



Subject card

Subject name and code	Systems with Machine Learning, PG_00064508						
Field of study	Informatics						
Date of commencement of studies	October 2024	Academic year of realisation of subject			2024/2025		
Education level	second-cycle studies	Subject group			Optional subject group Specialty subject group Subject group related to scientific research in the field of study		
Mode of study	Full-time studies	Mode of delivery			at the university		
Year of study	1	Language of instruction			English		
Semester of study	2	ECTS credits			3.0		
Learning profile	general academic profile	Assessment form			exam		
Conducting unit	Department of Computer Architecture -> Faculty of Electronics Telecommunications and Informatics -> Faculties of Gdańsk University of Technology						
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Jan Cychnerski					
	Teachers	dr inż. Jan Cychnerski mgr inż. Konrad Zawora					
Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	0.0	15.0	0.0	0.0	30
	E-learning hours included: 0.0						
	eNauczanie source addresses: Moodle ID: 44477 Systemy z Uceniem Maszynowym 2024/2025 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=44477						
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		9.0		36.0	75
Subject objectives	The main goal of the subject is to present practical methods of solving problems using artificial intelligence techniques: dataset construction, architecture choice, artificial intelligence algorithms training, model selection and testing.						

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[K7_W101] is able to make an in-depth identification of key objects and phenomena related to the field of study, as well as theories that describe them and applicable analytical and design methods	The student is able to use the appropriate methods, in order to assess whether the created artificial intelligence system meets the requirements, in particular whether the system achieves the minimum required quality and performance.	[SW3] Assessment of knowledge contained in written work and projects
	[K7_U12] is able, to an increased extent, to analyze the operation of components and systems related to the field of study, as well as to measure their parameters and study their technical characteristics, and to plan and carry out experiments related to the field of study, including computer simulations, interpret the obtained results and draw conclusions	The student knows the practical limitations and the best ways to apply methods and systems of artificial intelligence. The student understands the reasons of these limitations and their practical effects.	[SU1] Assessment of task fulfilment
	[K7_W04] knows and understands, to an increased extent, the principles, methods and techniques of programming and the principles of computer software development or programming devices or controllers using microprocessors or other elements or programmable devices specific to the field of study, and organization of work of systems using computers or such devices	The student has the advanced knowledge necessary to design systems based on artificial intelligence. The student understands the principles of operation and ways of using commonly used libraries and environments providing self-learning algorithms.	[SW1] Assessment of factual knowledge
	[K7_U04] can apply knowledge of programming methods and techniques as well as select and apply appropriate programming methods and tools in computer software development or programming devices or controllers using microprocessors or programmable elements or systems specific to the field of study, making assessment and critical analysis of the prepared software as well as a synthesis and creative interpretation of information presented with it	The student is able to choose the appropriate libraries, tools and programming environments that implement machine learning algorithms in order to achieve the required goals. He can use them in the correct way to build data analysis systems.	[SU1] Assessment of task fulfilment
Subject contents	<p>Course content – lecture</p> <ol style="list-style-type: none"> 1. General information about practical aspects of training artificial intelligence algorithms 2. Environments, tools and helper libraries in machine learning 3. Preparation of training, validation and test data sets 4. Preprocessing, normalization and augmentation of training data 5. Choosing machine learning methods in the context of problem requirements 6. Methods of performing training of artificial intelligence algorithms 7. Methods of machine learning hyperparameter assignment 8. Methods of testing and measuring effectiveness and performance of artificial intelligence algorithms 9. Identifying and solving typical problems in machine learning 10. Deployment of machine learning algorithms in the target environment <p>Course content – laboratory</p> <ol style="list-style-type: none"> 1. Building training, validation, and test datasets for artificial intelligence methods 2. Analyzing the characteristics of datasets for artificial intelligence methods 3. Implementation of training, testing, and experimental code for artificial intelligence methods 4. Conducting training, validation, and testing of artificial intelligence methods 5. Optimization, analysis of results, design of improvements to artificial intelligence methods 		
Prerequisites and co-requisites	Basic knowledge of artificial intelligence area, basic knowledge of Python programming language		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	laboratory	50.0%	50.0%
	written test	50.0%	50.0%
Recommended reading	Basic literature	<ol style="list-style-type: none"> 1. James, Gareth, et al. An introduction to statistical learning. Vol. 112. New York: springer, 2013. 2. Ian Goodfellow, Yoshua Bengio and Aaron Courville, Deep Learning, http://www.deeplearningbook.org/. 3. Scikit-learn Tutorials, http://scikit-learn.org/stable/tutorial/index.html. 	

	Supplementary literature	1. Andrew Ng, Machine Learning Yearning, http://www.mlyearning.org/ .
	eResources addresses	
Example issues/ example questions/ tasks being completed	Sample issues: - Training and testing datasets preparation for classifier training - Performing training and testing of a neural network or other artificial intelligence algorithm - Description of methods and measures for quality, efficiency and performance of machine learning algorithms	
Practical activities within the subject	Not applicable	

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