GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Artificial Intelligence Methods, PG_00064484						
Field of study	Informatics						
Date of commencement of studies	February 2025		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	Polish			
Semester of study	1		ECTS credits	3.0			
Learning profile	general academic profile		Assessment form	assessment			
Conducting unit	Department of Multimedia Systems -> Faculty of Electronics, Telecommunications and Informatics						
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. inż. Piotr Szczuko					
	Teachers	dr hab. inż. Piotr Szczuko					
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	0.0	30.0	0.0	0.0	45
	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	45		6.0	24.0	75	
Subject objectives	The lecture presents important methods of artificial intelligence, relations between selected theories and methods, explains important features and characteristics, and criteria of choice of the most appropriate methods for the particular tasks. The student will learn what are limitations and chances of the AI methods.						

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K7_W10] knows and understands, to an increased extent, the basic processes occurring in the life cycle of equipment, objects and technical systems, as well as methods of supporting processes and functions, specific to the field of study	Students is able to describe practical applications for artificial intelligence and their development; can use ML for automatic data analysis in a programming language of choice, knows and applies file formats for data and model storage.	[SW1] Assessment of factual knowledge [SW3] Assessment of knowledge contained in written work and projects
[K7_W11] knows and understands, to an increased extent, the general principles of creation and development of forms of individual entrepreneurship and the economic, legal and other conditions of various types of activities related to the awarded qualification, including the principles of protection of industrial property and copyright law	The student is able to discuss the theoretical underpinnings and justify practical consequences application of various models used in the field of artificial intelligence. Can predict the result of an action, comment on the advisability of the choice of method. Interprets the result and describes the relationship between methods.	[SW3] Assessment of knowledge contained in written work and projects [SW1] Assessment of factual knowledge
[K7_U07] can apply advanced methods of process and function support, specific to the field of study	Students will be able to select methods of preprocessing for a given set of data, indicate and apply an appropriate regression or classification model, apply it in practice, evaluate the result of its operation, formulate conclusions and explain obtained results.	[SU1] Assessment of task fulfilment [SU2] Assessment of ability to analyse information [SU3] Assessment of ability to use knowledge gained from the subject [SU4] Assessment of ability to use methods and tools [SU5] Assessment of ability to present the results of task

Subject contents

1. Introduction, data parameterisation, knowledge and decision making. Decision rules
2. Big data processing
3. Models accuracy metrics, choice of models and consequences of model application. Error of the model, its bias and variance. Data variance.
4. Cross validation and error estimation
5. Creating datasets for AI, problems of small and large datasets and feature sets. Feature selection methods, ridge regression and lasso method for feature selection.
6. Statistical tests of chi squared. Linear models and linear classifiers
7. From linear separation towards the decision trees, decision rules.
8. Rough set knowledge modelling, and fuzzy modelling
9. Rough set theory principles. Handing rough rules.
10. Boundary, upper, and lower approximation, approximation accuracy metrics, rule quality metrics. How rough sets relate to human intuition.
11. Fuzzy logic for expressing knowledge. Fuzzyfication and defuzzyfication. Rules and inference.
12. Practical aspects of fuzzy logic. Connection of rough and fuzzy methods.
13. Multivalued logics, explanation and examples. Modeling of values by gaussian mixtures, modelling of processes by hidden models. Practical applications and relations between methods.
14. Lifelong machine learning for AI. Practical problems, incl. forgetting.
15. Summary of presented AI methods, critical analysis, discussion.

Prerequisites and co-requisites

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
Evaluation from laboratory reports	51.0%	90.0%
Attendance at lectures	80.0%	10.0%

Recommended reading

Basic literature	Presentations and materials available on eNauczanie.
Supplementary literature	Hastie, Tibshirani and Friedman. The Elements of Statistical Learning. Springer-Verlag 2009. Zhiyuan Chen and Bing Liu, Lifelong machine learning. Morgan & Claypool Publishers, August, 2018
eResources addresses	Adresy na platformie eNauczanie:

Example issues/ example questions/ tasks being completed	Laboratory tasks concern practical familiarisation with methods used in machine learning and artificial intelligence. Students are discussed and presented with examples of code (R language, Python) performing the most important operations on data and generating decision models. As part of a practical task, the example should be modified, adapted to a different set of data, tested, critical aspects of operation observed, conclusions drawn. Practical classes have a problem-based character: a task is set, elements of a solution are presented, which must be independently adapted to the given issue and integrated into the overall process of data analysis and decision-making. The most important aspects of data analysis are explained in a practical way in the laboratory classes, with direct references to the material presented in the lecture.
Work placement	Not applicable

Document generated electronically. Does not require a seal or signature.