



Interuniversity Institute for Biostatistics
and statistical Bioinformatics



Development of a robust E-learning system in (Bio)Statistics and data science using R & R Markdown

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Hasselt University, Belgium & Moi University, Kenya

SUSAN2025
Addis Ababa, Ethiopia
03/09/2025



Visit us on
Facebook

ER-BioStat

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

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



@erbiostat

The >eR-Biostat Initiative

- >eR-Biostat = E-leaRning system in (bio)statistics and data science
- A short introduction to the >eR-BioStat platform.

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





Interuniversity Institute for Biostatistics
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The >eR-BioStat : short introduction about the ITP project

Our current website

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

The >eR-BioStat ITP project

- A 3 years project (24/25/26).
- ITP: International Training Program.
- Sponsorship: VLIR-UOS.
- Focus: Development of (local) E-learning and digital education platforms for (bio)statistics & data science.
- All levels of HE:
 - Undergraduate.
 - Graduate.
 - Service courses for non statisticians.

Project's structure

- Three years project: 2024-2026.
- Three countries:
 - Kenya.
 - Ethiopia.
 - South Africa.
- In total: 14+ Universities & institutes from the three countries.
- International team: USA, Canada Belgium.

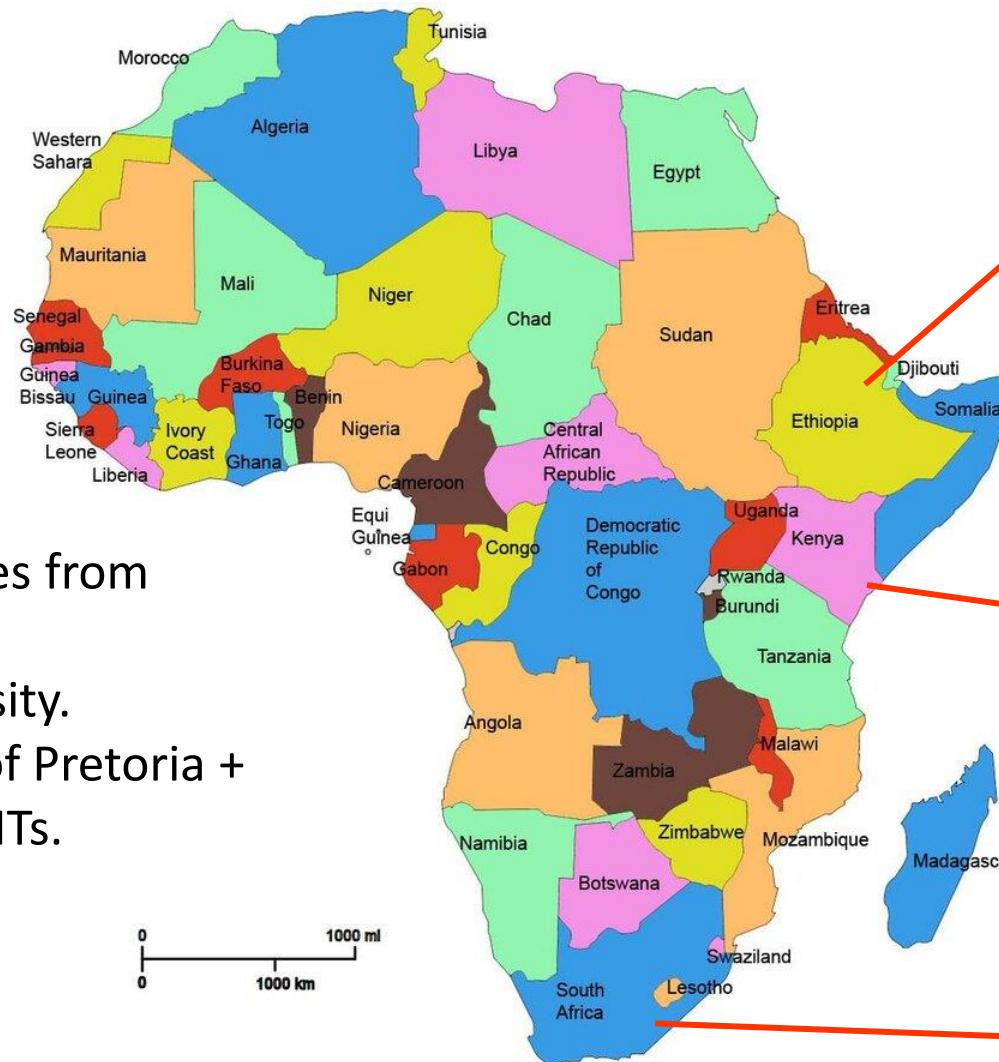


The eR-BioStat project in Ethiopia

- Originally, Gondar was suppose to be the coordinator in Ethiopia.
- Due to traveling restrictions we could not organize workshops in Ethiopia.
- We invited people from Ethiopia to activities in Kenya & South Africa.



Project's partners



Gondar University.
Addis Ababa university.
Ambo University.
Debre Berhan University.
Arsi University.
+others....

Moi University.
Karatina University.
JKUAT.
Masinde Muliro Uni.

University of Pretoria.
MRC-SA.
WITS.
Stellenbosch University.
The University of Venda.
The University of Zululand.

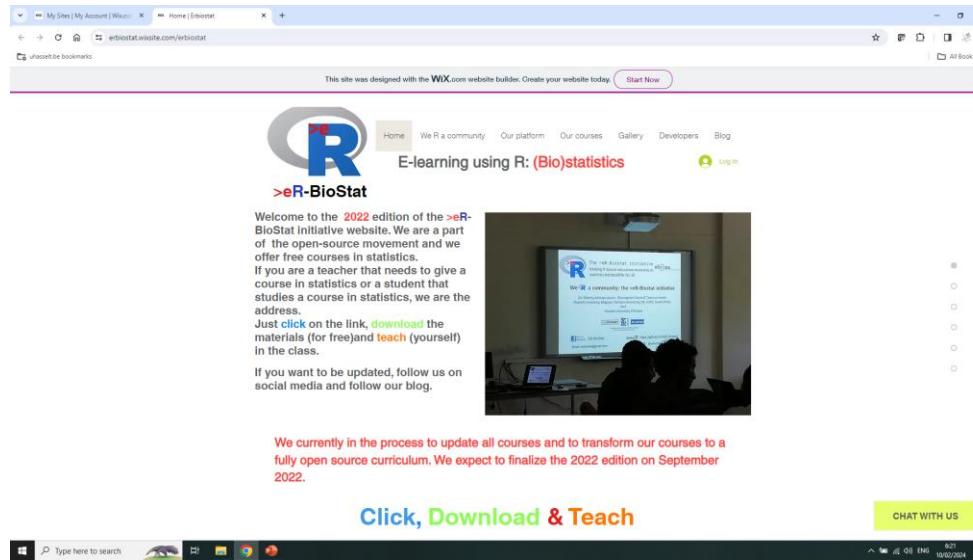
- Leading institutes from SSACAB:
 - Moi University.
 - University of Pretoria + SA-MRC, WITs.

Project's objectives

- Development of (local) networks of universities in Kenya, Ethiopia, South Africa that use the digital platform for statistics & DS.
- Training of local academic staff to create their own contents & websites.
- Establish international network to support local universities.
- The project is designed to support young academic staff in university with low capacity in statistics & DS.

Deliverable

- The >eR-BioStat website:
 - A website that offers a collection of free courses in statistics and data science.
- Updated the global version of <https://erbiostat.wixsite.com/erbiostat>.
- Development of a Local version of the >eR-BioStat website.
- “Editorial board” for the website.



Activities (workshops)

- From 01/24 to 12/26, workshops for training in the local universities:
 - 3 workshops per country (we aim for one per year) = 9 workshops in total.
 - Up to a 10 days workshop (minimum 7 days).
 - ~20 participants (local & international): for the partner institutes + others.
 - Workshops will be located in the leading partners.
 - If needed, online workshops (~3).
-
- Other workshops , in collaboration with other projects.
 - Workshop in Uganda (with IBS), March 2025.
 - Workshop in Hanoi, Vietnam, march 2025 (ICP connect).
 -

ITP workshops

Activities (website development)

- Development of global & local website.
- Development of core courses:
 - Basic course in statistics (under graduate).
 - Advanced courses (master level).
 - Short courses ??

Two examples in
this workshop.

Project's website and activities list

The screenshot shows a Wix website for 'The eR-BioStat ITP'. The header includes a navigation menu with links to Home, Workshops, The eR-BioStat, About Us, and Contact. Logos for VLIR-UOS, NOU University, DSI Data Science Institute, and UHASSLET are displayed. The main content area features a green-to-orange gradient background with text about the International Training Program and its focus on e-learning platforms in (bio)statistics. A '2023-2026' banner is at the bottom. The footer contains sections for Workshops & Short Courses and an International symposium on current trends in modeling and software development in data science and Statistics. The website is viewed in a Microsoft Edge browser on a Windows 10 desktop.

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

The eR-BioStat ITP

Home
Workshops
The eR-BioStat
About Us
Contact

vliruos

NOU UNIVERSITY

DSI DATA SCIENCE INSTITUTE

UHASSLET

f t

The VLIR-UOS INTERNATIONAL TRAINING PROGRAM:

The eR-BioStat ITP: Development of local E-learning platforms in (bio)statistics.

2023-2026

Workshops & Short Courses

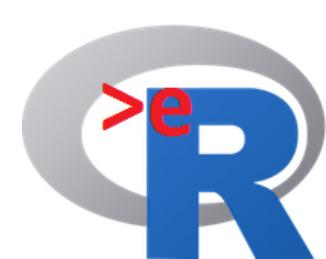
20/02/24-23/02/24

International symposium on current trends in modeling and software development in data science and Statistics.

Type here to search

Windows 10 Taskbar

<https://erbiostat.wixsite.com/itpa0>



Project's activites

- Three academic years: 23/24, 24/25 & 25/26.
 - Workshops:
 - ~~First workshop: Gondar Uni, Ethiopia (14/08/2023).~~
 - ~~Second workshop: SA-MRC, cape town (end of February 24: workshop + conference).~~
 - ~~Third workshop: Moi.~~
 - VISAYAS state university: the Philippines.
 - Hanoi Medical University, Vietnam.
 - Moi Uni, Kenya.
 - University of science and technology, Hanoi, Vietnam.
 - Uni. of Pretoria, South Africa (29/06-05/07).
 - Moi University, Kenya (14/07/25).
 - SUSAN 2025 (09/25).
- ITP 8** →
- South Africa
 - Kenya
 - ...
- Academic year 25/26.
Plan will be available in October.
- Academic year 24/25.
- Academic year 24/25.

The ITP project's website:
<https://erbiostat.wixsite.com/itpa0>



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The >eR-BioStat ITP project: project's structure

Our current website

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

Collaborators network (South partners)

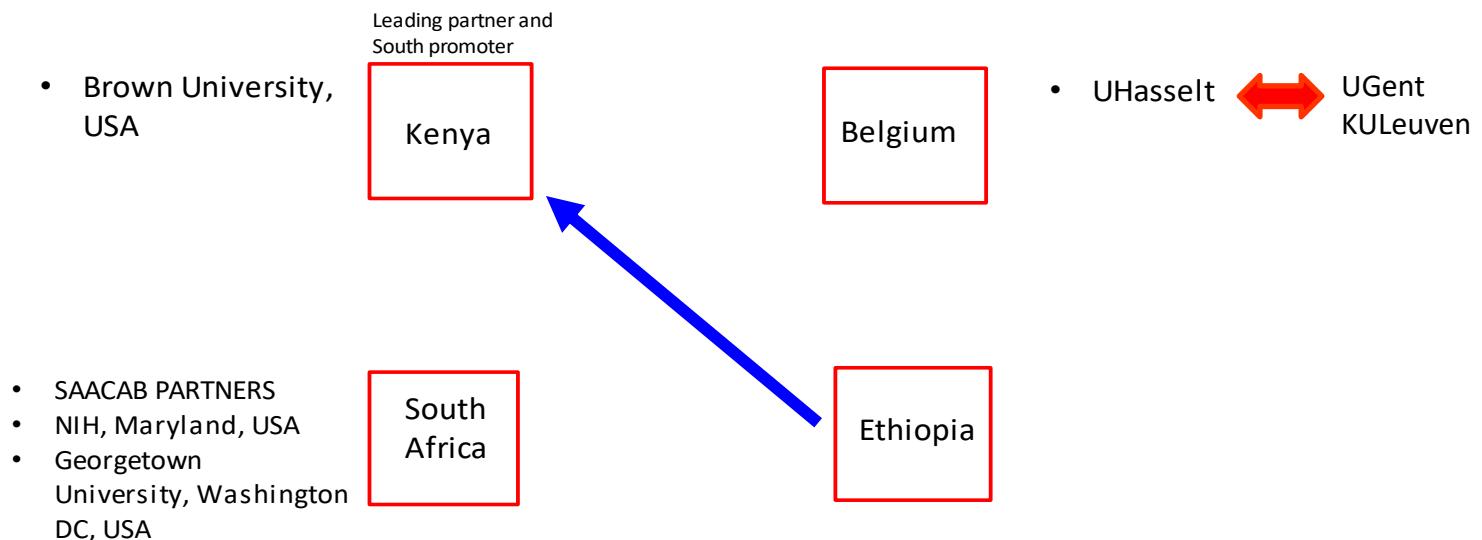
- Kenya:
 - [Moi University.](#)
 - Karatina University, The Department of Mathematics, Statistics and Actuarial Science.
 - Jomo Kenyatta University of Agriculture and Technology (JKUAT) ,The department of Statistics and actuarial science.
 - Masinde Muliro University of Science and Technology, department of statistics.
- Ethiopia:
 - Gondar University.
 - Addis Ababa university.
 - Ambo University, The department of statistics.
 - Arsi University, The Department of Statistics.
 - Debre Berhan University (DBU), Statistics Department.
- South Africa:
 - [University of Pretoria.](#)
 - [MRC-SA.](#)
 - [WITS.](#)
 - Stellenbosch University (SU), the division of epidemiology and biostatistics.
 - The University of Venda, The Department of Mathematical and Computational Sciences.
 - The University of Zululand (UNIZULU), The Department of Mathematical Science.



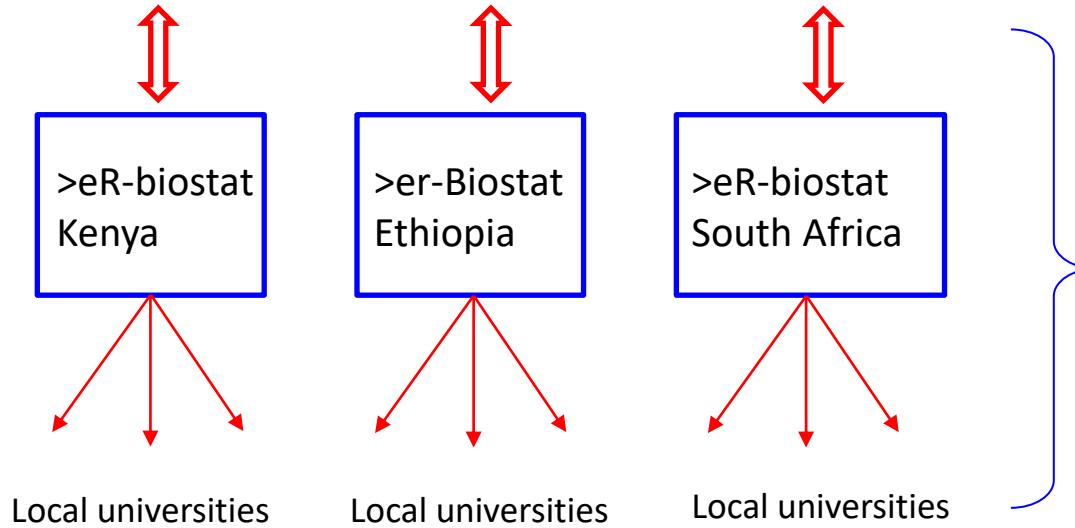
Other universities.

Collaborators network (International)

- Existing collaboration links among partners:



Online structure



Our aim within the project:

- to develop local versions.
- Connected to SSACAB.



Interuniversity Institute for Biostatistics
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The >eR-BioStat platform: a short introduction and main concepts

Our current website

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

Motivation

- Problems in education programs can be related to :
 - 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 education programs at a high level.

