

Incoming student mobility

Name of UNIOS University Unit: DEPARTMENT OF MATHEMATICS

COURSES OFFERED IN FOREIGN LANGUAGE FOR ERASMUS+ INDIVIDUAL INCOMING STUDENTS

Department or Chair within the UNIOS Unit	Department of Mathematics
Study program	<ul style="list-style-type: none"> • <i>Undergraduate university study programme in Mathematics and Computer Science</i> • <i>Undergraduate university study programme in Mathematics</i>
Study level	Undergraduate (Bachelor)
Course title	Machine Learning
Course code	M096
Language of instruction	English
Brief course description	<p>Syllabus.</p> <p>Supervised Learning:</p> <ol style="list-style-type: none"> 1. Introduction to the theory of machine learning. 2. Techniques of nonparametric learning. <i>K-nearest</i> neighbour method. Decision tree. 3. Bayesian learning. Bayesian naive and optimal classifier. 4. Neural network: representation and learning. 5. Regression and classification. Linear regression. Locally weighted linear regression. Logistical regression and classification. Regularization. 6. Support Vector Machine (SVM): Hyperplane separation. Optimal marginal classification. Dual problem. Kernel method. Sequential minimal optimization. 7. Theory of statistical learning. Vapnik-Chervonenkis dimension. <p>Unsupervised Learning:</p> <ol style="list-style-type: none"> 1. Introduction and motivation. Definitions. Different examples of applications Representative of the finite set from \mathbb{R} in least squares (LS) sense and in least absolute deviations (LAD) sense. Representative of the finite set from \mathbb{R}^2. Distance-like function in \mathbb{R}^2. Centroid, median and geometrics median in plane. Representative of the finite set from \mathbb{R}^n: centroid, median, geometrics median.

	<p>Applications of Mahalanobis distance-like function. Representative of the data on unit circle.</p> <ol style="list-style-type: none"> 2. Data clustering methods. K-means algorithm. EM (Expectation Maximization) algorithm. K-medoid method. Agglomerative clustering 3. Dimension reduction. Principal Component Analysis. 4. Appropriate number of clusters in a partition: Indexes. 5. Spectral clustering methods and theory of graphs. 6. Probabilistic and statistical aspects of data clustering
Form of teaching	Consultative teaching.
Form of assessment	<p>Lectures and exercises are illustrated by ready-made software packages. Exercises are partially auditory and partially laboratory, with the use of computers. Lectures, exercises and seminars are obligatory. Final exam consists of a written and oral part, and it is taken after the completion of lectures. Acceptable results achieved in mid-term exams throughout the semester replace the written part of the exam. Students may influence their final grade by doing homework or writing a seminar paper during the semester. Homework expands course contents, and students are expected to be independent and creative. Seminar papers are understood as an extension of homework.</p>
Number of ECTS	7
Class hours per week	3+2+0
Minimum number of students	
Period of realization	Summer semester
Lecturer	Kristian Sabo Domagoj Matijević