

Machine learning II

Academic Year: (2024 / 2025)

Review date: 26-04-2024

Department assigned to the subject: Signal and Communications Theory Department

Coordinating teacher: PARRADO HERNANDEZ, EMILIO

Type: Compulsory ECTS Credits : 6.0

Year : 3 Semester : 1

REQUIREMENTS (SUBJECTS THAT ARE ASSUMED TO BE KNOWN)

Programming
Machine Learning I

OBJECTIVES

Acquisition of skills in modelling continuous and discrete data

Acquisition of skills in the design of non-linear machine learning models based in kernel methods

Acquisition of skills in the application and interpretation of latent variable models

Acquisition of criteria to decide which advanced machine learning models or families of models should be used in each situation

Acquisition of skills to construct prototypes based on probabilistic machine learning or kernel methods oriented to the solution of data processing problems.

DESCRIPTION OF CONTENTS: PROGRAMME

In the subject we introduce advanced concepts in machine learning. In the first part, we concentrate of nonlinear classification and regression methods.

While in the second part, we will focus on advanced topics of non-supervised learning. In the last part of the course, we will cover transfer learning and multitask learning.

PART 1: Nonlinear classification and regression

Kernel methods

Ensemble methods (boosting y random forests)

Gaussian Processes for classification and regression

PARTE 2: Unsupervised Learning

Introduction to graphical models

Latent variable models

Bayesian nonparametrics

PARTE 3:

Multi-task learning

Transfer learning

LEARNING ACTIVITIES AND METHODOLOGY

Learning activities:

AF1: THEORETICAL-PRACTICAL CLASSES. They will present the knowledge that students should acquire. They will receive the class notes and will have basic texts of reference to facilitate the follow-up of the classes and the development of the subsequent work. Exercises, practical problems on the part of the student will be solved and workshops and evaluation test will be held to acquire the necessary skills.

AF2: Updated to allegation

AF3: INDIVIDUAL OR GROUP WORK OF THE STUDENT.

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

Learning methodology:

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

MD2: PRACTICES. Resolution of practical cases, problems, etc. raised by the teacher individually or in groups.

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

ASSESSMENT SYSTEM

% end-of-term-examination:	30
% of continuous assessment (assignments, laboratory, practicals...):	70

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

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

BASIC BIBLIOGRAPHY

- Christopher M. Bishop Pattern Recognition and Machine Learning, Springer, 2006

ADDITIONAL BIBLIOGRAPHY

- Kevin P. Murphy Machine Learning: A Probabilistic Perspective, The MIT Press, 2012