

Academic Year: (2024 / 2025)

Review date: 16-04-2024

Department assigned to the subject: Signal and Communications Theory Department

Coordinating teacher: GOMEZ VERDEJO, VANESSA

Type: Compulsory ECTS Credits : 6.0

Year : 1 Semester : 1

REQUIREMENTS (SUBJECTS THAT ARE ASSUMED TO BE KNOWN)

Linear algebra.
Multivariable calculus.
Statistics.
Introduction to Machine Learning (or similar)

OBJECTIVES

The goal of this course is that the student knows the different advanced machine learning techniques to solve classification, regression and unsupervised problems so that he/she is then able to implement, train and validate different algorithms depending on the available data or, even, propose and formulate modified or new models depending on the needs of the problem.

DESCRIPTION OF CONTENTS: PROGRAMME

Machine Learning

- * Review of data analysis and preprocessing.
- * Ensembles for classification/regression
- * Kernel methods: Support Vector Machines for classification and regression
- * Gaussian processes
- * Unsupervised learning: spectral clustering, novelty detection
- * Dimensionality reduction with kernel methods: KPCA, KPLS,....
- * Feature selection

LEARNING ACTIVITIES AND METHODOLOGY

LEARNING ACTIVITIES

The following training activities will be used for the development of the course

- AF3 Theoretical practical classes
- AF4 Laboratory practices
- AF5 Tutorials
- AF6 Team work
- AF7 Student individual work
- AF8 Partial and final exams

METHODOLOGY

MD1: Class lectures by the professor with the support of computer and audiovisual media, in which the main concepts of the course are developed and complemented with bibliography.

MD2: Critical reading of texts recommended by the professor of the course.

MD3: Resolution of practical cases, problems, etc. posed by the teacher individually or in groups.

MD4: Presentation and discussion in class, under the moderation of the professor, of topics related to the content of the course, as well as case studies.

MD5: Elaboration of works and reports individually or in groups.

Mainly, the classes will be developed with Python notebooks with practical theoretical content and will be complemented with practices to be carried out by the student individually or in groups.

TUTORING REGIME

There will be 2 hours a week of tutoring for students where the teacher will be available in his office.

ASSESSMENT SYSTEM

% end-of-term-examination:	0
% of continuous assessment (assignments, laboratory, practicals...):	100

The evaluation of the students will be carried out through continuous evaluation (100%) based on

SE2 Individual or group work or exams carried out during the course

SE3 Individual partial and/or final exams

The extraordinary evaluation (june call) will be carried out with a final exam (SE3) that weighs 100% of the grade.

BASIC BIBLIOGRAPHY

- C. E. Rasmussen Gaussian Processes for Machine Learning, MIT Press, 2006
- C. M. Bishop Pattern Recognition and Machine Learning, Springer, 2006
- R. O. Duda, P. E. Hart, D. G. Stork Pattern Classification (2nd ed.), Wiley Interscience, 2001
- T. Hastie, R. Tibshirani, J. Friedman The Elements of Statistical Learning: Data Mining, Inference, and Prediction, Second Edition , Springer, 2009