Motivation

- Approach until ~2015:
 - Many capacity development projects.
 - Mainly: North-South.
 - But:
 - Difficult to maintain the education programs at a high level after the end of the project...
 - Difficult to maintain the project's deliverable that were produced during the project duration **when the project funding is over...**

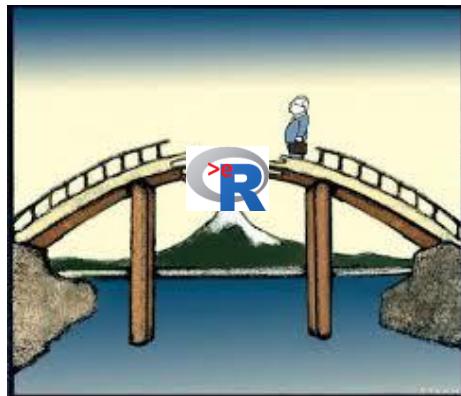
Digital education & E-learning

- We **DO NOT** develop online education program but we develop **online materials for on campus** education.
- The E-learning Initiative aims to **support on campus programs** by:
 - Develop accessible course materials in (bio)statistics.
 - Focus on **all education levels**:
 - Undergraduate & master programs, PhD schools.
 - Statisticians & non statisticians.
 - Bring students and teachers costs to minimum by providing **free, high quality and applied** course materials.

We >^eR a community

- Build up communities (in south & north).
- Create a “south-south-north” bridge between communities:

Academic staff and students in the south.



Development of E-learning capacity

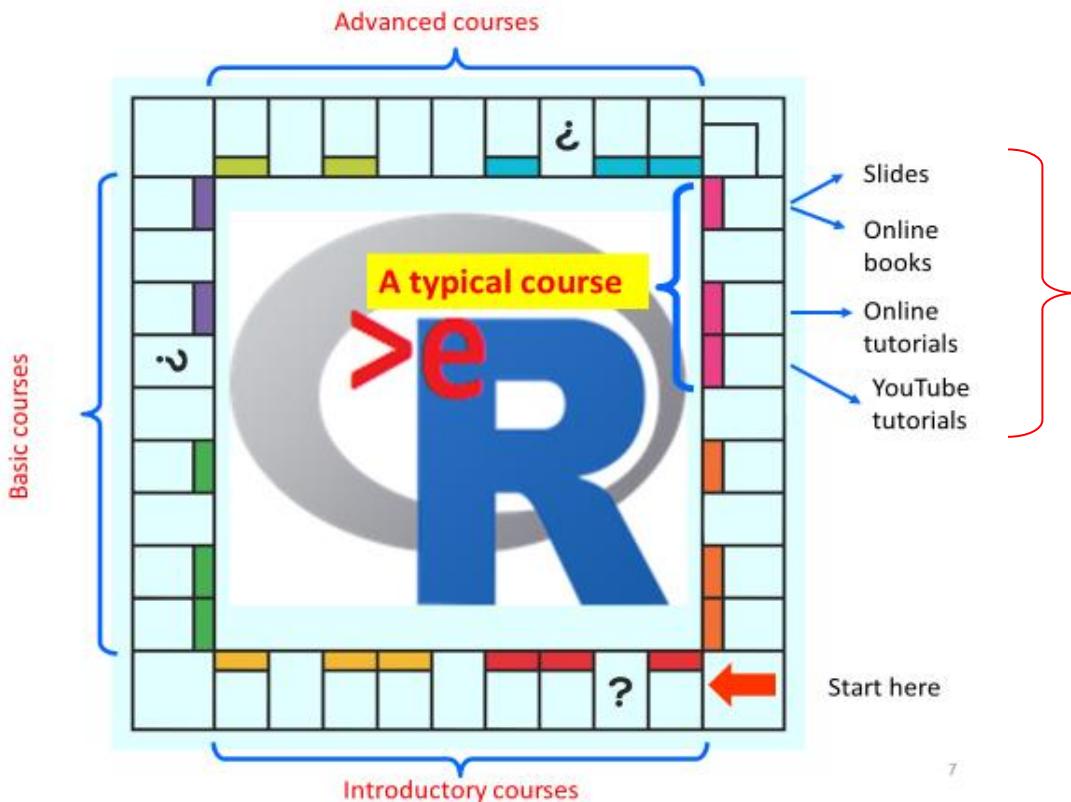
Academic staff in the north.

Concepts

- The E-learning system consists of few components:
 1. All course materials are available to the students/teachers online to download (for free).
 - Can be used **online or offline**.
 2. Selected courses were/will be developed.
 3. Courses can be used either as a complete course or a part of a course.
 4. Courses developed up to a class level, i.e. courses are ready to be given in the class.

Typical course structure

- Courses in three levels: introductory, basic & advanced.
- What does it means “fully develop a course...” ?



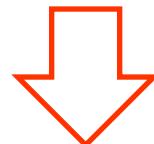
- Course materials are ready to be used in class.
- **Open source policy !!!**

Our approach (1): **free and publically available**

- Reduce costs to zero !!!
- Use publicly available products:
 - Storage course materials: GitHub (<https://github.com/>).
 - Website development: WIX (<https://www.wix.com/>).
 - Software: mostly publicly available software.
 - For example:
 - R (<https://www.r-project.org/>).
 - Python (<https://www.python.org/>).



All publicly
available
products.

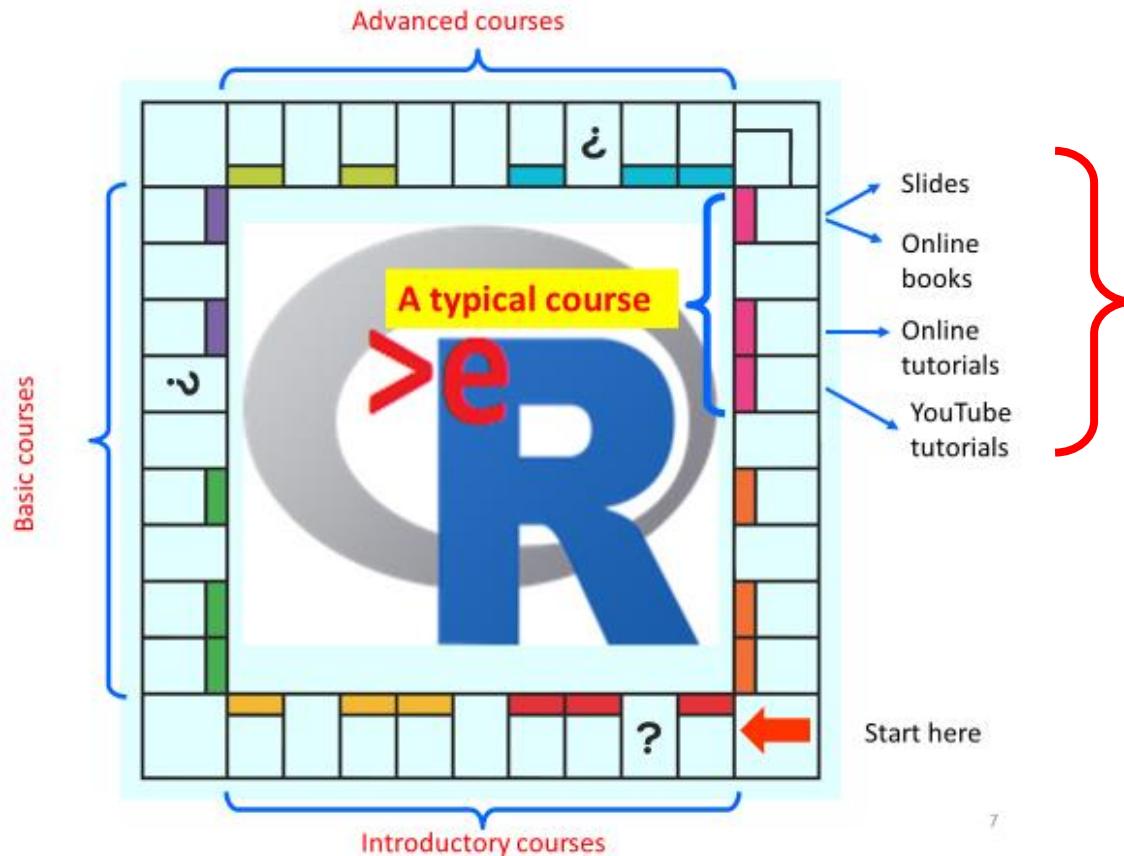


- Free for users(=students/teachers in the south):
 - No password.
 - No registration.

Our approach (2): open source

- For a given course, everything is available for free:
 - Slides for the class (pdf).
 - Source files to make the slides (PP, Tex, Rmd...) !!!
 - YouTube tutorials.
 - Software programs for the examples in the course.
 - Free for users:
 - No password.
 - No registration.
- 
- All publicly available.

Our approach (3): Communities



- All source materials are available for **FRRE** online.
- Everybody can download and use.
- Course materials **can be adapted** by the users for the local needs.

- Communities of users: students & teachers in the south &
- Communities of developers: in both south & north.

Concepts

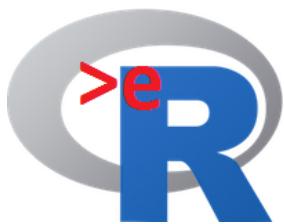
- The E-learning system consists of few components:
 1. All course materials are available to the students/teachers online to download.
 2. Selected courses were developed.
 3. Courses will be either a complete course or a part of a course.

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.



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The >eR-BioStat platform: What do we offer ?

Our current website

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

Two main products

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

```
graph TD; A["https://erbiostat.wixsite.com/erbiostat"] --> B["Course (or a part of a course) that can be used as a part of an education program in (bio)statistics & data science."]; A --> C["The >eR-BioStat short course service"]
```

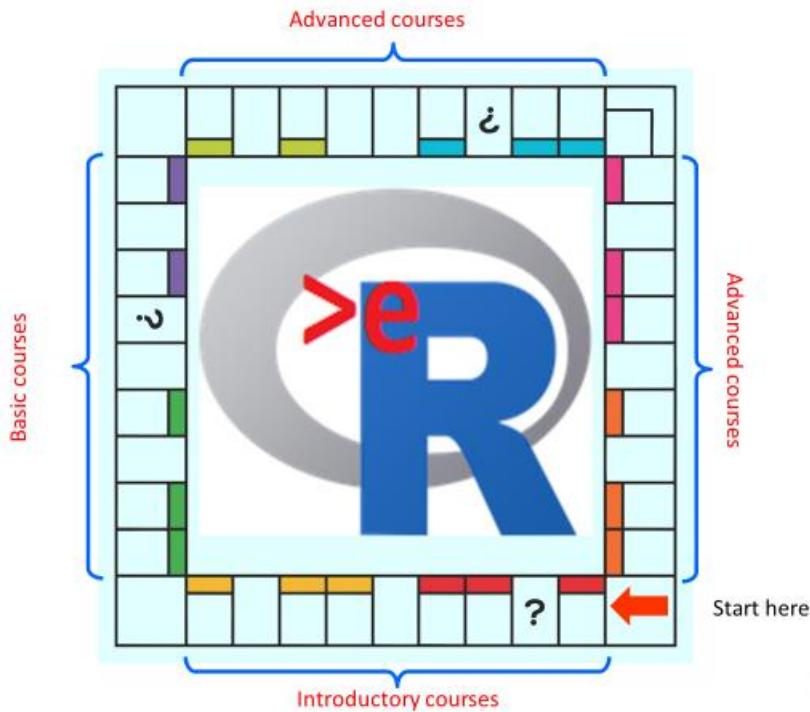
Course (or a part of a course) that can be used as a part of an education program in (bio)statistics & data science.

The >eR-BioStat short course service

Concepts

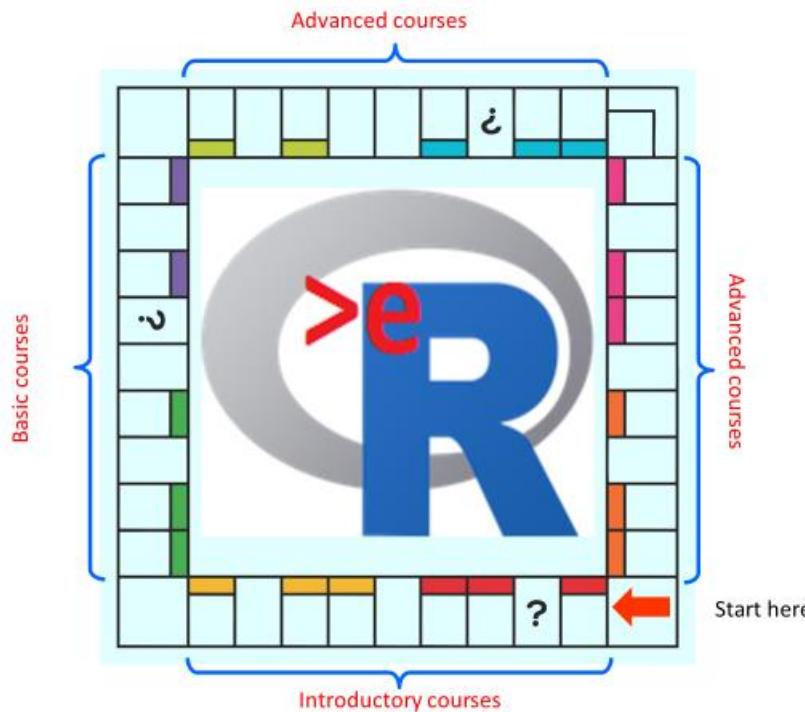
- We **DO NOT** developing distance learning courses !!!
- All our courses require **a teacher to teach the course in class.**
- We develop an **E-learning system to support on-campus education** programs in (bio)statistics & data science.

Introductory courses



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

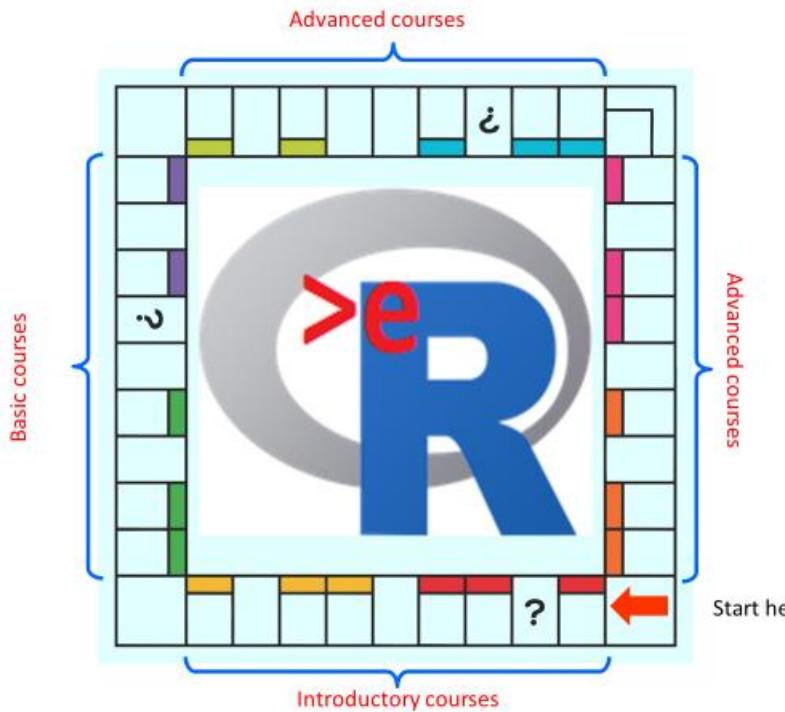
Introductory courses



- Basic concept of statistical inference.
- 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.~~



KU LEUVEN

Interuniversity Institute for Biostatistics
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The >eR-BioStat :

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

Our current 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 is designed with a WIX.com website builder, as indicated by a banner at the top. The main content features a large logo for >eR-BioStat, which includes a stylized 'R' with a red 'e' inside. Below the logo, the text 'E-learning using R: Biostatistics' is displayed. A welcome message for the 2020 edition of the initiative is present, along with a call to action encouraging users to click, download, and teach. To the right, there is a video player showing a presentation slide about the initiative, and a 'CHAT WITH US' button at the bottom right.

Open source

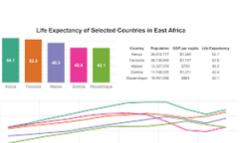
This site was designed with the **WIX**.com website builder. Create your website today.

[Start Now](#)

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 biostatistic/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 >R-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

- 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.



