

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>

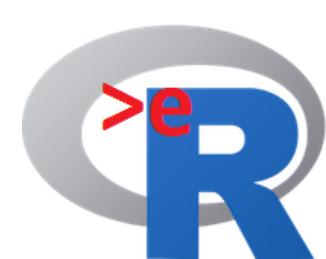


ER-BioStat

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).

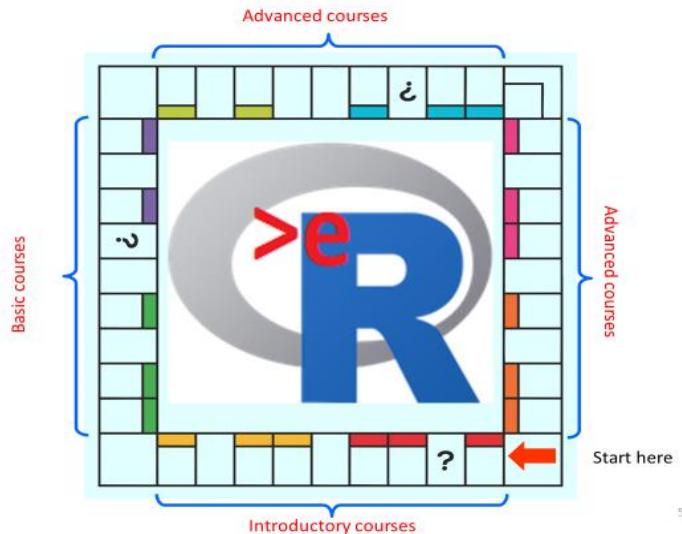
The >eR-Biostat initiative is a part of a past
and an ongoing VLIR-UOS project.



