries in education in biostatistics/statistics.
- Reasons:
 - Young teaching stuff (usually with master degrees).
 - Small number of PhD holders.
 - Lack of high quality materials for master programs.
 - Academic staff is not always updated in the current methods/software available.
- Result:
 - Difficult to maintain the level education programs at a high level.



The >eR-Biostat Initiative

- The >eR-Biostat Initiative aims to:
 - Develop accessible course materials in biostatistics/statistics.
 - Focus on **all education levels**:
 - Undergraduate & master programs.
 - Statisticians & non statisticians.
 - Bring students and teachers costs to minimum by providing **free, high quality and applied** course materials.
 - Increase usage of R (but not only R.....).



The >eR-Biostat Initiative: main concepts

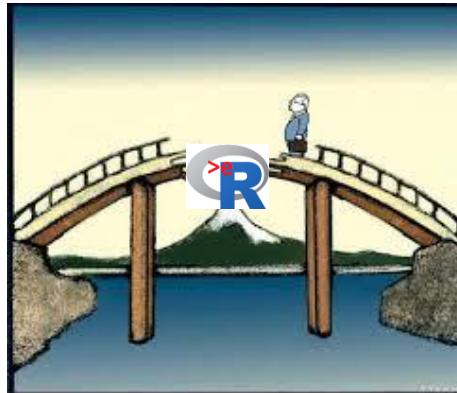
- Community based education development.
- Courses are developed by many collaborators (often in independent fashion).
- Preferably, an R based education:
 - Courses are developed in R.
 - Increase usage of R.



We >^eR a community

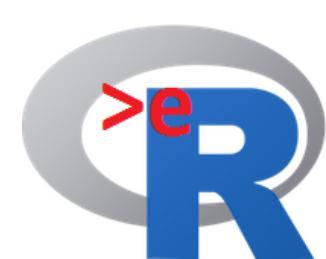
- Our aim is to bridge between two communities:

Academic staff and students in the south.



Academic staff in the north & south.

Development of E-learning capacity using R.



The >eR-Biostat Initiative: general idea

- The main idea:
 - Development of online, **publically available and free** materials at all education levels.
 - All materials available to download without password.
- Focus on all education levels:
 - **Introductory courses:** for all students (statisticians and non statisticians).
 - **Basic courses:** for undergraduate/master students in statistics.
 - **Core courses:** for students at a master level in biostatistics/statistics.



>eR-Biostat courses

(updated: 05/09/2021)

	introductory	Basic	Modeling 1	Modeling 2	Inference	Data analysis
R	Introduction to R	Statistical computing and EDA				EDA for multivariate data Computer intensive methods and bootstrap
Modeling	1. One-way ANOVA 2. Simple regression 3. Logistic regression	1. Linear regression using R.	1. Categorical analysis 2. GLM	1. Survival analysis (two courses) 2. LDA		
Inference		Inference (1) Inference (2)			Sample size calculation	
In the future:						
R						
Modeling			Linear models		Inference	Multivariate analysis
Inference	Introduction for applied statistics				CPS ?	

The >eR-BioStat : where to find us ?

Our new website

<https://erbiostat.wixsite.com/erbiostat>



We R online

- We provide **an online and free** platform:

<https://erbiostat.wixsite.com/erbiostat>

The screenshot shows a browser window with the URL erbiostat.wixsite.com/erbiostat. The page features the >eR-BioStat logo at the top left. A navigation bar includes links for Home, We R a community, Our platform, Our courses, Gallery, Developers, and Blog. A "Log In" button is also present. The main content area has a purple header with the text "E-learning using R: Biostatistics". Below this, a large text block welcomes visitors to the 2020 edition of the initiative, highlighting its role in the open-source movement and offering free courses in statistics. It encourages users to click on links, download materials, and teach themselves. A photograph of a classroom showing students looking at a presentation on a screen is displayed. A "CHAT WITH US" button is located at the bottom right of the page. The browser's taskbar at the bottom shows the Windows Start button, a search bar, and several pinned icons.

Open source

Inbox (4,678) - ziv.shkedy@uhasselt.be

erbiostat.wixsite.com/erbiostat

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Our platform

Online Courses

Our courses

We offer courses at different levels. **The green courses** are developed at an introductory level. Only basic level knowledge of statistics and R is required. These courses were developed for both non statisticians and statisticians. The courses within this cluster can also be used as courses to support R usage in undergraduate program in biostatistics/statistics. **The blue courses** are developed at a basic undergraduate level in statistics. A basic level knowledge of statistics and R is required at the beginning of the course. The courses aim to teach the students basic topics on specific subjects. **The orange courses** are more advanced and are focused on basic statistical modeling and inference methods at a master level.

Courses' structure

We offer few course structures, all of them were developed up to a class level course. Typically, a course in the >eR-BioStat platform consists of

- Slides.
- R programs for the examples discussed in the slides.
- Datasets.
- YouTube tutorials.

Open source

Our **open source policy** means that course materials, slides, programs for the examples discussed in the courses, are available for you. In some courses, source files for the presentations/course notes are available in PowerPoint or markdown files. Our aim is to have, as much that it is possible, a complete open source curriculum by the end of 2022.

Courses marked with red sticker are fully open source.

Courses marked with blue sticker are under development and not presented in their final version.

CHAT WITH US

Windows Taskbar: Type here to search, File Explorer, Microsoft Word, Microsoft Powerpoint, Google Chrome, 25°C Zonnig, ENG US, 16:17, 03/09/2021, battery status

- We provide the source files for the courses:
 - PPT/Tex/Rmds for slides.
 - Rmds and R programs.

Our courses

This screenshot shows a Wix website for 'Erbiostat' with a purple header bar. Below the header, a message from WIX.com encourages users to create their own website. The main content area features two sections: 'Introductory' and 'Advanced'. Each section contains a list of course titles, some of which are marked with blue or red dots. A green button at the bottom right says 'CHAT WITH US'.

Our courses

Introductory	Advanced
Introduction to R	Applied Generalized Linear Models (GLM) using R
Statistical modeling: Linear regression using R	Modelling Binary Data using R
Statistical modeling: One-way ANOVA using R	Longitudinal data analysis (LDA) using R
Statistical modeling: Logistic regression using R	Linear models using R
Vizualizing data using R: an introduction	Survival Analysis using R
Introductory Statistics for the Life and Biomedical Sciences	An introduction to bootstrap using R
	Sample size calculation using R

CHAT WITH US

- Courses are ready to be given in class.
- To select a course: click on the course name.

Example: introduction to R

This screenshot shows a Wix website for 'Erbiostat' featuring a list of courses in R. The page has a purple header bar with a 'Start Now' button. Below the header, there's a green box containing a note about the courses being in development. The main content area is titled 'Our courses' and is divided into two sections: 'Introductory' and 'Advanced'. The 'Introductory' section contains five green boxes with titles: 'Introduction to R', 'Statistical modeling: Linear regression using R', 'Statistical modeling: One-way ANOVA using R', 'Statistical modeling: Logistic regression using R', and 'Vizualizing data using R: an introduction'. The last two have blue circular icons next to them. The 'Advanced' section contains seven orange boxes with titles: 'Applied Generalized Linear Models (GLM) using R', 'Modelling Binary Data using R', 'Longitudinal data analysis (LDA) using R', 'Linear models using R', 'Survival Analysis using R', 'An introduction to bootstrap using R', and 'Sample size calculation using R'. Each of these advanced courses has a small red circular icon next to it. At the bottom right, there's a yellow 'CHAT WITH US' button. The browser taskbar at the bottom shows various open tabs and system status.

Our courses

Introductory

- Introduction to R
- Statistical modeling: Linear regression using R
- Statistical modeling: One-way ANOVA using R
- Statistical modeling: Logistic regression using R
- Vizualizing data using R: an introduction

Advanced

- Applied Generalized Linear Models (GLM) using R
- Modelling Binary Data using R
- Longitudinal data analysis (LDA) using R
- Linear models using R
- Survival Analysis using R
- An introduction to bootstrap using R
- Sample size calculation using R

development and not presented in their final version.

CHAT WITH US

Example: introduction to R

The screenshot shows a browser window displaying a Wix website for an R introduction course. The URL in the address bar is <https://erbiostat.wixsite.com/rintro>. The page title is "Introduction to R >eR-BioStat". The navigation menu includes Home, About, Topics (which is circled in red), Online book, and Contact. Below the menu, there is a text block about the course, a list of topics covered, and a note that the course is introductory level. To the right, there is a screenshot of an R console and graphics device showing a scatter plot of air quality data.

This site was designed with the **WIX**.com website builder. Create your website today. [Start Now](#)

R

Introduction to R

>eR-BioStat

Home About **Topics** Online book Contact

This course is an introductory course to R and can be given as a one/two-days workshop or as a course of 2-3 classes (3 hours per class). All topics in the course are presented at a basic level. Only a limited knowledge in R is required. Topics covered in the course include:

- Two sample t-test.
- Basic plots
- Basic programming in R: objects in R
- Reading external datasets
- Basic plots functions
- Programming in R: a for loop
- Statistical modeling in R: simple linear regression
- Statistical modeling in R: one-way ANOVA
- Statistical modeling in R: logistic regression
- Programming in R: user functions
- Two-way ANOVA
- Application of a for loop: bootstrap.
- The tidyverse package.