Interuniversity Institute for Biostatistics
and statistical Bioinformatics



The >eR-BioStat website:
Example of one course

Our current website

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

Example of one course

- What do we offer to you as a teacher of a course or a student in the course ?
 - Applied courses.
 - Slides.
 - Programs to conduct the analysis.
- Why to use our platform ?
 - Save time & effort.
 - Courses can easily adjusted to your need.

Example of one course: Introduction to R

This screenshot shows a Wix website for 'Erbiostat' featuring a list of courses categorized into 'Introductory' and 'Advanced' levels.

The 'Introductory' section contains the following courses:

- 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
- Introductory Statistics for the Life and Biomedical Sciences

The 'Advanced' section contains the following courses:

- 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

A red dashed circle highlights the 'Introduction to R' course in the introductory section. A green box at the bottom right of the page contains the text: 'development and not presented in their final version.'

At the bottom right of the page, there is a yellow button labeled 'CHAT WITH US'.

At the very bottom of the screen, the Windows taskbar is visible, showing the search bar, pinned apps (File Explorer, Microsoft Edge, Powerpoint), and system tray icons.

Example: introduction to R

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

Introduction to R >eR-BioStat

Home About **Topics** (circled) 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/ (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()' for further information on R.
Type 'demo()' for some demos, 'help()' for on-line help,
'RFAQ()' for an frequently asked questions list,
Type 'q()' to quit R. R will never forget to help.
Type 'q("q")' to quite R. R will never forget to help.
Errors had occurred for regular number (file may be corrupt)
in file 'airquality'. Error message:
file 'airquality' has magic number '4D31'
Use 'R --vanilla' to start R without deprecated
During startup - Warning message
source('C:/Users/ziv/Desktop/airquality.R')
#> library(tidyverse)
#> library(dplyr)
#> library(ggplot2)
#> library(readr)

R Graphics Device 2 (ACTIVE)
bathsPerZone
airquality\$Wind

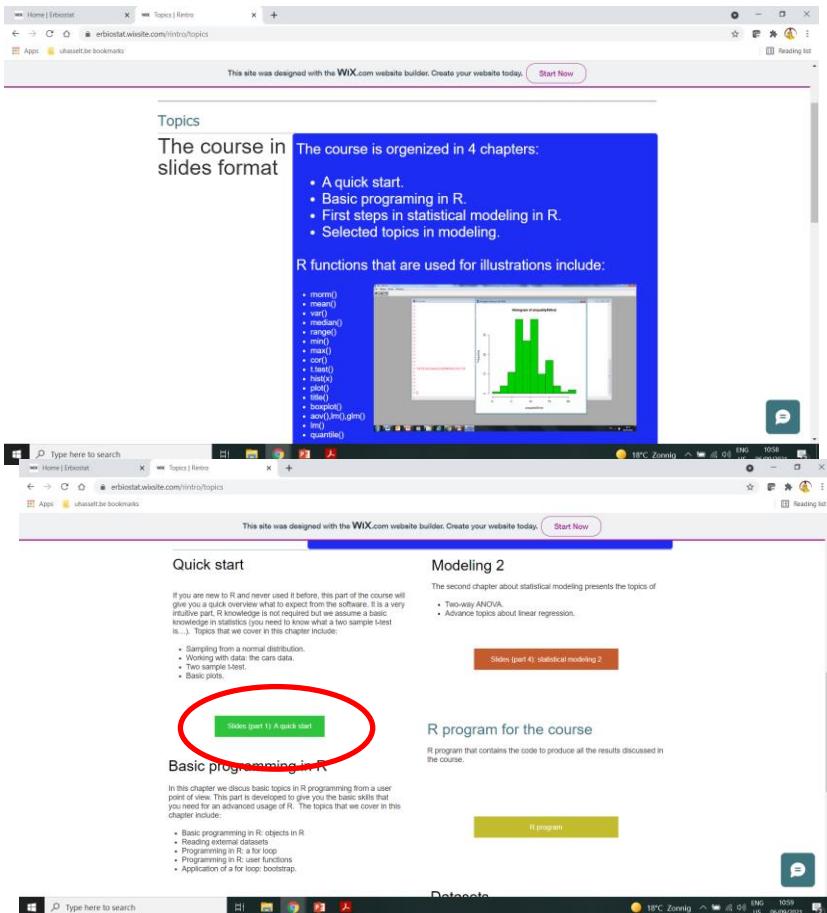
Rfig

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

<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.



Slide format

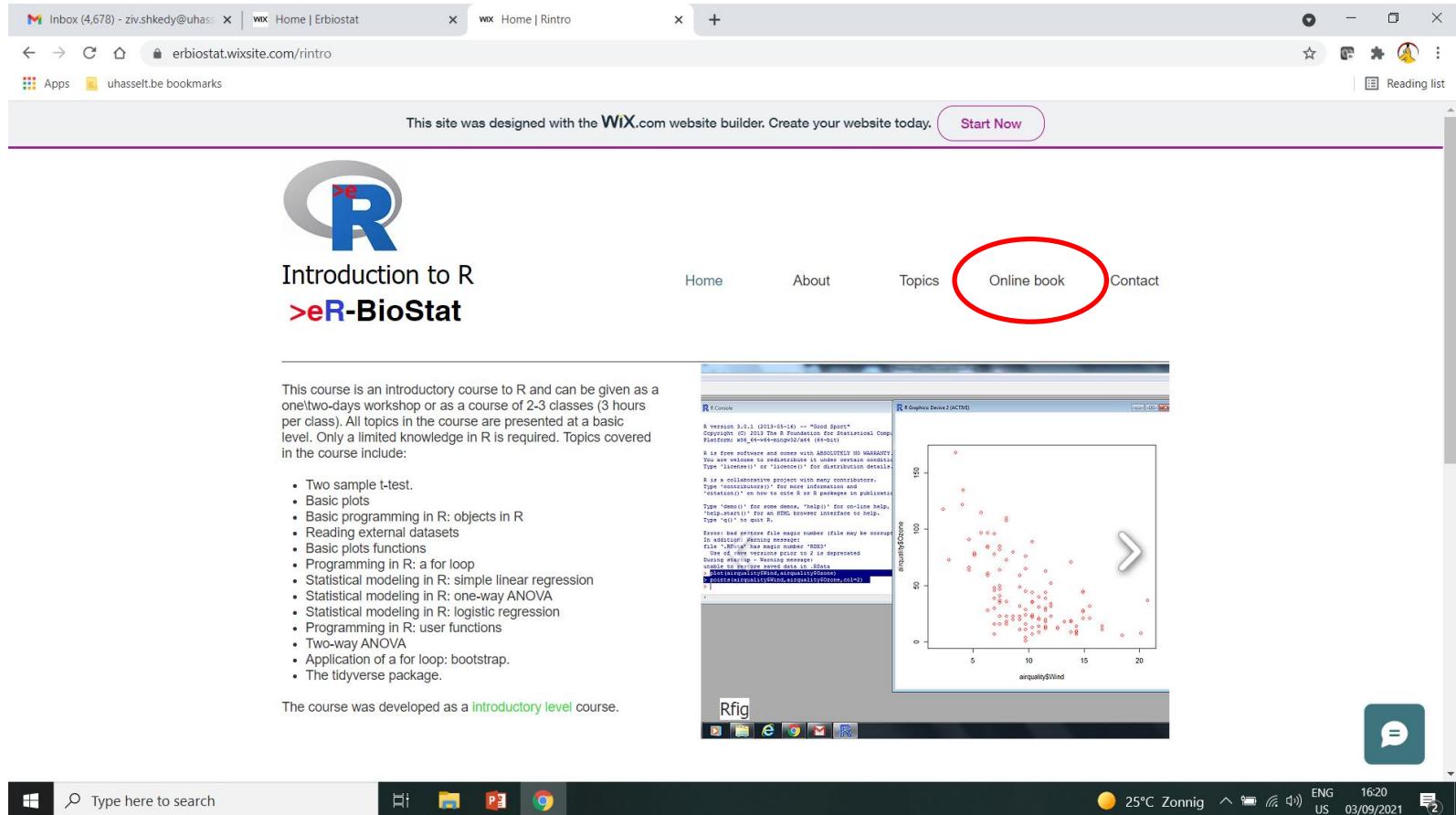
The screenshot shows a Microsoft Edge browser window with the following details:

- 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 blue 'R' with a red '>e' inside a grey circle.
 - 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 red box:** LAST UPDATE: 15/10/2017
- Taskbar:** Shows the Windows Start button, a search bar, and icons for File Explorer, Microsoft Word, and Google Chrome.
- System Tray:** Shows battery level, signal strength, temperature (19°C), location (Zonnig), date (06/09/2021), and time (11:14).

Introduction to R

- <https://erbiostat.wixsite.com/rintro>
 - Based on the course Programming in R in the MSc program in UHasselt.
 - Contents:
 - Basic R:
 - Basic programming in R.
 - Introduction to statistical modeling in R.
 - Modern R:
 - R Studio.
 - R Markdown.
 - The ggplot2 package.
 - The tidyverse package.
- 
- Short course
tomorrow with
Julia & Ziv.

Online book



Online book

The screenshot shows a Microsoft Edge browser window displaying an online book titled "Introduction to R: basic programming". The page content includes a sidebar with navigation links for chapters 1 through 8, and a main area with sections like "1 Introduction", "1.1 Slides, code and tutorials", and "1.2 R ?". A code editor window is also visible, showing R code snippets. The browser's address bar shows the URL of the book's page. The taskbar at the bottom of the screen displays various pinned icons.

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

- 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 like 1 Introduction, 2 R Objects, and 3 Basic plots in R. The main content area shows code snippets and text. Two specific sections are circled in red: "Slide for this part of the course are available online in the >eR-BioStat website. See [RcourseProgramming](#)." and "For a short YouTube introduction, by Mike Marin, about objects in R see [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
```

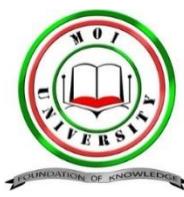
We can print the object x :

```
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.



Interuniversity Institute for Biostatistics
and statistical Bioinformatics



The >eR-BioStat :
The >eR-BioStat : open source approach

Our current website

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

Open source policy

- Open source means:
 - Our task is to develop free high quality educational products in statistics and data science.
 - All education levels:
 - Under graduate.
 - Graduate.
 - PhD.
 - Zero costs for users and developers.
 - We also provide supporting resources, such as slides, programs for the examples, videos, and more.
 - We provide the source programs to produce the course: power point, Tex, Rmd....
-

Example: Introduction to R

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

[Slides \(PDF, part 1\): A quick start](#)

Basic programming in R

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:

- 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.

[Slides \(PDF, part 2\): basic programing in R](#)

Modeling 1

The first chapter about statistical modelling presents, at a very basic level, the topics of

- Simple linear regression.
- One-way ANOVA.
- Logistic regression.

The R functions lm(), glm() and aov() are used to fit the models. We assume that you studies a basic course in statistics and you familiar with the three models above.

[Slides \(PDF, part 3\): statistican modeling 1](#)

R program for the course

R program that contains the code to produce all the results discussed in the course.

[R program](#)



Datasets

External datasets that we use in the course.

[External Datasets](#)

Slides for the course in PP

For the slides of the course in PowerPoint format, click on the blue button below.

To download the slides: click on the button below and then click on "download" button in the Github page (at the right side of the screen).

[Slides in PowerPoint format](#)



The R program for the course

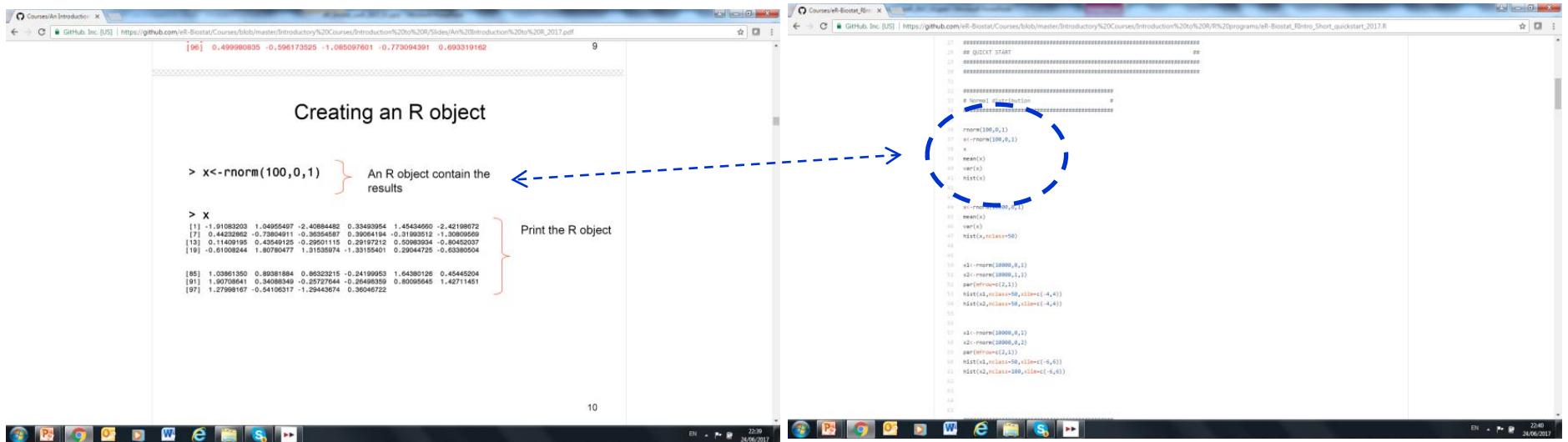
A screenshot of a web browser displaying an R script on GitHub. The browser has multiple tabs open, including 'Home | eR-Biostat', 'Topics | Rintro', and 'Courses/introductory Courses/'. The main content area shows the file 'eR-Biostat_Rintro_Short_quickstart_2017.R' with the following code:

```
1 #####  
2 #####  
3 # An introduction to R  
4 # Developed by  
5 # Ziv Shkedy and Dan Lin  
6 # Hasselt University  
7 # >eR-Biostat initiatve (2017)  
8 #####  
9 #####  
10 #####  
11 #####  
12 #####  
13 #####  
14 #####  
15 # External datasets used in this course:  
16 #####  
17 #####  
18 #####  
19 spwh3<-read.table('c:\\\\projects\\\\wseda\\\\spwh3.txt', header=FALSE,na.strings="NA", dec=".")  
20 cashdat<-read.table('c:\\\\projects\\\\wseda\\\\Rintro\\\\cashdat.txt', header=FALSE,na.strings="NA", dec=".")  
21 sero<-read.table('c:\\\\projects\\\\wseda\\\\Rintro\\\\sero1.txt', header=FALSE,na.strings="NA", dec=".")  
22 spwh2<-read.table('c:\\\\projects\\\\wseda\\\\spwh2.txt', header=FALSE,  
23 na.strings="NA", dec=".")  
24 #####  
25 #####  
26 #####  
27 #####  
28 ## QUICKT START  
29 #####  
30 #####  
31 #####  
32 #####
```

An introduction to R: slides and R program

Example of a Slide

R program on line



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

Example: Slides for Introduction to R

This screenshot shows a web browser window displaying a Wix website for an R programming course. The browser has multiple tabs open, including the home page and various topic pages.

The main content area shows sections for basic programming, modeling, and datasets, each with associated PDF download links and other course materials.

A large red arrow points from the "Slides in PowerPoint format" button in the Modeling 1 section towards the "Slides in PowerPoint format" button in the Slides for the course in PP section.

Basic programming in R

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:

- 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.

Modeling 1

The first chapter about statistical modelling presents, at a very basic level, the topics of

- Simple linear regression.
- One-way ANOVA.
- Logistic regression.

The R functions lm(), glm() and aov() are used to fit the models. We assume that you studies a basic course in statistics and you familiar with the three models above.

Slides for the course

R program for the course

R program that contains the code to produce all the results discussed in the course.

Datasets

External datasets that we use in the course.

External Datasets

Slides for the course in PP

For the slides of the course in PowerPoint format, click on the blue button below.

To download the slides: click on the button below and then click on "download" button in the Github page (at the right side of the screen).

