



UNIVERSITÀ  
DEGLI STUDI DI MILANO-BICOCCA

## COURSE SYLLABUS

### Bayesian Statistics M

2122-2-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.

#### Contents

- Introduction to Bayesian modeling.
- Prior selection.
- Bayesian calculations.
- 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

## **Teaching methods**

Class lessons and lab sessions.

## **Assessment methods**

Written and lab examination

## **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**

Second term (six weeks) of the first semester.

## **Teaching language**

Italian

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