Content

Course Code	Course Name	Semester	Theory	Practice	Lab	Credit	ECTS
VM 532	Machine Learning	2	4	0	0	3	8

Prerequisites	
Admission Requirements	

Language of Instruction	English
Course Type	Compulsory
Course Level	Masters Degree
Objective	The objective of this course is to provide students with a solid foundation in machine learning and deep learning. By covering both theoretical concepts and practical applications, students will learn to design, implement, and evaluate various machine learning models for solving real-world problems.
Content	Course content includes an introduction to machine learning, mathematical foundations, the deep relationship between optimization and machine learning, problems encountered in optimization and their solutions, training processes of different models, frequently encountered problems and their solutions, and practical project work.
References	https://udlbook.github.io/udlbook/ https://www.amazon.com/Hundred-Page-Machine-Learning-Book/dp/199957950X https://www.di.ens.fr/appstat/spring-2023/

Theory Topics

Week	Weekly Contents
1	Overview of machine learning, types of learning, and applications.
2	Minimal reusable ML data pipeline and data leakage
3	Optimization foundations
4	Training = minimizing a loss
5	Gradient descent for univariate functions
6	Gradient descent for multivariate functions
7	Saddle point problem and higher order methods
8	Regularization
9	Model Toolbox I : Regression, forecasting and binary classification
10	Model Toolbox II : Multiclass classification, decision trees and random forests
11	Model Toolbox III : Gradient boosting with trees, XGBoost, LightGBM and Clustering / Segmentation