Slides (PDF, part 1): A quick start

Slides (PDF, part 2): basic progrming in R

Slides (PDF, part 3): statistican modeling 1

Slides (PDF, part 4): R program

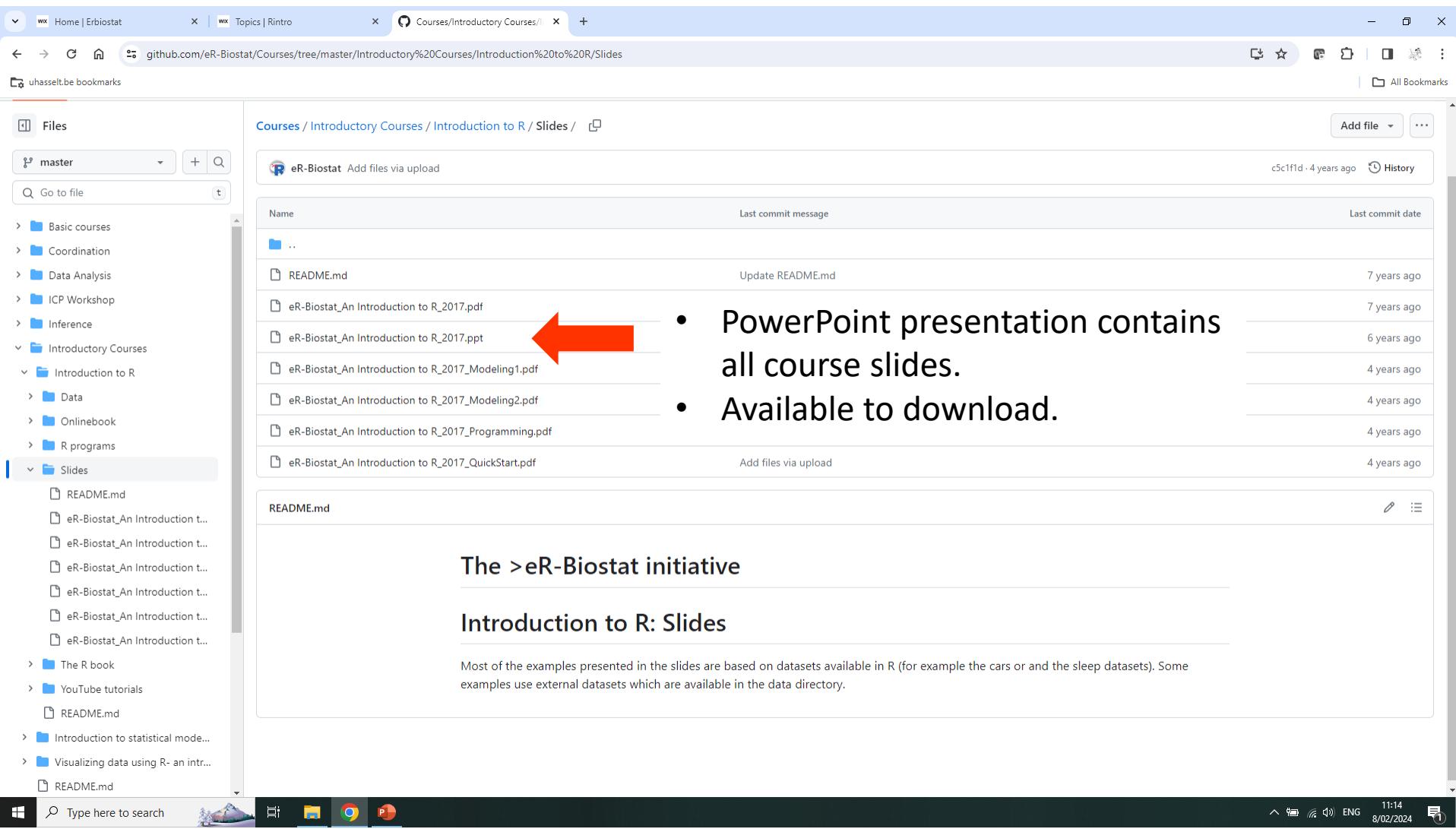
Slides in PowerPoint format

© 2020 by >eR-BioStat. Proudly created with Wix.com

Windows Taskbar: Type here to search, File Explorer, Google Chrome, etc.

System tray: Battery, Network, Volume, ENG, 11:12, 8/02/2024, etc.

Storage on GitHub



The screenshot shows a GitHub repository for 'eR-Biostat' containing course materials. The repository structure is as follows:

- Basic courses
- Coordination
- Data Analysis
- ICP Workshop
- Inference
- Introductory Courses
 - Introduction to R
 - Slides
 - README.md
 - eR-Biostat_An Introduction to R_2017.ppt
 - eR-Biostat_An Introduction to R_2017_Modeling1.pdf
 - eR-Biostat_An Introduction to R_2017_Modeling2.pdf
 - eR-Biostat_An Introduction to R_2017_Programming.pdf
 - eR-Biostat_An Introduction to R_2017_QuickStart.pdf
 - DATA
 - Onlinebook
 - R programs
 - Slides
 - README.md
- The R book
- YouTube tutorials
- README.md

A red arrow points to the 'eR-Biostat_An Introduction to R_2017.ppt' file in the 'Slides' folder.

- **PowerPoint presentation contains all course slides.**
- **Available to download.**

The >eR-Biostat initiative

Introduction to R: Slides

Most of the examples presented in the slides are based on datasets available in R (for example the cars or the sleep datasets). Some examples use external datasets which are available in the data directory.

Example: Introduction to R (online book)

The screenshot shows a web browser window with the following details:

- Address Bar:** Introduction to R: basic programming
- Left Sidebar (Table of Contents):**
 - 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
 - 4 Summary statistics
- Right Content Area:**

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
- Bottom Status Bar:** Type here to search, taskbar icons (File Explorer, Mail, Edge, Google Chrome), battery level (25°C Zonnig), system status (ENG US), date (03/09/2021), and a small icon with a '2'.

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

The source program for the online book

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

All the materials are available in html, .Rmd and PDF formats. **Practical sessions and exercises are available below**

Online interactive book (chapter 1-3) Rmd & PDF files of the book (chapter 1-3) The [tidyverse](#) package: an introduction (r 4)

Source file (in R) that can be used to produce the book in your laptop.

EXAMPLES: TO TURN THE CODE YOU CAN COPY AND PASTE THE CODE TO R OR TO USE THE R MARKDOWN PROGRAM OF THE BOOK THAT IS AVAILABLE ONLINE AS WELL.

Online book (html): programming Online book 1 (Rmd) Online book 1 (PDF)
Online book (html): simple linear regression Online book 2 (Rmd) Online book 2 (PDF)
Online book (html): One Way ANOVA Online book 3 (Rmd) Online book 3 (PDF)

Online book 4 (html): the tidyverse
Online book 4 (PDF) Online book 4 (Rmd)
The Tidyverse: pdf for the slides
The Tidyverse: Rmd for slides

Practical sessions and exercises

Online book (html): practical sessions Online book (Rmd): practical sessions



The source program for the online book

Universiteit Hasselt - UHasselt × | Inbox (6,582) - ziv.shkedy@uhasselt.be × | wx Home | Erbiostat × | wx Online book | Rintro × | Courses/Introductory Courses/i × +

github.com/eR-Biostat/Courses/blob/master/Introductory%20Courses/Introduction%20to%20R/Onlinebook/Rintro_Prog(html)_V1.Rmd

All Bookmarks

Files

master

Go to file

Basic courses

Coordination

Data Analysis

ICP Workshop

ITP workshop

Inference

Introductory Courses

Introduction to R

Data

Onlinebook

libs

README.md

Rintro_AOV(html)_V1.Rmd

Rintro_AOV-html-_V1.html

Rintro_AOV-pdf-_V1.pdf

Rintro_PracticalS(html)_V2a.R...

Rintro_PracticalS-html-_V2a...

Rintro_Prog(html)_V1.Rmd

Rintro_Prog-html-_V1.html

Rintro_Prog-pdf-_V1.pdf

Rintro_Reg(html)_V1.Rmd

Rintro_Reg-html-_V1.html

Rintro_Reg-pdf-_V1.pdf

Rintro_Tidy(html)_V1.Rmd

Courses / Introductory Courses / Introduction to R / Onlinebook / Rintro_Prog(html)_V1.Rmd

Code Blame 764 lines (491 loc) • 18.7 KB Code 55% faster with GitHub Copilot

Raw ▾

```
41 library(e1071)
42 library(lattice)
43 library(ggplot2)
44 library(mvtnorm)
45 ...
46
47
48 \newpage
49
50 # Introduction
51
52
53 ## Slides, code and tutorials
54
55 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 8
56
57 ## R ?
58 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 par
59
60 ````{r}
61 library(bootstrap)
62 ````

63
64
65 ## Slides
66 Slides for this part of the course are available online in the >eR-Biostat website. See [RcourseProgramming](https://github.com/eR-Biostat/Courses/blob/master/Introductory%20Courses/Introduction%20to%20R/Slides/eR-Biostat_Slides.html).
67
68
69 # R Objects
70
71 ## YouTube tutorial: objects in R
72
73 For a short YouTube introduction, by Mike Marin, about objects in R see [YTobjects1](https://www.youtube.com/watch?v=UYc1mg1_KLk).
74
75
76 ## Introduction
77
78 R works with objects. An object in R could be a scalar, for example
79
80 ````{r}
81 x<-1
```

Type here to search

12:03 ENG 14/02/2024

The source program for the online book

A screenshot of a GitHub repository interface. The left sidebar shows a tree view of files and folders. A red box highlights the file 'Rintro_Prog.html_V1.Rmd'. The main content area displays the R markdown code for this file. The code includes sections for 'Slides, code and tutorials', 'R Objects', and 'YouTube tutorial: objects in R'. A red box highlights the text 'R markdown file for the book'.

```
Code / Blame / 76 lines (491 loc) - 18.7 KB  Code 55% faster with GitHub Copilot
41 library(lattice)
42 library(gplots)
43 library(evdnorm)
44 ...
45 
46 
47 
48 
49 Viewpage
50 
51 ## Slides, code and tutorials
52 
53 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's content.
54 
55 ## R ?
56 
57 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
58 
59 
60 
61 library(bootstrap)
62 ...
63 
64 
65 ## Slides
66 Slides for this part of the course are available online in the eR-Biostat website. See [CourseProgramming](https://elthub.uhasselt.be/onlinebook/Intro.html)
67 
68 
69 ## R Objects
70 
71 ## YouTube tutorial: objects in R
72 
73 For a short YouTube introduction, by Mike Marin, about objects in R see [YouTube1](https://www.youtube.com/watch?v=Uvleg1_kla).
74 
75 
76 ## Introduction
77 
78 It works with objects. An object in R could be a scalar, for example
79 
80 ...
81 x<-1
```

- Source file (in R) that can be used to produce the book in your laptop.
- But can be also updated and produce a more relevant content...

A screenshot of a web browser window displaying the online book content. The page title is 'Introduction to R: basic programming'. A red box highlights the text 'The book on the laptop on online.'

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

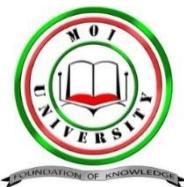
This chapter of the interactive book contains all R code that was used to produce the results and output presented in chapter 2 (programming) in the course's slides. We include YouTube tutorials as a part of the content. Relevant tutorials are provided in different sections. Note that these tutorials 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



Interuniversity Institute for Biostatistics
and statistical Bioinformatics



The >eR-BioStat platform: Our users

Our current website

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

Who use the course ?

- We do not know who use/download the course:
 - No password protection.
 - No registration.
- We do know:
 - Number of users.
 - Locations of users.

R course users in a 365 days period: 20/21

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 Reading list

Wix Rintro Explore Help Hire a Professional Search... 1 3 ziv.shkedy@uhasselt.be

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

See full report

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 10:41 ENG US 09/09/2021 64

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

Inbox (4,694) - ziv.shkedy@uhasselt.be Dashboard | Wix.com

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

Apps uhasselt.be bookmarks

WiX Rintro Explore Help Hire a Professional

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

Traffic Overview

See full report

Selected period Previous period

20 0 Sep 10 Oct 14 Nov 16 Dec 20 Jan 23 Feb 26 Apr 2 May 6 Jun 9 Jul 13 Aug 16

New vs Returning Visitors

Unique Visitors 478

New 472 Returning 6

See full report

Sessions by Device

Site Sessions 1,926

Desktop 1,845 Mobile 75 Tablet 6

See full report

Top Pages by Sessions

What ?

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

See full report

Sessions by Country

How ?