The course was developed as a **introductory level** course.

R version 3.6.1 (2019-05-16) -- "Good Sport"
Copyright (C) 2019 The R Foundation for Statistical Computing
Platform: x86_64-w64-mingw32/v4.0 (64-bit)
R is free software and comes with ABSOLUTELY NO WARRANTY.
You are welcome to redistribute it under certain conditions.
Type 'license()' or 'licence()' for distribution details.
R is a trademark of The R Foundation for Statistical Computing.
Type 'citation()' on how to cite R or R packages in publications.
Type 'demo()' for some demos, 'help()' for on-line help,
'reproducible()' for the code that produced this image,
'q()' to quit R. R will never interfere with your system.
Type 'q("q")' to quite R in its current interface.
Errors had occurred for regular number (file may be corrupt)
in file 'airquality.RData'. Error in readBin(file, what = "double", n = 1, file = "airquality.RData", n = 1):
file 'airquality.RData' has magic number "4D31"
Use 'readBin(file, what = "double", n = 1, file = "airquality.RData", n = 1)' to
deprecate. During startup - Warning message:
In readBin(file, what = "double", n = 1, file = "airquality.RData", n = 1):
 file 'airquality.RData' has magic number "4D31"
 file 'airquality.RData' has magic number "4D31"

R Graphics Device 2 (ACTIVE)

50 100 150

airquality\$Ozone

0 5 10 15 20

airquality\$Wind

Rfig

Windows Taskbar: Type here to search, File Explorer, File Manager, Task View, Google Chrome, Mail, R icon, 25°C Zonnig, ENG US, 16:20 03/09/2021, 2 notifications

<https://erbiostat.wixsite.com/rintro>

Slide format

- The course in a usual slides format.
 - Slides.
 - R program to produce the results presented in the slides.

The image consists of three vertically stacked screenshots of a website titled "Topics" from "eribstat.wixsite.com/intro/topics".

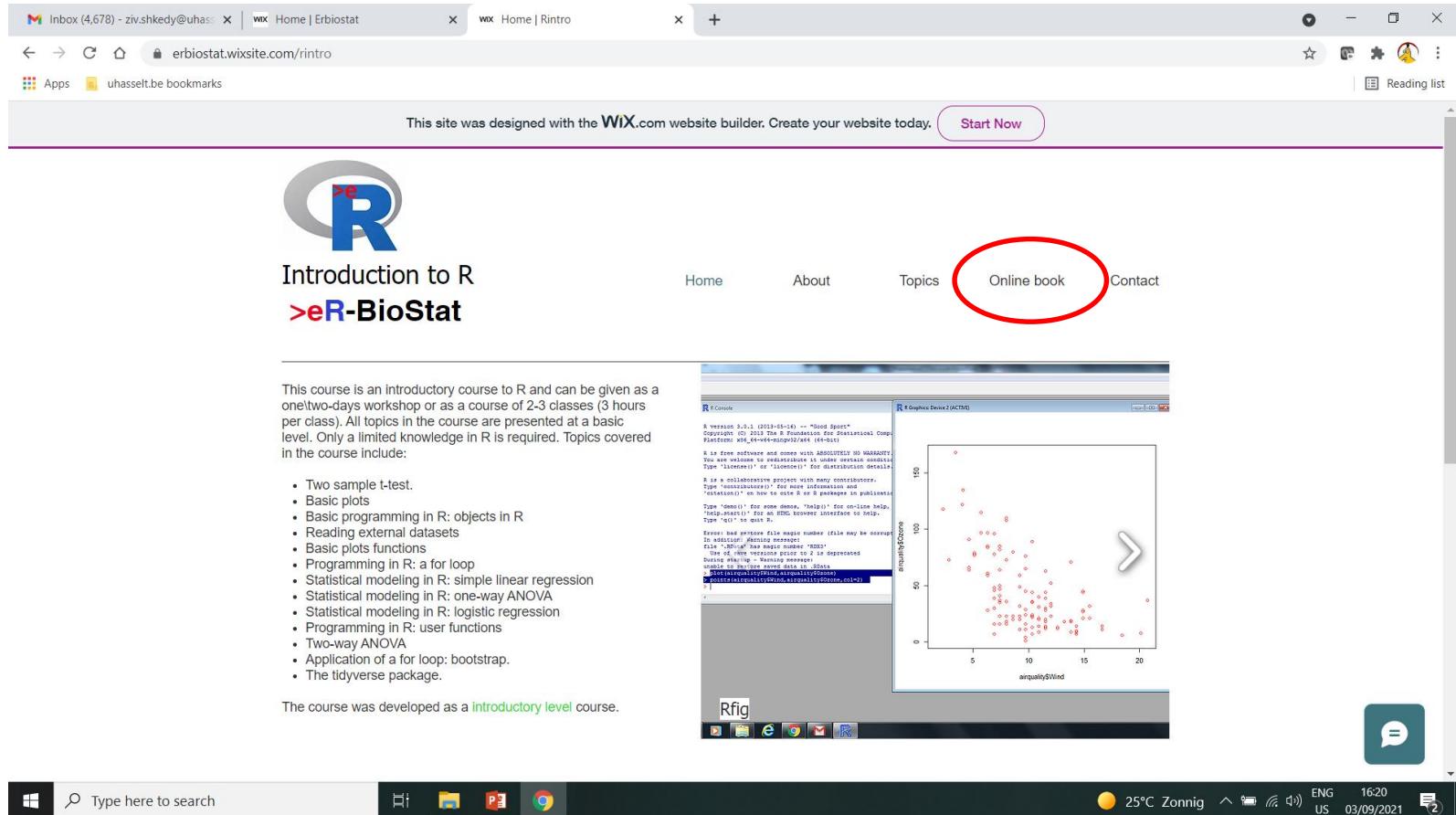
- Top Screenshot:** A blue box highlights the text "The course is organized in 4 chapters:" followed by a bulleted list:
 - A quick start.
 - Basic programming in R.
 - First steps in statistical modeling in R.
 - Selected topics in modeling.A smaller blue box highlights the text "R functions that are used for illustrations include:" followed by a list of R functions:
 - mean()
 - median()
 - var()
 - quantile()
 - range()
 - min()
 - max()
 - cor()
 - tapply()
 - hist(x)
 - plot(x)
 - boxplot(x)
 - aov(mpc~gmc)
 - wtd.var
 - quantile()Below this is a screenshot of a computer screen showing two histograms.
- Middle Screenshot:** A blue box highlights the section "Quick start". It contains text about being new to R and a list of topics:
 - Sampling from a normal distribution.
 - Working with data: the cars data.
 - Two sample t-test.
 - Basic plots.A green button labeled "Slides (part 1) A quick start" is circled in red.
- Bottom Screenshot:** A blue box highlights the section "Modeling 2". It contains text about two-way ANOVA and linear regression, and a green button labeled "Slides (part 4): statistical modeling 2".

Slide format

The screenshot shows a Microsoft Edge browser window with the following details:

- Address Bar:** github.com/eR-Biostat/Courses/blob/master/Introductory%20Courses/Introduction%20to%20R/Slides/eR-Biostat_An%20Introduction%20to%20R_2017_QuickStart.pdf
- Tab Bar:** Home | Erbiostat, Topics | Rintro, Courses/eR-Biostat_An Introducti... (active tab)
- Content Area:**
 - Logo:** A large logo featuring a blue 'R' with a red '>e' symbol to its left.
 - Text:** The >eR-Biostat initiative
Making R based education materials in statistics accessible for all
 - Title:** An introduction to R: Short Version (2017)
 - Section:** Part 1: a quick start
 - Text:** Developed by Dan Lin (Hasselt University) and Ziv Shkedy (Hasselt University)
 - Text in a red-bordered box:** LAST UPDATE: 15/10/2017
- Taskbar:** Shows the Windows Start button, a search bar with "Type here to search", and icons for File Explorer, Microsoft Word, and Google Chrome.
- System Tray:** Shows battery level (19%), temperature (19°C), location (Zonnig), signal strength, and system status (ENG US 11:14 06/09/2021).

Online book



Online book

The screenshot shows a Microsoft Edge browser window displaying an online book titled "Introduction to R: basic programming". The left sidebar contains a table of contents with chapters 1 through 3 and a summary section. Chapter 1 includes sections for slides, code, and tutorials, as well as R help and slides. Chapter 2 covers YouTube tutorials and various data structures like vectors, factors, and data frames. Chapter 3 covers basic plots and graphical functions. The main content area shows the first chapter's introduction and its sub-sections. A code block in the main area shows a warning message about the mvtnorm package. Below the main content, there is a search bar and a taskbar at the bottom.

Inbox (4,678) - ziv.shkedy@uhasselt.be | Home | Erbiostat | Online book | Rintro | Introduction to R: basic program... +

Not secure | htmlpreview.github.io/?https://github.com/eR-Biostat/Courses/blob/master/Introductory%20Courses/Introduction%20to%20R/Onlinebook/Rintro_Prog-html-_V1.html

Apps uhasselt.be bookmarks Reading list

Introduction to R: basic programming

First steps of programming in R (July 2020)

```
## Warning: package 'mvtnorm' was built under R version 3.6.2
```

1 Introduction

1.1 Slides, code and tutorials

This chapter of the interactive book contains all R code that was used to produce the results and output presented in chapter 2 (programming) in the course's slides. We include YouTube tutorials as a part of the chapter and links to the relevant tutorials are provided in different sections. Note that these tutorials were not developed especially for this book, they cover the same topics using different examples.

