COMILLAS
UNIVERSIDAD PONTIFICIA
ICAI ICADE CIHS

Syllabus
2025 - 2026

FICHA TÉCNICA DE LA ASIGNATURA

Datos de la asignatura

Subject name	Machine Learning and Artificial Intelligence with Python
Subject code	DTC-SAP-333
Credits	6,0 ECTS
Type	Optativa
Department	Department of Telematics and Computer Sciencies

Datos del profesorado

Teacher

Name	Álvaro Rubio García
Department	Department of Telematics and Computer Sciencies
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DATOS ESPECÍFICOS DE LA ASIGNATURA

Contextualización de la asignatura

Aportación al perfil profesional de la titulación

This introductory course provides students with a hands-on foundation in artificial intelligence (AI) and machine learning (ML), offering a practical, beginner-friendly path to understanding and creating their first AI models. Students will explore essential AI and ML concepts, develop skills in Python programming for AI, and gain experience in popular AI domains such as Natural Language Processing (NLP) and Computer Vision.

Prerrequisitos

Python programming.

Competencias - Objetivos

BLOQUES TEMÁTICOS Y CONTENIDOS

Contenidos – Bloques Temáticos

Course contents

Theory:

- Module 1: Introduction to Artificial Intelligence
- Module 2: Machine Learning Basics
- Module 3: Supervised Learning Algorithms: classification
- Module 4: Supervised Learning Algorithms: regression

- Module 5: Unsupervised Learning Algorithms: clustering
- Module 6: Unsupervised Learning Algorithms: dimensionality reduction
- Module 7: Introduction to Neural Networks and Deep Learning
- Module 8: Natural Language Processing (NLP)
- Module 9: Computer Vision
- Module 10: Ethics and Social Implications of AI, and Explainable AI (XAI)
- Module 11: Final Project and Presentations

Laboratory:

- Lab 1: Setting up Python environment for AI. Using Python for AI.
- Lab 2: Supervised learning algorithms: K-nearest neighbours and linear regression
- Lab 3: Supervised learning algorithms: Logistic regression, regularisation and validation
- Lab 4: Supervised learning algorithms: Decision trees and ensemble methods
- Lab 5: Supervised learning algorithms: Naive Bayes
- Lab 6: Data preprocessing and implementation of ML: Practice and quiz
- Lab 7: Unsupervised learning algorithms: Clustering (k-means, hierarchical, ...)
- Lab 8: Unsupervised learning algorithms: PCA for dimensionality reduction.
- Lab 9: Neural networks and deep learning: MLP
- Lab 10: Natural Language Processing: Text preprocessing.
- Lab 11: Computer Vision: Image preprocessing.
- Lab 12: Final project implementation: Guidance on integrating AI techniques into a final project for presentations.

METODOLOGÍA DOCENTE

Aspectos metodológicos generales de la asignatura

EVALUACIÓN Y CRITERIOS DE CALIFICACIÓN

- Final exam 35%
- Project 15%
- Midterm 20%
- Lab 20%
- Class participation 10%

The use of AI to create entire works or relevant parts, without citing the source or the tool, or without explicit permission in the assignment description, will be considered plagiarism and will be regulated in accordance with the University General Regulations.

For this course, students may use AI tools to assist with idea generation, drafting, feedback, and refinement of their works. However, students are expected to critically evaluate and edit AI-generated content to demonstrate their own understanding *(this corresponds to Level 3 – AI Collaboration on the AI Assessment Scale (AIAS))*.

Calificaciones

The following conditions must be met to pass the course:

- A minimum overall grade of at least 5 out of 10.
- A minimum grade in the ordinary and/or extraordinary final exam of 4 out of 10.

The overall grade is obtained as follows:

- Final exam 35%
- Project 15%
- Midterm 20%
- Lab 20%
- Class participation 10%

BIBLIOGRAFÍA Y RECURSOS

Bibliografía Básica

Introduction to Machine Learning with Python: A Guide for Data Scientists. Andreas C. Mueller & Sarah Guido. O`Reilly.

Materials and codes provided by the instructor.