The >eR-BioStat platform

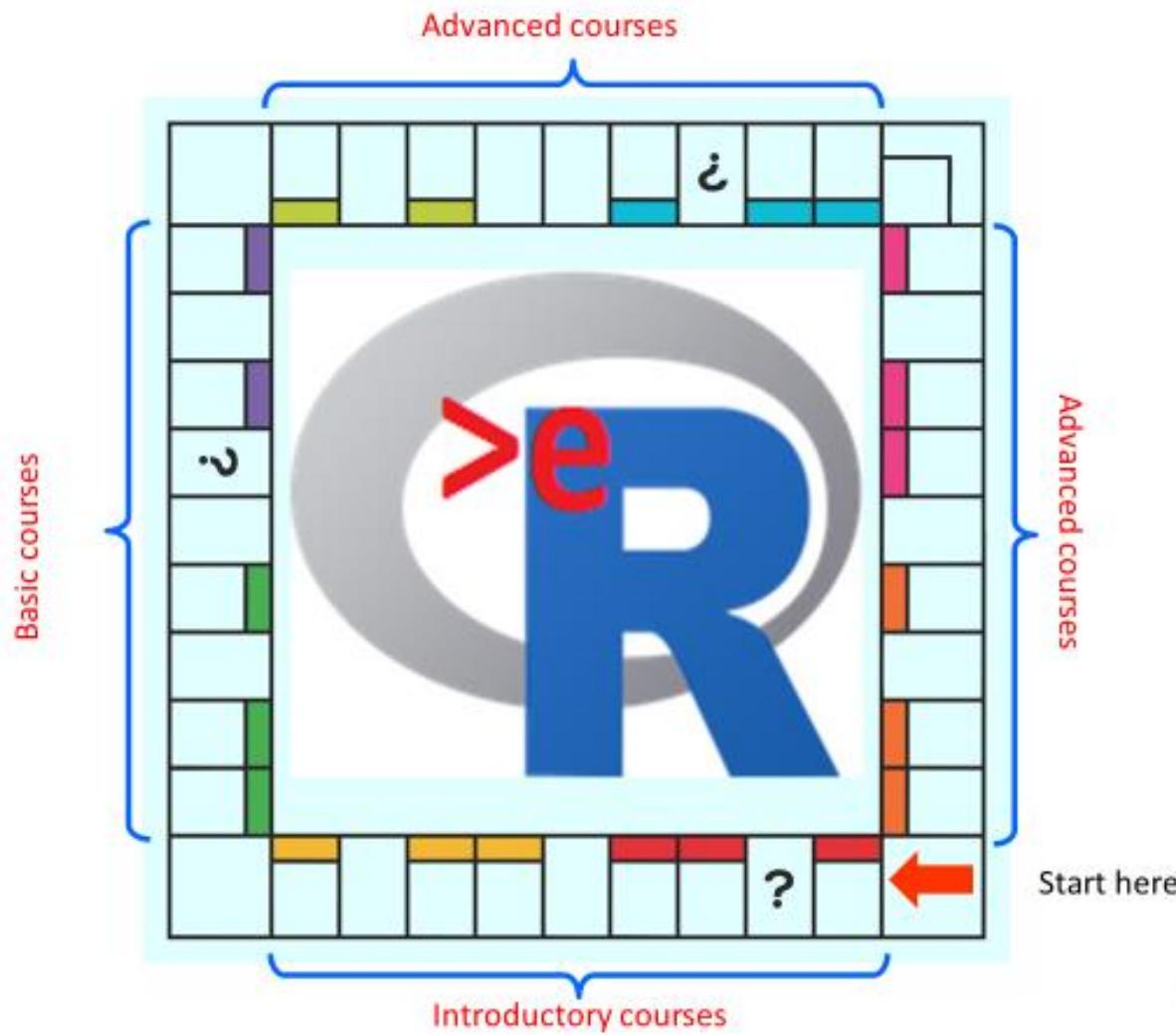
Very short introduction

The >eR-BioStat platform

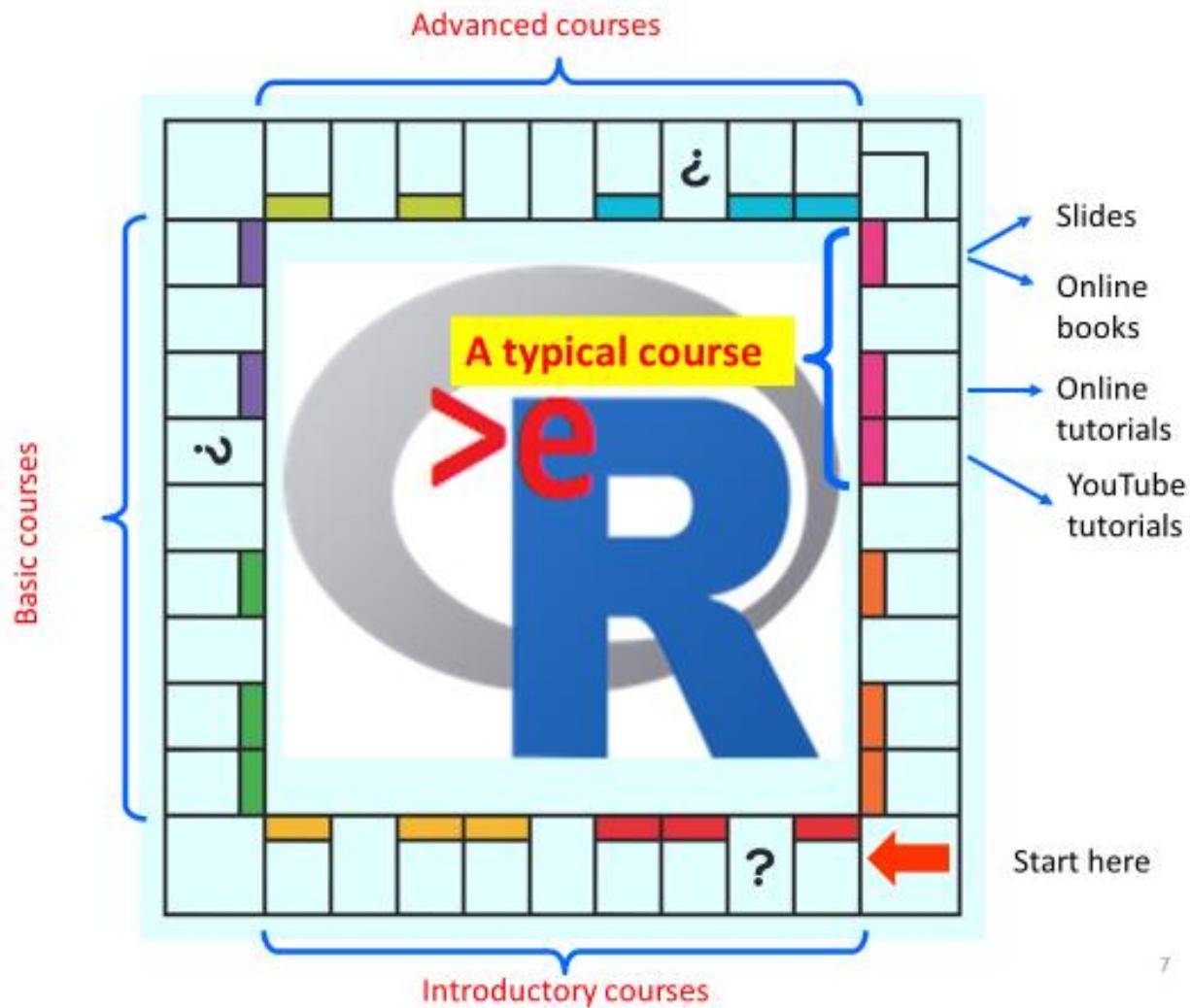


- A collection of courses in (bio)statistics & data science online.
- Courses were developed for both teachers & students.
- Ready to be given in class.

Three clusters of courses



Typical course structure



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 be either a complete course or a part of a course.

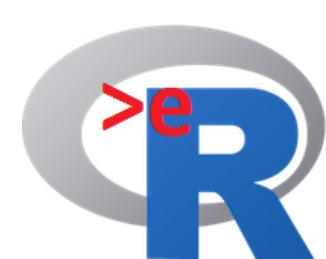
Few points to think about

- 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

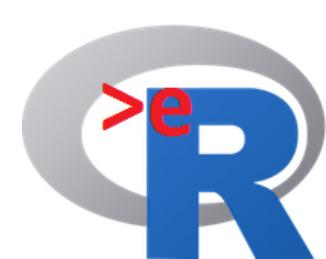
- Reduce costs to zero !!!
 - Storage course materials: GitHub (<https://github.com/>).
 - Website: WIX (<https://www.wix.com/>).
 - Software: R (<https://www.r-project.org/>).
 - Free for users:
 - No password needed.
 - No registration.
- 
- All publically available products.

The >eR-BioStat system for robust E-learning



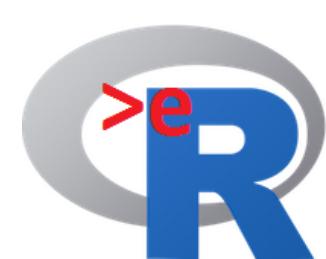
Motivation

- 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

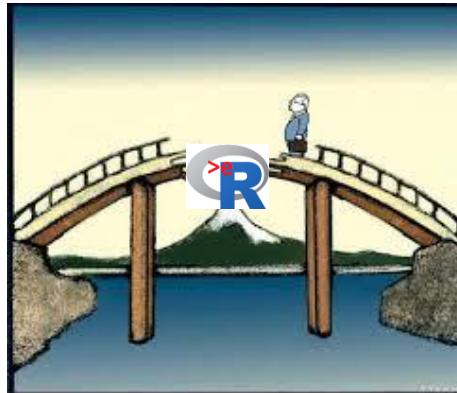
- Community based education development.
 - Courses are developed by many collaborators (often in independent fashion).
- Preferably, an R based education:
 - Courses are developed in R.
 - Increase usage of R.



We >^eR a community

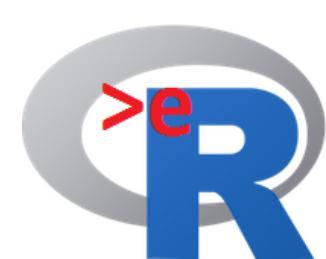
- Our aim is to bridge between two communities:

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.



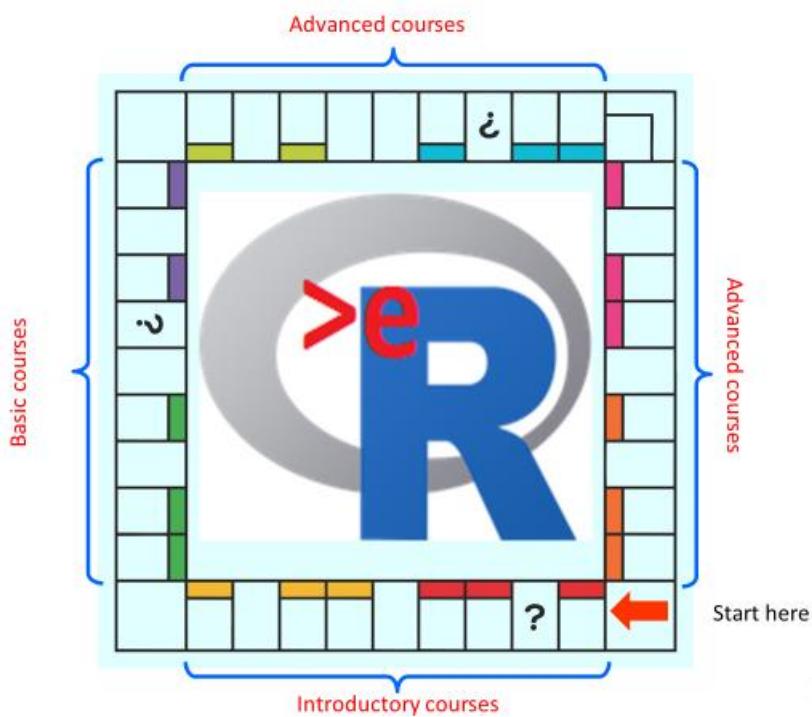
>eR-Biostat courses

(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 ?	

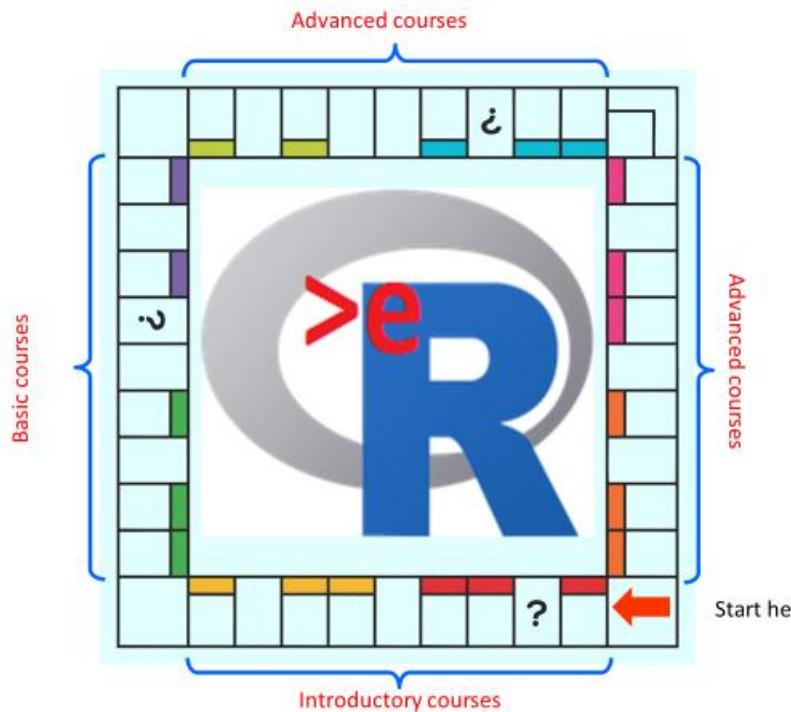
The >eR-BioStat: few main concepts

Introductory courses



- Software and visualization:
 - Introduction to R.
 - Basic skills in visualization.

