Software Engineering Institute			Semester 1 of the curriculum 2026-27-1			
Name of the subject:	Code of the subject:	Credits:	Weekly hours:			
				lec	sem	lab
Introduction to machine learning	NSXIMLEMNF	5	full-time	1	1	2
Responsible person for the subject: Dr. Adrienn Dineva			Classification: associate professor			
Subject lecturer(s): Póra Krisztián						
Prerequisites:	NSXPPDEMNF	Programming paradigms and data structures				
Way of the assessment:	Exam					

Course description	
Goal:	The aim of the course is to enable students to transform domain-specific practical problems into machine learning tasks and to critically evaluate the properties of various machine learning algorithms. Students will also learn to select and apply the appropriate methods for a given learning objective. In addition, they will gain knowledge of a wide range of data preprocessing techniques and will be prepared to evaluate machine learning methods in terms of their applicability.
Course description:	Principles of machine learning. Data preprocessing techniques. Unsupervised learning: clustering methods. Supervised learning for predicting nominal class labels: classification. Supervised learning for predicting continuous output variables: regression. Model selection. Feature selection. Fundamental techniques (1R, Naïve Bayes, covering algorithms), Bayesian networks, k-NN, inductive learning and decision trees, support vector machines, Random Forests, ensemble learning models. Reinforcement learning. Evaluation of model performance. Quality and error measures, cross-validation. Bias–variance trade-off. AutoML. Following the theoretical material, students examine and compare various machine learning algorithms on diverse datasets during practical and laboratory sessions, through individual and group project assignments, primarily using Python packages.

Lecture schedule	
Education week	Topic
1.	Introduction: Overview of the principles of machine learning and data preprocessing techniques.
2.	Unsupervised learning: Clustering methods.
3.	Supervised learning for predicting nominal class labels: Classification.
4.	Supervised learning for predicting continuous output variables: Regression.
5.	Fundamental techniques: 1R, Naïve Bayes, covering algorithms.
6.	Fundamental techniques: Bayesian networks, k-NN.
7.	Fundamental techniques: Inductive learning and decision trees.
8.	Supervised learning – modern classification methods: Overview of modern classification problems and challenges. Machine learning-based classification: Support Vector Machines (SVM), Random Forests.
9.	Supervised learning – modern regression methods: Modern regression models: XGBoost, LightGBM. Application of machine learning to regression: Gradient Boosting and ensemble models.

10.	Model tuning and feature selection: Grid Search, Random Search (detailed hyperparameter optimization), Feature Importance, Wrapper Methods.
11.	Model performance evaluation: Confusion matrix, ROC-AUC analysis, quality and error measures, cross-validation, complex evaluation metrics, bias–variance trade-off.
12.	Introduction to AutoML: Using automated machine learning tools. Introduction to Neural Networks.
13.	Reinforcement learning.
14.	Group assignments: Submission and presentation.

Mid-term requirements

Conditions for obtaining a mid-term grade/signature	Complete 7 out of 10 weekly quizzes (answering correctly at least 2 out of 3 questions). Complete the group project with a minimum score of 70%.

Assessment schedule

Education week	Topic
13	Submission and Presentation of Group Assignments (project work).
14	Late Submission and Presentation of Group Assignments (project work)

Method used to calculate the *mid-term grade* (to be filled out only for subjects with mid-term grades)

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Type of the replacement

Type of the replacement of written test/mid-term grade/signature	There is one opportunity to the replacement of the missing signature during the first week of the examination period by submitting and presenting the Group Assignment and/or writing a test.

Type of the exam (to be filled out only for subjects with exams)

After the assessment eligibility criteria is met, an exam for 100% of the course grade is scheduled for the exam period covering materials from the whole course.

Calculation of the exam mark (to be filled only for subjects with exams)

The final grade will be determined based on the score achieved on the written exam taken during the examination period.

Final grade calculation methods:

The final grade will be calculated using the following scale:

Achieved result	Grade
88% - 100%	excellent (5)
76%- 87%	good (4)
66% -75%	satisfactory (3)
51% - 65%	pass (2)
0 - 50 %	failed (1)

References

Obligatory:	Online teaching materials available on the elearning.uni-obuda.hu educational portal.

Recommended:	• Hastie, Trevor, Robert Tibshirani, J. H. Friedman, The Elements of Statistical Learning: Data Mining, Inference, and Prediction, 2nd ed. New York: Springer, 2009 • Mitchell, T.M., Machine Learning, McGraw-Hill, New York, 1997 • Christopher M. Bishop, Pattern Recognition and Machine Learning (Information Science and Statistics), Springer-Verlag, Berlin, Heidelberg, 2006 • Aurelien Geron, Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow: Concepts, Tools, and Techniques to Build Intelligent Systems (2nd. ed.), O'Reilly Media, Inc., 2019
Other references:	