



UNIVERSITÀ  
DEGLI STUDI DI MILANO-BICOCCA

## SYLLABUS DEL CORSO

### Introduzione all'Inferenza Statistica M

2425-1-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).

The course, by introducing basic notions of inference and explorative statistics, contributes to achieve the educational objectives of the area "Statistics" of the degree program.

#### Contents

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

## Detailed program

**NOTICE:** Lectures will begin on September 9 according to the following schedule for the first two weeks:

Monday, 9th September 10.30-13.30, room U6-38  
Thursday, 12th September 12.30-15.30, room U6-38  
Monday, 16th September 10.30-12.30, room U2-04  
Monday, 16th September 13.30-15.30, room U2-03  
Wednesday, 18th September 10.30-12.30, room U1-12  
Wednesday, 18th September 13.30-15.30, room U1-12  
Friday, 20th September 10.30-12.30, room U1-14  
Friday, 20th September 13.30-15.30, room U1-14

## PROGRAM

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

## Prerequisites

Elementary notions of mathematics and probability, at a level of first year undergraduate courses.

The course is not suitable for undergraduate students enrolled in the Erasmus Program. Erasmus postgraduate students are invited to contact the teacher at the beginning of the course.

## Teaching methods

Class lectures will be taught in Italian and will be held in person.

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.

Note that the lectures will begin in the week of September 9-15.

## Assessment methods

Final oral exam on the subjects taught during the course.  
There are no tests during the course.

The final oral 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).

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Friday, 20th September 10.30-12.30, room U1-14  
Friday, 20th September 13.30-15.30, room U1-14

Afterwards, lectures will take place:

Wednesday: 10.30 - 12.30 and 14.30 - 16.30  
Thursday: 10.30 - 12.30 and 14.30 - 17.30  
Friday: 14.30 - 17.30.

## **Teaching language**

Italian

## **Sustainable Development Goals**

QUALITY EDUCATION

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