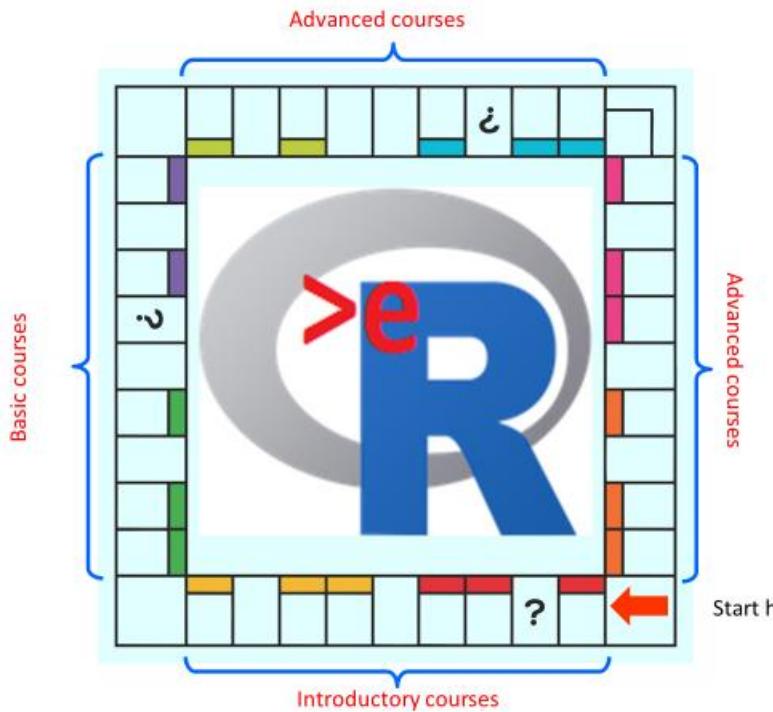
Introductory courses



- Modeling:
 - Introduction to statistical modeling using R.

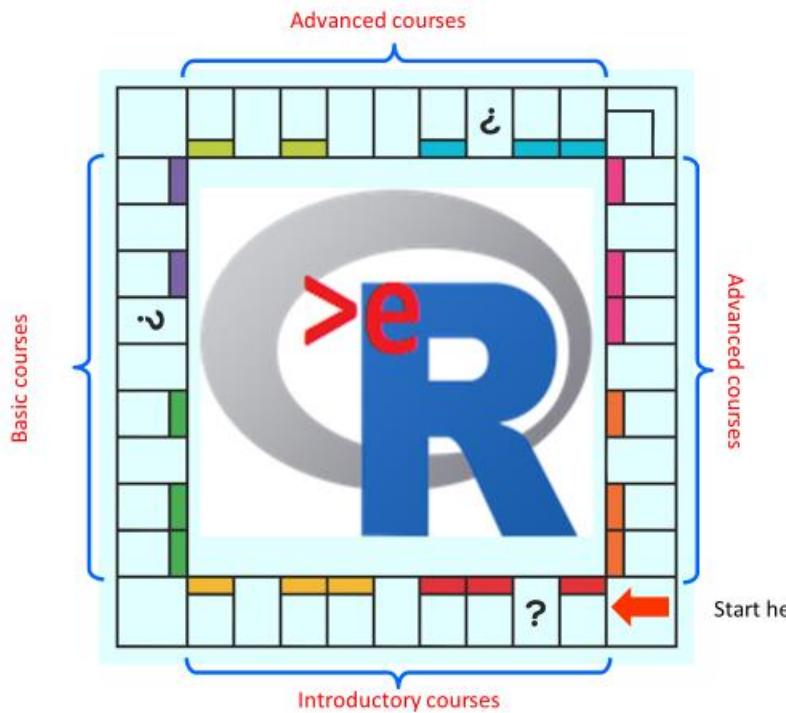


Advanced courses



- Developed at a master level:
 - GLM.
 - Modeling binary data.
 - LDA.
 - Survival analysis.
 - Resampling based methods (bootstrap).
- Sample size calculation.
- EDA for multivariate data.

Basic courses



- Developed at an undergraduate level:
 - Basic inference.
 - Linear models.

The >eR-BioStat : where to find us and what do we offer ?

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. To the right is a 'Log In' button. The main content area has a heading 'E-learning using R: Biostatistics'. Below it is a large text block about the 2020 edition of the initiative, mentioning open-source movement, free courses, and teaching resources. To the right is a video player showing a presentation slide about the initiative. At the bottom right is a yellow 'CHAT WITH US' button. The browser 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 icon

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

Our courses

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development and not presented in their final version.

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 the text 'This site was designed with the WIX.com website builder. Create your website today.' and a 'Start Now' button. Below the header, there's a green box containing the note 'development and not presented in their final version.' 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 of the page is a yellow 'CHAT WITH US' button. The browser taskbar at the bottom shows the Windows Start button, a search bar, and various pinned application icons like File Explorer, Microsoft Word, and Google Chrome. The system tray shows the date and time as 16/05/2022, 14:39, with a battery level of 22°C and weather information.

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

CHAT WITH US

Example: introduction to R

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Introduction to R

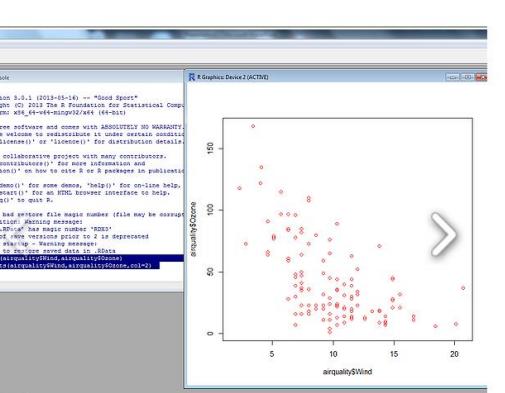
>eR-BioStat

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.

Home About **Topics** Online book Contact



R> library(eR) > data(angus) > plot(angus\$Score ~ angus\$Wind)

Rfig

<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 from erbiostat.wixsite.com/intro/topics.

Screenshot 1 (Top): Topics

The page title is "Topics". The main content area says "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.

Below this, it says "R functions that are used for illustrations include:" followed by a list of R functions:

- mean()
- median()
- var()
- quantile()
- range()
- min()
- max()
- cor()
- t.test()
- hist(x)
- plot(x)
- lm(x)
- boxplot(x)
- aov(lm(x).genc)
- wtd.var
- quantile(x)

A screenshot of a computer screen showing two histograms is displayed.

Screenshot 2 (Middle): Quick start

The page title is "Quick start". It says "If you are new to R and never used it before, this part of the course will give you a quick overview what to expect from the software. It is a very intuitive part. R knowledge is not required but we assume a basic knowledge about statistics. We will discuss what a sample t-test is, ...". Below this, it says "Topics that we cover in this chapter include:" followed by a list:

- 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.

Screenshot 3 (Bottom): Basic programming in R

The page title is "Basic programming in R". It says "In this chapter 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:" followed by a list:

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

A green button labeled "R program" is visible.

Slide format

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

- Address Bar:** Shows the URL: github.com/eR-Biostat/Courses/blob/master/Introductory%20Courses/Introduction%20to%20R/Slides/eR-Biostat_An%20Introduction%20to%20R_2017_QuickStart.pdf
- Content Area:** Displays the eR-Biostat initiative logo (a stylized 'R' with a red '>e' prefix) and text:

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

An introduction to R: Short Version (2017)

Part 1: a quick start

Developed by
Dan Lin (Hasselt University) and Ziv Shkedy (Hasselt University)

LAST UPDATE: 15/10/2017
- Taskbar:** Shows the Windows Start button, a search bar with the placeholder "Type here to search", and icons for File Explorer, Microsoft Word, and Google Chrome.
- System Tray:** Shows the date (06/09/2021), time (11:14), battery level (ENG US), and a small notification icon.

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, vectors, factors, index vectors, data frames, and matrices. Chapter 3 covers basic plots, graphical functions, and a law school data section. 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, a taskbar with icons for File Explorer, Google Sheets, PDF, and Chrome, and a system tray showing weather (25°C Zonnig), battery level (16:21), and system status.

