

Bayesian Inference

Academic Year: (2023 / 2024)

Review date: 11-08-2023

Department assigned to the subject: Statistics Department

Coordinating teacher: AUSIN OLIVERA, MARIA CONCEPCION

Type: Compulsory ECTS Credits : 3.0

Year : 1 Semester : 2

REQUIREMENTS (SUBJECTS THAT ARE ASSUMED TO BE KNOWN)

Experience with classical statistical methods.

OBJECTIVES

The main course objectives are:

1. Understand fundamental concepts of probability relevant to Bayesian Statistics.
2. Compare and contrast the Frequentist and Bayesian approaches to statistical inference.
3. Learn about conjugate distributions and their significance in Bayesian analysis.
4. Develop proficiency in computational methods used for Bayesian estimation.
5. Gain knowledge in Regression and Linear Models within a Bayesian framework.
6. Explore Generalized Linear Models (GLMs) from a Bayesian perspective.
7. Study Bayesian clustering techniques for data analysis and pattern discovery.
8. Learn about Nonlinear Regression and its application in Bayesian modeling.

DESCRIPTION OF CONTENTS: PROGRAMME

1. Basic concepts of probability related with Bayesian Statistics
2. Frequentist vs. Bayesian approach
3. Conjugate distributions
4. Computational methods for Bayesian estimation
5. Regression and Linear Models
6. Generalized linear models
7. Bayesian clustering
8. Non linear regression

LEARNING ACTIVITIES AND METHODOLOGY

Learning activities:

Theoretical lessons

Exercises

Practical lessons in class using the computer

Individual project

Teaching methodologies:

Presentations of the professor in class with computing and visual media, where the professor develops the main concepts of the subject and provides bibliography supplementing the knowledge of students.

Solving practical case studies, problems, etc., proposed by the professor either individually or in groups

ASSESSMENT SYSTEM

- Weekly exercises (20%)
- Project in groups (20%)
- Final exam (60%)

% end-of-term-examination:	60
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% of continuous assessment (assignments, laboratory, practicals...):	40
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BASIC BIBLIOGRAPHY

- Jeff Gill Bayesian Methods A Social and Behavioral Sciences Approach Third Edition , CRC Press.

ADDITIONAL BIBLIOGRAPHY

- Bolstad, W.M. Introduction to Bayesian statistics, Wiley.
- Box, G.E. and Tiao, G.C. Bayesian inference in statistical analysis, Wiley.
- Chen, M-H Monte Carlo methods in bayesian computation, Springer.
- Congdon, P. Applied Bayesian modelling, Wiley.
- D' Agostini, J. Bayesian reasoning in data analysis : a critical introduction, World Scientific.
- Dey, D.K. and Rao, C.R. Bayesian thinking : modeling and computation, Elsevier.
- Gamerman, D. Markov chain Monte Carlo : stochastic simulation for Bayesian inference, Chapman & Hall.
- Gilks, W., Richardson, S. and Spiegelhalter, D.J. Markov chain Monte Carlo in practice, Chapman and Hall.
- Robert, C.P. The Bayesian choice : from decision-theoretic foundations to computational implementation (2nd edition), Springer.