1.2 R ?

No previous knowledge about R is required. We start from the basic and follow a user approach and not a programmer approach. The datasets used for illustrations are available in R, one of them (the law school data) is part of the R package. To run the code smoothly, this package need to be installed.

```
library(bootstrap)
```

1.3 Slides

Ziv Shkedy
Hasselt University, Belgium
May, 2020

Type here to search

25°C Zonnig 25°C Zonnig ENG US 16:21 03/09/2021

- Available in
 - HTML.
 - PDF.
 - Rmd to reproduce the book on your laptop.

Online book

The screenshot shows a Microsoft Edge browser window displaying an online book titled "Introduction to R: basic programming". The left sidebar contains a table of contents with sections like 1 Introduction, 2 R Objects, and 3 Basic plots in R. The main content area shows code snippets and text. Two specific links are circled in red: one pointing to course slides and another to a YouTube tutorial about objects in R.

Introduction to R: basic programming

- 1 Introduction
 - 1.1 Slides, code and tutorials
 - 1.2 R?
 - 1.3 Slides
- 2 R Objects
 - 2.1 YouTube tutorial: objects in R
 - 2.2 Introduction
 - 2.3 Scaler
 - 2.4 vectors
 - 2.5 Factors
 - 2.6 index vectors
 - 2.7 Data frame
 - 2.8 Matrix
- 3 Basic plots in R
 - 3.1 Introduction
 - 3.2 Graphical functions (I)
 - 3.3 Graphical functions (II): the law school data

A summary statistic bar at the bottom indicates "Aantal statistieken: 1".

1.3 Slides

Slide for this part of the course are available online in the >eR-BioStat website. See [RcourseProgramming](#).

2 R Objects

2.1 YouTube tutorial: objects in R

For a short YouTube introduction, by Mike Marin, about objects in R see [YTobjects1](#).

2.2 Introduction

R works with objects. An object in R could be a scalar, for example

```
x<-1
```

We can print the object x :

```
print(x)
```

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

The object x can be a vector defined using the R function c()

Links to the course slides and YouTube tutorials from the book.

19°C Zonnig 11:20 06/09/2021

R course users in the last 365 days

10/09/2020-10/09/2021

The screenshot shows the Wix Analytics Dashboard with the following details:

- Traffic Overview:** Last 365 days (Sep 10, 2020 - Today) compared to previous period (Sep 11, 2019 - Sep 9, 2020).
 - Site Sessions:** 1,926 (↑ 224%)
 - Unique Visitors:** 478 (↑ 635%)
 - Avg. Session Duration:** 3m 21s (↑ 99%)
- Sessions over Time:** A line chart showing session counts over time from Sep 10 to Aug 16. The chart has two data series: "Selected period" (blue line with dots) and "Previous period" (light blue line with dots). The "Selected period" shows significant spikes in September and October 2020.
- Top Traffic Sources by Sessions:**
 - Direct: 1,308 (↑ 16,250%)
 - blackboard.uantwerpen.be: 277
 - bb.uhasselt.be: 171
 - Unknown: 94 (↑ 176%)
 - wix.com: 25 (↑ 92%)
- Top Pages by Sessions:**
 - /rintro/online-book: 1,262 (↑ 4,948%)

How and what our users use the website ? (of R introduction)

The screenshot shows the Wix Analytics Dashboard with the following sections:

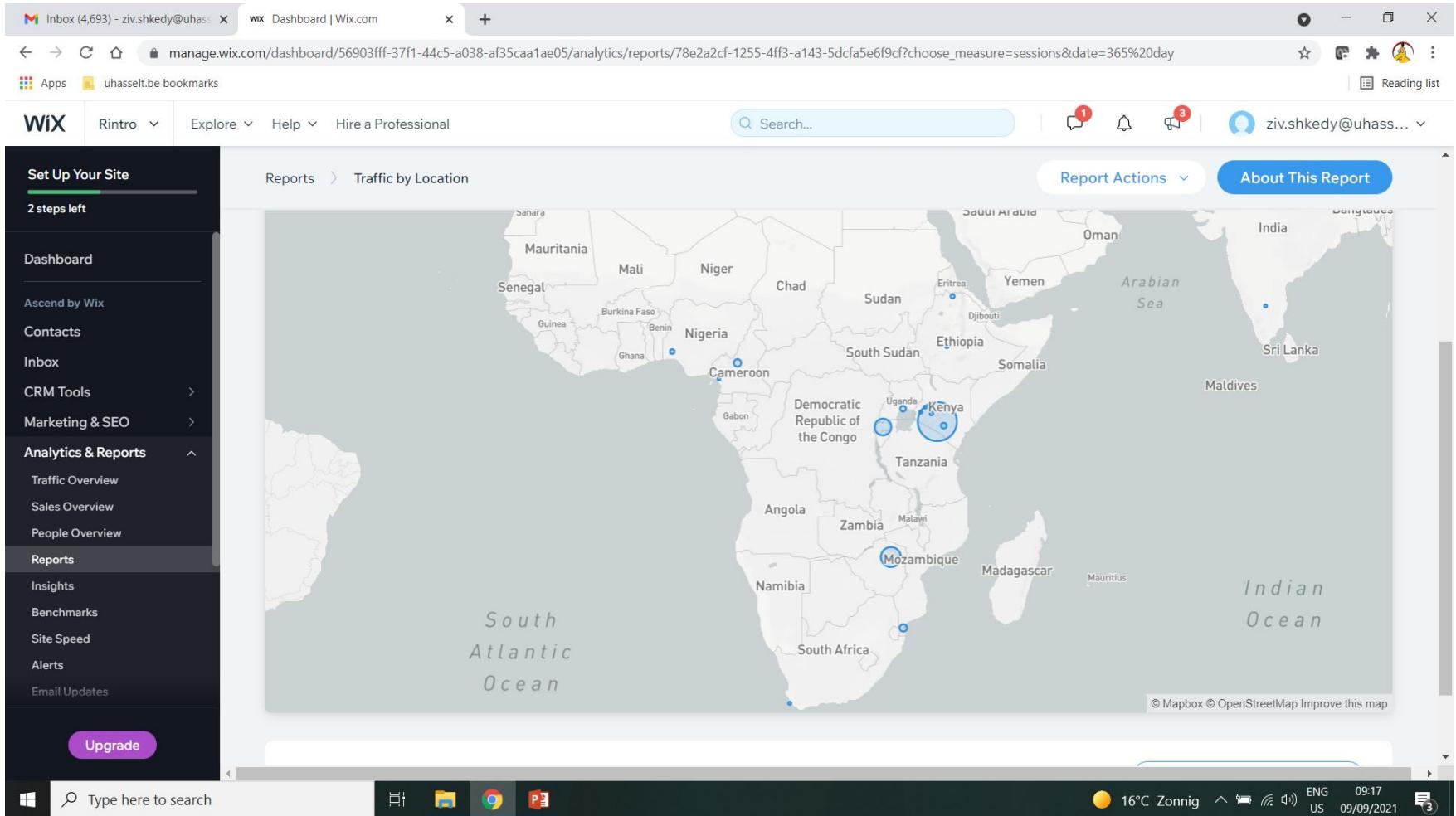
- Traffic Overview:** A line chart showing traffic from September 2019 to August 2020. The Y-axis ranges from 0 to 20. A legend indicates the "Selected period" (blue) and "Previous period" (light blue).
- New vs Returning Visitors:** A donut chart showing 478 Unique Visitors (New: 472, Returning: 6).
- Sessions by Device:** A donut chart showing Site Sessions (1,926). Breakdown: Desktop (1,845), Mobile (75), Tablet (6).
- What ?** (highlighted with a red arrow pointing to the "Top Pages by Sessions" table)
- Top Pages by Sessions:** A table listing the most popular pages with growth percentages and session counts.

Page	Growth (%)	Sessions
/intro/online-book	4,948%	1,262
/intro	1,112%	982
/intro/topics	4,181%	685
/intro/about	1,438%	246
/ (Homepage)	-	88

Annotations in red:

- A large red arrow points to the "What ?" section.
- Two smaller red arrows point to the "Top Pages by Sessions" table.

