COURSE DESCRIPTION CARD - SYLLABUS

Course name
Machine learning

Course

Field of study
Mathematics in technology

Year/Semester
1/2

Area of study (specialization)
Programming in technology

Profile of study
general academic

Level of study
Second-cycle studies

Course offered in
Polish

Form of study
full-time

Requirements
elective

Number of hours

Lecture	Laboratory classes	Other (e.g. online)
30	15	
Tutorials	Projects/seminars	

Number of credit points

3

Lecturers

Responsible for the course/lecturer:
dr inż. Marek Kraft

Responsible for the course/lecturer:

Prerequisites

Has deepened and theoretically founded knowledge of computer science, including numerical methods; knows at least one software package or a programming language in detail;

Can construct an algorithm for solving a complex engineering task or a simple research problem and implement and test it in a selected programming environment;

Is able to select the appropriate sources of knowledge and obtain the necessary information from them, make a critical analysis and assessment of solutions to complex and unusual engineering tasks or simple research problems and propose their improvement;

Course objective

The objective of the course is to make the students familiar with the methods and algorithms used in machine learning and use the gained knowledge for solving practical tasks.

Course-related learning outcomes

Knowledge

Has deepened and theoretically founded knowledge of computer science, including numerical methods; knows at least one software package or a programming language in detail;

Knows and understands the impact of mathematics on the progress of science.

Skills

Can use mathematical techniques, tools and methods, including numerical or optimization ones, to solve advanced engineering tasks or simple research problems;

Can construct an algorithm for solving a complex engineering task or a simple research problem and implement and test it in a selected programming environment;

Social competences

is aware of the role and importance of knowledge in solving cognitive and practical problems typical of the professions and jobs appropriate for graduates of the studied major; is aware of the need to deepen and expand knowledge;

is ready to think and act in a creative and entrepreneurial way, taking into account safety, work ergonomics and its economic aspects; is aware of the need to inspire and organize actions for the public interest and responsibility for the work of the team and its individual participants; shows readiness to fulfil social obligations resulting from the nature of work typical for graduates of the faculty;

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lecture: final test on the Moodle e-learning platform. Laboratories: final project.

Programme content

Lecture:

Machine learning definition and the differences between machine learning and traditional programming.

Supervised and unsupervised machine learning, reinforcement learning.

Machine learning algorithm performance evaluation - measurements and metrics.

The role of features in machine learning.

Presentation of selected machine learning algorithms - their operating principles and characteristics: bayesian classifier, decision trees, random forests, support vector machines, clustering, neural networks.

Reinforcement learning - algorithms and applications.

Laboratories:

Introduction of the scikit-learn and TensorFlow libraries. Implementation of selected algorithms using the mentioned libraries, performance evaluation and graphical presentation of the results on real-life tasks.

Teaching methods

Multimedia presentations during lectures, subsequently posted for free viewing using a streaming service. Lab exercises using Python noteboks - implementation of selected machine learning for solving real-life tasks.

Bibliography

Basic

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

Additional

Bengio, Yoshua, Ian Goodfellow, and Aaron Courville. Deep learning. Vol. 1. Massachusetts, USA: MIT press, 2017.

Breakdown of average student's workload

	Hours	ECTS
Total workload	90	3,0
Classes requiring direct contact with the teacher	45	1,5
Student's own work (literature studies, preparation for laboratory classes/tutorials, preparation for tests/exam, project preparation) [1]	45	1,5

[1] delete or add other activities as appropriate