Study programme(s): Computer Science	
Level: Masters Academic Studies	
Course title: Machine Learning	
Lecturer: Miloš M. Radovanović	
Status: elective	
ECTS: 8	
Requirements: Continuous Probability and Statistics	

Learning objectives

Enabling students to master the principles and functioning of machine-learning (ML) techniques, as well as their implementation and application to real-world problems.

Learning outcomes

Minimum: At the end of the course it is expected from a successful student to demonstrate basic understanding of the principles of machine learning, and capability to apply ML techniques on an illustrative example.

Desirable: At the end of the course it is expected from a successful student to demonstrate thorough understanding of the principles of machine learning through critical analysis, selection, implementation, and application of ML techniques to real-world problems.

Syllabus

Theoretical instruction

Notions of machine learning (ML) and data mining. Intelligent agents, the action-perception cycle, applications. Supervised, semi-supervised and unsupervised learning. Classification: techniques, performance measures, overfitting. Computational learning theory. Dimensionality reduction, feature selection. Clustering: techniques, performance measures. Reinforcement learning. Numeric prediction, regression, neural networks. Association learning. Data transformation and preparation. Applications of machine learning techniques.

Practical instruction

Application of machine-learning techniques on illustrative examples. Implementation of solutions of more complex ML problems in an appropriate programming language, aided by external libraries and resources.

Literature

Recomended

1. I. H. Witten, E. Frank, M. A. Hall, C. Pal. Data Mining: Practical Machine Learning Tools and Techniques. 4th Edition, Morgan Kaufmann, 2016

2. Y. S. Abu-Mostafa, M. Magdon-Ismail, H.-T. Lin. Learning from Data: A Short Course. AMLBook, 2012

Weekly teaching load

Lectures: 2	Exercises: 1	Practical Exercises: 2	Student research: 0	Other: 0

Teaching methodology

Lectures are held using classical methods involving a projector. Principles and functioning of machine-learning techniques are explained. During exercises, classical teaching methods are used to practice the principles and functioning of ML techniques through illustrative examples. Implementations of ML techniques are presented and tested on the computer. Students' knowledge is checked through solution of practical problems (individual and homework) and written tests (elective). At the oral exam the student demonstrates understanding of ML principles and techniques, and methodologies for their application to pratical problems.

Grading method (maximal number of points 100)

Pre-exam oblications	points	Final exam	points
practical exercises – individual problems	20	oral examination (obligatory)	20-40
practical exercises – homework problems	40	tests (elective)	0-20