DTC-SAP-333 Machine Learning & Artificial Intelligence with Python

SEMESTER: Spring

CREDITS: 6 ECTS (lecture 3 credits + laboratory 3 credits)

LANGUAGE: English

DEGREES: SAPIENS program

Course overview

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.

Prerequisites

- Python programming.
- Basic statistics.

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
- 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 neighbors and logistic regression
- Lab 3: Supervised learning algorithms: Decision trees and ensemble methods
- Lab 4: Feature selection
- Lab 5: Data preprocessing and implementing linear regression.
- Lab 6: Unsupervised learning algorithms: clustering (k-means, hierarchical, …)
- Lab 7: Unsupervised learning algorithms: PCA for dimensionality reduction.
- Lab 8: Neural networks and deep learning.
- Lab 9: Natural Language Processing: Text preprocessing.
- Lab 10: Computer Vision: Image preprocessing.
- Lab 11: Ethics in AI: Detecting bias in datasets and evaluating model fairness.
- Lab 12: Final project implementation: Guidance on integrating AI techniques into a final project for presentations.
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Textbook

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

Grading

The following conditions must be accomplished to pass the course:

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

The overall grade is obtained as follows:

- Final exam (50%)
- Midterms (20%)
- Final project (10%)
- Labs (10%)
- Class participation (10%)