- 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 chapters 1 through 3. The main content area shows a section on "R Objects" with a "YouTube tutorial" link and a "Basic introduction" section. Two specific links are circled in red: one to "RcourseProgramming" and another to "YToobjects1". A large text box on the right side of the page contains the text: "Links to the course slides and YouTube tutorials from the book."

library(bootstrap)

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 [YToobjects1](#).

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.

R course users in the last 365 days

10/09/2020-10/09/2021

Inbox (4,693) - ziv.shkedy@uhasselt.be wix Dashboard | Wix.com

manage.wix.com/dashboard/56903fff-37f1-44c5-a038-af35caa1ae05/analytics/overviews/traffic?referralInfo=sidebar

Apps uhasselt.be bookmarks

Wix Rintro Explore Help Hire a Professional

Search... 1 3 ziv.shkedy@uhasselt.be

Set Up Your Site
2 steps left

Dashboard

Ascend by Wix

Contacts

Inbox

CRM Tools

Marketing & SEO

Analytics & Reports

Traffic Overview

Sales Overview

People Overview

Reports

Insights

Benchmarks

Site Speed

Alerts

Email Updates

Upgrade

Traffic Overview

Last 365 days (Sep 10, 2020 - Today) compared to previous period (Sep 11, 2019 - Sep 9, 2020)

Site Sessions: 1,926 ↑ 2249% Unique Visitors: 478 ↑ 635% Avg. Session Duration: 3m 21s ↑ 99%

Sessions over Time

Selected period Previous period

Top Traffic Sources by Sessions

Traffic Source	Change (%)	Sessions
Direct	16,250%	1,308
blackboard.uantwerpen.be		277
bb.uhasselt.be		171
Unknown	176%	94
wix.com	92%	25

See full report

Top Pages by Sessions

Page	Change (%)	Sessions
/rintro/online-book	4,948%	1,262

16°C Zonnig 10:14 ENG US 09/09/2021

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

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

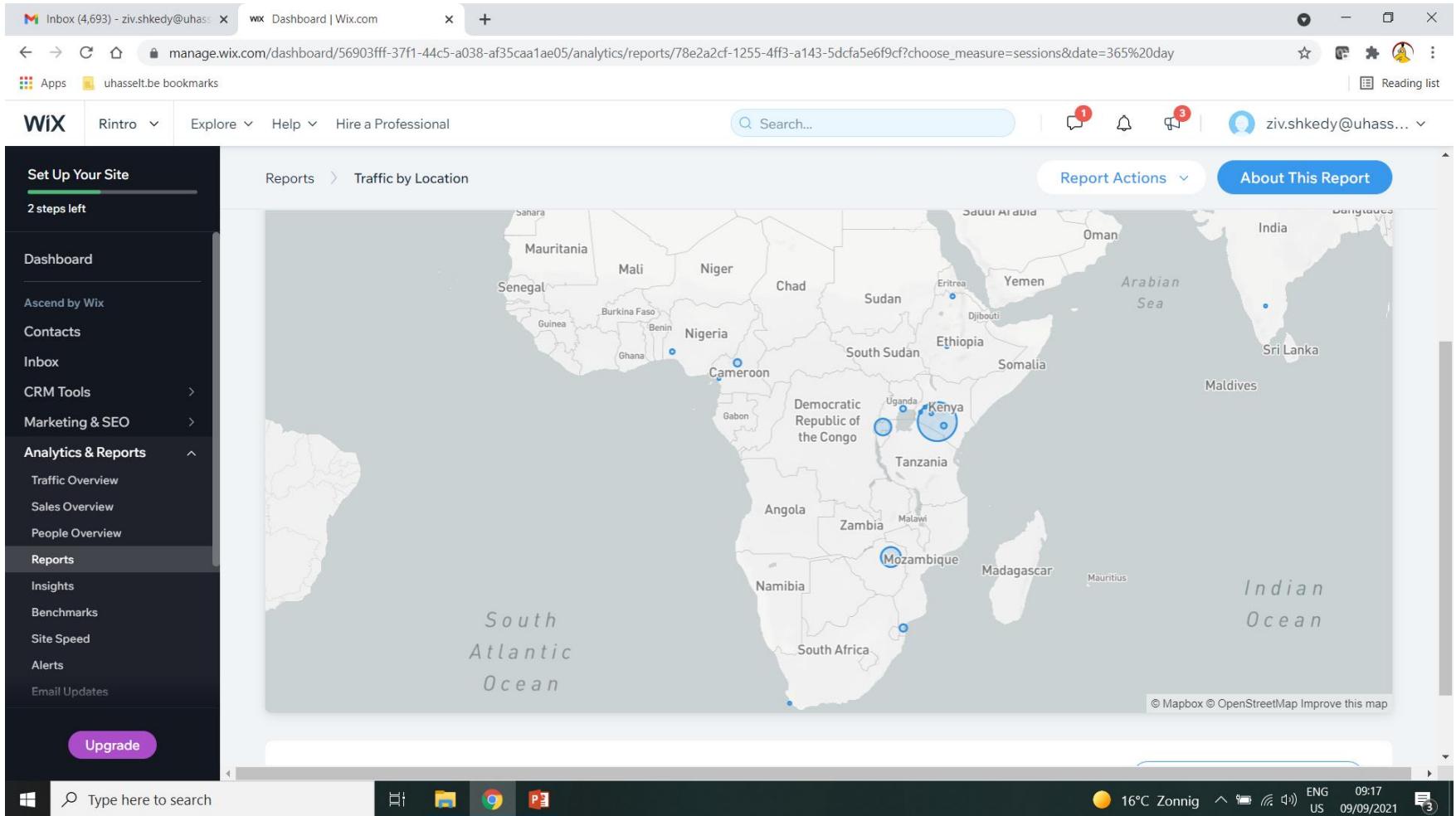
- Traffic Overview:** A line chart showing traffic fluctuations from Sep 10 to Aug 16. A blue dot indicates the "Selected period".
- New vs Returning Visitors:** A donut chart showing 478 Unique Visitors (New: 472, Returning: 6).
- Sessions by Device:** A donut chart showing Site Sessions (1,926) broken down by Desktop (1,845), Mobile (75), and Tablet (6).
- Top Pages by Sessions:** A list of pages with their session counts and growth percentages.

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:

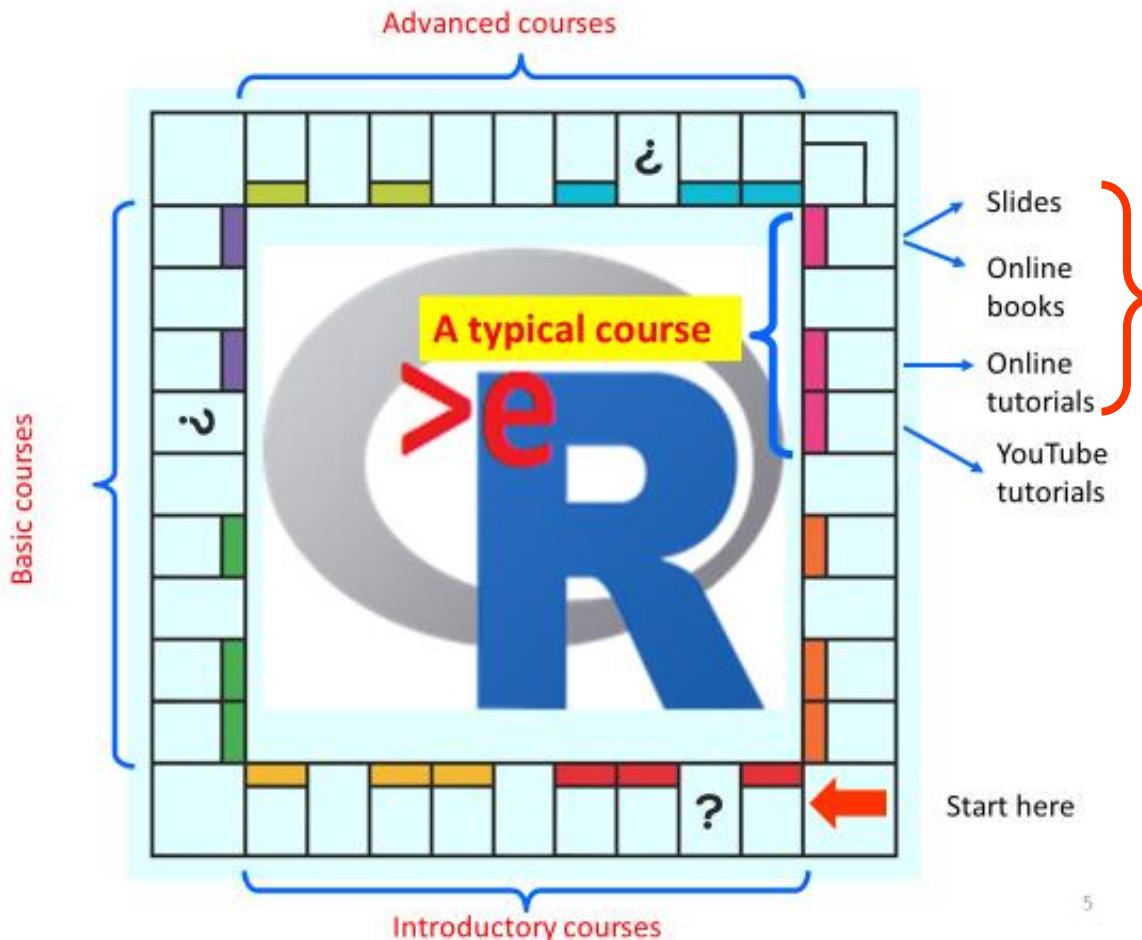
- A red arrow points to the "What?" section in the top right.
- A red arrow points to the "Sessions by Device" chart.

