COURSE DESCRIPTION CARD - SYLLABUS

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

Course

Field of study
Automatic Control and Robotics

Year/Semester
1/1

Area of study (specialization)
Autonomous Robots and Systems

Profile of study
general academic

Level of study
second-cycle

Course offered in
Polish

Form of study
part-time

Requirements
compulsory

Number of hours

Lecture
20

Laboratory classes
20

Other
0

Tutorials
0

Projects/seminars
0

Number of credit points

4,00

Coordinators

dr inż. Marek Kraft
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Lecturers

Prerequisites

Knowledge: A student beginning this subject should have basic knowledge of mathematics - including, mainly, matrix calculus, knowledge of elements of mathematical logic, basics of mathematical analysis and probability theory. 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:

Learning outcomes presented above are verified as follows:
Lecture - final credit test carried out on Moodle plaftorm.
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.
Reinforncement 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.

Course topics

The course topics include a presentation of the basic concepts of machine learning and a basic knowledge of algorithms, metrics and practical applications of machine learning methods.

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