GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Artificial Intelligence Methods, PG_00038279
Field of study	Automation, Robotics and Control Systems

Date of commencement of studies	October 2024	Academic year of realisation of subject	2024/2025
Education level	second-cycle studies	Subject group	Obligatory subject group in the field of study
			Subject group related to scientific research in the field of study
Mode of study	Part-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	Department of Control Engineering -> Faculty of Electrical and Control Engineering

Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Krzysztof Armiński
	Teachers	

Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	20.0	0.0	10.0	0.0	0.0	30
	E-learning hours included: 0.0						
	Adresy na platformie eNauczanie:						

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	5.0	40.0	75

Subject objectives	The aim of the course is to familiarize students with the basic concepts and ideas in the field of artificial intelligence.

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[K7_U08] has the necessary preparation to work in an industrial environment, carry out research, apply principles of health and safety at work	The student knows the basics of C++ language, can handle the Visual Studio environment, write a simple genetic algorithm that solves the optimization problem.	[SU4] Assessment of ability to use methods and tools [SU1] Assessment of task fulfilment
	[K7_W05] has knowledge of artificial intelligence computing techniques, inference, learning and solution-finding methods in algorithmic terms applied to automation and robotics systems	The student knows the methods and algorithms of artificial intelligence used in simple problems in the field of automation.	[SW1] Assessment of factual knowledge

Subject contents	Basic definitions of intelligence, artificial intelligence, the research of artificial intelligence. The tasks of artificial intelligence - the formal and approximate inference, learning from the information, the search space of solutions - an overview of intelligent computational techniques. Examples of tasks are fixed methods of artificial intelligence. Approximate inference, fuzzy logic - knowledge representation and processing of a qualitative nature, fuzzy sets, operations on sets, fuzzy inference, fuzzy controller, fuzzy rules base on the basis of numerical data. Neural network, multilayer perceptron learning, learning with reinforcement - the formulation task, function values, the learning with strengthening as a method of approximation of functions. Searching the solution space genetic algorithm (GA). Diagram and operation of the GA, the representation of the population, the population of the initial adjustment function, genetic operators, parameters of the algorithm. Theoretical Foundations of GA. Computer Implementation of classical GA. Genetic techniques. Representation and structure of the population. GA solving optimization problems. Multiobjective optimization problem in the GA. An example of evolutionary autonomous robot route planning in the environment, determining the trajectory of a ship in collision situations at sea. LABORATORY EXERCISES Study of genetic algorithm depending on the method of selection, encoding and applied operators. Solving the task of optimizing the method of evolutionary constraints. Optimization of routes in the environment the robot evolutionary method.

Prerequisites and co-requisites	Knowledge of the Basics of of Automatics		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Colloquium	50.0%	50.0%
	RepoEvaluation of laboratory exercises	50.0%	50.0%
Recommended reading	Basic literature	1. G. Luger, Artificial intelligence, Prentice Hall, 2008. 2. A. Zilouchian, M. Jamshidi, Intelligent Control Systems Using Soft Computing Methodologies, CRC Press, 2001 3. P. Cichosz, Systemy uczące się, Wydawnictwa Naukowo-Techniczne, Warszawa 2000. 4. S. Osowski, Sieci neuronowe w ujęciu algorytmicznym, Wydawnictwa Naukowo-Techniczne, Warszawa 1999. 5. J. Arabas, Wykłady z algorytmów ewolucyjnych, Wydawnictwa Naukowo-Techniczne, Warszawa 2001. 6. Andrzej Piegat, Modelowanie i sterowanie rozmyte. Exit, 1999 7. L. Rutkowski , Metody i techniki sztucznej inteligencji. Wydawnictwo Naukowe PWN, Warszawa, 2005		
	Supplementary literature	1. David E. Goldberg, Algorytmy genetyczne i ich zastosowania. WNT, 1995 2. D. Rutkowska, M. Piliński, L. Rutkowski, Sieci neuronowe, algorytmy genetyczne i systemy rozmyte. PWN, 1997 3. Zbigniew Michalewicz, Algorytmy genetyczne + struktury danych = programy ewolucyjne. WNT, 1999		
	eResources addresses		
Example issues/ example questions/ tasks being completed	The tasks of artificial intelligence - formal and approximate reasoning, learning from the information search space of solutions. Fuzzy sets, operations on sets, fuzzy inference, fuzzy controller. Neural networks, multilayer perceptron learning, learning by reinforcement. Design and functionality of AG, the representation of the population, the population of initial adjustment function, genetic operators, parameters of the algorithm.		
Work placement	Not applicable		

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