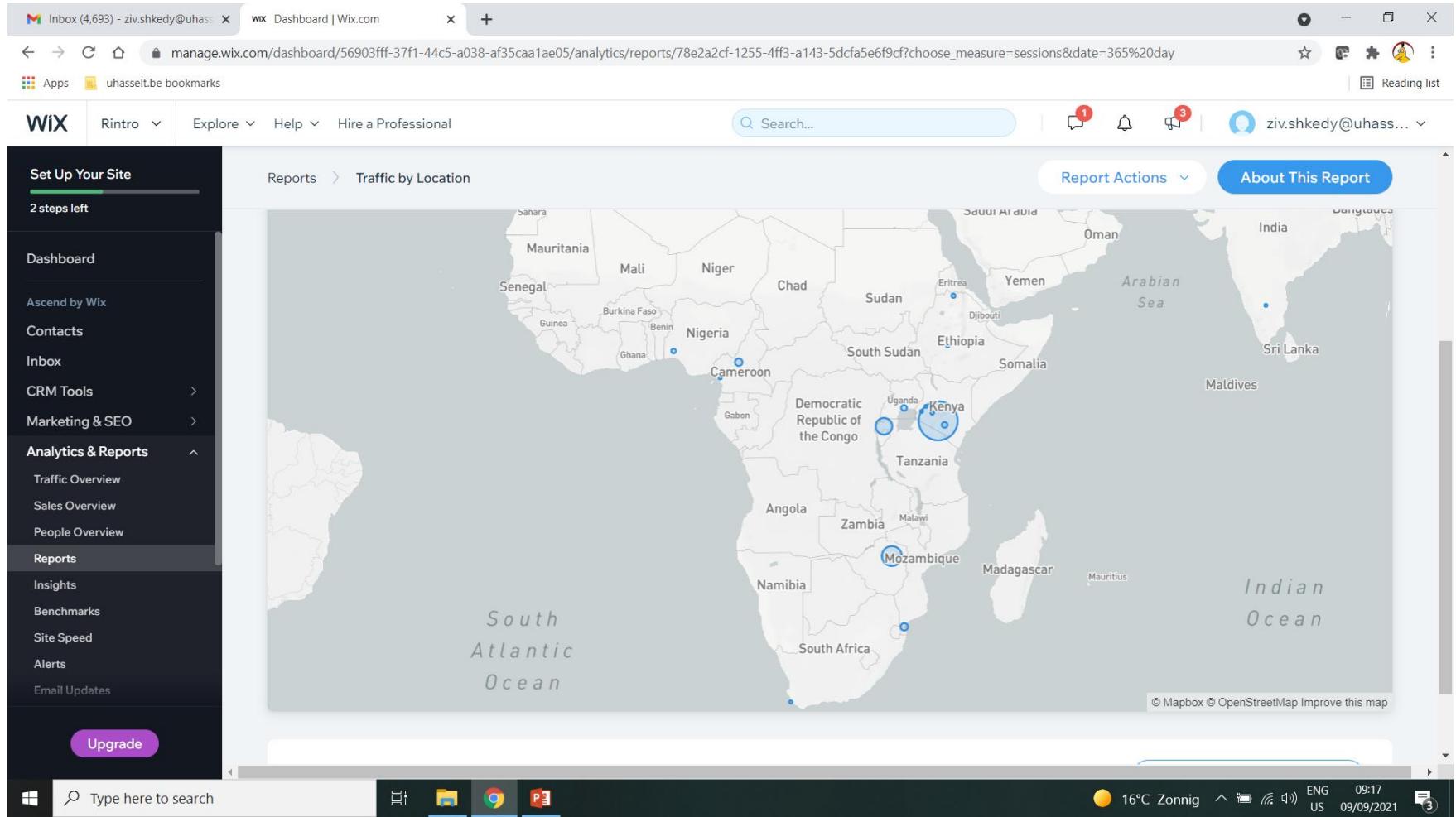
Countries

16°C Zonnig ENG US 09:27 09/09/2021 65

Type here to search

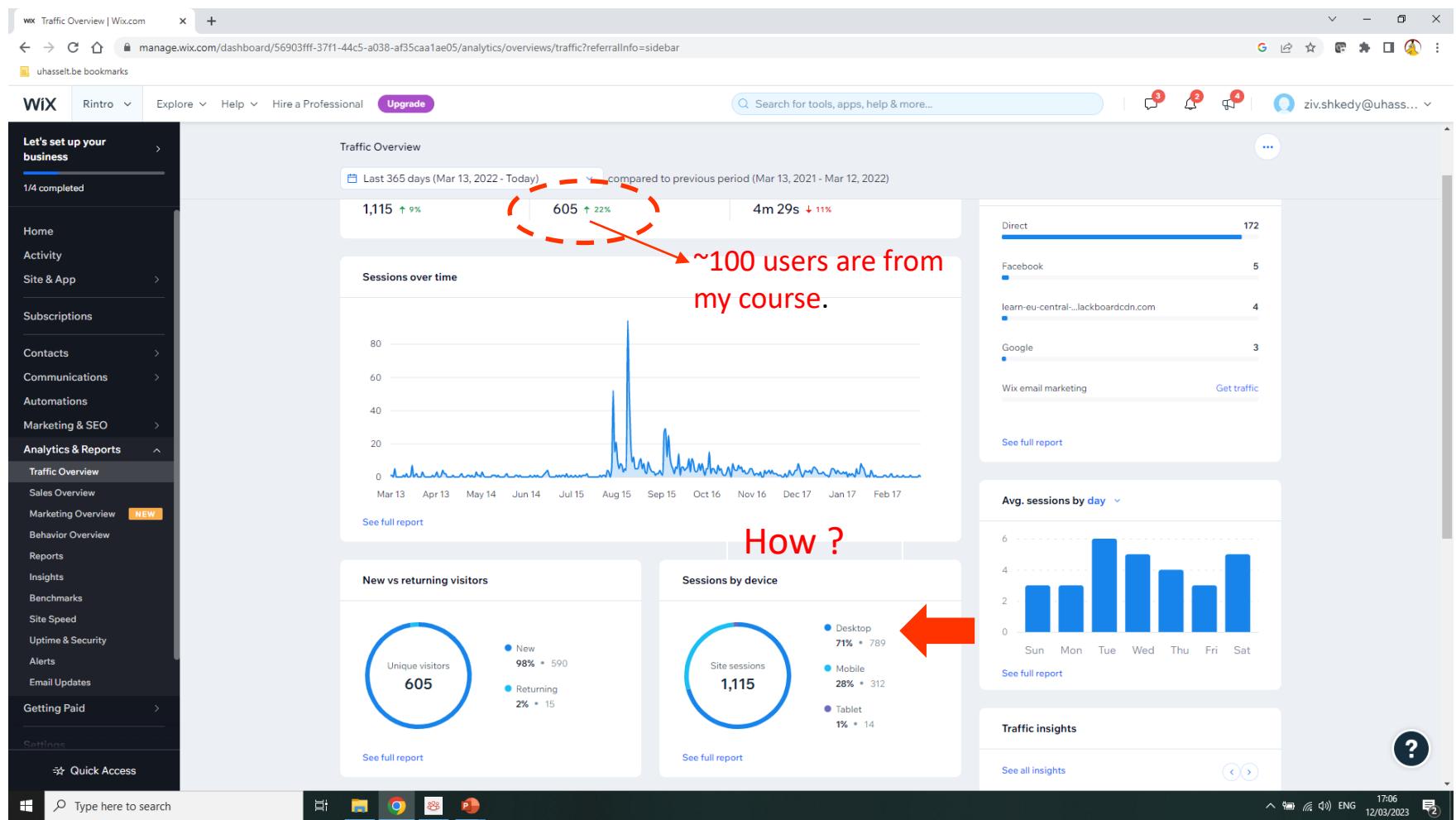
Who are our users in Africa ? (of R introduction)

10/09/2020-10/09/2021



R course: users over 365 days 22/23

13/03/2022-12/03/2023:605 users.



Who are our users? (Introduction to R)

13/03/2022-12/03/2023

wix Reports | Wix.com

manage.wix.com/dashboard/56903fff-37f1-44c5-a038-af35caa1ae05/analytics/reports/78e2a2cf-1255-4ff3-a143-5dcfa5e6f9cf?date=365+day&referralInfo=traffic-overview-page

uhasselt.be bookmarks

WiX Rintro Explore Help Hire a Professional Upgrade

Search for tools, apps, help & more...

Done viewing the report? Go back to traffic overview

Find out where visitors to your site come from. View report definitions

Time period: Mar 13, 2022 - Today

Country Map City Map Table

Save Report View

Time period: Last 365 Days Select a measure: Unique visitors Country: is any value Group by: City More + 25

just now

Country Map

City Map

Table

Analytics & Reports

Traffic Overview

Sales Overview

Marketing Overview NEW

Behavior Overview

Reports

Insights

Benchmarks

Site Speed

Uptime & Security

Alerts

Email Updates

Getting Paid

Quick Access

49

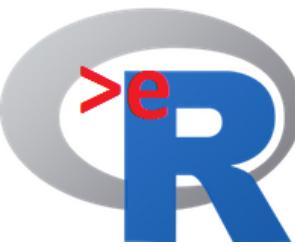
1

Map showing visitor locations worldwide. A legend indicates 49 unique visitors. The map highlights visitor activity in Europe, North America, and Africa.

© Mapbox © OpenStreetMap Improve this map

Windows Type here to search

17:09 ENG 12/03/2023



Who are our users? (Introduction to R)

Last 365 days (30/06/25): **1558** users.

wx Traffic | Wix.com

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

uhasselt.be bookmarks All Bookmarks

WIX Rintro Explore Hire a Professional Help Upgrade

Quick Actions Let's set up your business > 1/4 completed

Setup Home Getting Paid Sales Apps Site & Mobile App Inbox Customers & Leads Marketing Analytics > Highlights Real-time Traffic Behavior Marketing Session Recordings Insights Benchmarks All Reports Automations > Edit Site

Traffic Overview Last 365 days (May 23, 2024 - Today) compared to previous period (May 24, 2023 - May 22, 2024)

Unique visitors 474 99% • 467 Returning 1% • 7

Site sessions 1,558 Mobile 10% • 157 Tablet 0% • 3

View Report View Report View Report

Traffic insights Your most popular traffic source is erbiostat.wixsite.com/erbiostat (Referral). See All Insights

Sessions by country

World map showing session distribution by country.

Countries	Sessions
Japan >	497
Belgium >	468
Kenya >	104
Uganda >	98
Ethiopia >	53
South Africa >	37

View Report

My course in UHasselt

Users in Sub Saharan Africa

21:09 22/05/2024



Who are our users? (Introduction to R)

wix Traffic by Location | Wix.com

manage.wix.com/dashboard/56903fff-37f1-44c5-a038-af35caa1ae05/analytics/reports/b57180f4-5777-4007-aa34-4ed4affcfb36?referralInfo=change_view

uhasselt.be bookmarks All Bookmarks

WIX Rintro Explore Hire a Professional Help Upgrade

Quick Actions

Let's set up your business >

1/4 completed

Setup

Home

Getting Paid

Sales

Apps

Site & Mobile App

Inbox

Customers & Leads

Marketing

Analytics

Highlights

Real-time

Traffic

Behavior

Marketing

Session Recordings

Insights

Benchmarks

All Reports

Automations

Edit Site

Done viewing the report? Go back to Traffic Overview

Subscribe Download

Country Map City Map Table

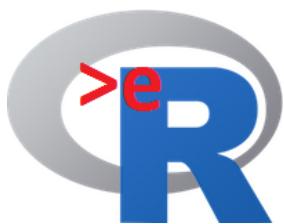
Users in: June 2025

Partners in the ITP

Keyboard shortcuts Map data ©2025 Google, INEGI 1000 km Terms

Type here to search

21:42 ENG 22/05/2025



Interuniversity Institute for Biostatistics
and statistical Bioinformatics



The >eR-BioStat new website :

Our new website

Not yet online

The new eR-BioStat website

- Same concepts.
 - Updated materials.
 - Easy to use approach.
 - Reduce website text.
-
- Not online yet (next month ??).

The new eR-BioStat website

- Three types of courses:
 - Introductory courses.
 - Advanced courses.
 - Short courses.

The new home page

A screenshot of a web browser showing the >eR-BioStat website in preview mode. The browser tabs include 'Universiteit Hasselt - UHasselt', 'Inbox (7,795) - ziv.shkedy@uhasselt.be', 'Setup | Wix.com', and 'Wix Website Editor | eRbiostat2'. The main content area shows the website's header with a large '>eR' logo, a navigation bar with 'Our Story', 'Our Courses' (highlighted with a red box and arrow), 'Tricks & tips', and 'Contact Us'. Below the header is a section with the text 'E-learning system for (Bio)statistics & data science.' and social media icons for Facebook, Twitter, and LinkedIn. A central box features the text '>eR-BioStat'. At the bottom, there is a welcome message about the 2025 edition and a dark footer bar with various icons.

You're now in Preview mode

Upgrade your website to remove Wix ads [Upgrade Now](#)

>eR-BioStat

Our Story Our Courses Tricks & tips Contact Us

E-learning system for (Bio)statistics & data science.

>eR-BioStat

Welcome to the 2025 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

Type here to search

Introductory courses

The screenshot shows a Wix website editor interface with the URL editor.wix.com/html/editor/web/renderer/edit/03c6aaca-7bf2-4200-b9bc-7f0ef78b6b0e?metaSiteId=6b061828-a16f-466f-a93f-9de86e7be283. The page title is "Our Courses". The main heading is "Introductory courses". There are three course cards:

- Introduction to R**

The course covers basic concepts in
 - R programming,
 - R Studio / R markdown.
 - Data management using tidyverse().
 - ggplot2().

[Course materials](#)
- Visualizing Data and Exploratory Data Analysis Using R**

The course covers basic concepts visualization and EDA using
 - ggplot().
 - Static, interactive & animated visualization,
 - Dashboard tools in R.

[Course materials](#)
- Introduction to statistical modeling using R**

The course covers
 - Simple linear regression.
 - One-way ANOVA.
 - Simple logistic regression

[Course materials](#)

At the bottom, there is a section titled "Basic concepts of statistical inference" with a blue speech bubble icon.

Introductory courses

- For whom ?
 - Undergraduate students in statistics.
 - MSc student in statistics/biostatistics/data science
 - Service courses for non statisticians.
 - PhD school trainings.

Example of one course: basic concepts of statistical inference

The screenshot shows a Wix website editor interface. The top navigation bar includes tabs for 'WIX', 'School', and 'Publish'. The main content area displays a course page. On the left, a sidebar has a 'Course materials' button. The main content area features a large red box around a section titled 'Basic concepts of statistical inference using R'. This section includes a summary of topics and a bulleted list of learning objectives. To the right of this red box is a blue curved arrow pointing to a bulleted list of two items: 'Information about the course.' and 'Link to course materials.'. Below this list is a 'Course materials' button. Further down the page, there's a section for 'Advanced courses' with three options: 'Applied generalized linear models (GLM) using R', 'Modeling Binary data using R', and 'Survival analysis using R'. The bottom of the screen shows a Windows taskbar with various icons and system status.

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>eR-BioStat

Course materials

Course materials

Course materials

Basic concepts of statistical inference using R

The course covers topics in statistical inference for

- Continuous variable in one population.
- Continuous variable in two populations.
- Binary variable in one & two populations.

Course materials

- Information about the course.
- Link to course materials.

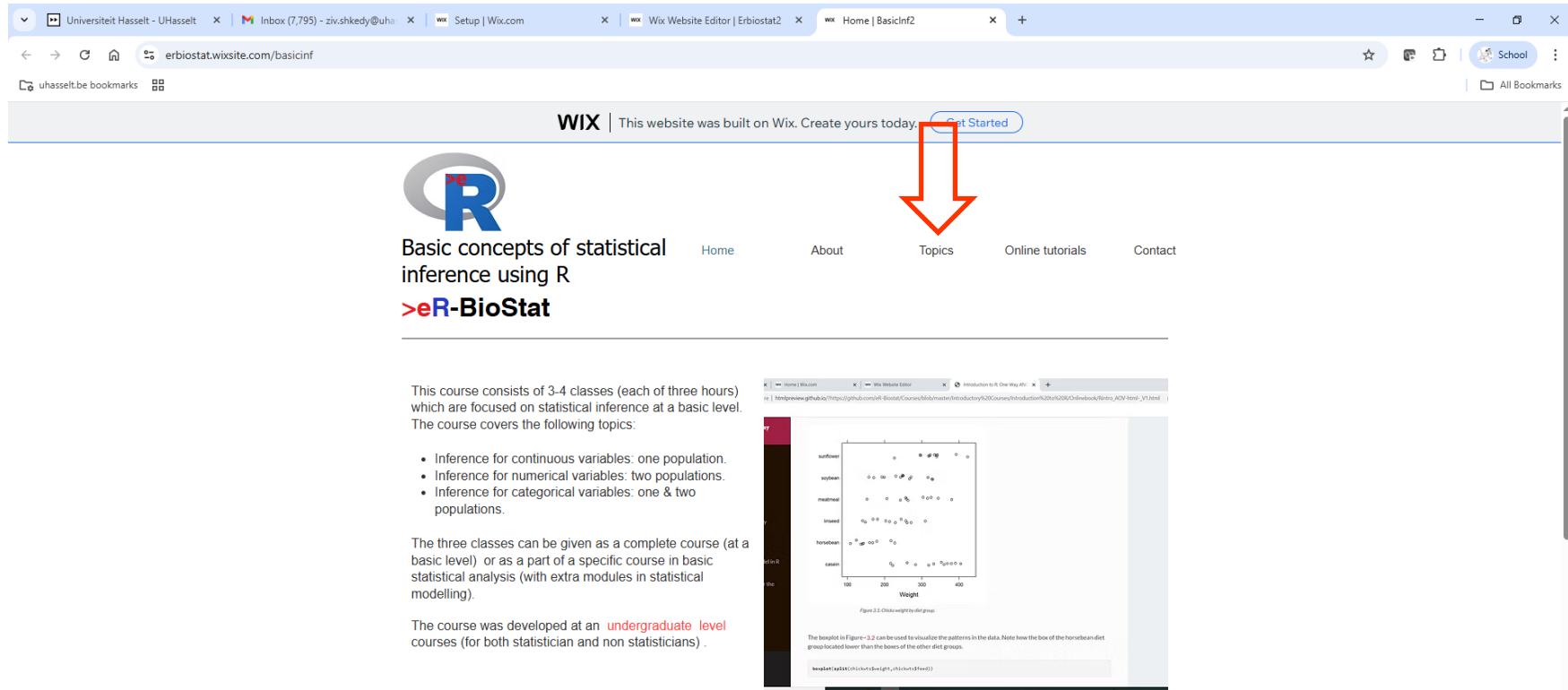
Advanced courses

Applied generalized linear models (GLM) using R

Modeling Binary data using R

Survival analysis using R

Basic concepts of statistical inference



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R
Basic concepts of statistical inference using R
>eR-BioStat

Home About Topics Online tutorials Contact

This course consists of 3-4 classes (each of three hours) which are focused on statistical inference at a basic level. The course covers the following topics:

- Inference for continuous variables: one population.
- Inference for numerical variables: two populations.
- Inference for categorical variables: one & two populations.

The three classes can be given as a complete course (at a basic level) or as a part of a specific course in basic statistical analysis (with extra modules in statistical modelling).

The course was developed at an [undergraduate level](#) courses (for both statistician and non statisticians).

This is an open source course and all source files used to produce the slides are available online (in PP, Tex or Rmd formats).

THE COURSE IS UNDER DEVELOPMENT AND THIS IS NOT THE FINAL VERSION OF THE COURSE.

100% Zoomed ↻

Figure 2.1. Chick weight by diet group.

horsebean

soybean

meatmeal

sunflower

casein

Weight

Group	100	200	300	400
horsebean	150	180	200	220
soybean	180	200	220	240
meatmeal	200	220	240	260
sunflower	220	240	260	280
casein	240	260	280	300
chickens	260	280	300	320

Topics

The screenshot shows a Wix website for 'Basic concepts of statistical inference using R'. The page includes a logo, navigation links for Home, About, Topics, Online tutorials, and Contact, and a 'Get Started' button. A blue box highlights the 'Topics' section, which contains text about course organization and topics like Inference for continuous data (one and two samples) and Inference for categorical data (one & two samples). An orange arrow points from the right towards this blue box. The Windows taskbar at the bottom shows various open applications.

- We offer:
 - Two courses on the same topic.

Topics

The slides in this page are organised in three chapters that cover basic topics in statistical inference using R. The course is focused on the practical aspects of inference and not only on the theory behind and covers the following topics:

- Inference for continuous data: one sample.
- Inference for continuous data: two sample.
- Inference for categorical data: one & two samples.

