UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

COURSE SYLLABUS

Foundations of Probability and Statistics

2526-1-FDS02Q006

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).

By the end of the course, students will be able to:

- Understand the fundamental concepts of descriptive and inferential statistics.
- Apply basic statistical methods to real data.
- Critically evaluate results and choose the most appropriate statistical method.
- Communicate the results of statistical analysis clearly and effectively, including through graphs and tables.
- Acquire the foundation to pursue more advanced statistical studies independently.

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

Assessment methods

WRITTEN EXAM: it consists of a set of multiple-choice questions and numerical exercises aimed at assessing knowledge of the THEORY covered in class and the ability to use the R language to conduct statistical analyses (maximum score: 30).
The students who scored 30 on the written exam can request the oral exam to obtain "30 cum laude".

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

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