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



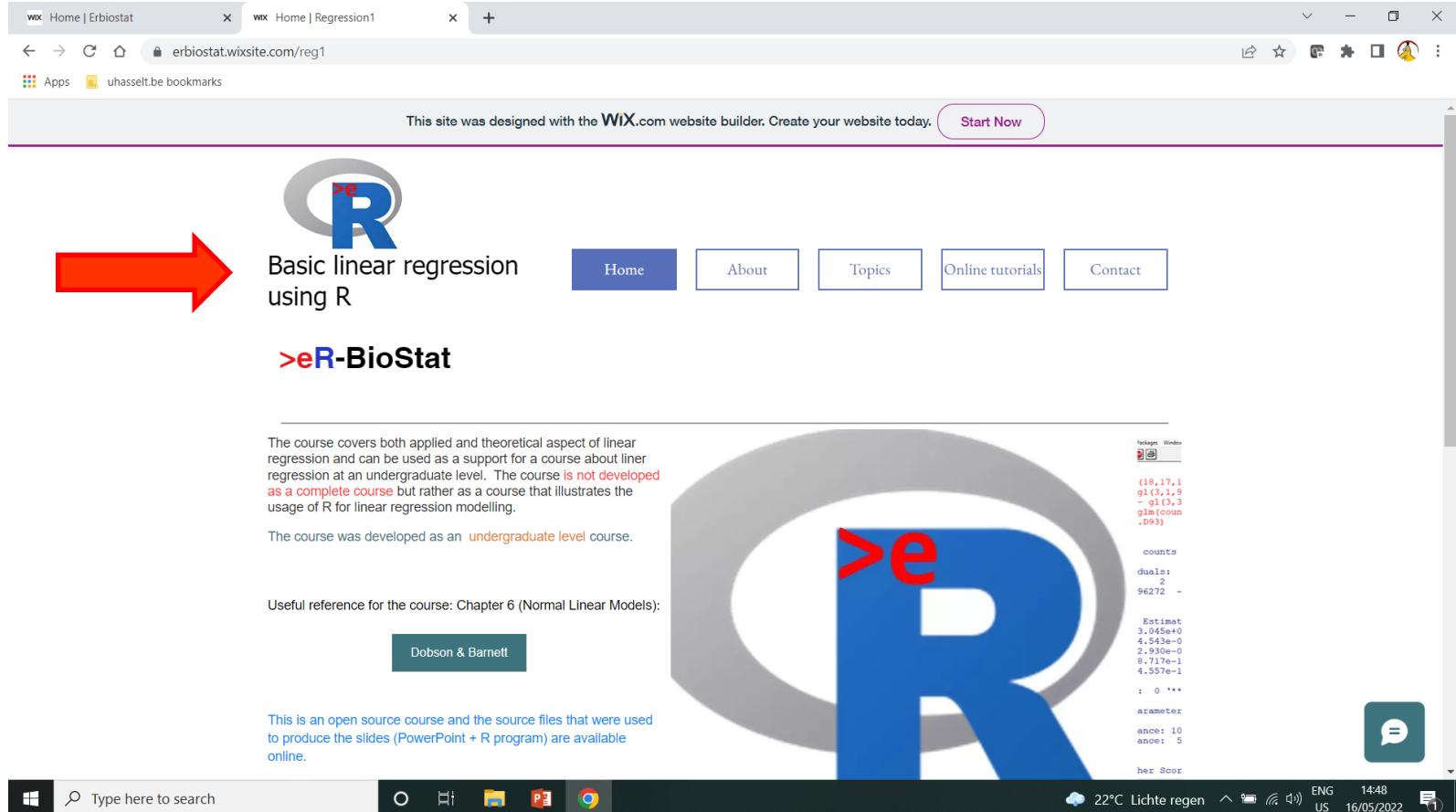
The >eR-BioStat initiative: an Open source platform

Open Source



- Source files available online:
 - R programs.
 - PowerPoint, Rmd & Tex files to produce slides.

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

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

Windows taskbar: Type here to search, File Explorer, File History, Task View, Control Panel, Google Chrome, 22°C Lichte regen, ENG US, 14:48, 16/05/2022.

Code window:

```
Package: Windows  
(18,17,1  
g1(1,2  
- g1(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
```

PowerPoint file for the slides

wx Home | Erbiostat wx Topics | Regression1 +

erbiostat.wixsite.com/reg1/topics

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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.

PDF files with the slides.

R program contains all the examples

[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.

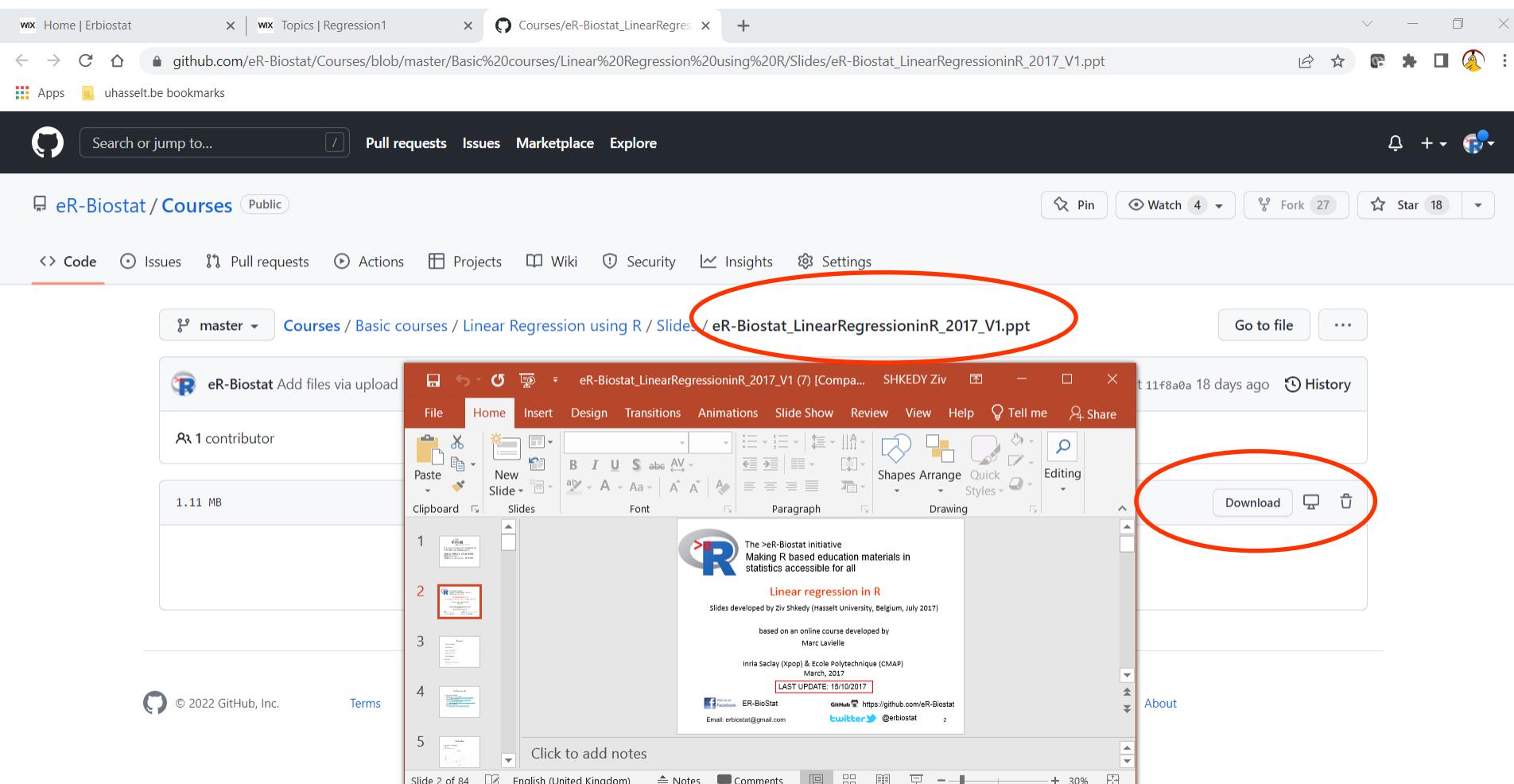
[Online course \(html\)](#)