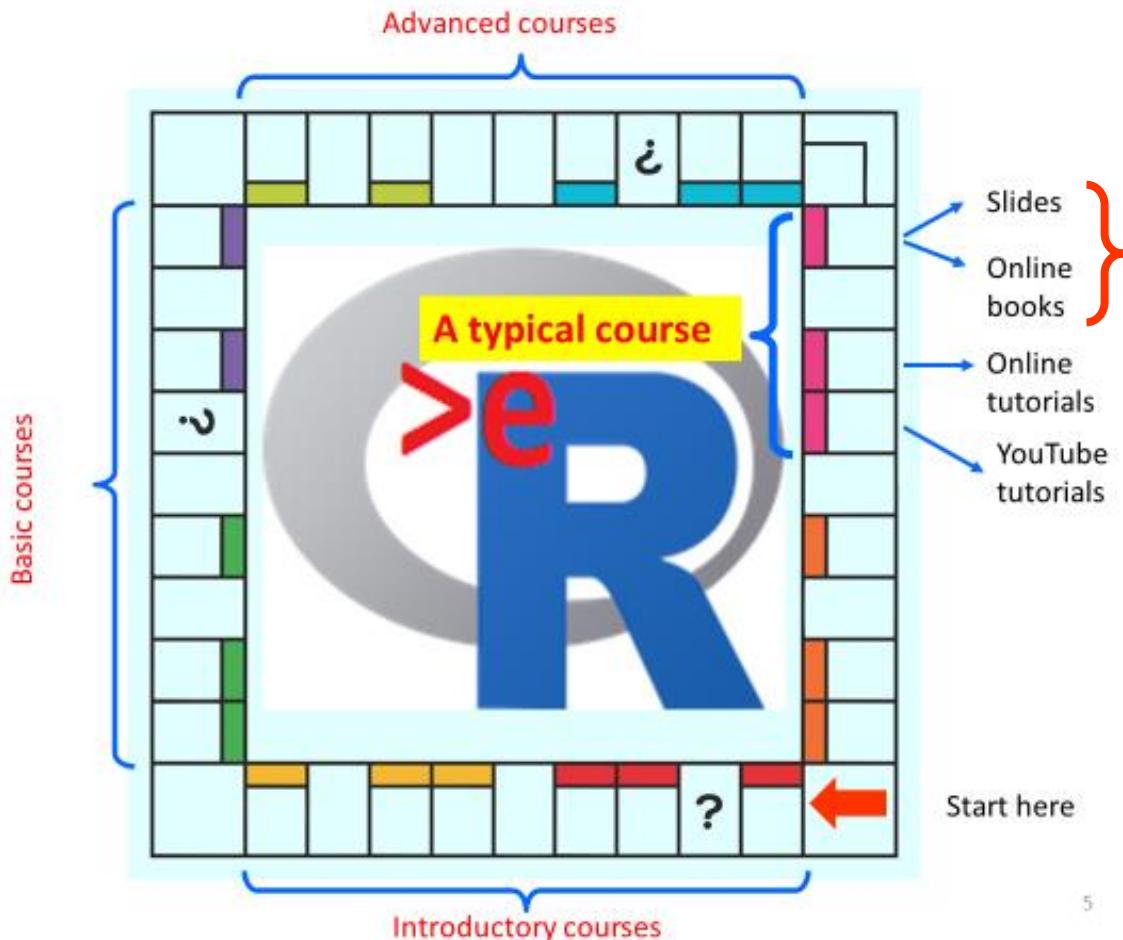
Who are our users in Africa ? (of R introduction)



The >eR-BioStat initiative: an Open source platform

What is an open source platform ?

Open Source



- Source files:
 - R programs.
 - PowerPoint Rmd
 - Tex files to produce slides.

Example: linear regression

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>eR-BioStat

The course covers both applied and theoretical aspect of linear regression and can be used as a support for a course about liner regression at an undergraduate level. The course **is not developed as a complete course** but rather as a course that illustrates the usage of R for linear regression modelling.

The course was developed as an [undergraduate level](#) course.

Useful reference for the course: Chapter 6 (Normal Linear Models):

Dobson & Barnett

This is an open source course and the source files that were used to produce the slides (PowerPoint + R program) are available online.

```
Package: Windows  
(18,17,1  
g 1 1,2  
- g 1(3,3  
glm(count  
.D93)  
  
counts  
duals:  
2  
96272 -  
  
Estimate  
3.045e+0  
4.543e-0  
2.930e-0  
8.717e-1  
4.557e-1  
  
: 0 ***  
Parameter  
ance: 10  
ance: 5  
  
her Scor
```

wx Home | Erbiostat wx Topics | Regression1

erbiostat.wixsite.com/reg1/topics

Apps uhasselt.be bookmarks

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- confint()
- predict()

Slides

Materials are in the following formats:

- PDF file of the slides.
- PowerPoint file of the slides.
- R programs with the examples presented in the slides and online book.

 [Slides \(PDF\)](#)

[Slides \(PowerPoint\)](#)

[R programm](#)

Online book

The online book contains all the information presented in the slides and the R code to produce the output.

[Online course \(html\)](#)

