Bayesian Data Analysis

Academic Year: (2018 / 2019)   **Review date: 04/05/2018 15:44:39**

Department assigned to the subject: Statistics Department

Coordinating teacher: AUSIN OLIVERA, MARIA CONCEPCION

Type: Compulsory ECTS Credits : 6.0

Year : 3 Semester : 2

REQUIREMENTS (SUBJECTS THAT ARE ASSUMED TO BE KNOWN)

Probability and Data Analysis
Introduction to Statistical Modeling
Statistical Learning

OBJECTIVES

CB2: Students should know how to apply their knowledge in their jobs or vocation in a profesional manner and have the skills that are usually demonstrated through the elaboration and defense of arguments and the resolution of problems within their area of ¿¿study.

CB3: Students should have the ability to gather and interpret relevant data (ussually within their area of ¿¿study) to make judgments that include a reflection on relevant issues of social, scientific or ethical nature

CE2: Ability to correctly identify problems of predictive nature corresponding to certain objectives and data and to use the basic results of regression analysis as a basic basis for prediction methods.

CG1: Adequate knowledge and skills to analyze and synthesize basic problems related to engineering and data science, solve them and communicate them efficiently.

CG4: Ability to solve technological, computer, mathematical and statistical problems that may arise in engineering and data science.

DESCRIPTION OF CONTENTS: PROGRAMME

1. Bayesian basics:
1.1. Bayes theorem
1.2. Prior and posterior distribution
1.3. Credible intervals
1.4. Bayesian prediction

2. Exact Bayesian estimation
2.1. Coin tossing problems
2.2. Rare events
2.3. The normal distribution

3. Bayesian networks
3.1. Graphical models
3.2. Latent variables
3.3. Parameter learning
3.4. Structure learning

4. Approximate Bayesian estimation
4.1. Numerical methods

4.2. Sampling methods

5. Bayesian regression and hierarchical models
5.1. Linear models
5.2. Generalized linear models
5.3. Hierarchical models

6. Bayesian classification and clustering
7. Dynamic models

LEARNING ACTIVITIES AND METHODOLOGY

AF1: THEORETICAL-PRACTICAL LESSONS where the knowledge that students should acquire is presented. Students will receive class notes and basic reference texts to facilitate the follow-up of the classes and the development of the subsequent work. Exercises, practical problems will be solved by students and workshops and evaluation tests will be held to acquire the necessary skills.

AF3: INDIVIDUAL OR GROUP WORK OF THE STUDENT.

AF9: FINAL EXAM where the knowledge, skills and abilities acquired throughout the course will be assessed globally.

MD1: CLASS THEORY. Presentations offered by the teacher in class with computer support and audiovisual media, where the main concepts of the subject are developed and materials and bibliography are provided to complement the students' learning.

MD2: PRACTICES. Resolution of practical case studies, problems, etc. proposed by the teacher individually or in groups.

MD3: TUTORIALS. Individualized assistance (individual tutorials) or group (collective tutorials) offered to students by the teacher.

ASSESSMENT SYSTEM

% end-of-term-examination/test:	60
% of continuous assessment (assigments, laboratory, practicals…):	40

SE1: FINAL EXAMINATION. Knowledge, skills and abilities acquired throughout the course will be assessed globally.

SE2: CONTINUOUS EVALUATION. Work in class, presentations, debates, presentations, exercises, practices and workshops throughout the course will be evaluated.

BASIC BIBLIOGRAPHY

- Albert, J. Bayesian Computation with R, Springer. , 2007

- Kruschke, J.K., Doing Bayesian Data Analysis: A Tutorial with R and BUGS, Academic Press., 2015

- Robert, C.P., Casella, G Introducing Monte Carlo Methods with R, Springer , 2010