SYLLABUS DEL CORSO

Foundations of Probability and Statistics

2425-1-F1702Q005

Learning objectives

The course aims to introduce the concepts and methods of descriptive statistics, probability and statistical inference (point and interval estimation, tests) both from a theoretical and an application point of view through the use of software (R).

At the end of the course the student has the opportunity to understand the statistical induction and the implications on the population deriving from the study of a data sample, being able to experiment and apply the knowledge acquired on real datasets.

Contents

Descriptive statistics, probability and statistical inference (point and interval estimation, tests)

Detailed program

- Introduction to data analysis with R
- R packages: base, dplyr, purrr, ggplot
- Descriptive analysis: distributions, graphical representations, position and variability indices, minimum squares line
- Probability: probabilistic conceptions, probability on events, Bayes theorem, random variables and probability distributions, large distributions, LLN and CLT statements
- Statistical inference: the logic of probabilistic sampling. Estimators and their properties. Point estimate (Average, variance and proportion). Notes on maximum likelihood estimators.
- Interval estimation: concept of confidence, confidence intervals, particular cases on the mean and variance

- Hypothesis testing: The concept of test statistics. The significance and power of the test. Test on average, variance, proportion, on the difference between averages, independence test.

Prerequisites

None.

Teaching methods

Lectures with and without computer (in presence).
Traditional teaching hours: 42
Interactive teaching hours: 0
On the e-learning page, the material for the exam preparation will be provided, considering also possible non-attending students.

Assessment methods

WRITTEN EXAM: it is a multiple choice and numeric exercises exam with the aim to verify knowledge of the theoretical issues proposed in class and the ability ot use the R language to conduct statistical analysis (max grade 31).

There is no mid term evaluation

Grading policy:
insufficient: less than18; sufficient: 18-23; good: 24-27; very good: 28-30; excellent: 30 cum laude

Textbooks and Reading Materials

Teacher material available for the students on e-learning site

On the elearning website attending and not attending students will find the necessary material to prepare themselves for the exam

Textbook:
Alan Agresti, Maria Kateri (2022), Foundations of Statistics for Data Scientists With R and Python, Chapman & Hall

Other texts of your choice:

- A.M. Mood, F.A. Graybill, D.C. Boes, Introduzione alla statistica
- G. Cicchitelli, P. D'Urso M. Minozzo, Statistica: principi e metodi
- P.S. Mann, Introductory Statistics
- M. Lavine, Introduction to Statistical Thought

Semester

I semester (September-November)

Teaching language

English

Sustainable Development Goals

QUALITY EDUCATION