Course Name : Machine Learning

Course Code	Course Type	Regular Semester	Lecture (hours/week)	Seminar (hours/week)	Lab. (hours/week)	Credits	ECTS
CMP 501	B	Fall	3.00	1.00	0.00	3.50	6.00

Lecturer	Denard Veshi, Prof. Asoc. Dr.
Assistant	Olsi Shehu, MSc
Course language	Albanian
Course level	Master
Description	The “Machine Learning” course introduces the fundamental principles and main techniques of learning from data. It covers both supervised and unsupervised algorithms and their practical applications in classification, regression, clustering, and dimensionality reduction.
Objectives	To understand the mathematical and statistical foundations of Machine Learning. To apply supervised and unsupervised algorithms to real-world problems. To evaluate model performance and understand overfitting/underfitting. To use modern tools and libraries such as Scikit-learn, TensorFlow, Keras.
Core Concepts	Linear and logistic regression Classification with KNN, SVM, Naive Bayes Clustering with K-Means and PCA Basic neural networks and the concept of Deep Learning Model evaluation (cross-validation, confusion matrix) Overfitting, underfitting, and regularization

Course Outline

Week	Topic
1	Introduction to Machine Learning and Applications
2	Statistical and Probabilistic Foundations
3	Linear and Logistic Regression
4	Classification with KNN and Naive Bayes
5	SVM and Separating Hyperplanes
6	Decision Trees and Random Forests
7	Model Performance Evaluation
8	Midterm Exam
9	Clustering Algorithms: K-Means, DBSCAN
10	Dimensionality Reduction: PCA and t-SNE
11	Neural Networks and Backpropagation
12	Overfitting, Underfitting, and Regularization
13	ML with Scikit-learn and Keras
14	Practical Applications and Case Studies
15	Project Presentations
16	Final Exam

Prerequisites	The student must attend the course at a minimum rate of 75%.
Literature	• Kevin P. Murphy – Machine Learning: A Probabilistic Perspective, MIT Press, 2012.
References	• Christopher Bishop – Pattern Recognition and Machine Learning, Springer, 2006. • Aurélien Géron – Hands-On Machine Learning with Scikit-Learn, Keras & TensorFlow, 3rd Edition, O'Reilly, 2022. • Trevor Hastie, Robert Tibshirani, Jerome Friedman – The Elements of Statistical Learning, Springer, 2017.

Course Outcome

1	Students will understand and apply commonly used Machine Learning algorithms.
2	They will be able to analyze data and build predictive models.
3	They will evaluate and improve model performance through advanced techniques.
4	They will use powerful libraries to implement practical solutions in Python.

Course Evaluation

In-term Studies	Quantity	Percentage
Midterms	0	0
Quizzes	0	0
Projects	1	25
Term Projects	0	0
Laboratory	0	0
Class Participation	1	10
Total in-term evaluation percent		**35**
Final exam percent		**65**
Total		**100**

ECTS Workload (Based on Student Workload)

Activities	Quantity	Duration (hours)	Total (hours)
Course duration (Including the exam week: 16x Total hours of the course)	16	4	64
Study hours outside the classroom (Preparation, Practice, etc.)	14	5	70
Duties	1	10	10
Midterms	0	0	0
Final Exam	1	6	6
Other	0	0	0
Total Work Load			**150**
Total Work Load / 25 (hours)			**6.00**
ECTS			**6.00**