GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Artificial intelligence, PG_00021008		
Field of study	Technical Physics		
Date of commencement of studies	October 2021	Academic year of realisation of subject	2022/2023
Education level	first-cycle studies	Subject group	
Mode of study	Full-time studies	Mode of delivery	at the university
Year of study	2	Language of instruction	Polish
Semester of study	4	ECTS credits	4.0
Learning profile	general academic profile	Assessment form	assessment
Conducting unit	Department of Theoretical Physics and Quantum Information -> Faculty of Applied Physics and Mathematics		
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Paweł Syty	
	Teachers	dr inż. Paweł Syty	

Lesson types and methods of instruction

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	30.0	0.0	0.0	0.0	15.0	45

E-learning hours included: 0.0

Address on the e-learning platform: https://enauczanie.pg.edu.pl/moodle/course/view.php?id=19689

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	0.0	0.0	45

Subject objectives

Student knows the extent of research on artificial intelligence
Student knows the principles of building systems for automatic inference
Students know what are the strategies of doubles games
Student knows the principle of operation and application of genetic algorithms
Student knows the principle of operation and applications machine learning and neural networks
Student knows the principle of operation and application of cellular automata

Learning outcomes

Course outcome	Subject outcome	Method of verification
K6_U07	The student has knowledge of artificial intelligence and is able to present it in a popular way.	[SU3] Assessment of ability to use knowledge gained from the subject [SU4] Assessment of ability to use methods and tools
K6_U08	The student has knowledge of artificial intelligence and can present it.	[SU2] Assessment of ability to analyse information [SU5] Assessment of ability to present the results of task
K6_W02	The student has knowledge of artificial intelligence and can use it in practice	[SW1] Assessment of factual knowledge [SW3] Assessment of knowledge contained in written work and projects

<table>
<tr><td>Subject contents</td><td>LECTURE 1st The importance of intelligence. Natural and artificial intelligence. The scope of research into artificial intelligence. 2nd Inference. The syntax and semantics of the language of logic. Construction of automated reasoning. 3rd Language PROLOG inference system as an example, the realization of the principle of automatic inference, sample predicates. PROLOG as a declarative language. 4th Genetic algorithms. Encoding function adaptation, mating, mutation. Applications of genetic algorithms to solve NP problems. 5th Fuzzy logic. The role of imperfect knowledge in the inference. Bayesian inference. 6th Inference as the task of searching space. A review of selected strategies search space: search in depth and breadth of the growth method, random walk, simulated annealing. 7th Doubles game strategies. MINMAX algorithm and alpha-beta pruning. 8th Inductive inference. Discussion of conditional attribute properties. The principle of learning from the teacher. Error function. The problem of generalization. Role trenującego and test set. 9th Methods for construction of decision trees. 10th Machine learning and Neural Networks. The problem of multilayer perceptron learning. 11th Recursive neural networks - Hopfield network, Boltzmann machine. Self-organizing maps - Kohonen networks. 12th With reinforcement learning as a method of approximation of functions. Discussion of features. 13th Selected applications of neural networks. 14th Introduction to cellular automata. Gödel"s theorem. Turing machine. 15th Applications of artificial intelligence in the media. Image recognition, speech and speakers.

SEMINAR 1st Inference based on uncertain and incomplete knowledge, Bayesian inference - examples of accounts. 2nd Fuzzy logic - examples of accounts. 3rd Genetic algorithms. Selection of the evaluation function (eg, "task Knapsack"). Choice of search strategy. 4th Computational complexity of searching algorithms. 5th Inductive Inference - examples and exercises. 6th Double play - examples and exercises. 7th Learning strategies with reinforcement - examples of accounts. DRAFT The project, students develop topics directly related to the theme of the lecture. Double work is allowed. Some issues are purely theoretical and requires some programming. Sample topics to develop: - Expert systems. - Artificial intelligence in the automotive industry. - Artificial intelligence in computer games. - Programming in Prolog. The use of language to solve logical tasks. - Fighting spam using Bayesian classifier. - Artificial intelligence - threats and opportunities. - Neural networks in practice (an overview of the SNNS - Stuttgart Neural Network Simulator). - Modelling of traffic and the spread of the gas by using cellular automata. - Kalman Filtering. - Gödel"s theorem.</td></tr>
<tr><td>Prerequisites and co-requisites</td><td></td></tr>
<tr><td>Assessment methods and criteria</td><td>
<table>
<tr><th>Subject passing criteria</th><th>Passing threshold</th><th>Percentage of the final grade</th></tr>
<tr><td>Presenting a talk</td><td>50.0%</td><td>40.0%</td></tr>
<tr><td>Interview</td><td>50.0%</td><td>60.0%</td></tr>
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<tr><td>Recommended reading</td><td>
<table>
<tr><td>Basic literature</td><td>B.-A. Mordechai, Logika matematyczna w informatyce, WNT, Warszawa, 2005

P. Cichosz, Systemy uczące się, WNT, Warszawa, 2000 S. Osowski,

Sieci neuronowe w ujęciu algorytmicznym, WNT, Warszawa, 1999

A. Géron, Uczenie maszynowe z użyciem Scikit-Learn i TensorFlow. Wydanie II, O'Reilly, 2020</td></tr>
<tr><td>Supplementary literature</td><td>J. Arabas, Wykłady z algorytmów ewolucyjnych, WNT, Warszawa, 2001

S. Russell, P. Norvig, Artificial Intelligence. A Modern Approach (2nd ed.), Prentice-Hall, Berkeley, 2003

U. Nilsson, J. Maluszynski, Logic, Programming and Prolog (2nd ed.), John Wiley & Sons Ltd, NY, 2000</td></tr>
<tr><td>eResources addresses</td><td>Adresy na platformie eNauczanie:</td></tr>
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</td></tr>
<tr><td>Example issues/ example questions/ tasks being completed</td><td>During the seminars students develop topics directly related to the theme of the lecture. Some issues are purely theoretical and requires some programming. Sample topics to develop: - Expert systems. - Artificial intelligence in the automotive industry. - Artificial intelligence in computer games. - Programming in Prolog. The use of language to solve logical tasks. - Fighting spam using Bayesian classifier. - Artificial intelligence - threats and opportunities. - Neural networks in practice (an overview of the SNNS - Stuttgart Neural Network Simulator). - Modelling of traffic and the spread of the gas by using cellular automata. - Kalman Filtering. - Gödel"s theorem.</td></tr>
<tr><td>Work placement</td><td>Not applicable</td></tr>
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