Bayesian Inference

Academic Year: (2019 / 2020)   **Review date: 30-04-2019**

Department assigned to the subject: Department of Statistics

Coordinating teacher: MARIN DIAZARAQUE, JUAN MIGUEL

Type: Electives ECTS Credits : 6.0

Year : 2 Semester : 1

STUDENTS ARE EXPECTED TO HAVE COMPLETED

Experience with classical statistical methods.

COMPETENCES AND SKILLS THAT WILL BE ACQUIRED AND LEARNING RESULTS.

The aim of this course is to introduce the modern approach to
Bayesian statistics, emphatizing the computational aspects and the
differences between the classical and Bayesian approaches.

DESCRIPTION OF CONTENTS: PROGRAMME

1. Introduction & basic results
a) probability and Bayes theorem
b) coin tossing problems
2. Conjugate families of distributions
a) coin tossing problems
b) rare events
c) problems with the normal distribution
3. Subjective and objective prior distributions
a) bayesian inference and subjective priors
b) objective priors
4. Numerical methods y MCMC
a) analytic approximations
b) Monte Carlo
c) MCMC and Gibbs sampling
5. Estimation and hypothesis testing
a) point and interval estimation
b) hypothesis tests and model selection
c) Bayes factor and the DIC
6. Regression and hierarchical models
a) linear regression
b) hierarchical models
c) generalized linear models
7. Time series & forecasting
a) Dynamic linear models
b) Bayesian Kalman filter
c) Other models
8. Nonparametrics
a) Non-parametric inference
b) Dirichlet processes

LEARNING ACTIVITIES AND METHODOLOGY

Practical sessions on Bayesian computing and on the use of Bayesian software to implement MCMC algorithms.

ASSESSMENT SYSTEM

1) End of course project applying the Bayesian approach in a research area of interest to the student.
2) Intermediate mini computing projects: using software to implement Bayesian inference.
3) Intermediate written test.

% end-of-term-examination: 0

% of continuous assessment (assigments, laboratory, practicals…):   100