

Study program: Artificial intelligence			
Name of the subject: Pattern Recognition and Machine Learning			
Teacher(s): Marko Panić, Oskar Marko			
Status of the subject: obligatory			
Number of ECTS credits: 6			
Conditions: none			
Subject goal			
<ul style="list-style-type: none"> - Understanding of a wide range of pattern recognition/machine learning methods - Understanding of advantages/disadvantages of the taught methods - Ability to select appropriate methods for the problem at hand - Ability to implement the taught methods in Python - 			
Outcome of the subject			
<ul style="list-style-type: none"> - Ability and experience in applying the taught methods on real-world problems - Ability to apply the taught methods on research problems from a wide variety of application areas 			
Subject content			
<i>Theory</i>			
Statistical Pattern Recognition: Bayesian Decision Theory, Quadratic Classifiers, Parameter and Density Estimation, Nearest Neighbors; Neural network approaches: Linear Discriminants, Multilayer Perceptrons, Radial Basis Functions, Validation; Clustering: Mixture models and EM algorithm, Statistical Clustering, Self-Organizing Maps; Dimensionality Reduction: Principal Components Analysis, Fisher's Discriminants Analysis, Feature Subset Selection; Advanced topics: Support Vector Machines, Hidden Markov Models, Ensemble Learning, Evolutionary algorithms, multi-objective optimisation, portfolio optimisation, reinforcement learning and transfer learning.			
<i>Practical learning</i>			
Application examples in electric grid (smart grid), computer vision, medical imaging, speech recognition, agriculture, etc.; Implementation of the taught methods in Python ; Application of selected methods on real-world examples through the course project.			
Literature			
Main textbook: C. Bishop: Pattern recognition and machine learning, Springer, 2006			
Textbook (additional) R. Sutton, Reinforcement Learning: An Introduction (Adaptive Computation and Machine Learning Series), MIT Press (1998) T. Hastie, R. Tibshirani and J. Friedman: Elements of Statistical Learning. Springer, 2009 R.O. Duda, P.E. Hart and D.G. Stork: Pattern Classification, Wiley, 2000. S. Theodoridis, K. Koutroumbas: Pattern Recognition, Academic Press, 2008.			
Number of active teaching classes	Theoretical teaching: 3	Practical teaching: 2	
Method of carrying out the teaching			
Lectures; revisions of the material; active students' participation in problem solving; knowledge tests – colloquia; application of the taught material on real-world examples.			
Evaluation of knowledge (maximum number of points 100)			
Pre-exam obligations	points	Final exam	points
Colloquia	30	Written exam	40
Course project	30		