Universidad Carlos III de Madrid

Machine Learning for Business Decision Making

Academic Year: (2021 / 2022)　　　　　　　　　　　　　　　　　　**Review date: 10-06-2021**

Department assigned to the subject: Computer Science and Engineering Department

Coordinating teacher: ALER MUR, RICARDO

Type: Compulsory ECTS Credits : 6.0

Year : 4 Semester : 1

REQUIREMENTS (SUBJECTS THAT ARE ASSUMED TO BE KNOWN)

Big data and business analitics

OBJECTIVES

CB1. That students show to have knowledge in an area of study that starts from a base in secondary education, and reaches a level that, although supported by advanced textbooks, also includes some aspects from the forefront of his field of study.

CB2. That students know how to apply their knowledge to their work or vocation in a professional way and possess the skills that are usually demonstrated through the elaboration and defense of arguments and the resolution of problems within their area of study

CB3. That students have the ability to gather and interpret relevant data (usually within their area of study) to make judgments on relevant issues of social, scientific or ethical nature

CG3. To be able to manage, identify, gather and interpret relevant information on issues related to business in the digital age.

CG5. To know how to design, plan and align the evolution of technology (information and communication systems and technologies) with respect to the organization of the company and its evolution.

CT3. Being able to evaluate the reliability and quality of the information and its sources using such information in an ethical manner, avoiding plagiarism, and in accordance with the academic and professional conventions of the study area.

CT5. To know and be able to manage interpersonal skills on initiative and responsibility, negotiation, emotional intelligence, etc. as well as calculation tools that allow consolidating the basic technical skills that are required in all professional fields.

CE13. To understand advanced information systems, as well as the main technological tools applicable in companies and businesses, as well as their needs in matters of security and protection of information. cryptography, artificial intelligence and big data

CE16. To understand the possibilities of Big data and artificial intelligence in business development, and to know their implementation needs and their capabilities in improving business processes. To know how to analyze and solve a problem in the disciplinary field of the Degree applying knowledge, skills, tools. and strategies acquired or developed in it.

RA1. To have acquired advanced knowledge and demonstrated an understanding of the theoretical and practical aspects and of the working methodology in the field of business administration and digital technology with a depth that reaches the forefront of knowledge

RA3. To have the ability to collect and interpret data and information on which to base their conclusions, including, when necessary and pertinent, reflection on issues of a social, scientific or ethical nature in the field of business in the digital age.

DESCRIPTION OF CONTENTS: PROGRAMME

1. Introduction to Machine Learning
2. Data Extraction and Exploration
3. Basic models for classification and regression
   3.1. Nearest neighbor (KNN)
   3.2. Trees and rules
4. Methodology: training, hyper-parameter tuning, model evaluation, pre-processing
5. Feature Selection / Generation
6. Advanced models for classification and regression
   6.1. Bagging, Random Forest
   6.2. Boosting

6.3. Stacking
6.4. Support Vector Machines
7. Unsupervised learning:
7.1. Data clustering
7.2. Associative Learning

LEARNING ACTIVITIES AND METHODOLOGY

AF1. THEORETICAL-PRACTICAL CLASSES. They will present the knowledge that students should acquire. They will receive the class notes and will have reference texts 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 tests will be carried out to acquire the necessary skills.
AF2. TUTORING. Individual or group.
AF3. INDIVIDUAL OR GROUP STUDENT WORK.
MD1 THEORY CLASS. Lectures with support of computer and audiovisual media, in which the main concepts of the subject are taught and the materials and bibliography are provided to complement the students' learning.
MD2. PRACTICES. Resolution of practical cases individually or in group.
MD3. TUTORING. Individual or group. For 6 credit courses, 4 hours with 100% attendance.

ASSESSMENT SYSTEM

SE1. FINAL EXAM. In which the knowledge, skills and abilities acquired throughout the course will be assessed globally.
SE2. CONTINUOUS ASSESSMENT. exercises, assignments and tutorials will be evaluated.

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

BASIC BIBLIOGRAPHY

 - Aurélien Géron Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow: Concepts, Tools, and Techniques to Build Intelligent Systems, O'Reilly Media, 2019
 - Ian H. Witten, Eibe Frank, Mark A. Hall, Christopher J. Pal Data Mining: Practical Machine Learning Tools and Techniques, Morgan Kaufmann, 2016

ADDITIONAL BIBLIOGRAPHY

 - Max Kuhn Applied Predictive Modeling, Springer, 2013

BASIC ELECTRONIC RESOURCES

 - Aurélien Géron . Github for Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow: Concepts, Tools, and Techniques to Build Intelligent Systems: https://github.com/ageron/handson-ml2
 - Scikit-learn team . Scikit-learn webpage (library and tutorials): https://scikit-learn.org/stable/