Bayesian Methods

Academic Year: (2022 / 2023) **Review date: 28-04-2022**

Department assigned to the subject: Statistics Department

Coordinating teacher: WIPER , MICHAEL PETER

Type: Compulsory ECTS Credits : 6.0

Year : 4 Semester : 1

REQUIREMENTS (SUBJECTS THAT ARE ASSUMED TO BE KNOWN)

Statistical Inference Techniques I
Statistical Inference Techniques II
Regression Methods
Stochastic Processes

OBJECTIVES

1. To understanding the ideas of Bayesian statistics and the differences between this approach and the classical or frequentist approach in Statistics.
2. To know and use the main conjugate families of distributions.
3. Use specific Bayesian statistical software to solve problems.

1. Capacity for analysis and synthesis.
2. Model and solve problems.
3. Oral and written communication skills.

DESCRIPTION OF CONTENTS: PROGRAMME

1. Introduction and review of basic concepts of probability theory.
1.1 Definitions and basic theorems
1.2 Bayes theorem
1.3 Applications of the Bayes thorem

2. Conjugate families of distributions.
2.1 Beta-binomial family
2.2 Normal-normal family
2.3 Applications

3. Estimation and tests.
3.1 Beta-binomial models
3.2 Normal-normal models
3.3 Examples

4. Regression and linear models.
4.1 Normal linear models
4.2 General linear models

5. Simulation methods for Bayesian statistics.
5.1 Bayes factors
5.2 Introduction to MCMC methods
5.3 Examples

LEARNING ACTIVITIES AND METHODOLOGY

Theory (4 ECTS). Theoretical classes with support material available on the Web. Practice (2 ECTS) problem-solving classes. Computing practices in computer labs. Presentations and debates.

ASSESSMENT SYSTEM

25% Midterm exam
25% Exercises and Practices.
50% Final exam.

% end-of-term-examination:	50
% of continuous assessment (assigments, laboratory, practicals…):	50

BASIC BIBLIOGRAPHY

- Antelman, G. Elementary Bayesian Statistics, Cheltenham, 1997
- Bernardo, J.M. Bioestadística una perspectiva Bayesiana, Vicens Viven, España, 1981
- Boldstad, W.M. Introduction to Bayesian Statistics, Wiley, 2007
- Gill J. Bayesian Methods: A Social and Behavioral Sciences Approach (3ed), Chapman & Hall. , 2015

ADDITIONAL BIBLIOGRAPHY

- Albert J. Bayesian Computation with R (Use R), Springer, 2009
- Lee, P.M. Bayesian Statistics: An Introduction, Arnold, Londres, 2004

BASIC ELECTRONIC RESOURCES

- Michael Wiper . Teaching Page: http://halweb.uc3m.es/esp/Personal/personas/mwiper/eng/docencia.html