



Subject card

Subject name and code	Machine Learning I, PG_00053428						
Field of study	Automation, Robotics and Control Systems						
Date of commencement of studies	February 2023		Academic year of realisation of subject		2023/2024		
Education level	second-cycle studies		Subject group				
Mode of study	Full-time studies		Mode of delivery		at the university		
Year of study	1		Language of instruction		Polish		
Semester of study	2		ECTS credits		3.0		
Learning profile	general academic profile		Assessment form		assessment		
Conducting unit	Faculty of Electrical and Control Engineering						
Name and surname of lecturer (lecturers)	Subject supervisor		dr hab. inż. Michał Grochowski				
	Teachers		dr hab. inż. Michał Grochowski dr inż. Bartosz Puchalski Rafał Buler Jakub Buler				
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	0.0	0.0	15.0	0.0	30
	E-learning hours included: 0.0						
Learning activity and number of study hours	Learning activity	Participation in didactic classes included in study plan		Participation in consultation hours		Self-study	SUM
	Number of study hours	30		10.0		35.0	75
Subject objectives	The aim of the course is to introduce students to a comprehensive knowledge of the dynamically developing field of Machine Learning and to indicate its practical applications in widely understood automation and computer science.						
Learning outcomes	Course outcome		Subject outcome		Method of verification		
	K7_W11		The student in a small team is able to design, prepare and carry out an experiment, and then draw appropriate conclusions. For example, he/she is able to prepare a diagnostic system, which allows to identify damage to a selected system.		[SW3] Assessment of knowledge contained in written work and projects		
	K7_U07		Students will be able to apply known artificial intelligence tools and algorithms to solve research problems e.g. to design a neural classifier.		[SU4] Assessment of ability to use methods and tools		
Subject contents	The programme contents will be realised in three thematic blocks: 1. Data analysis, among others:- exploratory research- data grouping, clustering - feature selection and extraction, - dimension reduction, - data normalization,- multidimensional data visualization. 2. Models and methods of their learning, e.g:- regression models, - Support vector machines, - Neural networks, - recurrent neural networks,- deep neural networks, - learning: supervised, unsupervised, semi-supervised, reinforcement learning- decision trees- random forests- ensembling and gradient boosting methods- automatic machine learning (AutoML)3. Model performance analysis and improvement, including- quality measures of model performance, - regularization techniques,- model validation,- selection of hyperparameters for models,- analysis of algorithm performance using explanatory artificial intelligence (XAI).						

Prerequisites and co-requisites	Basic knowledge of artificial intelligence methods and optimisation		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Kolokwium	50.0%	50.0%
	Ocena projektu	50.0%	50.0%
Recommended reading	Basic literature	<ul style="list-style-type: none">• Bonaccorso, G. Algorytmy uczenia maszynowego. Zaawansowane techniki implementacji. Helion, 2019• Szeliga, M. Data Science i uczenie maszynowe. Wydawnictwo Naukowe PWN, 2017.• Grus, J. Data science od podstaw. Analiza danych w Pythonie. Helion, 2019.• Bengio, Y., Courville A., Goodfellow I. Deep Learning. Systemy uczące się. Wydawnictwo Naukowe PWN, 2018.• Alpaydin, E. Introduction to Machine Learning. The MIT Press Cambridge, Massachusetts London, England 2010.• Chollet, F. Deep Learning. Helion, 2019	
	Supplementary literature	<ul style="list-style-type: none">• Haykin, S. Neural Networks and Learning Machines (3rd Edition), Prentice Hall, 2009.• Bishop C. M. Pattern Recognition and Machine Learning. Springer, 2006.• MATLAB Statistics and Machine Learning Toolbox User's Guide, 2021.• James, Gareth, et al. An introduction to statistical learning. Vol. 112. New York: springer, 2013.• Murphy, Kevin P. Machine learning: a probabilistic perspective. MIT press, 2012.	
	eResources addresses	Adresy na platformie eNauczanie: UCZENIE MASZYNOWE I [2023/24] - Moodle ID: 32199 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=32199	
Example issues/ example questions/ tasks being completed	<ul style="list-style-type: none">• Feature mining and knowledge extraction from large data sets, data normalisation, treatment of missing data, dimension reduction, visualisation of multidimensional data.• Analysis of footballers' characteristics in terms of their suitability for a given team/position.• Detection of anomalies/diagnosis of processes on the basis of multidimensional analysis of signals from measuring devices.		
Work placement	Not applicable		