



National University of Engineering (UNI)
School of Artificial Intelligence
Syllabus 2027-I

1. COURSE

AI263. Introduction to Machine Learning (Mandatory)

2. GENERAL INFORMATION

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|-----------------------------------|---|--|
| 2.1 Course | : | AI263. Introduction to Machine Learning |
| 2.2 Semester | : | 6 th Semester. |
| 2.3 Credits | : | 4 |
| 2.4 Hours | : | 2 HT; 4 HP; |
| 2.5 Duration of the period | : | 16 weeks |
| 2.6 Type of course | : | Mandatory |
| 2.7 Learning modality | : | Face to face |
| | | <ul style="list-style-type: none"> • STA251. Probability Calculation. (3rd Sem) |
| 2.8 Prerequisites | : | <ul style="list-style-type: none"> • AI161. Applied AI. (3rd Sem) • CS210. Algorithms and Data Structures. (4th Sem) |

3. PROFESSORS

Meetings after coordination with the professor

4. 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.

5. GOALS

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

6. COMPETENCES

AG-C08) Problem Analysis: Identifies, formulates, and analyzes complex computing problems. (Usage)

AG-C09) Design and Development of Solutions: Designs, implements, and evaluates solutions for complex computing problems. (Usage)

7. TOPICS

Unit 1: ML Fundamentals (15 hours)	
Competences Expected: AG-C08,AG-C09	
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: AG-C08,AG-C09	
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: AG-C08,AG-C09	
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: AG-C08,AG-C09	
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]	

8. WORKPLAN

8.1 Methodology

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

8.2 Theory Sessions

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

8.3 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.

9. EVALUATION SYSTEM

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

10. BASIC BIBLIOGRAPHY