



COMILLAS

UNIVERSIDAD PONTIFICIA

ICAI

ICADE

CIHS

Syllabus
2025 - 2026

TECHNICAL SHEET OF THE SUBJECT

Data of the subject

Subject name	Machine Learning I: Fundamentos y Aprendizaje Supervisado/Machine Learning I Principles and Supervised Learning
Subject code	E000014028
Involved programs	Grado en Análisis de Negocios/Bachelor in Business Analytics [Third year]
Credits	6,0 ECTS
Type	Obligatoria (Grado)
Department	Departamento de Métodos Cuantitativos

Teacher Information

Teacher

Name	Carlos Martínez de Ibarreta Zorita
Department	Departamento de Métodos Cuantitativos
Office	Alberto Aguilera 23 [O-202]
EMail	charlie@icade.comillas.edu

Teacher

Name	Eduardo César Garrido Merchán
Department	Departamento de Métodos Cuantitativos
EMail	ecgarrido@icade.comillas.edu

Teacher

Name	Jenny Alexandra Cifuentes Quintero
Department	Departamento de Métodos Cuantitativos
EMail	jacifuentes@icade.comillas.edu

Teacher

Name	Miguel Ángel Sanz Bobi
Department	Department of Telematics and Computer Sciences
Office	Alberto Aguilera 25 [D-419]
EMail	Miguelangel.Sanz@iit.comillas.edu

Teacher

Name	Pedro Pablo Pérez Velasco
Department	ONEXED
EMail	ppperez@icade.comillas.edu

Teacher

Name	Rodrigo Alejandro de Marcos Peiróten
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Department	Departamento de Métodos Cuantitativos
EMail	Rodrigo.Demarcos@comillas.edu

SPECIFIC DATA OF THE SUBJECT

Contextualization of the subject

Contribution to the professional profile of the degree

Many business decisions and problems can be improved through analytical techniques applied to the large amounts of data available today. This course introduces machine learning techniques, with a focus on prediction and classification methods. The emphasis is on real-world applications, enabling students to develop skills to tackle business and economic problems effectively.

Prerequisites

- Fundamentals of Statistical Data Analysis
- Basic Programming in Python
- Fundamentals of Business Analytics

Competencies - Objectives

THEMATIC BLOCKS AND CONTENTS

Contents - Thematic Blocks

Introduction to Machine Learning: supervised & unsupervised learning

Working with data: EDA, preprocessing, enrichment, and preliminary descriptive analysis

Basic ML models: linear and logistic regression, performance metrics

Methodology and tools for building, evaluating, and improving ML models

Classical ML algorithms: KNN, decision trees, random forests, ensembles

Introduction to neural networks

Introduction to Interpretability and explainability techniques

TEACHING METHODOLOGY

General methodological aspects of the subject

La asignatura es de orientación eminentemente práctica y aplicada.

Los alumnos antes de clase deberán haber preparado los contenidos a ver.

En la clase presencial se reforzarán los contenidos teóricos y conceptos principales, para pasar enseguida a casos sencillos de aplicación.



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Habr  cinco sesiones pr cticas desdobladas en las que se realizaran casos pr cticos para aplicar lo visto y profundizar m s en los conceptos, adem s de algunas otras practicas para realizar en casa.

El trabajo de aplicaci n pr ctica tratar  de aplicar las t cnicas de machine learning a datos reales aplicados a un problema preferentemente de caracter empresarial o econ mico

Uso de ChatGPT o similares herramientas de IA generativa. Es bienvenido para depurar y corregir c digo (debugging), ayuda con c digo, resoluci n de dudas, etc. Se fomentar  su empleo como "copiloto", pero el alumno siempre tiene que ser capaz de supervisar, entender y poder explicar todo lo realizado. Siempre el uso ser  bajo la responsabilidad del alumno, puesto que el contenido generado por ChatGPT o modelos similares no tiene porque ser veraz.

Su uso queda expresamente prohibido en las actividades de evaluaci n presenciales individuales (ex menes, defensa oral del trabajo)

In-class Methodology: Activities

Presentation of key theoretical concepts

Completion of simple application examples

Sharing and correction of cases and problems completed by students

Assessment activities

Non-Presential Methodology: Activities

Personal study

Completion of case studies and practical application assignments, using data and programming

SUMMARY STUDENT WORKING HOURS

Contact Hours:

- Lectures: 30 hours
- Problem-solving sessions: 30 hours

Independent Work:

- Exercises and case studies: 30 hours
- Study and organized reading: 30 hours
- Written assignments/projects: 30 hours



EVALUATION AND CRITERIA

- Final Exam (theory + practical): 35%
- Midterm Exam: 10%
- Periodic Practical Cases: 10%
- Practical Project: 35% [Proposal (10.5%), Written Report (7%), Oral Defense (17.5%)]

Ratings

To pass: minimum 5/10 in Final Exam and Practical Project (with mandatory oral defense).

The practical application project must be completed and **MUST BE PASSED WITH A MINIMUM GRADE OF 5/10** in order to pass the course, both in the regular and resit sessions, with the **oral defense being MANDATORY**. In a course of an applied nature, it is essential to demonstrate the ability to apply theoretical concepts to real data using appropriate analytical techniques and the necessary programming skills.

The project accounts for **35% of the final grade**, distributed as follows: **10.5% proposal, 7% written deliverable, and 17.5% oral defense**.

In the third and subsequent sessions, it is recommended to redo the project, although this is not mandatory. The final grade in such cases will be the best of the following two options:

- a) 70% exam and 30% project, or
- b) 100% exam.

Incoming exchange students (IN): subject to the same requirements as regular students.

Outgoing exchange students (OUT): same requirements as those for third and subsequent sessions.

Use of generative AI

The use of ChatGPT or other generative AI tools is welcomed in this course as a *copilot* for generating examples, answering questions, improving and organizing writing, and assisting with coding or debugging, among other tasks. Its use is always under the student's responsibility, as ChatGPT or any other generative AI tool may provide inaccurate results.

The use of generative AI will be valued in the practical project when it involves proposing and applying methods not covered in class (including variations of methods studied in class), provided that the student can explain and demonstrate understanding during the oral defense of the project.

Its use is **strictly prohibited** in individual in-person assessments (final exam, tests, presentations, and oral defense of the project).

WORK PLAN AND SCHEDULE

Activities	Date of realization	Delivery date
final project proposal		mid-semester



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Final project submission		on the date of the final exam
Midterm		mid-semester

BIBLIOGRAPHY AND RESOURCES

Basic Bibliography

Garrido E. et al (2023). An introduction to Machine Learning for Undergraduate Business Students with 101 Answered Questions. EV Services

Moodle materials

Complementary Bibliography

Provost, F., & Fawcett, T. (2013). *Data Science for Business: What you need to know about data mining and data-analytic thinking*. O'Reilly Media, Inc.

James, Gareth, et al. *An introduction to statistical learning*. Vol. 112. New York: springer, 2013.

Youtube channel dot.csv

<https://www.youtube.com/channel/UCy5znSnfMsDwaLIROnZ7Qbg>

Cátedra Santa Lucía de "Analytics for education" channel

<https://www.youtube.com/@catedraAfE>