Feedback icon

Type here to search ○ ⏷ 📁 🎥 🌐

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

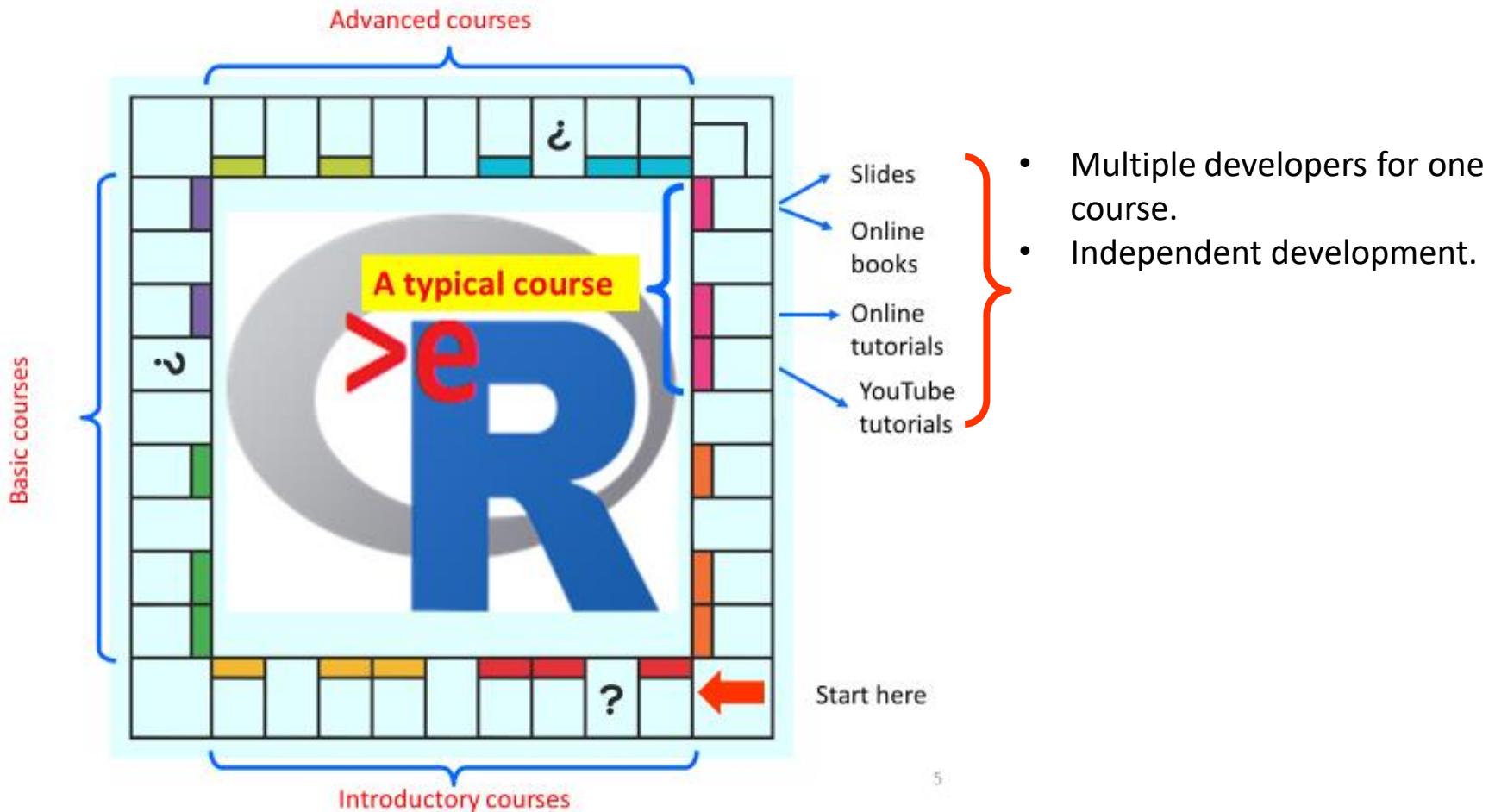
PowerPoint file for the slides



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

The >eR-BioStat initiative: community based development

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

aunce: 10.5814 on 8 degrees of freedom
aunce: 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()".

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)

Windows taskbar at the bottom:

- Type here to search
- Icons for File Explorer, Microsoft Word, Microsoft Excel, and Microsoft Edge
- Cloud icon: 20°C Lichte regen
- System icons: battery, signal, volume, etc.
- Language: ENG US
- Date and time: 16/05/2022 15:03
- Feedback icon

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

wix Home | Erbiostat x | wix Topics | Regression1 x | Polynomial regression model: an x +