All examples are illustrated using the R software. Useful R functions include:

- t.test()
- prop.test()
- chisq.test()

External datasets for illustration are included in the data

Topics covered in the course.



Course 1: course materials

The screenshot shows a Wix website for course materials. The top navigation bar includes links for 'University Hasselt - UHasselt', 'Inbox (7,795) - ziv.shkedy@uhasselt.be', 'Setup | Wix.com', 'Wix Website Editor | Erbiostat2', and 'Topics | BasicInf2'. The main content area is titled 'Basic concepts of inference (one population)'.

Basic concepts of inference (one population)

This chapter introduces the important concepts in drawing estimates from samples from one population. We discuss methods of inference and estimation for a population mean and cover three topics:

- Point estimates for a population mean.
- Interval estimates methods.
- Testing hypotheses about the population mean.

External datasets are available in the data repository.

Inference for continuous data (one population & two populations)

This chapter discusses the settings where The methods discussed in the previous class are applied to multiple populations. This include:

- The analysis of paired observations
- The comparison of two or more independent groups.

Both normal and t distribution are used for both interval estimation and inference.

Inference for binary and categorical data

In this chapter, methods for estimation and inference are extended to categorical data, such as binomial proportions or data in two-way tables. We cover the following topics:

- Tests and estimation methods for proportion in one population.
- Tests and estimation methods for proportions in two populations.
- Chi-square tests.

External datasets are available in the data repository.

Resources:

- Slides (PDF): Chapter 4
- Slides (PP): Chapter 4
- R programm
- Slides (PDF): Chapter 5
- Slides (PP): Chapter 5
- R programm
- Slides (PDF): Chapter 8
- Slides (PP): Chapter 8
- R programm

Course's slides in PDF

Screenshot of a web browser showing a PDF document titled "er.biostat_Introduction to Statistics_2024_Chapter4.pdf".

The document title is "Courses / Inference / Introductory Statistics for the Life and Biomedical Sciences / er.biostat_Introduction to Statistics_2024_Chapter4.pdf".

The file size is 2.37 MB.

The content includes:

- A logo for "The >eR-Biostat initiative" featuring a stylized "R" with a "e" above it.
- The text: "The >eR-Biostat initiative", "Making R based education materials in statistics accessible for all".
- A large red title: "Introduction to Statistical inference and estimation using R: Foundations of inference (one population)".
- A developer note: "Developed by Ziv Shkedy (Hasselt University, Belgium) and Tadesse Awoke (Gondar University, Ethiopia)."
- A yellow box indicating the "LAST UPDATE: 03/2024".
- Social media links: Facebook, ER-BioStat, GitHub, and Twitter.
- A footer section titled "Development team" with a "2" icon.

The browser interface shows multiple tabs and a sidebar with file navigation.

R program for the example

The screenshot shows a Wix website with a blue header bar containing several tabs. Below the header, there's a banner with the text "External datasets for illustration are included in the data repositories." A red arrow points from the bottom left towards the "R programm" button in the first column.

WIX | This website was built on Wix. Create yours today. Get Started

External datasets for illustration are included in the data repositories.

basic concepts of inference (one population)	Inference for continuous data (one population & two populations)	Inference for binary and categorical data
This chapter introduces the important concepts in drawing estimates from samples from one population. We discuss methods of inference and estimation for a population mean and cover three topics: <ul style="list-style-type: none">• Point estimates for a population mean.• Interval estimates methods.• Testing hypotheses about the population mean. External datasets are available in the data repository.	This chapter discusses the settings where The methods discussed in the previous class are applied to multiple populations. This include: <ul style="list-style-type: none">• The analysis of paired observations• The comparison of two or more independent groups. Both normal and t distribution are used for both interval estimation and inference. External datasets are available in the data repository.	In this chapter, methods for estimation and inference are extended to categorical data, such as binomial proportions or data in two-way tables. We cover the following topics: <ul style="list-style-type: none">• Tests and estimation methods for proportion in one population.• Tests and estimation methods for proportions in two populations.• Chi-square tests. External datasets are available in the data repository.

Slides (PDF): Chapter 4
Slides (PP): Chapter 4
R programm

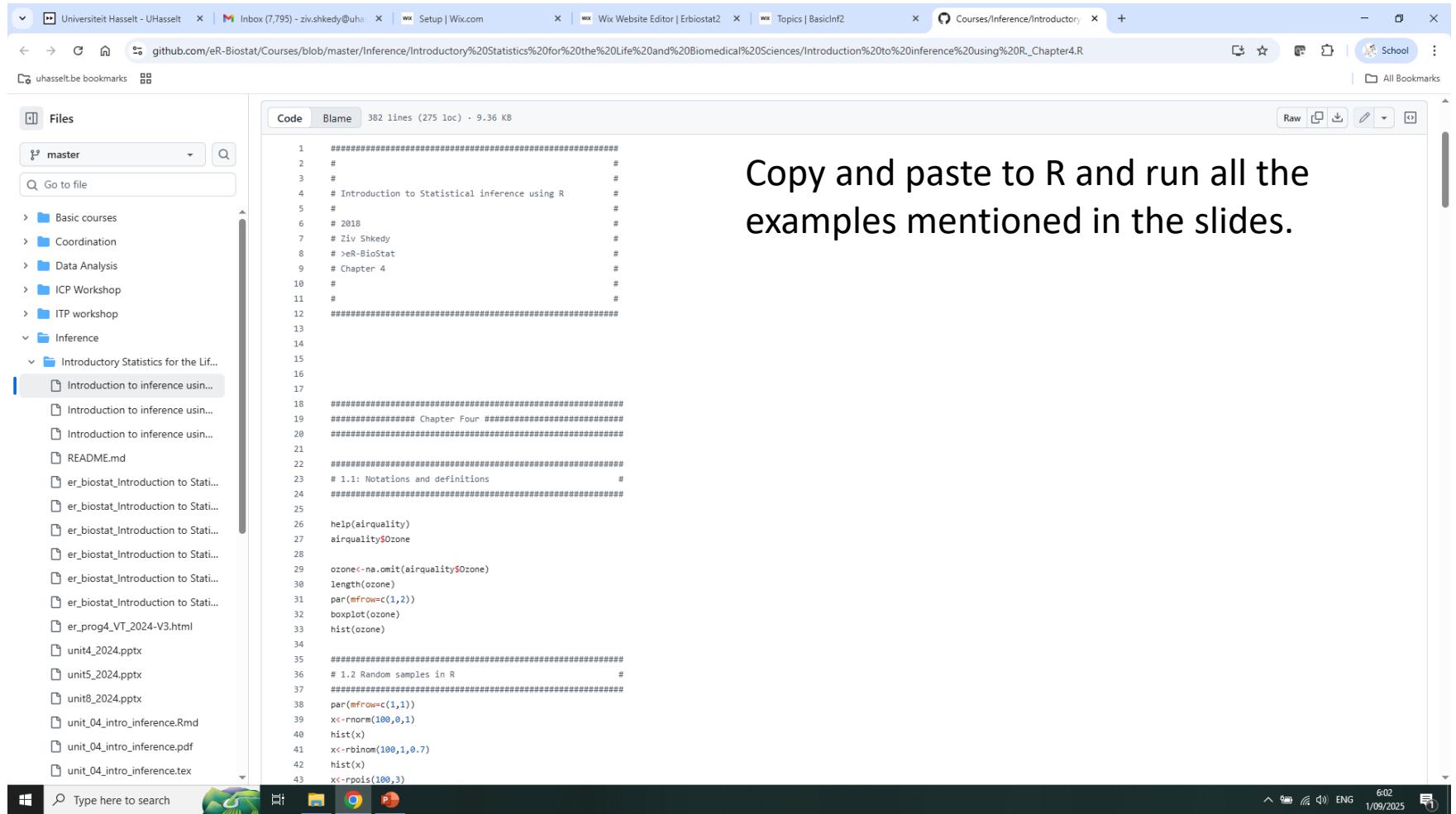
Slides (PDF): Chapter 5
Slides (PP): Chapter 5
R programm

Slides (PDF): Chapter 8
Slides (PP): Chapter 8
R programm

Type here to search

5:59 1/09/2025 ENG

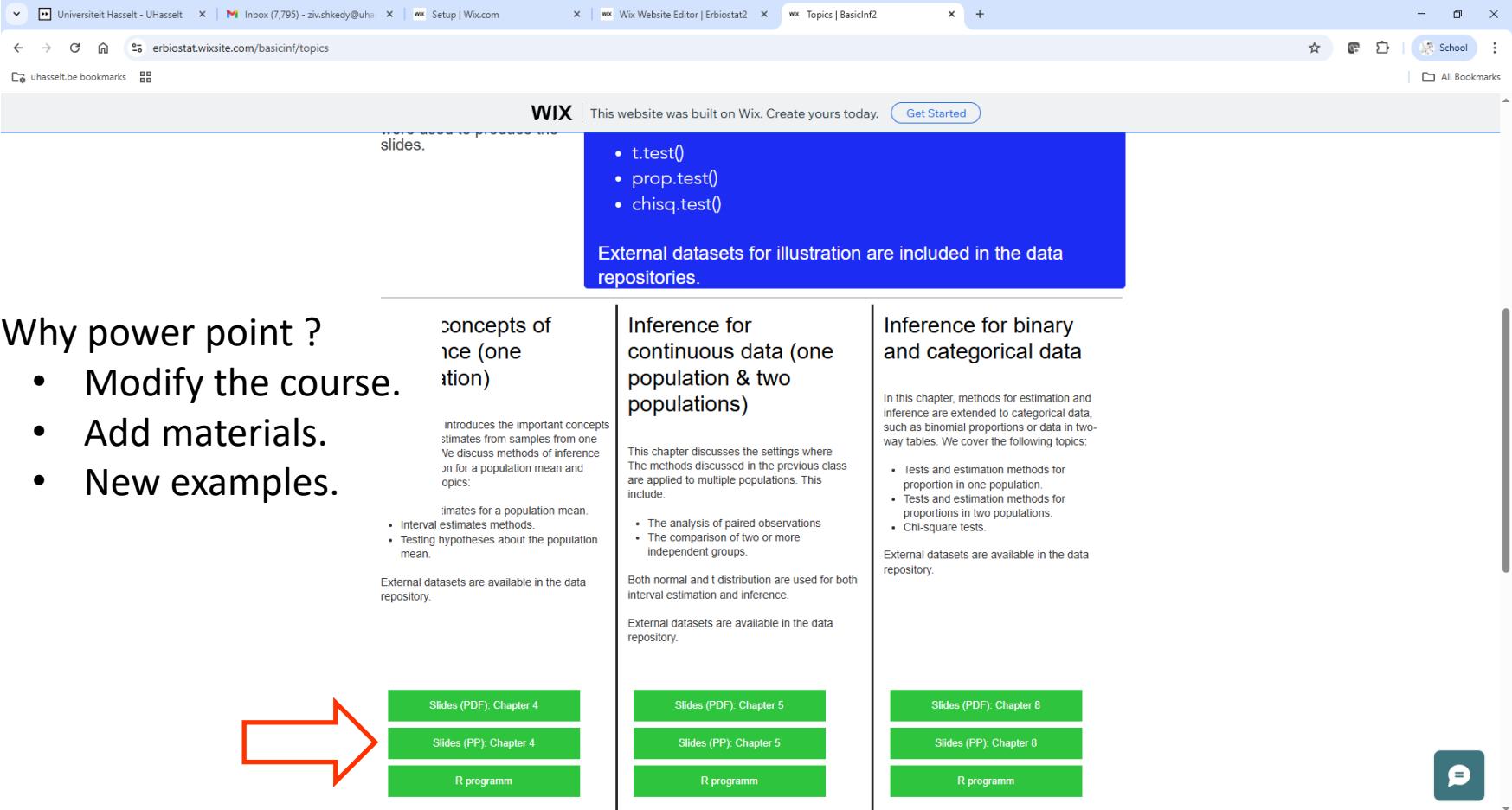
R program for the example



The screenshot shows a web browser window with multiple tabs open. The active tab displays an R script titled 'BasicInf2.R' from a GitHub repository. The script contains several lines of R code, primarily for data visualization and random sampling. A large text overlay on the right side of the screen reads: 'Copy and paste to R and run all the examples mentioned in the slides.'

```
1 #####  
2 # #####  
3 # #####  
4 # Introduction to Statistical inference using R  
5 # #####  
6 # 2018  
7 # Ziv Shkedy  
8 # >R-BioStat  
9 # Chapter 4  
10 # #####  
11 # #####  
12 #####  
13  
14  
15  
16  
17  
18 #####  
19 ##### Chapter Four #####  
20 #####  
21  
22 #####  
23 # 1.1: Notations and definitions  
24 #####  
25  
26 help(airquality)  
27 airquality$Ozone  
28  
29 ozone<-na.omit(airquality$zzone)  
30 length(ozone)  
31 par(mfrow=c(1,2))  
32 boxplot(ozone)  
33 hist(ozone)  
34  
35 #####  
36 # 1.2 Random samples in R  
37 #####  
38 par(mfrow=c(1,1))  
39 x<-rnorm(100,0,1)  
40 hist(x)  
41 x<-rbinom(100,1,0.7)  
42 hist(x)  
43 x<-rpois(100,3)
```

Course's slides in power point



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

- Universiteit Hasselt - UHasselt
- Inbox (7,795) - ziv.shkedy@uhasselt.be
- Setup | Wix.com
- Wix Website Editor | Erbiostat2
- Topics | BasicInf2

The main content area displays a Wix website for course materials. The page has a blue header with the text "WIX | This website was built on Wix. Create yours today." and a "Get Started" button.

The page content includes:

- A sidebar on the left with the text "slides."
- A blue callout box containing:
 - t.test()
 - prop.test()
 - chisq.test()
- A text box stating: "External datasets for illustration are included in the data repositories."
- Three main sections with green download buttons:
 - Concepts of inference (one population)**:
 - Introduces the important concepts of inference from samples from one population.
 - Discusses methods of inference for a population mean and proportions.
 - Estimates for a population mean.
 - Interval estimates methods.
 - Testing hypotheses about the population mean.

External datasets are available in the data repository.
 - Inference for continuous data (one population & two populations)**:
 - This chapter discusses the settings where the methods discussed in the previous class are applied to multiple populations. This includes:
 - The analysis of paired observations
 - The comparison of two or more independent groups.
 - Both normal and t distribution are used for both interval estimation and inference.

External datasets are available in the data repository.
 - Inference for binary and categorical data**:
 - In this chapter, methods for estimation and inference are extended to categorical data, such as binomial proportions or data in two-way tables. We cover the following topics:
 - Tests and estimation methods for proportion in one population.
 - Tests and estimation methods for proportions in two populations.
 - Chi-square tests.
 - External datasets are available in the data repository.

At the bottom of the page, there are green download buttons for each chapter:

- Chapter 4: Slides (PDF), Slides (PP), R programm
- Chapter 5: Slides (PDF), Slides (PP), R programm
- Chapter 8: Slides (PDF), Slides (PP), R programm

Course's slides in power point

er_biorstat_Introduction to Statistics_2024_Chapter4.ppt [Protected View] - PowerPoint

File Home Insert Design Transitions Animations Slide Show Review View Recording Help Acrobat

PROTECTED VIEW Be careful—files from the Internet can contain viruses. Unless you need to edit, it's safer to stay in Protected View. [Enable Editing](#)

1 This course was developed as a part of the VLIR-UOS Cross-Cutting projects:

- Statistics: 2011-2016, 2017.
- Statistics: 2017.
- Statistics for development : 2018-2022.
- The >eR-BioStat ITP: 2024-2026.

2 The >eR-BioStat initiative Making R based education materials in statistics accessible for all
Introduction to Statistical inference and estimation using R:
Foundations of inference (one population)
Developed by Ziv Shkedy (Hasselt University, Belgium) and Tadesse Awoke (Gondar University, Ethiopia).
[LAST UPDATE: 03/2024](#)

3 Development team

- Tadesse Awoke Mengasha (Gondar University).
- Abubka Guremmata (Denna University).
- Ziv Shkedy (Hasselt University).
- Tadesse Awoke (Gondar University).
- Thi Huyen Nguyen (Hasselt University).