R program contains all the examples

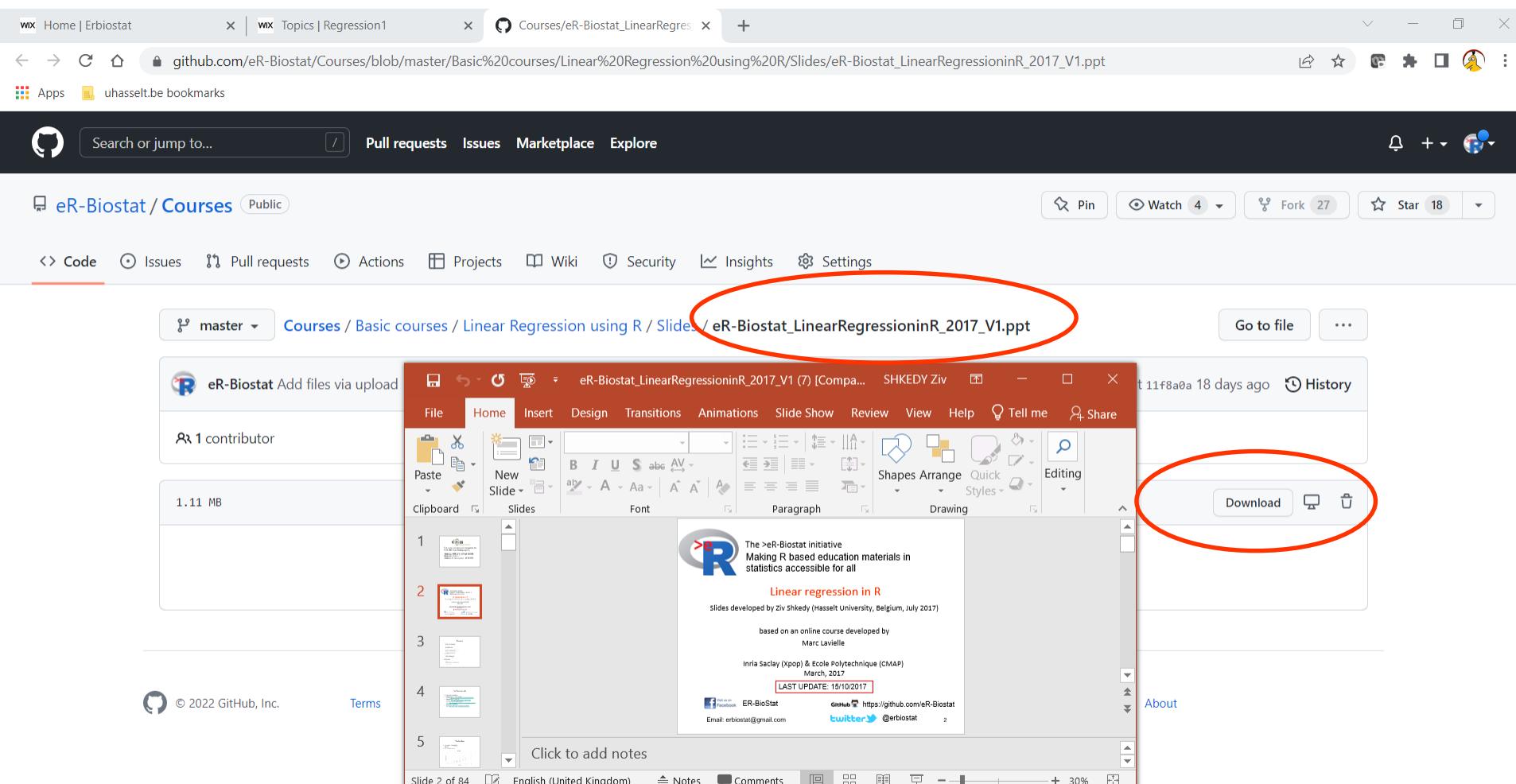


Type here to search

O E P C

22°C Lichte regen ENG US 14:48 16/05/2022

PowerPoint file for the slides

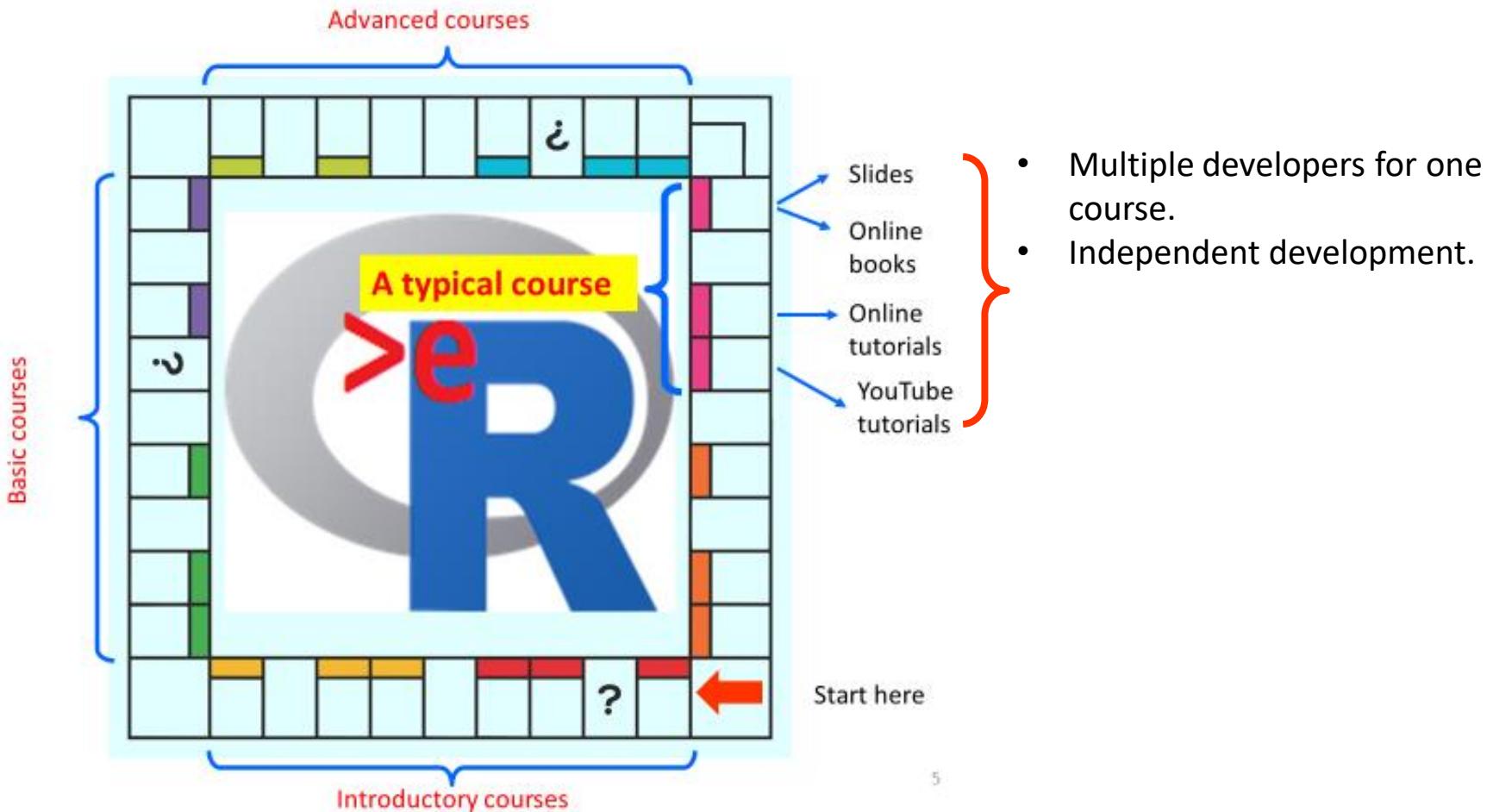


- The teacher of the course can modify the course for his/her program.

The >eR-BioStat initiative: community based development

What does it mean a community based development ?

Community based development



Example: basic linear regression....

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>eR-BioStat

The course covers both applied and theoretical aspect of linear regression and can be used as a support for a course about liner regression at an undergraduate level. The course **is not developed as a complete course** but rather as a course that illustrates the usage of R for linear regression modelling.

The course was developed as an [undergraduate level](#) course.

Useful reference for the course: Chapter 6 (Normal Linear Models):

Dobson & Barnett

```
(18,17,15,20,10,20,25,13,12)
g1(3,1,9)
g1(3,3)
glm(counts ~ outcome + treatment, family = poisson())
.D93)

counts ~ outcome + treatment, family = poisson()

duals:
  2      3      4      5      6      7      8      9
96272 -0.16965 -0.21999 -0.95552  1.04939  0.84715 -0.09167 -0.96656

Estimate Std. Error z value Pr(>|z|)
3.045e+00 1.709e-01 17.815 <2e-16 ***
4.543e-01 2.022e-01 -2.247  0.0246 *
2.930e-01 1.927e-01 -1.520  0.1285
8.717e-16 2.000e-01  0.000  1.0000
4.557e-16 2.000e-01  0.000  1.0000

: 0 **** 0.001 *** 0.01 ** 0.05 *' 0.1 ' ' 1

parameter for poisson family taken to be 1

ance: 10.5814 on 8 degrees of freedom
ance:  5.1291 on 4 degrees of freedom

her Scoring iterations: 4
```

22°C Lichte regen 20:45 16/05/2022

Course materials: slides, R program and online book

The screenshot shows a web browser window with two tabs: "Home | Erbiostat" and "Topics | Regression1". The main content area displays a Wix website for course materials. A blue callout box highlights two R functions: `confint()` and `predict()`. The left sidebar under "Slides" lists materials in PDF, PowerPoint, and R program formats. The right sidebar under "Online book" describes the online book's purpose and includes an "Online course (html)" link. The Windows taskbar at the bottom shows various pinned icons and the date/time.

This site was designed with the **WIX.com** website builder. Create your website today. [Start Now](#)

- `confint()`
- `predict()`

Slides

Materials are in the following formats:

- PDF file of the slides.
- PowerPoint file of the slides.
- R programs with the examples presented in the slides and online book.

[Slides \(PDF\)](#)

[Slides \(PowerPoint\)](#)

[R programm](#)

Online book

The online book contains all the information presented in the slides and the R code to produce the output.

[Online course \(html\)](#)

20°C Lichte regen 15:03
ENG US 16/05/2022

Slides & R program

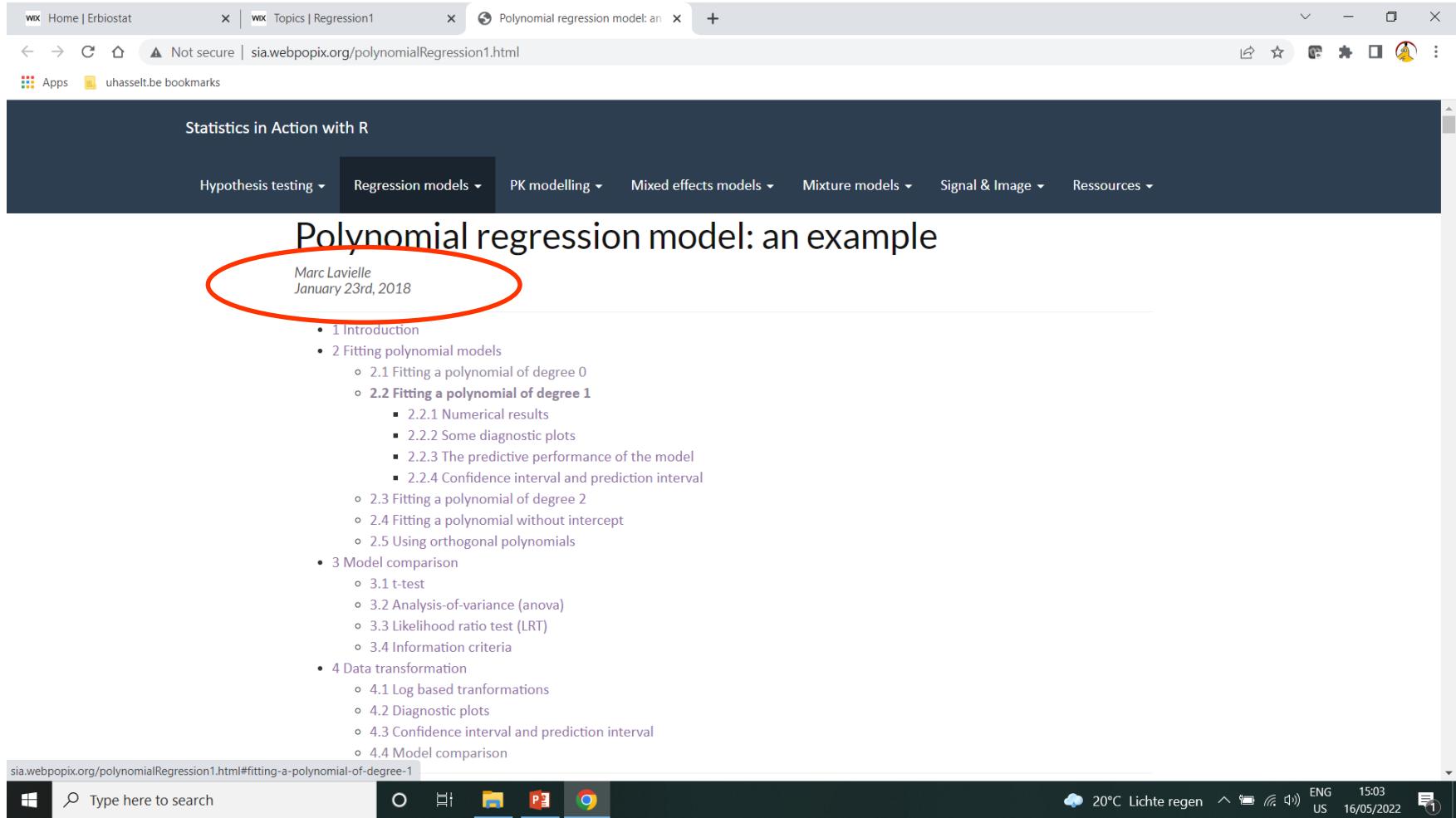
The screenshot shows a presentation slide with the following content:

