NATIONAL UNIVERSITY OF SAN MARCOS

FACULTY OF MATHEMATICAL SCIENCES

SYLLABUS

1. GENERAL INFORMATION

1.1 Course name	:	Introduction to Machine Learning
1.2 Code	:	AI263
1.3 Academic Program	:	Scientific Computing
1.4 Credits	:	4
1.5 Prerrequisites	:	CS261. Artificial Intelligence. (7^{th} Sem)
1.6 Type of Course	:	Mandatory
1.7 Area of Studies	:	Estudios Generales
1.8 Number of Weeks	:	16
1.9 Hours per week	:	2 HT; 4 HP;
1.10 Cycle	:	I
1.11 Learning modality	:	Face to face
1.12 Academic Period	:	2026-I
1.13 Semester Start Date	:	
1.14 Semester End Date	:	

2. PROFESSORS

Meetings after coordination with the professor

3. INTRODUCTION TO THE COURSE

This course introduces the fundamentals of machine learning, covering classical and modern algorithms for classification, regression, and clustering problems. It focuses on practical implementation using scikit-learn and TensorFlow, with applications in computer vision and natural language processing.

4. GOALS

- Understand the mathematical principles behind ML algorithms.
- Implement complete ML pipelines with Python.
- Evaluate and optimize models using standard metrics.

5. COMPETENCES

ABET-1) An ability to identify, formulate, and solve broadly defined technical or scientific problems by applying knowledge of mathematics and science and/or technical topics to areas relevant to the discipline. (Usage)

ABET-2) An ability to formulate or design a system, process, procedure, or program for the intended purpose. (Usage)

6. TOPICS

Unit 1: ML Fundamentals (15 hours)	
Competences Expected: ABET-1,ABET-2	
Topics	**Learning Outcomes**
• Supervised vs unsupervised learning • Overfitting and regularization • Cross-validation and learning curves	• Explain the bias-variance tradeoff [Familiarizarse] • Implement k-fold cross-validation [Usar]
Readings : [**Bishop2006**], [**Goodfellow2016**]	

Unit 2: Linear Models (15 hours)	
Competences Expected: ABET-1,ABET-2	
Topics	**Learning Outcomes**
• Linear and logistic regression • Support Vector Machines (SVM) • Linear discriminant analysis	• Program linear models with scikit-learn [Usar] • Interpret regression coefficients [Evaluar]
Readings : [**Hastie2009**], [**Murphy2012**]	

Unit 3: Ensembles and Trees (15 hours)	
Competences Expected: ABET-1,ABET-2	
Topics	**Learning Outcomes**
• Decision trees and random forests • Gradient Boosting (XGBoost, LightGBM) • Stacking and voting	• Optimize hyperparameters with GridSearch [Usar] • Visualize decision trees [Evaluar]
Readings : [**Hastie2009**], [**Geron2022**]	

Unit 4: Basic Neural Networks (15 hours)	
Competences Expected: ABET-1,ABET-2	
Topics	**Learning Outcomes**
• Multilayer perceptrons (MLP) • Backpropagation and optimizers • Introduction to Keras/TensorFlow	• Build simple neural networks [Usar] • Monitor training with TensorBoard [Evaluar]
Readings : [**Goodfellow2016**], [**Chollet2021**]	

7. WORKPLAN

7.1 Methodology

Individual and team participation is encouraged to present their ideas, motivating them with additional points in the different stages of the course evaluation.

7.2 Theory Sessions

The theory sessions are held in master classes with activities including active learning and roleplay to allow students to internalize the concepts.

7.3 Practical Sessions

The practical sessions are held in class where a series of exercises and/or practical concepts are developed through problem solving, problem solving, specific exercises and/or in application contexts.

8. EVALUATION SYSTEM

********* EVALUATION MISSING ********

9. BASIC BIBLIOGRAPHY