

Academic Year: (2023 / 2024)

Review date: 22-07-2023

Department assigned to the subject: Statistics Department

Coordinating teacher: MARIN DIAZARAQUE, JUAN MIGUEL

Type: Electives ECTS Credits : 3.0

Year : 1 Semester : 2

REQUIREMENTS (SUBJECTS THAT ARE ASSUMED TO BE KNOWN)

Probability
Statistical Inference
Programming in R

OBJECTIVES

The student will acquire the following knowledge:

1. Proficiency of Monte Carlo simulation techniques.
2. Proficiency of simulation techniques for random variables and vectors.
3. Proficiency of discrete event simulation techniques.
4. Knowledge of variance reduction techniques and MCMC.
5. Proficiency of bootstrap resampling techniques for complex environments and data.

DESCRIPTION OF CONTENTS: PROGRAMME

1. Introduction to Monte Carlo techniques
2. Simulating random variables and vectors
3. Discrete event simulation
4. Variance reduction and MCMC
5. Introduction to the bootstrap
6. Bootstrap for two samples and complicated data structures
7. Bootstrap-based inference

LEARNING ACTIVITIES AND METHODOLOGY

The classes consist of a mixture of presentations on the fundamental concepts of the subject and the presentation of practical cases through the use of software. The statistical language R is preferably used. Students are expected to bring their own laptops to experiment with the code during the lectures.

*** Training activities**

- AF1: Theoretical lesson.
- AF2: Practical lesson.
- AF5: Tutorials.
- AF6: Group work.
- AF7: Individual work.
- AF8: On-site evaluation tests.

*** Teaching methodologies**

- MD1: Class lectures by the professor with the support of computer and audiovisual media, in which the main concepts of the subject are developed and the bibliography is provided to complement the students' learning.
- MD2: Critical reading of texts recommended by the professor of the subject: press articles, reports, manuals and/or academic articles, either for later discussion in class, or to expand and consolidate the knowledge of the subject.
- MD3: Resolution of practical cases, problems, etc. posed by the teacher individually or in groups.
- MD4: Presentation and discussion in class, under the moderation of the professor of topics related to the content of the subject, as well as case studies.
- MD5: Preparation of papers and reports individually or in groups.

ASSESSMENT SYSTEM

SE2 Group or individual take-home assignments: 100%

- Simulation project: 40%
- Resampling project: 30%
- Classroom work: 30%

There is no final exam.

The extraordinary evaluation will be in terms of a Simulation project (40%) and a Resampling project (30%), with a total weight of 70% of the final grade.

% end-of-term-examination:	0
% of continuous assessment (assignments, laboratory, practicals...):	100

BASIC BIBLIOGRAPHY

- Blaine, B Introductory Applied Statistics: With Resampling Methods & R, Springer, 2023
- Bradley Efron, Robert Tibshirani An Introduction to Bootstrap, Chapman & Hall, 1998
- Sheldon Ross Simulation, Academic Press, 2013
- Templ, M. Simulation for data science with R, Packt Publishing Ltd., 2016

ADDITIONAL BIBLIOGRAPHY

- Ralf Korn, Elke Korn, Gerald Kroisandt Monte Carlo Methods and Models in Finance and Insurance, Chapman & Hall/CRC, 2010