4 Recommended reading
Introductory Statistics for the Life Sciences, 4th edition.
The book is available for free online:
<https://www.openstax.org/books/biostat/>
Chapter 4: Foundations for inference

5 Recommended reading

The >eR-BioStat initiative Making R based education materials in statistics accessible for all
Introduction to Statistical inference and estimation using R:
Foundations of inference (one population)
Developed by Ziv Shkedy (Hasselt University, Belgium) and Tadesse Awoke (Gondar University, Ethiopia).
LAST UPDATE: 03/2024

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GitHub  <https://github.com/eR-BioStat>

twitter  @erbiostat

Comments

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Comments

File Home Insert Design Transitions Animations Slide Show Review View Recording Help Acrobat

Search

SHKEDY Ziv 52

103 ENG 1/09/2025

Online book

- The online book covers the topics form the course.
- Presents new example.
- Provides code for the analysis.



The screenshot shows a Wix website for a course. At the top, there are links for 'Slides (PDF): Chapter 4', 'Slides (PP): Chapter 4', and 'R programm'. Below these are links for 'Chapter 4: HTML' and 'Chapter 4: Rmd'. A large green button labeled 'Online book' is centered. To the right, there are sections for 'Unit 4', 'Unit 5', and 'Unit 8' with their respective material links. A red arrow points from the left side of the slide towards the 'Online book' button. The bottom of the screen shows a Windows taskbar with various icons and a system tray.

This part of the course is based on [unit 4](#) in Vu & Harrington course and it covers the following topics:

- Inference for one population.
- Point estimate and interval estimates.

This part of the course is based on [unit 5](#) in Vu & Harrington course and it covers the following topics:

- Inference for paired data.
- Inference for independent samples.

This part of the course is based on [unit 8](#) in Vu & Harrington course and it covers the following topics:

- Categorical outcome and chi-square tests.
- Binary outcome and test for proportions.

Online book

The screenshot shows a web browser window with multiple tabs open. The active tab is titled 'RPubs - Chapter 4' and displays an RPubs document. The document has a dark header with the RPubs logo and navigation links for 'Sign in' and 'Register'. The main content area has a light background. On the left, there's a sidebar with a table of contents:

1. Variability in estimates
A point estimate for the population parameter
Example: the wind speed in the airquality dataset
The variability of the sample mean
The sampling distribution for the mean
the Central Limit Theorem
2. Standard error of the mean
3. Confidence intervals
4. Hypothesis testing
5 Hypothesis testing and confidence intervals
6 Decision error (Type I and Type II error)

The main content starts with the date '03-05-2024' and author 'Ziv Shkedy & eR-BioStat'. The title 'Foundations for inference using R' is prominently displayed. Below it, a subtitle reads 'A point estimate for the population parameter'. A text block explains that a natural way to estimate features of the population is to use the corresponding summary statistic calculated from the sample. It mentions the sample mean \bar{x} as a point parameter estimate for the population mean μ and the sample variance s^2 as a point parameter estimate for the population variance σ^2 . An example follows: 'Example: the wind speed in the airquality dataset'. The 'Data and point estimates' section describes the 'airquality' dataset, which contains information about 153 daily air quality measurements in New York, May to September 1973. Below this, a code block shows the first few rows of the dataset:

```
## [1] 153 6
```

	Ozone	Solar.R	Wind	Temp	Month	Day
## 1	41	190	7.4	67	5	1
## 2	36	118	8.0	72	5	2
## 3	12	149	12.6	74	5	3
## 4	18	313	11.5	62	5	4

At the bottom of the page, there are links for 'Comments (-)', 'Share', and 'Hide Toolbars'. The browser interface includes a search bar, a toolbar with icons for file operations, and a status bar showing the date and time.

Tomorrow (04/09) in the short course: how to produce a book in R.

Rmd file for the online book

The screenshot shows a Wix website for 'BasicInf2'. The top navigation bar includes links for 'University Hasselt - UHasselt', 'Inbox (7,795) - ziv.shkedy@uhasselt.be', 'Setup | Wix.com', 'Topics | BasicInf2', and a '+' button. Below the navigation is a toolbar with icons for back, forward, search, and file operations, along with a 'School' icon and a 'All Bookmarks' link.

The main content area features a grid of course materials:

Chapter	Format	Link
Chapter 4	Slides (PDF)	Slides (PDF): Chapter 4
Chapter 4	Slides (PP)	Slides (PP): Chapter 4
Chapter 4	R programm	R programm
Chapter 5	Slides (PDF)	Slides (PDF): Chapter 5
Chapter 5	Slides (PP)	Slides (PP): Chapter 5
Chapter 5	R programm	R programm
Chapter 8	Slides (PDF)	Slides (PDF): Chapter 8
Chapter 8	Slides (PP)	Slides (PP): Chapter 8
Chapter 8	R programm	R programm

Below the grid, a text block states: "Recommended reading for the classes about inference for one and two population and for inference of categorical data are [Chapter 4](#), [Chapter 5](#) and [Chapter 8](#) in the book "Introductory statistics for the life and biomedical sciences", respectively, which is available online here:

A red arrow points from the text to the 'Chapter 4: Rmd' button.

The page also includes sections for 'Online book' and three detailed descriptions of course units:

- Unit 4:** Based on Vu & Harrington course. Topics: Inference for one population, Point estimate and interval estimates.
- Unit 5:** Based on Vu & Harrington course. Topics: Inference for paired data, Inference for independent samples.
- Unit 8:** Based on Vu & Harrington course. Topics: Categorical outcome and chi-square tests, Binary outcome and test for proportions.

At the bottom, the Windows taskbar shows the search bar, pinned apps (File Explorer, Photos, Google Chrome, Microsoft Edge), system tray icons (battery, signal, volume), and a notification bubble. The status bar indicates the date (1/09/2025), time (6:05), language (ENG), and battery level.

The file that
we use to
produce the
book.

Why Rmd?

- The users can:
 - Change the contact.
 - Add examples.
 - Add more theory.
 - Own the course: connect their (local) course to the online book.

Course 2: course materials

Screenshot of a Wix website for course materials. The page displays sections for R programming, recommended reading for inference, and an online book.

R programm (repeated three times)

Recommended reading for the classes about inference for one and two population and for inference of categorical data are [Chapter 4](#), [Chapter 5](#) and [Chapter 8](#) in the book "Introductory statistics for the life and biomedical sciences", respectively, which is available online here:

[Chapter 4: HTML](#) | [Chapter 4: Rmd](#) | [Chapter 5: HTML](#) | [Chapter 5: Rmd](#) | [Chapter 8: HTML](#) | [Chapter 8: Rmd](#)

[Online book](#)

Chapter 4

This part of the course is based on [unit 4](#) in Vu & Harrington course and it covers the following topics:

- Inference for one population.
- Point estimate and interval estimates.

[Slides \(PDF\): Unit 4](#) | [Slides \(PP\): Unit 4](#) | [Slides \(Rmd\): Unit 4](#)

This part of the course is based on [unit 5](#) in Vu & Harrington course and it covers the following topics:

- Inference for paired data.
- Inference for independent samples.

[Slides \(PDF\): Unit 5](#) | [Slides \(PP\): Unit 5](#) | [Slides \(Rmd\): Unit 5](#)

This part of the course is based on [unit 8](#) in Vu & Harrington course and it covers the following topics:

- Categorical outcome and chi-square tests.
- Binary outcome and test for proportions.

[Slides \(PDF\): Unit 8](#) | [Slides \(PP\): Unit 8](#) | [Slides \(Rmd\): Unit 8](#)

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Course 2's slides

The screenshot shows a browser window with multiple tabs open, including one for 'University Hasselt - UHasselt' and another for 'Inbox (7,795) - ziv.shkedy@uhasselt.be'. The main content is a GitHub repository for 'eR-Biostat/Courses'. The repository has 37 forks and 21 stars. The 'Code' tab is selected, showing a list of files in the 'master' branch. One file, 'unit_04_intro_inference.pdf', is currently being viewed. The PDF title is 'Unit 4: Introduction to Inference' and it is from the 'Statistics S-100 Teaching Team' for Summer 2024. The GitHub interface includes a search bar, notifications, and a sign-in/sign-up button.

Chapter 4

91

Online materials related to the course

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R
Basic concepts of statistical inference using R
>eR-BioStat

This course consists of 3-4 classes (each of three hours) which are focused on statistical inference at a basic level. The course covers the following topics:

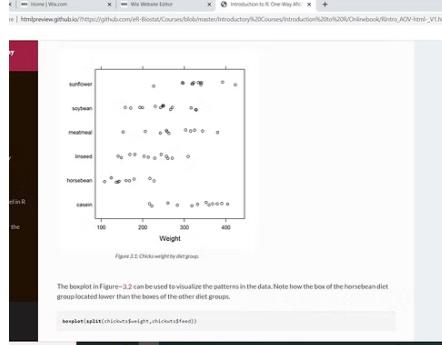
- Inference for continuous variables: one population.
- Inference for numerical variables: two populations.
- Inference for categorical variables: one & two populations.

The three classes can be given as a complete course (at a basic level) or as a part of a specific course in basic statistical analysis (with extra modules in statistical modelling).

The course was developed at an [undergraduate level](#) courses (for both statistician and non statisticians).

This is an open source course and all source files used to produce the slides are available online (in PP, Tex or Rmd formats).

THE COURSE IS UNDER DEVELOPMENT AND THIS IS NOT THE FINAL VERSION OF THE COURSE.



Links to online materials

Universiteit Hasselt - UHasselt | Inbox (7,795) - ziv.shkedy@uhasselt.be | Setup | Wix.com | Wix Website Editor | Erbiostat2 | Online tutorials | BasicInf2

erbiostat.wixsite.com/basicinf/online-tutorials

uhasselt.be bookmarks

WIX | This website was built on Wix. Create yours today. Get Started

>EN-BIOSTAT

Basic concepts of statistical inference using R: online tutorials

Online tutorials

The online tutorials consists of YouTube and online notes and books. The online tutorials cover the same topic discussed in the course but use different examples for illustration. Topics cover in the tutorials include:

- One sample t test.
- Two sample t test for independent samples.
- Paired t-test.
- Confidence intervals for the population mean.
- Test for proportions.
- Confidence intervals for proportions.
- Chi-squared tests.

YouTube tutorials

This part of the course consists of 15 YouTube tutorials about basic concepts of inference using R. The R code used for the examples presented in the tutorials and the datasets are a part of the tutorial videos.

[YouTube tutorial 1: two sample t-test in R Studio \(host: Charlene McCord\)](#)

[YouTube tutorial 6: One-Sample t Test & Confidence Interval in R with Examples \(host: Mark Martin\)](#)

[YouTube tutorial 11: The Two-Sample Test of Proportions in R \(host: Patrick Rafail\)](#)

[Two sample t test](#)

[YouTube tutorial 2: Two sample t-Test in R \(host: AGRON Info-Tech\)](#)

[t test & C.I.s](#)

[Test for two proportions](#)

[YouTube tutorial 7: One sample t-Test in R \(host: AGRON Info-Tech\)](#)

[YouTube tutorial 12: Performing a Chi Square contingency table test using R \(host: KnowHow\)](#)

[Two sample t test](#)

[One sample t test](#)

[Chi-Square test](#)

https://youtu.be/MYHmreq6jQw

Type here to search

9:08 1/09/2025 ENG

YouTube video: two sample t-test in R Studio

The screenshot shows a Mac desktop environment with the following windows:

- Browser:** Multiple tabs are open, including "Universiteit Hasselt - UHasselt", "Inbox (7,795) - ziv.shkedy@uhasselt.be", "Setup | Wix.com", "Wix Website Editor | Erbiostat2", "Online tutorials | BasicInfo2", and "two sample t-test in R Studio".
- File Manager:** A Finder window showing a desktop with various folders like "damsels", "blank grad check templates", "Macintosh HD", "personal and other", "Fall 2019 CSUDH", "Desktop of this laptop", "literature review template", "R-examples", "CSUDH BIO Letterhead v3.docx", "reimbursement_M eCord_BIO361", "C Rodriguez.docx", "ABD_all_data", "Spring 2020", "p card approval...ord.pdf", "RTP docs", "accounting-services...orm.pdf", "software.csv", and "exam 2 data".
- Spreadsheet:** An Excel window titled "hagfish_induction" showing a table with columns "concentration" and "induction_time". The data includes rows from 1 to 37, with "high" appearing in row 21 and "low" appearing in rows 22 through 37.
- YouTube Player:** A video player for "two sample t-test in R Studio" by Charlene McCord. The video has 51K views and is 5 years old. It shows a screenshot of RStudio with a t-test plot and the following text:

two sample t-test in R Studio

Charlene McCord

Subscribe

51K views 5 years ago

635

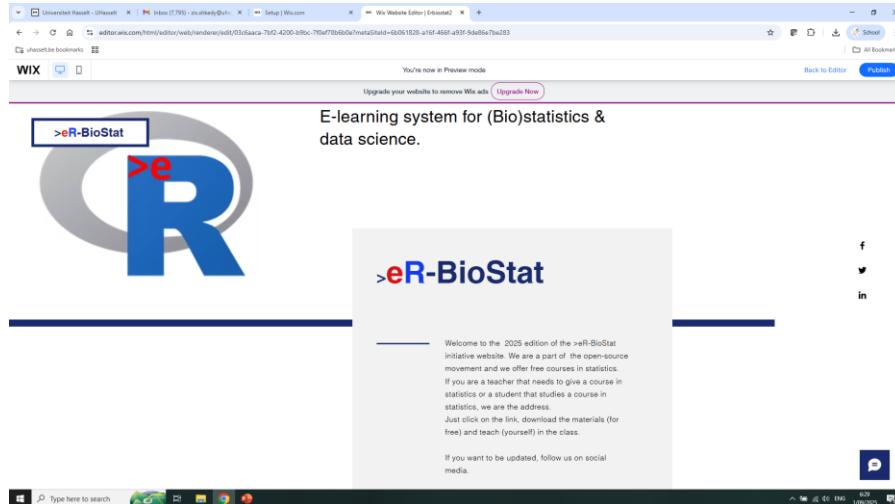
Share

Download

Clip

...
- System Tray:** Shows icons for battery, signal, and date/time (6:09, 1/09/2025).

The eR-Biostat website: courses



- Courses:

- Introductory courses (BSc, MSc).
- Advanced courses (MSc level).
- Short courses (all levels).

Advanced courses

You're now in Preview mode

Upgrade your website to remove Wix ads [Upgrade Now](#)

>eR-BioStat

Advanced courses

Applied generalized linear models (GLM) using R

The course covers topics in generalized linear models:

- Models for Normal data.
- Models for Binary data.
- Estimation, Inference and model selection.
- The exponential family.
- Model diagnostics.
- The R function `glm()`.

[Course materials](#)

Modeling Binary data using R

The course covers topics in binary data analysis:

- Relative risks & Odds ratio.
- Analysis of 2 X 2 tables & chi-square tests.
- Inference and estimation.
- Logistic regression.
- The R function `glm()`.

[Course materials](#)

Survival analysis using R

The course covers topics in survival analysis:

- Non-parametric estimation of a survival distribution.
- Inference with censored data.
- Proportional hazards Models.
- Parametric models for survival data.
- Designing a survival study

[Course materials](#)

An introduction to bootstrap using R

The course covers topics in bootstrap:

- The basic bootstrap.

Longitudinal data analysis (LDA) using R

The course covers topics in LDA:

- Introduction to LDA.
- Models for Longitudinal

Linear models using R

The course will be ready by the end of 2026.

Universiteit Hasselt - UHasselt | Inbox (7,795) - ziv.shkedy@uhasselt.be | Setup | Wix.com | Wix Website Editor | Erbiostat2

uhasselt.be bookmarks

Back to Editor Publish

f t in

Short courses

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>eR-BioStat

Short courses

Basic linear regression using R

- Fitting polynomial models
- Confidence interval and prediction interval
- Model comparison
- Data transformation
- Model comparison

[Course page](#)

Basic concepts in statistical inference using R

- One sided test
- Two sided test
- Confidence interval for the mean
- Assuming equal variances
- Assuming different variances
- Power of a t-test
- Mann-Whitney-Wilcoxon test

[Course page](#)

Introduction to visualization using ggplot2 using R

- Using ggplot2() for EDA and visualization.

[Course page](#)

R functions that you must know to follow our system

- `t.test()`.
- `lm()`.
- `glm()`.

