



COURSE DESCRIPTION CARD - SYLLABUS

Course name

Selected topics in machine learning [N2AiR1-RiSA>WZUM]

Course

Field of study	Year/Semester
Automatic Control and Robotics	1/1
Area of study (specialization)	Profile of study
Autonomous Robots and Systems	general academic
Level of study	Course offered in
second-cycle	polish
Form of study	Requirements
part-time	compulsory

Number of hours

Lecture	Laboratory classes	Other (e.g. online)
20	20	0
Tutorials	Projects/seminars	
0	0	

Number of credit points

4,00

Coordinators

dr inż. Marek Kraft
marek.kraft@put.poznan.pl

Lecturers

Prerequisites

Knowledge: A student beginning this subject should have basic knowledge of mathematics - including, mainly, matrix calculation, knowledge of elements of mathematical logic, basics of mathematical analysis and probabilistics. Skills: He or she should have the ability to operate a PC and implement simple algorithms and programming tasks. Additionally, the ability to obtain information from indicated sources is essential.

Course objective

The aim of this course is to learn the theoretical basis and characteristics of selected machine learning algorithms and related issues. After completing the training, the student should be able to select an algorithm or a set of algorithms that make up a complete machine learning system and implement and test such a system on their own.

Course-related learning outcomes

Knowledge

Knows and understands in enhanced level the selected areas of mathematics. has broad and in-depth knowledge necessary to formulate and solve complex tasks in the field of control theory, optimization,

modeling, identification and signal processing (K2_W1 [P7S_WG])

Skills

The graduate is able to determine models of systems and processes, as well as to use them for the analysis and design of automation and robotics systems (K2_U10 [P7S_UW])

Social competences

The graduate is aware of the need for a professional approach to technical issues, meticulous familiarization with the documentation and environmental conditions in which the equipment and its components can operate (K2_K4 [P7S_KR])

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

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Lecture - final credit test carried out on Moodle platform.

Laboratories - credit project and final practical programming test.

Programme content

Lecture:

Definition of machine learning and differences between machine learning and traditional programming.

Supervised, unsupervised machine learning, reinforcement learning.

Evaluation of machine learning methods - measurements and metrics.

The role of features in machine learning.

Presentation of machine learning algorithms, their operating principles and characteristics: Bayesian classifier, decision trees, random forest, carrier vector machines, clustering, neural networks. Classifier ensembles - boosting and bagging.

Reinforcement learning- algorithms and applications.

Sample applications: time series analysis, tabular data analysis, predictive analysis.

Laboratories:

Familiarization with scikit-learn and TensorFlow libraries. Implementation of selected algorithms with the use of the library, performance evaluation and graphical presentation of the output of algorithms in practical applications.

Teaching methods

Lectures with multimedia presentations, additionally uploaded to a streaming service to be played later.

Laboratory classes covering the implementation and testing of selected algorithms for image and video processing using Python language and solving selected practical problems.

Bibliography

Basic

1. Sebastian Raschka, Vahid Mirjalili, Python. Uczenie maszynowe. Helion, 2019

2. Supplementary course materials posted on Moodle

Additional

Selected scientific papers related to the course.

Breakdown of average student's workload

	Hours	ECTS
Total workload	100	4,00
Classes requiring direct contact with the teacher	40	1,50
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	60	2,50