



UNIVERSITÀ  
DEGLI STUDI DI MILANO-BICOCCA

## SYLLABUS DEL CORSO

### Introduzione all'Inferenza Statistica M

2122-1-F8204B013

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#### Learning objectives

The aim of the course is to present basic concepts of statistical inference and some tools of multivariate statistics necessary to follow the subsequent statistical courses. It is addressed to students who do not possess a statistical background comparable to the one provided by a bachelor degree in Statistics.

At the end of the course the student should master the key concepts of parametric inferential statistics in a one dimensional framework. Moreover she/he should interpret and apply standard inferential procedures (point and interval estimators, tests) developed for some common parametric models and should be able, to a large extent, to build such procedures for more general uni-parametric models. Furthermore the student is expected to understand fundamental concepts and interpret results of some methods of multivariate statistics (in particular cluster analysis and principal components).

#### Contents

- Elements of probability theory
- Sampling and statistical inference
- Point estimation
- Interval estimation
- Hypotheses testing
- Principal components
- Cluster analysis

## Detailed program

1. Random variables, main discrete and continuous univariate distributions
2. Random vectors, some examples (Normal and multinomial)
3. Law of large numbers and central limit theorem
4. Sampling and statistical inference
5. Point estimation: property of estimators, criteria of evaluation
6. Estimation methods
7. Interval estimation: methods of construction, important examples
8. Hypotheses testing: test statistic, first and second kind error, p-value
9. Some important tests
10. Data matrix and its summaries
11. Data representation, subject and variable spaces, distances among subjects and among variables.
12. Cluster analysis: main clustering techniques, clustering evaluation, applications.
13. Principal components: component extraction, stopping rules, measures of explained variability, applications.

## Prerequisites

Elementary notions of mathematics.

## Teaching methods

Class lectures taught in Italian.

Lectures are aimed at understanding methodological issues through simple exercises and dataset analysis, with the objective of developing capacity of dealing with real problems and critical ability with respect to the considered methods.

## Assessment methods

Oral exam on the subjects taught during the course.

Such exam is aimed at verifying the understanding of the concepts underlying the considered statistical procedures and the capacity of employing them to face real problems.

## Textbooks and Reading Materials

- Cicchitelli, G. Probabilità e Statistica 2 edizione, Maggioli, 2004.
- Zani, S., Cerioli, A. Analisi dei dati e data mining per le decisioni aziendali. Giuffrè Editore, Milano 2007.

## Semester

I semester, I term (six weeks)

**Teaching language**

Italian

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