6:10
1/09/2025

Course's page

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

- Address Bar:** erbiostat.wixsite.com/shortc1
- Page Title:** WIX | This website was built on Wix. Create yours today.
- Content Area:**
 - Section Header:** Short course:
Introduction to Visualizing data using ggplot2
 - Text:** Information about the course:
 - Duration: 3 hours.
 - Course given in: IBS-UHasselt meeting in Uganda (may, 12, 2025).
 - Course level: beginners.
 - Given by: Ziv Shkedy.
 - Text:** Course's content:
 - Basic visualization & EDA using `ggplot2()`.
 - Course level: beginners.
 - Text:** Course materials
 - Slides (PDF).
 - Rmd file with the examples.
 - Online book.
- Bottom Taskbar:** Shows the Start button, a search bar with "Type here to search", and icons for File Explorer, Google Chrome, and Microsoft Edge. On the right, it shows battery level (611), signal strength, ENG, 1/09/2025, and a notification icon.

Course materials

Universiteit Hasselt - UHasselt | Inbox (7,795) - ziv.shkedy@uhasselt.be | Setup | Wix.com | Wix Website Editor | Erbiostat2 | Home | shortc1

erbiostat.wixsite.com/shortc1

uhasselt.be bookmarks

All Bookmarks

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>eR-BioStat

- Given by: Ziv Shkedy.

Course's content:

- Basic visualization & EDA using `ggplot2()`.
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Course materials

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- Online book.

[Slides \(PDF\)](#) [Rmd programs](#) [Online book](#)

Contact — [>eR-BioStat](#)

Head Office — DSI, UHasselt, Belgium

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Type here to search

6:11 1/09/2025



Slides in PDF

Screenshot of a web browser showing a PDF document titled "eR_biotstat_Intro_EDA_VIZ_V4.pdf". The document is a presentation slide for the "The >eR-Biostat initiative".

The slide features the >eR logo, logos for UHASSELT, iBiostat, KU LEUVEN, and vliroos, and the text "The >eR-Biostat initiative".

Introduction to Visualization using the R package ggplot2

Developed by
Thi Huyen Nguyen and Ziv Shkedy
(Hasselt University, Belgium)

LAST UPDATE: 05/2025

ER-BioStat

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

twitter [@erbiostat](#)

2

Windows taskbar at the bottom:

- Type here to search
- File Explorer icon
- Google Chrome icon
- PowerShell icon
- Network icon
- Signal strength icon
- Wi-Fi icon
- Battery icon
- ENG
- 6:12
- 1/09/2025
- Task View icon

Online book

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101

Online book

The screenshot shows a Microsoft Edge browser window with several tabs open. The active tab is titled "RPubs - VD1" and displays a presentation slide.

Page Content:

Visualizing Data and Exploratory Data analysis using ggplot2 in R

Ziv Shkedy and Thi Huyen Nguyen

1. Introduction

"Exploratory data analysis can never be the whole story, but nothing else can serve as the foundation stone - as the first step."

— John W. Tukey (1977)

Location, Spread and Shape in univariate data

In this course, we focus on descriptive measures, numerical and graphical, to characterize and visualize the features of a particular univariate distribution. The following three main concepts are usually used to specify a particular distribution:

- Location
- Spread
- Shape

Each of these control different characteristics of a distribution.

R datasets for illustrations

In order to simplify the usage of slides, the data we used for illustrations are R datasets. We give a short description of each data in the relevant slides. * More details can be found with `help(dataset)` or in

- The singers data: `singers`.
- The airquality data: `airquality`.
- The cars data: `mtcars`.
- The Old Faithful Geyser Data: `oldfaithful`.
- The Boston data: `boston`.

Browser UI:

- Address bar: rpubs.com/zivshkedy/1329125
- Toolbar icons: Back, Forward, Stop, Refresh, Home, Search, etc.
- Tab bar: Universiteit Hasselt - UHasselt, Inbox (7,795) - ziv.shkedy@uhasselt.be, Setup | Wix.com, Wix Website Editor | Erbiostat2, Home | shortc1, RPubs - VD1.
- Right sidebar: School, All Bookmarks, Sign in, Register.
- Bottom status bar: VD1 by Ziv Shkedy Last updated about 2 months ago, Comments (-), Share, Hide Toolbars, 6:13, ENG, 1/09/2025.

Rmd file to produce the online book

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erbiostat.wixsite.com/shortc1

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Course materials

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- Online book.

[Slides \(PDF\)](#) [Rmd programs](#) [Online book](#)

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Type here to search

6:11 1/09/2025

Rmd files to produce the online book

The screenshot shows a GitHub repository for the eR-Biostat course. The repository path is `Courses / ITP workshop / Kampala2025 / Day1 (May 12) / Programs /`. The main view displays several Rmd files:

- `..`
- `README.md` (Last commit message: Create README.md, 4 months ago)
- `Visualization_intro.Rmd` (Last commit message: Add files via upload, 4 months ago)
- `er_prog4c_2_VT_2025 V1.Rmd` (Last commit message: Add files via upload, 4 months ago)

A detailed view of the `README.md` file content is shown:

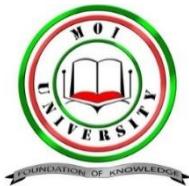
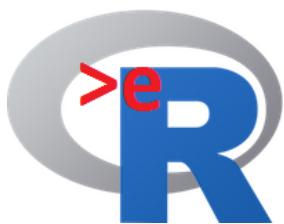
```
R & Rmd programs for the course
```

The left sidebar shows the repository structure:

- Basic courses
- Coordination
- Data Analysis
- ICP Workshop
- ITP workshop
 - Eldoret24
 - Eldoret25
 - Hanoi2025
- Kampala2025
 - Day1 (May 12)
 - Programs
 - README.md
 - Visualization_intro.Rmd
 - er_prog4c_2_VT_2025 V1.Rmd
 - README.md
 - S Manda_SAE_IBS_Uganda_2...
 - eR_biostat_Intro_EDA_VIZ_V4....
 - journal.pone.0253375.pdf

Summary (1)

- Why to use the eR-BioStat website ?
 - Materials are available for free for a complete course or a part of a course !!!



Interuniversity Institute for Biostatistics
and statistical Bioinformatics



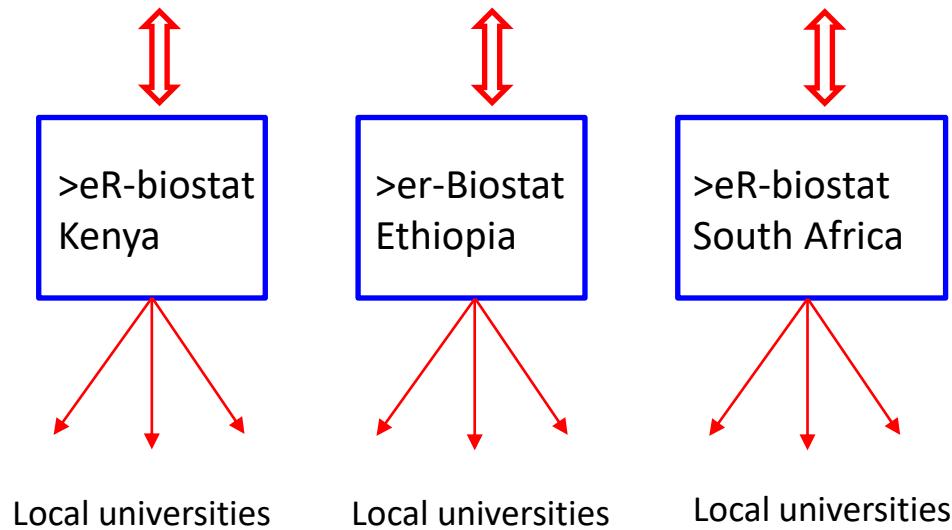
A local version of the >eR-BioStat :

An example of the implementation in Debra Berhan, Ethiopia

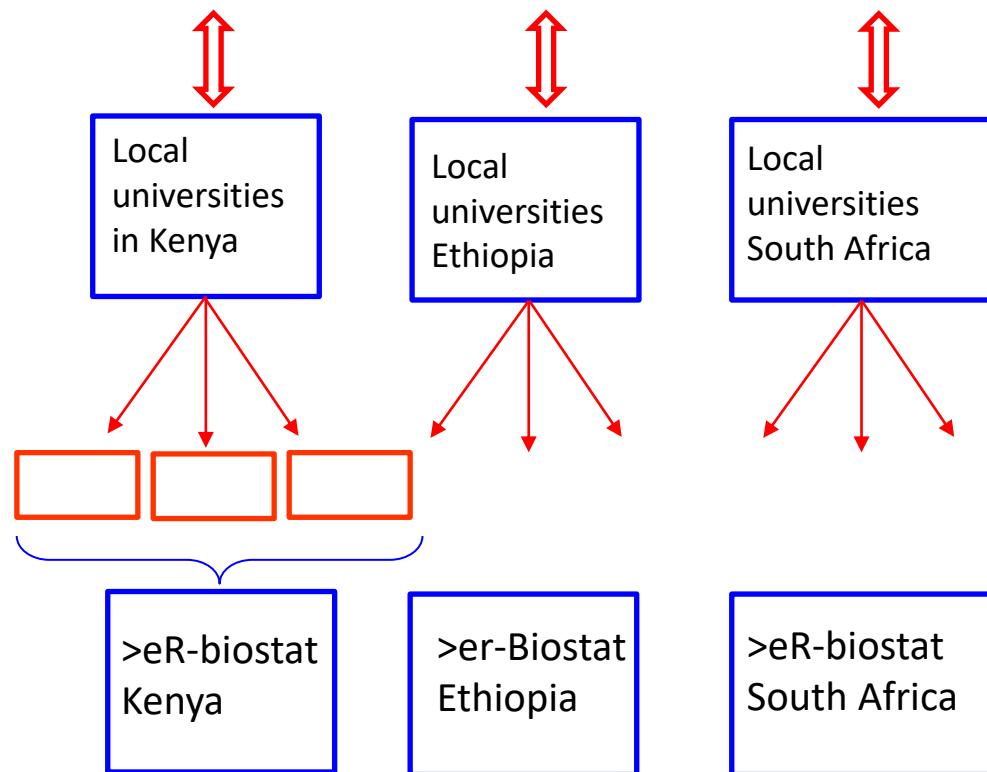
Local >eR-BioStat platform

- Why local ?
- A local platform:
 - Better internet connection.
 - More relevant: allows to add specific courses of (local) interest.

Online structure: original idea

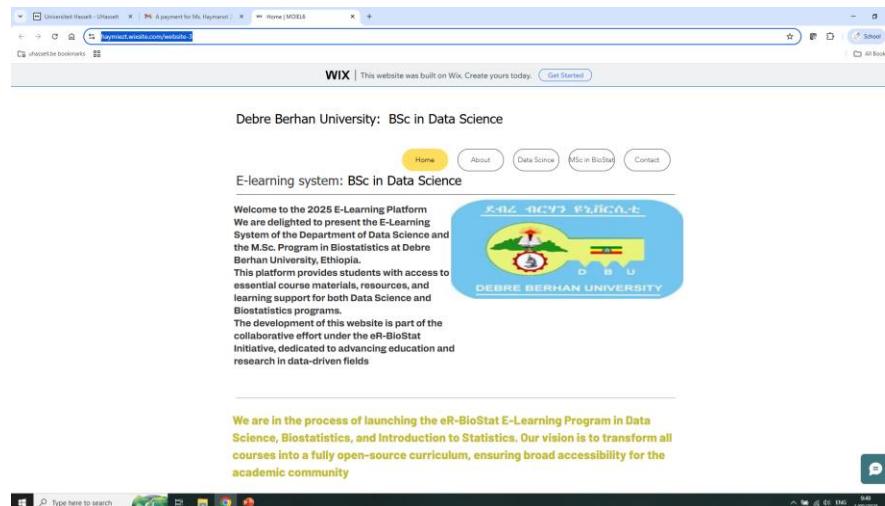


Online structure: current approach



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

- Example: data science in Debra Behar University.
 - Link between:
 - Core courses in Debre Behar.
 - Courses in eR-BioStat.
- } Haymanot (after the coffee break)



<https://haymiez.t.wixsite.com/website-3>



Interuniversity Institute for Biostatistics
and statistical Bioinformatics

The >eR-BioStat :

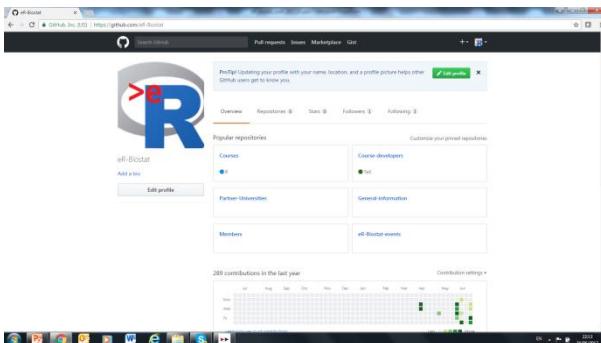
The >eR-BioStat : where can you find us online ?

Our new website

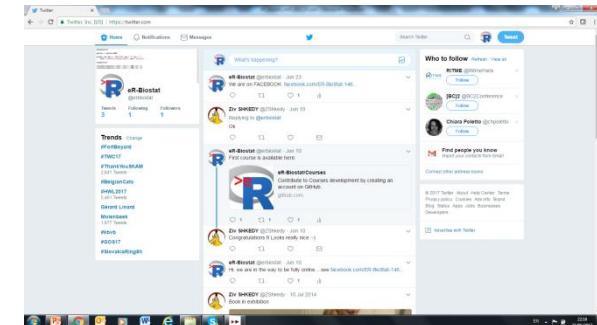
<https://erbiostat.wixsite.com/erbiostat>

We >R an online community

The community online:



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



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

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ER-BioStat

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

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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

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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

113



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Manage Page

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- Planner
- Publishing Tools

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News Feed

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ER-BioStat

+ Add a Button Promote ...

Create Live Event Job Offer ...

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Get Started

Create Ad See all

How would you like to grow your business?

- Create New Ad
- 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

① Hasselt University, belgium [erbiostat.wixsite.com/erbiostat](#)
Joined June 2017

2 Following 223 Followers

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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.

Log in Sign up Close

Windows Type here to search 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 with 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 >eR-BioStat initiative Making R based education materials in statistics accessible for all

We R a community: the >eR-BioStat initiative

Zy 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

Email: erbiostat@gmail.com <https://github.com/eR-School>

CHAT WITH US

Windows taskbar: Type here to search, File Explorer, File History, Google Chrome, Task View. System tray: Battery (25°C Zonnig), Network, Volume, ENG US, Date and time (03/09/2021).

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

We >R (an online) community

A screenshot of a Google search results page. The search query 'er-biostat' is entered in the search bar. A red circle highlights the search bar and the Google logo. Below the search bar, there are filters for 'All', 'Images', 'Videos', 'Maps', 'News', 'More', 'Settings', and 'Tools'. The search results show approximately 5,730,000 results found in 0.44 seconds. The first result is 'eR-BioStat' from GitHub, followed by 'eR-Biostat (erbiostat) · GitHub', 'eR-Biostat/Courses - GitHub', 'ER-BioStat | Facebook', and 'eR-Biostat (@erbiostat) | Twitter'.

For links: make google search

website

GitHub

Course materials

Facebook

Twitter

Communication

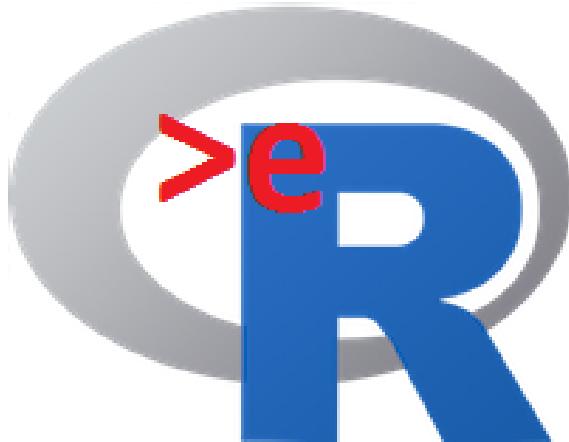
The 'Course materials' section is bracketed by a red curly brace under the 'GitHub' result. The 'Communication' section is bracketed by a red curly brace under the 'Facebook' and 'Twitter' results.

Short discussion: challenges and lessens learned

- Implementation without training will not be successful.
- Training:
 - Teachers:
 - How to work with the system.
 - What is available.
 - Students:
 - How the materials are related to their courses ?
 - How to use ?

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.
- Network of users.



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

Thank you vey much !!

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



ER-BioStat

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

 @erbiostat