



UNIVERSITÀ  
DEGLI STUDI DI MILANO-BICOCCA

## SYLLABUS DEL CORSO

### Statistica Bayesiana M

2425-1-F8204B016

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#### Learning objectives

The course aims at giving the fundamental concepts of the Bayesian approach to inference together with an overview of some widespread models.

The course contributes to achieve the educational objectives of the area "Statistics" of the degree program.

#### Contents

- Introduction to Bayesian modeling.
- Prior selection.
- Bayesian calculations (MCMC).
- Decision-theoretic foundations.
- Bayesian inference.
- Linear model

#### Detailed program

1. Introduction to Bayesian modeling: prior distribution, likelihood function, posterior distribution. From prior to posterior: Bayes theorem.
2. Prior selection: subjective determination, non informative priors, conjugate priors, predictive distribution based priors.
3. Bayesian calculations: Monte Carlo and Markov chain Monte Carlo methods
4. Decision-theoretic foundations: loss functions, optimality criteria, risk functions, posterior expected loss.
5. Bayesian inference: estimation, credible regions, hypothesis testing and Bayes factor.
6. The linear model

## **Prerequisites**

Elements of inferential statistics, stochastic processes and R programming.

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 lessons and lab sessions with R.

There will be a total of six lab lectures, which will be conducted remotely.

The remaining lectures will be held in person

## **Assessment methods**

Written and lab examination including theory, numerical exercises and R script.

The exam is closed-notes and closed-book, but students are allowed to use the R scripts made available by the teacher.

No phones are allowed during the exam.

## **Textbooks and Reading Materials**

- Berger J.O., Statistical Decision Theory and Bayesian Analysis, Springer-Verlag, 1985.
- Lee P.M., Bayesian Statistics: an Introduction, Arnold, 2004.
- Piccinato L., Metodi per le Decisioni Statistiche, Springer-Verlag Italia, 1996.
- Robert C.P., The Bayesian Choice, 2nd edition, Springer, 2001.
- Additional material (R-codes and past exams) are made available through the e-learning web page of the course.

## **Semester**

First term (six weeks) of the second semester.

## **Teaching language**

Italian

# Sustainable Development Goals

QUALITY EDUCATION

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