- Making R based education materials III**
statistics accessible for all
- Linear regression in R**
- Slides developed by Ziv Shkedy (Hasselt University, Belgium, July 2017)
- based on an online course developed by
Marc Lavielle
- Inria Saclay (Xpop) & Ecole Polytechnique (CMAP)
March, 2017
- LAST UPDATE: 15/10/2017
- Social media links: Facebook, GitHub, Twitter
- Email: erbiostat@gmail.com

The screenshot shows an R script with the following code:

```
1 #####  
2 #  
3 #  
4 # Linear regression in R  
5 #  
6 #  
7 #####  
8 #  
9 #####  
10 ## The cars data  
11 #####  
12 #  
13 data(cars)  
14 head(cars)  
15 #  
16 #####  
17 ## ggplot  
18 #####  
19 #  
20 library(ggplot2)  
21 theme_set(theme_bw())  
22 #  
23 #  
24 #  
25 g1 <- ggplot(cars) + geom_point(aes(x=speed, y=dist), size=1, color="#993399") +  
26 # xlab("Speed (mph)") + ylab("Stopping distance (ft)")  
27 print(g1)  
28 #  
29 tail <- tail(cars, -1)  
30 tail
```

Online book



The screenshot shows a web browser window with three tabs open. The active tab is titled "Polynomial regression model: an example". The page content is from "Statistics in Action with R" by Marc Lavielle, dated January 23rd, 2018. A red circle highlights the author's name and date. The page lists a table of contents with sections like Introduction, Fitting polynomial models, Model comparison, etc. The status bar at the bottom shows the URL "sia.webpopix.org/polynomialRegression1.html#fitting-a-polynomial-of-degree-1", the Windows taskbar, and system tray icons.

Statistics in Action with R

Hypothesis testing ▾ Regression models ▾ PK modelling ▾ Mixed effects models ▾ Mixture models ▾ Signal & Image ▾ Ressources ▾

Polynomial regression model: an example

Marc Lavielle
January 23rd, 2018

- 1 Introduction
- 2 Fitting polynomial models
 - 2.1 Fitting a polynomial of degree 0
 - 2.2 **Fitting a polynomial of degree 1**
 - 2.2.1 Numerical results
 - 2.2.2 Some diagnostic plots
 - 2.2.3 The predictive performance of the model
 - 2.2.4 Confidence interval and prediction interval
 - 2.3 Fitting a polynomial of degree 2
 - 2.4 Fitting a polynomial without intercept
 - 2.5 Using orthogonal polynomials
 - 3 Model comparison
 - 3.1 t-test
 - 3.2 Analysis-of-variance (anova)
 - 3.3 Likelihood ratio test (LRT)
 - 3.4 Information criteria
 - 4 Data transformation
 - 4.1 Log based tranformations
 - 4.2 Diagnostic plots
 - 4.3 Confidence interval and prediction interval
 - 4.4 Model comparison

sia.webpopix.org/polynomialRegression1.html#fitting-a-polynomial-of-degree-1

20°C Lichte regen 15:03 ENG US 16/05/2022

Online tutorial

The screenshot shows a web browser window with three tabs open:

- Home | Erbiostat
- Online tutorials | Regression1
- Linear Regression in R | An Easy Step-by-Step Guide

The third tab is active. The page title is "Linear Regression in R | An Easy Step-by-Step Guide". Below the title, a red circle highlights the publication information: "Published on February 25, 2020 by Rebecca Bevans. Revised on May 6, 2022." The main content area starts with a definition of linear regression: "Linear regression is a regression model that uses a straight line to describe the relationship between variables. It finds the line of best fit through your data by searching for the value of the regression coefficient(s) that minimizes the total error of the model." It then discusses the two types of linear regression: simple and multiple. A sidebar on the right provides a detailed explanation of simple linear regression, mentioning a dataset of 500 people with income and happiness data.

Scribbr Proofreading & Editing Plagiarism Checker Citation Tools Knowledge Base

Search...

Statistics

- Statistical analysis step by step
- + Collecting data
- + Preparing data
- + Levels of measurement
- Descriptive statistics
- + Measures of central tendency
- + Measures of variability
- Correlation coefficient
- Coefficient of determination
- Pearson correlation coefficient
- Inferential statistics
- Normal distribution
- Standard normal distribution
- Poisson distribution
- t distribution

Linear Regression in R | An Easy Step-by-Step Guide

Published on February 25, 2020 by Rebecca Bevans. Revised on May 6, 2022.

Linear regression is a regression model that uses a straight line to describe the relationship between variables. It finds the line of best fit through your data by searching for the value of the regression coefficient(s) that minimizes the total error of the model.

There are two main types of linear regression:

- **Simple linear regression** uses only one independent variable
- **Multiple linear regression** uses two or more independent variables

In this step-by-step guide, we will walk you through linear regression in R using two sample datasets.

Simple linear regression

The first dataset contains observations about income (in a range of \$15k to \$75k) and happiness (rated on a scale of 1 to 10) in an imaginary sample of 500 people. The income values are divided by 10,000 to make the income data match the scale of the happiness scores (so a value of \$2 represents \$20,000, \$3 is \$30,000, etc.)

Type here to search

20°C Lichte regen ENG US 15:04 16/05/2022

YouTube video (host: Ani Katachova)

The screenshot shows a YouTube video player with the following details:

- Video Title:** Linear Regression in R
- Views:** 37,864
- Date:** 24 Mar 2013
- Description:** Simple and Multiple Linear Regression in R
- Player Controls:** Like (225), Dislike, Share, Download, Clip, Save, Description, and a three-dot menu.
- RStudio Session:** A large window on the left displays R code and its output. The code includes reading data from a CSV file, defining variables, calculating correlations, plotting scatter diagrams, performing simple linear regression, and multiple linear regression. A red circle highlights the title "Linear Regression in R" at the bottom of the RStudio interface.
- Sidebar:** On the right, there is a sidebar with several recommended videos:
 - Create Your Own Website** by Wix (1:02:48)
 - Predictive Modeling with R** by Bryan Cafferty (1:02:48)
 - Mix – econometricsacademy** (YouTube channel)
 - QuantBros.com Introduction to R Programming for Financial...** by QuantCourse (1:05:30)
 - Probit and Logit Models** by econometricsacademy (13K views)
- System Status Bar:** At the bottom, it shows a Windows taskbar with icons for File Explorer, Edge, and Google Chrome. It also displays weather information (20°C, Lichte regen), system status (ENG US), and a date/time stamp (16/05/2022).

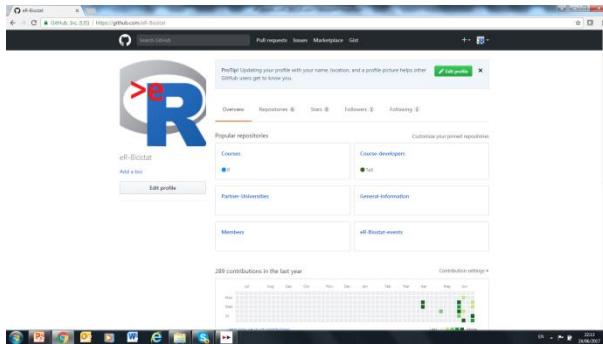
The >eR-BioStat : where can you find us online ?



We >R an online community

The community online:

GitHub

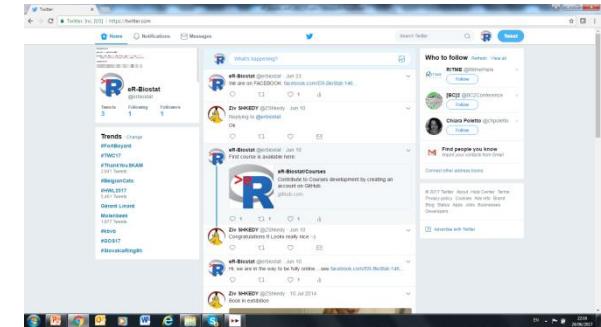


<https://github.com/eR-Biostat>

facebook.



twitter



ER-BioStat

@erbiostat

- GitHub page with course materials .
- Information about activities.
- Communication teachers/students in the south.
- Information about course materials.
- Information about activities.



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facebook.com/eRBiostat

Apps uhasselt.be bookmarks

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ER-BioStat

Business Suite

- Inbox • 1 new message & 17 new comments
- Planner
- Publishing Tools

Home

News Feed

Podcasts

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Events

Promote

Type here to search

16°C Zonnig 12:52 27/10/2021 ENG US

E-learning system using R Biostatistics

ER-BioStat @eRBiostat • 5 (10 reviews) · Education

+ Add a Button

Promote

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You're missing some details for your Page. Help people discover and learn about your Page by adding more information.

Get Started

49



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facebook.com/eRBiostat

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- Inbox (1 new message & 17 new comments)
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Create Ad See all

How would you like to grow your business?

Create New Ad Make an ad using text, photos or videos to promote your business

Boost a Post

Automated Ads Get personalized ads that adjust over time to help you get better results.

835 People reached 36 Engagements - Distribution Score Boost Post

15 Likes 6 Shares

Comment as ER-BioStat

ER-BioStat September 5, 2020

Our new course "Basic skills in bootstrap using R" is available online in our website. More courses will be ready in September.