Not secure | sia.webpopix.org/polynomialRegression1.html

Apps uhasselt.be bookmarks

Statistics in Action with R

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

Polynomial regression model: an example

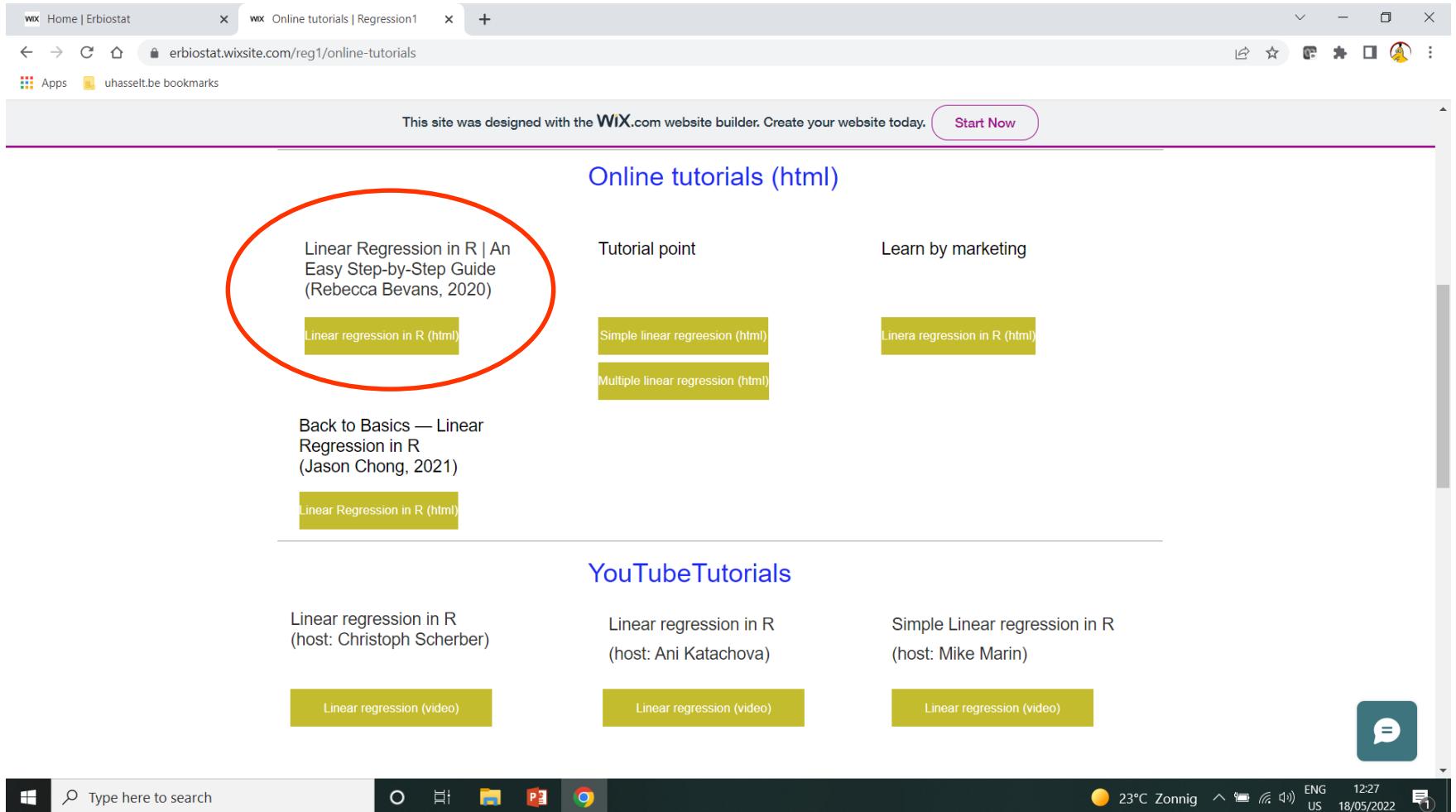
Marc Lavielle
January 23rd, 2018

- 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 transformations
 - 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

Windows Type here to search O E 20°C Lichte regen ENG US 15:03 16/05/2022

Online tutorials (I)



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Online tutorials (html)

<p>Linear Regression in R An Easy Step-by-Step Guide (Rebecca Bevans, 2020)</p> <p>Linear regression in R (html)</p>	<p>Tutorial point</p> <p>Simple linear regression (html)</p> <p>Multiple linear regression (html)</p>	<p>Learn by marketing</p> <p>Linear regression in R (html)</p>
<p>Back to Basics — Linear Regression in R (Jason Chong, 2021)</p> <p>Linear Regression in R (html)</p>		

YouTubeTutorials

<p>Linear regression in R (host: Christoph Scherber)</p> <p>Linear regression (video)</p>	<p>Linear regression in R (host: Ani Katachova)</p> <p>Linear regression (video)</p>	<p>Simple Linear regression in R (host: Mike Marin)</p> <p>Linear regression (video)</p>
---	--	--

23°C Zonnig 12:27 18/05/2022 ENG US

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". 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." Below this, it says: "There are two main types of linear regression:" followed by a bulleted list: "Simple linear regression uses only one independent variable" and "Multiple linear regression uses two or more independent variables". Further down, it states: "In this step-by-step guide, we will walk you through linear regression in R using two sample datasets." A callout box titled "Simple linear regression" provides a detailed description of the dataset used for this guide.

Online tutorial (II)

wx Home | Erbiostat wx Online tutorials | Regression1

erbiostat.wixsite.com/reg1/online-tutorials

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Online tutorials (html)

Linear Regression in R An Easy Step-by-Step Guide (Rebecca Bevans, 2020)	Tutorial point	Learn by marketing
Linear regression in R (html)	Simple linear regression (html)	Linear regression in R (html)
	Multiple linear regression (html)	

Back to Basics — Linear Regression in R
(Jason Chong, 2021)

[Linear Regression in R \(html\)](#)

YouTubeTutorials

Linear regression in R (host: Christoph Scherber)	Linear regression in R (host: Ani Katchova)	Simple Linear regression in R (host: Mike Marin)
Linear regression (video)	Linear regression (video)	Linear regression (video)

23°C Zonnig 12:27 18/05/2022 ENG US

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
- More Options:** ...more
- Player Controls:** Like (225), Dislike, Share, Download, Clip, Save, Description, ...
- RStudio Session:** The video displays a RStudio interface with an R script window showing code for linear regression. A red circle highlights the title "Linear Regression in R".
- Code Snippet:**

```
> # Linear Regression in R
> # Copyright 2013 by Ani Katchova
> mydata<- read.csv("C:/Econometrics/Data/regression_auto.csv")
> attach(mydata)
>
> # Define variables
> Y <- cbind(mpg)
> X1 <- cbind(weight)
> X <- cbind(weight, price, foreign)
>
> # Correlation among variables
> cor(Y, X)
>
> # Plotting data on a scatter diagram
> plot(Y ~ X1, data = mydata)
>
> # Simple linear regression
> olreg1 <- lm(Y ~ X1)
> summary(olreg1)
> confint(olreg1, level=0.95)
> anova(olreg1)
>
> # Plotting regression line
> abline(olreg1)
>
> # Predicted values for dependent variable
> Yhat <- predict(olreg1)
> summary(Yhat)
> plot(Yhat ~ X1)
>
> # Regression residuals
> elhat <- residuals(olreg1)
> summary(elhat)
> plot(elhat ~ X1)
>
> # Multiple linear regression
> olreg2 <- lm(Y ~ X)
> summary(olreg2)
> confint(olreg2, level=0.95)
> anova(olreg2)
>
> # Predicted values for dependent variable
> Yhat <- fitted(olreg2)
> summary(Yhat)
```
- Wix Advertisement:** A sidebar ad for "Create Your Own Website" featuring the Wix logo and a "START NOW" button.
- Related Videos:**
 - Predictive Modeling with R by Bryan Cafferty (1:02:48)
 - Understanding Predictive Modeling with R by Bryan Cafferty (22K views, 3 years ago)
 - Mix – econometricsacademy (YouTube channel)
 - QuantBros.com Introduction to R Programming for Financial... by QuantCourse (62K views, 5 years ago)
 - Probit and Logit Models by econometricsacademy (13K views, 1 year ago)

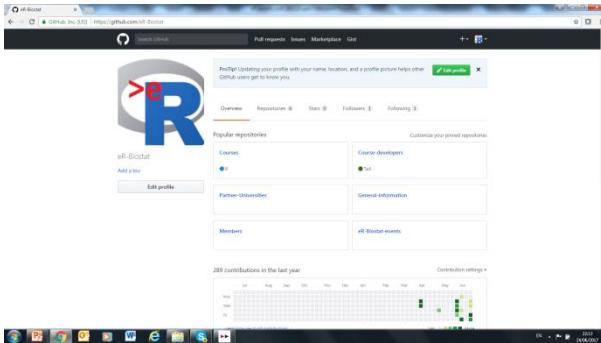
The >eR-BioStat : where can you find us online ?



We >R an online community

The community online:

GitHub

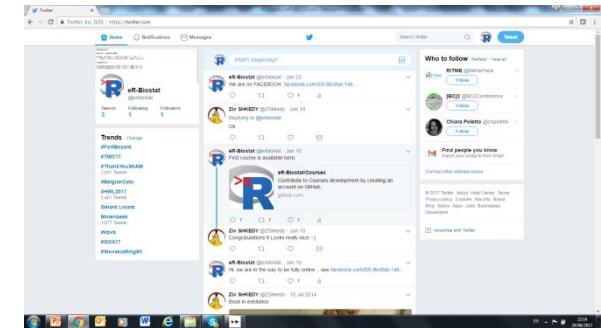


<https://github.com/eR-Biostat>

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.



