



ADVANCED BIostatISTICS

Enrollment year	2019/2020
Academic year	2021/2022
Regulations	DM270
Academic discipline	MED/01 (MEDICAL STATISTICS)
Department	DEPARTMENT OF INTERNAL MEDICINE AND THERAPEUTICS
Course	MEDICINE AND SURGERY
Curriculum	PERCORSO COMUNE
Year of study	3°
Period	1st semester (27/09/2021 - 14/01/2022)
ECTS	3
Lesson hours	24 lesson hours
Language	Italian
Activity type	WRITTEN AND ORAL TEST
Teacher	VILLANI SIMONA (titolare) - 1 ECTS BERNARDINELLI LUISA - 1 ECTS GENTILINI DAVIDE - 1 ECTS
Prerequisites	To follow the course the student should have basic knowledge of Epidemiology and Medical Statistics
Learning outcomes	The course aims to develop in the student the theoretical-practical knowledge of the most frequent statistical-epidemiological methodologies (knowledge and understanding), as well as the ability to correctly apply this knowledge to the analysis of experimental and epidemiological studies (ability to apply knowledge and understanding). At the end of the course the student will be able to use the main statistical data analysis tools, to interpret the results deriving from the application of advanced statistical methodologies in a conscious and critical way, to communicate the evidence deriving from the analyses themselves.

Course contents

The course is organized in 3 distinct modules.

Module 1 - Principles of Statistical Analysis with R

- Lesson 1 Title: "The programming environment R generalities and main objects"
 - R installation and configuration
 - Syntax and main objects (Vectors, Lists, Matrices, Data Frames)
 - Import data into R
 - Treatment of missing data
 - Univariate descriptive measures
 - Laboratory with R
- Lesson 2 Title: "Graphic representation with R"
 - Types of graphs and choice of the appropriate graphical representation
 - Basic package
 - Grid package
 - ggplot2 package
 - Laboratory with R
- Lesson 3 Title: "Data Mining with R"
 - Techniques for reducing the dimensionality of data
 - Exercises with R
- Lesson 4 Title: "Identifying the relationships between variables with R"
 - Statistical methods to evaluate the relationships between variables
 - Exercises with R

Module 2 - Statistical methods in genetic epidemiology

- Lesson 1 Title: "Association studies in Genetics"
 - Concepts of genetic epidemiology "the study design"
 - Statistical approaches to evaluate the association
 - Exercises with R
- Lesson 2 Title: "Power calculation and sample size"
 - Calculation of power and sample size with R
 - The problem of multiple tests
- Lesson 3 Title: "Association studies in Genetics"
 - Association analysis and transmission models
 - Exercises with R
- Lesson 4 Title: "Genome Wide Association Studies"
 - Complex diseases and GWAS
 - Methodology in GWAS
 - Exercises with R

Module 3 - Survival analysis

When using the survival analysis.

Kaplan-Meier survival estimates.

How to determine if there is a different survival: the Log-rank test.

	<p>Cox's model of proportional hazards: when it can be applied and what information it provides. How to determine which model is best.</p> <p>Notes on the stratified Cox model.</p>
Teaching methods	<p>The teaching activity includes lectures with a problem solving approach and exercises with applications in R to data sets, to answer specific research questions and to help the student obtaining the necessary skills for planning studies and biostatistic analyzes</p>
Reccomended or required readings	<ul style="list-style-type: none"> - Daniel WW, Cross CL. Biostatistica. EdiSES, 2019. - Data Mining with R: Learning with Case Studies, Second Edition Luis Torgo - CRC Press - The Elements of Statistical Learning: Data Mining, Inference, and Prediction Trevor Hastie, Robert Tibshirani , e al. Springer - Genetic Epidemiology Methods and Protocols Editors: Evangelou, Evangelos (Ed.)
Assessment methods	<p>Verification of knowledge and skills will be performed on all topics of the course.</p> <p>The exam modality will be written</p>
Further information	<p>Students who will attend the course are asked to have a laptop available for exercises in R.</p> <p>The teachers receive students only by appointment after sending an email to</p> <p>simona.villani@unipv.it davide.gentilini@unipv.it luisa.bernardinelli@unipv.it</p>
Sustainable development goals - Agenda 2030	<p>\$lbl_legenda_sviluppo_sostenibile</p>