835 People reached 36 Engagements - Distribution Score Boost Post

15 Likes 6 Shares

Comment as ER-BioStat

ER-BioStat August 26, 2020

Do not miss our new course "Longitudinal data analysis using R", written by Prof. Tadesse Awoke Ayele from Gondar University, Ethiopia, is now available online in our website: <https://erbiostat.wixsite.com/erbiostat>.

Materials available free online for the course include: Slides, R program, Datasets, Online examples and R code. ... See More

16°C Zonnig ENG US 12:52 27/10/2021



Inbox (4,800) - ziv.shkedy@uhasselt.be X eR-Biostat (@erbiostat) / Twitter X +

← eR-Biostat 86 Tweets

```
data(galaxies)
galaxies <- galaxies/1000
plot(x = c(0, 40), y = c(0, 0.3), type = "n", bty = "1",
xlab = "velocity of galaxy (km/s)", ylab = "density")
rug(galaxies)

lines(density(galaxies, width = 3.25, n = 200), lty = 1)
lines(density(galaxies, width = 2.56, n = 200), lty = 3)
```

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Sign up with phone or email

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The eR-Biostat initiative is focused on education programs in (Bio)statistics developing countries and aim to develop new E-learning system publicly available

© Hasselt University, belgium ↗ erbiostat.wixsite.com/erbiostat
Joined June 2017

2 Following 223 Followers

Tweets Tweets & replies Media Likes

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By using Twitter's services you agree to our Cookies Use. We and our partners operate globally and use cookies, including for analytics, personalisation, and ads.

16°C Zonnig 12:55 ENG US 27/10/2021 2

Website

Click Download & Teach

The screenshot shows a web browser window with two tabs open. The active tab is for the >eR-BioStat website, which is built using WIX.com. The URL in the address bar is <https://erbiostat.wixsite.com/erbiostat>. A red circle highlights the address bar area. The website content includes a logo, navigation links (Home, We R a community, Our platform, Our courses, Gallery, Developers, Blog), and a 'Log In' button. A large text block welcomes visitors to the 2020 edition of the initiative, mentioning free courses in statistics and encouraging users to click, download, and teach. To the right of the text is a photograph of two people in a classroom setting, looking at a screen displaying the website's content. At the bottom of the browser window, there is a search bar and a taskbar with various icons.

Inbox (4,678) - ziv.shkedy@uhasselt.be

erbiostat.wixsite.com/erbiostat

This site was designed with the **WIX**.com website builder. Create your website today. [Start Now](#)

Home We R a community Our platform Our courses Gallery Developers Blog

>eR-BioStat

Welcome to the 2020 edition of the >eR-BioStat initiative website. We are a part of the open-source movement and we offer free courses in statistics. If you are a teacher that needs to give a course in statistics or a student that studies a course in statistics, we are the address. Just **click** on the link, **download** the materials (for free) and **teach** (yourself) in the class. In the next few weeks, we will update and refresh our curriculum. If you want to be updated, follow us on social media and follow our blog. All our courses, as before, are available online in our Github [page](#).

The >eR-BioStat initiative
Making R based education materials in statistics accessible for all

We R a community: the >eR-BioStat initiative

Ziv Shkedy, Adetayo Kasim, Kharegani Zuma & Tadesse Aweke
Hasselt University, Belgium, Durham University, UK, HSMC, South Africa
Anoosha Suleiman
Gondar University, Ethiopia

UNIVERSITY OF HASSELT ER BioStat GITHUB

https://github.com/eR-School

Email: erbiostat@gmail.com

CHAT WITH US

<https://erbiostat.wixsite.com/erbiostat>



We >eR (an online) community

er-biostat - Google Search

Google er-biostat

All Images Videos Maps News More Settings Tools

About 5.730.000 results (0,44 seconds)

eR-BioStat
<https://er-biostat.github.io> › Courses ▾
An >eR-BioStat event in HSRC, Pretoria, South Africa. Posted on July 11, 2018. Ziv Shkedy, University of Hasselt (CenStat) [Read More]. Tags: eR-BioStat event, ...
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eR-Biostat (erbiostat) · GitHub
<https://github.com> › eR-Biostat ▾
Making R based education materials in statistics accessible - eR-Biostat
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eR-Biostat/Courses - GitHub
<https://github.com> › eR-Biostat › Courses ▾
Contribute to eR-Biostat/Courses development by creating an account on GitHub.
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ER-BioStat | Facebook
<https://www.facebook.com> › Pages › Businesses › Education › ER-BioStat ▾
ER-BioStat - - Rated 5 based on 6 Reviews "Great initiative, promising and will be very useful to the Biostatistics and the R community."

eR-Biostat (@erbiostat) | Twitter
<https://twitter.com> › erbiostat ▾
The latest Tweets from eR-Biostat (@erbiostat). The eR-Biostat initiative focuses on education programs in (Bio)statistics developing countries and aim to ...

For links: make google search

website GitHub

Course materials

Facebook Twitter

Communication

Short discussion: who do we support ?

- Students in statistics: all levels.
- Students in other disciplines: all levels.
- Academic staff : all levels.
- Main concepts:
 - Download and use in class.
 - Website/courses: not password protected.
 - Use as a complete course (i.e., a credit course within a program curriculum) or as a part of existing course.
- Next year: more open source courses (with source files for slides available).
- Network of users.



The >eR-Biostat initiative
E-learning system using R
Biostatistics

Thank you veRy much !!

<https://erbiostat.wixsite.com/erbiostat>



Visit us on
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ER-BioStat

Email: erbiostat@gmail.com



<https://github.com/eR-Biostat>



@erbiostat

Some extra slides (I)

The >eR-BioStat initiative: implementation in Gondar University, Ethiopia

How to tailor the >eR-BioStat platform to your program ?

- Example: MSc in biostatistics in Gondar University.
- March 2020: Gondar university shifted to online teaching.
- A website for (a part of) the program with links to >eR-Biostat courses.
- Example how you can use the >eR-BioStat as a part of your education program.

The master in Biostatistics & epidemiology in Gondar university

The screenshot shows a Microsoft Edge browser window. The address bar displays the URL <https://erbiostat.wixsite.com/gondarel2>. The page content is as follows:

This site was designed with the **WIX**.com website builder. Create your website today. [Start Now](#)

University of Gondar - Collage of Medicine and Health Sciences

E-learning system:
Biostatistics

Welcome to the 2020 edition of the E-learning system in Biostatistics/statistics of the Collage of Medicine and Health Sciences, Institute of Public Health in the University of Gondar, Ethiopia. This website provides course materials for MSc students in Biostatistics and MSc and PhD students in Epidemiology and Public health.

This website was developed as a part of the >eR-BioStat initiative.



The logo of the University of Gondar is displayed, featuring a blue oval border with the text "የኢትዮጵያ" (University of Gondar) in Amharic and "UNIVERSITY OF GONDAR" in English. Inside the oval is a yellow illustration of a building with a gear-like emblem on its facade.

At the bottom of the screen, the Windows taskbar is visible, showing the Start button, a search bar with the text "Type here to search", and icons for File Explorer, Google Chrome, and Microsoft Word. On the right side of the taskbar, there are system status icons for battery level, signal strength, and network connectivity, along with the text "22°C Zonnig". The date and time are shown as "12:08 06/09/2021". A small speech bubble icon is also present.

<https://erbiostat.wixsite.com/gondarel2>

Online course materials

This site was designed with the **WIX**.com website builder. Create your website today. [Start Now](#)

University of Gondar - Collage of Medicine and Health Sciences

E-learning system:
Biostatistics

MSc's courses

The flowing courses and parts of the MSc program
and are available online:

- Introduction and basic programming in R.
- Linear models.
- Generalized linear models (GLMs).
- Longitudinal data analysis.
- Survival analysis.

MSc in BioStatistics.

- Program director: Dessie Abebaw (dessieabebaw96@gmail.com)
- E-Learning program coordination and development: Tadesse Awoke (tawoke7@mail.com), Adetayo Kasim (a.s.kasim@durham.ac.uk) and Ziv Shkedy (ziv.shkedy@uhasselt.be)

22°C Zonnig 12:10 06/09/2021

- Selected courses in Biostatistics from the >eR-BioStst website.
- All courses in the cuticulum of the master in Gondar.

Online course materials

The screenshot shows a web browser window with three tabs open:

- wix My Sites | Wix.com
- wix MSc BioStat | GondarEL2
- Courses/Statistical modeling (1) | Courses/Statistical modeling (1)

The main content area displays a Wix website for "Courses/Statistical modeling (1)". The header includes a "Start Now" button and a banner image of people.

Basic programming in R

In this course we discuss basic topics in R programming from a user point of view. This part is developed to give you the basic skills that you need for an advanced usage of R. The topics that we cover in this chapter include:

- Basic programming in R: objects in R
- Reading external datasets
- Programming in R: a for loop
- Programming in R: user functions
- Application of a for loop: bootstrap.

Teacher in 2020/2021: this is a self learning course.

[Basic programing in R](#)

Linear models

This course introduces simple and multiple linear regression models to model relationship between predictor(s) a continuous response variable. In this course, you will learn the fundamental theory behind linear regression and, through data examples, learn to fit, examine, and utilize regression models to examine relationships between multiple variables, using the free statistical software R and RStudio.

