GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Systems with Machine Learning, PG_00064480		
Field of study	Informatics		
Date of commencement of studies	February 2027	Academic year of realisation of subject	2026/2027
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	Polish
Semester of study	1	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						

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	6.0	39.0	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

Course content – lecture

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

Course content – laboratory

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	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 activites within the subject

Not applicable

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