

## 关。GDAŃSK UNIVERSITY 创 OF TECHNOLOGY

## Subject card

Subject name and code	Artificial Intelligence Methods, PG_00054187							
Field of study	Informatics							
Date of commencement of studies	February 2023		Academic year of realisation of subject		2022/2023			
Education level	second-cycle studies		Subject group		Optional 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	t	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		2.0		28.0		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_W43] Knows and understands, to an increased extent, the nformal, technical and social aspects of the operation of complex information systems in the information society and in the global information n infrastructure.	Students will be able to discuss the theoretical basis and justify the practical consequences of the application of various models used in the field of artificial intelligence. He/she is able to predict the result of an action, comment on the purposefulness of the choice of a method. Interprets the result and describes relations between methods.	[SW1] Assessment of factual knowledge [SW3] Assessment of knowledge contained in written work and projects			
	[K7_W41] Knows and understands, to an increased extent, the standards, production methods, life cycle and development trends of software as well as information systems and applications.	Students will be able to discuss and practically apply methods of artificial intelligence, integrate them in applications of automatic data analysis in a selected programming language, know and apply standards of data and model recording.	[SW1] Assessment of factual knowledge [SW3] Assessment of knowledge contained in written work and projects			
	[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			
	[K7_W06] Knows and understands, to an increased extent, the basic processes taking place in the life cycle of devices, facilities and technical systems.	Students will be able to discuss examples of practical application and development of artificial intelligence methods.	[SW1] Assessment of factual knowledge [SW3] Assessment of knowledge contained in written work and projects			
Subject contents	<ol> <li>Introduction, data parameterisation, knowledge and decision making. Decision rules</li> <li>Big data processing</li> <li>Models accuracy metrics, choice of models and consequences of model application. Error of the model, its bias and variance. Data variance.</li> <li>Cross validation and error estimation</li> <li>Creating datasets for AI, problems of small and large datasets and feature sets. Feature selection methods, ridge regression and lasso method for feature selection.</li> <li>Statistical tests of chi squared. Linear models and linear classifiers</li> <li>From linear separation towards the decision trees, decision rules.</li> <li>Rough set knowledge modelling, and fuzzy modelling</li> <li>Rough set theory principles. Handing rough rules.</li> <li>Boundary, upper, and lower approximation, approximation accuracy metrics, rule quality metrics. How rough sets relate to human intuition.</li> <li>Fuzzy logic for expressing knowledge. Fuzzyfication and defuzzyfication. Rules and inference.</li> <li>Practical aspects of fuzzy logic. Connection of rough and fuzzy methods.</li> <li>Multivalued logics, explanation and examples. Modeling of values by gaussian mixtures, modelling of processes by hidden models. Practical applications and relations between methods.</li> <li>Lifelong machine learning for AI. Practical problems, incl. forgetting.</li> </ol>					
Prerequisites and co-requisites						
Assessment methods	Subject passing criteria	Passing threshold	Percentage of the final grade			
and criteria	Attendance at lectures	80.0%	10.0%			
	Evaluation from laboratory reports	51.0%	90.0%			
Recommended reading	Basic literature	Presentations and materials available on eNauczanie: Kurs: Metody sztucznej inteligencji (pg.edu.pl)				
	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:				
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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. Translated with www.DeepL.com/Translator (free version)
Work placement	Not applicable