Teacher in 2020/2021: Prof. Dr. Bisrat Misganaw (bisratcsa@gmail.com).

Survival analysis

This course in survival analysis (also known as the analysis of event-time data) introduces the main ideas in non-parametric and semi-parametric regression for censored event-time data. Background theory is covered as well, but the emphasis is on applications. The course was developed by David Harrington and the material are organized into both standard lectures and interactive lab sessions. All computing will be done using R. Lectures and labs will include both output and code..

Teacher in 2020/2021: name name (email@gmail.com).

[Survival Analysis](#)

Course Title

Text about the course.....The second chapter about statistical modeling presents the topics of

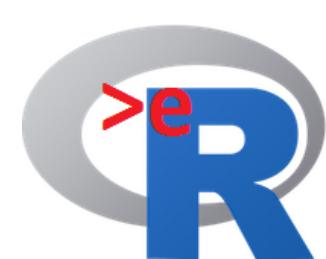
- Two-way ANOVA.
- Advance topics about linear regression.

Teacher in 2020/2021: name name (email@gmail.com).

Windows taskbar at the bottom:

- Type here to search
- Icons for File Explorer, Google Chrome, and Powerpoint
- System tray icons for battery, signal, and volume
- Language: ENG US
- Date and time: 12:10 06/09/2021

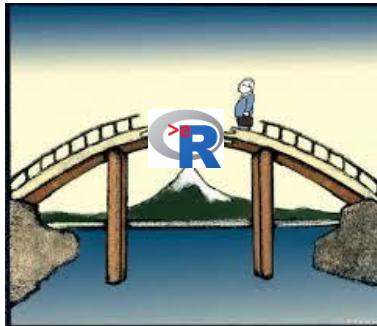
Some extra slides (II)



We >eR a community

- Capacity building in statistics education (at all levels) via community building.
- Target departments, i.e. undergraduate & master programs.

Credit courses as a part of the **curriculum of the master program** in the south.

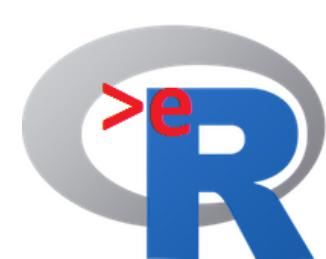


In the long run:
Independent usage
and NOT short
courses format.

>eR-Biostat courses

A screenshot of a web browser displaying a course management system. The URL in the address bar is 'http://www.biostat.uni-saarland.de/eR-Biostat-Courses'. The page shows a list of courses under 'All Biostat courses on GitHub Issues Refreshed'. The courses listed are: 'Introductory Courses', 'Statistical Computing', 'REACME', and 'REACME'. Below the course list, there is a section titled 'The >eR-Biostat initiative' with a brief description: 'Making R based education materials assessable for all'.

Introductory courses.
Linear models.
GLM.
Non Parametric.
Survival analysis.
Longitudinal data analysis.
Multivariate analysis.
Bayesian analysis.
More...



A typical course structure (for most courses)

- Applied approach: link with software so students can implement the methods from the class.
- Focus on data analysis using R (but not only....).
- A typical course materials:
 - Slides.
 - Set of R program for all the examples in the slides.
 - Datasets (if not included in R).
 - ~~Home works assignments.~~
 - ~~Example of Exams.~~
 - YouTube tutorials.



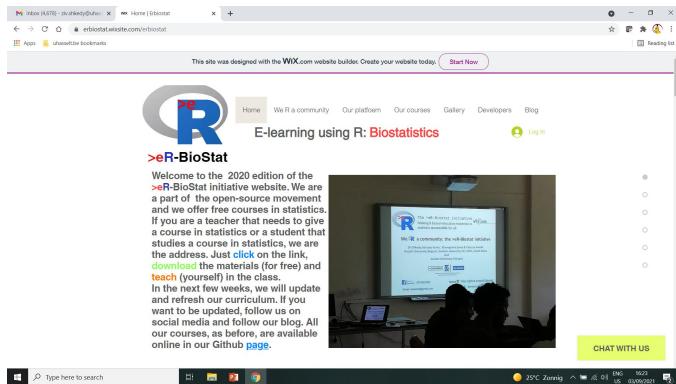
<https://er-biostat.github.io/Courses/>



Usage of courses materials

The community online:

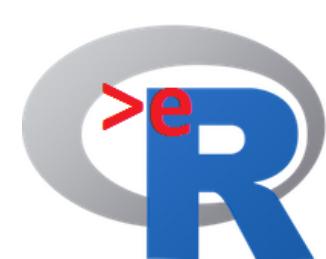
<https://erbiostat.wixsite.com/erbiostat>



- Link to courses' website.
- Link to GitHub page with course materials .
- Information about activities.

- Accessible to everybody.
- Independent usage of course materials by academic staff and students in the south.
- No password is needed.
- Taring workshops (in both north & south).

The R course in GitHub



We >eR (an online) community

- Community based course development.
 - Courses can be (and are) developed by more than one person.
 - Courses can be (and are) developed in multiple styles:
 - Slides.
 - YouTube tutorials.
 - R programs available online.
 - Etc.
- 
- Typically, developed by more than one person



Example of a course: An introduction to R

- Online course materials :

The screenshot shows a GitHub repository page for 'eR-Biostat/Courses'. The repository has 249 commits, 1 branch, 0 releases, and 1 contributor. A red circle highlights the 'Introductory Courses' folder in the file list, and a red arrow points from this folder to a bulleted list of three items. The repository description at the bottom states: 'The >eR-Biostat initiative Making R based education materials assessable for all'.

No description, website, or topics provided.

Add topics

249 commits 1 branch 0 releases 1 contributor

Branch: master New pull request Create new file Upload files Find file Clone or download

File/Folder	Action	Last Commit
Core -1	Update README.md	3 days ago
Introductory Courses	Delete eR-Biostat_Statistical_Computing_2017_V1.pdf	5 days ago
README.md	Update README.md	8 days ago
README.md		

The >eR-Biostat initiative

Making R based education materials assessable for all

The E-learning system, developed as a part of the >eR-Biostat initiative, offers free online course materials for master students in biostatistics/statistics in developing countries. For each course, the materials are publicly available and consist of several types of course materials:

- An introduction to R:
 - A part of the introductory courses.
 - Train students to use R in data analysis.
 - The students are not expected to study anything new in statistics.



Example of a course: An introduction to R

- A part of the introductory courses:

The screenshot shows a GitHub repository page for 'eR-Biostat' with the URL <https://github.com/eR-Biostat/Courses/tree/master/Introductory%20Courses>. A red circle highlights the 'Introduction to R' file in the file list. Another red circle highlights the 'Available courses in this group:' section at the bottom of the page.

eR-Biostat committed on GitHub Delete eR-Biostat_Statistical_Computing_2017_V1.pdf Latest commit 1911720 a day ago

..

Basic concepts in exploratory data analysis ... Delete eR-Biostat_Statistical_Computing_2017_V1.pdf a day ago

Introduction to R Update README.md 4 days ago

Introduction to statistical modeling using R Update README.md 2 days ago

README.md Update README.md 2 days ago

README.md

The >eR-Biostat initiative

Making R based education materials assessable for all

Introductory courses

This group of courses are developed at an introductory level. Only basic level knowledge of statistics is required. The courses DO NOT aim to teach the student new topics in statistics but to train the students to use R in data analysis.

Available courses in this group:

- Introduction to R (<https://github.com/eR-Biostat/Courses/tree/master/Introductory%20Courses/Introduction%20to%20R>).
- Basic concepts in exploratory data analysis and computational statistics in R (<https://github.com/eR-Biostat/Courses/tree/master/Introductory%20Courses/Basic%20concepts%20in%20exploratory%20data%20analysis%20and%20computational%20statistics>).
- Introduction to statistical modeling using R (will be available online in 2018).



Example of a course: An introduction to R

- Online course materials :

The screenshot shows a GitHub repository page for 'eR-Biostat / Courses'. The repository has 0 issues, 0 pull requests, 0 projects, and 0 wiki pages. It has 0 stars, 0 forks, and 0 watchers. The code tab is selected. A red circle highlights the 'Data', 'R programs', and 'Slides' folders in the file tree. A red arrow points from the text 'The >eR-Biostat initiative' to the 'Datasets, if not a part of R, are available online as well.' bullet point.

The >eR-Biostat initiative

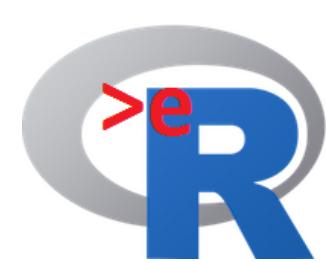
- Datasets, if not a part of R, are available online as well.

Introduction to R

This course is an introductory course to R and can be given as a two-days workshop or as a course of 3-4 classes (3 hours per class). All topics in the course are presented at a basic level and do not intend to introduce new materials. Only a limited knowledge in R is required. Topics covered in the course include:

- Two sample t-test.
- Basic plots

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An introduction to R: slides and R program

Example of a Slide

R program

- All materials in the slides are reproducible using the code in the program.