Course Unit Descriptor

Study Programme: Computer Science – Master

Course Unit Title: Machine Learning

Course Unit Code: CS714

Name of Lecturer(s): Miloš Radovanović

Type and Level of Studies: Master Academic Degree

Course Status (compulsory/elective): Elective

Semester (winter/summer): Summer

Language of instruction: Serbian (primary), English (secondary)

Mode of course unit delivery (face-to-face/distance learning): Face-to-face

Number of ECTS Allocated: 8

Prerequisites: Continuous Probability and Statistics

Course Aims: 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:

Theory

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.

Practice

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.

Required Reading:

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 Contact Hours: 5	**Lectures:** 2	**Practical work:** 3

Teaching Methods:

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 and written tests (elective). The student

demonstrates understanding of ML principles and techniques, and methodologies for their application to pratical problems by writing and presenting a seminar paper.			
Knowledge Assessment (maximum of 100 points):			
Pre-exam obligations	points	**Final exam**	points
Practical exercises – individual problems	30	Seminar paper	50
Tests	20		
The methods of knowledge assessment may differ; the table presents only some of the options: written exam, oral exam, project presentation, seminars, etc.			