Inbox (4,800) - ziv.shkedy@uhasselt.be | ER-BioStat | Facebook

facebook.com/eRBiostat

Apps uhasselt.be bookmarks

Search Facebook

Manage Page

ER-BioStat

Business Suite

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

Home

News Feed

Podcasts

Business Apps

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

Add More Information to ER-BioStat

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

Get Started

54



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facebook.com/ERBiostat

Search Facebook

Manage Page

ER-BioStat

Business Suite

- Inbox (1 new message & 17 new comments)
- Planner
- Publishing Tools

Home

News Feed

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Business Apps

Events

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ER-BioStat

+ Add a Button Promote ...

Create Live Event Job Offer ...

Add More Information to ER-BioStat

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Get Started

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

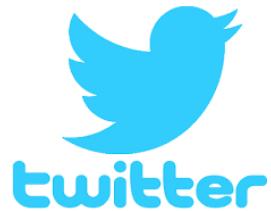
Comment as ER-BioStat

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)
```

>eR-Biostat
@erbiostat

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

Don't miss what's happening People on Twitter are the first to know.

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.

Log in Sign up Close

Windows Type here to search 16°C Zonnig ENG US 12:55 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.

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

E-learning using R: Biostatistics

>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 website features a large image of a person presenting a slide titled "The >eR-BioStat initiative Making R based education materials in statistics accessible for all". The slide includes names like Ziy Shkedy, Adetayo Kasim, Kharegani Zuma & Tadesse Aweke, and logos for Hasselt University, Belgium, Durham University, UK, HSMC, South Africa, and Gondar University, Ethiopia.

CHAT WITH US

Windows taskbar at the bottom: Type here to search, File Explorer, File Manager, Task View, Google Chrome, 25°C Zonnig, ENG US, 16:23, 03/09/2021, 2 notifications.

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



We >eR (an online) community

A screenshot of a Google search results page. The search query 'er-biostat' is highlighted with a red oval. The results include:

- 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, ...
You've visited this page many times. Last visit: 8/20/19
- eR-Biostat (erbiostat) · GitHub**
https://github.com › eR-Biostat ▾
Making R based education materials in statistics accessible - eR-Biostat
You've visited this page many times. Last visit: 4/7/19
- eR-Biostat/Courses - GitHub**
https://github.com › eR-Biostat › Courses ▾
Contribute to eR-Biostat/Courses development by creating an account on GitHub.
You've visited this page many times. Last visit: 4/2/19
- 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

Facebook

Twitter

Course materials

Communication

The diagram illustrates the components of the eR community. A red curly brace groups the 'website' (eR-BioStat), 'GitHub' (eR-Biostat), and 'Facebook' (ER-BioStat) entries under the heading 'Course materials'. Another red curly brace groups the 'Twitter' entry under the heading '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
Facebook

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

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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.

UNIVERSITY OF GONDAR

22°C Zonnig ENG US 12:08 06/09/2021

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

Online course materials

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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:

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

The current page is "Courses/Statistical modeling (1)". The URL is erbiostat.wixsite.com/gondarel2/msc-biostat. The page content includes:

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

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

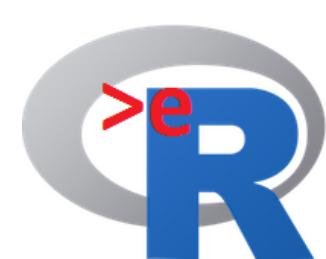
- Two-way ANOVA.
- Advance topics about linear regression.

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 network
- Language: ENG US
- Date and time: 06/09/2021 12:10

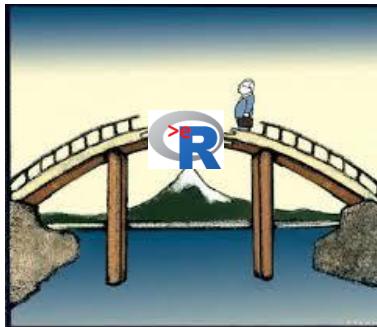
Some extra slides (II)



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.

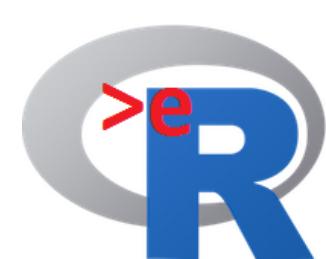


In the long run:
Independent usage
and NOT short
courses format.

>eR-Biostat courses

A screenshot of a computer screen displaying a web-based learning platform. The title bar says 'eR-Biostat Courses'. The main area shows a list of courses with columns for name, description, and status. Courses listed include 'Introductory Courses', 'Linear Models', 'GLM', 'Non Parametric', 'Survival analysis', 'Longitudinal data analysis', 'Multivariate analysis', and 'Bayesian analysis'. Below the list, it says 'The >eR-Biostat initiative' and '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:

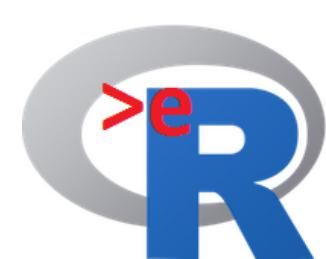
<https://erbiostat.wixsite.com/erbiostat>



- 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. A red arrow points from this folder to a bulleted list of three items.

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' containing introductory R courses. A red circle highlights the 'Introduction to R' file in the file list, and another red circle highlights the 'Available courses in this group:' section in the main content area.

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 'Datasets, if not a part of R, are available online as well.' to the circled folder names.

The >eR-Biostat initiative

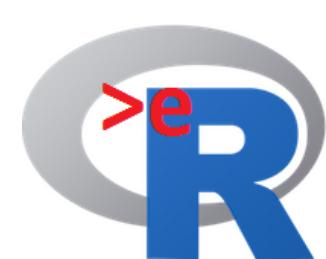
- Datasets, if not a part of R, are available online as well.

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

EN 22:38 24/06/2017



An introduction to R: slides and R program

Example of a Slide

```
Courses/An Introduction.html GitHub, Inc. [US] https://github.com/vfR-Biostat/Courses/blob/master/introduction%20Courses/introduction%20of%20R/slides/An%20Introduction%20of%20R_2017.pdf
```

Creating an R object

```
> x<-rnorm(100,0,1)
```

An R object contain the results

```
> x
```

Print the R object

```
[1] -0.91083203 0.04955497 -2.40884482 0.33493954 1.45434660 -2.42198872  
[7] 0.44232862 -0.73804491 -0.38584587 0.30061194 -0.31993512 -1.30860569  
[13] 0.11408195 0.42549125 -0.29501115 0.23197212 0.30884307 -0.84053307  
[19] -0.61008244 0.80784777 1.31530974 -0.38159401 0.20044728 -0.63382504  
[85] 0.03861350 0.80981884 0.86323215 -0.24199953 1.64380128 0.45445204  
[91] 1.90708641 0.34088349 -0.25727644 -0.26498359 0.80095645 1.42711451  
[97] 1.27998167 -0.54106317 -1.29443874 0.36046722
```

10

R program

```
Courses/An Introduction.R GitHub, Inc. [US] https://github.com/vfR-Biostat/Courses/blob/master/introduction%20Courses/introduction%20of%20R%20Programs/vfR-Biostat_RIntro_Short_quickstart_2017.R
```

```
## RSTART ##  
## RSTOP ##  
  
##  
## rnorm(100,0,1)  
## x<-rnorm(100,0,1)  
## mean(x)  
## var(x)  
## hist(x)  
##  
## x1<-rnorm(10000,0,1)  
## x2<-rnorm(10000,0,1)  
## par(mfrow=c(2,1))  
## hist(x1,nclass=50,clab=c(-4,4))  
## hist(x2,nclass=50,clab=c(-4,4))  
##  
## x1<-rnorm(10000,0,1)  
## x2<-rnorm(10000,0,1)  
## par(mfrow=c(2,1))  
## hist(x1,nclass=50,clab=c(-6,6))  
## hist(x2,nclass=50,clab=c(-6,6))
```

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

