GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Intelligent Information Services, PG_00047718		
Field of study	Informatics		
Date of commencement of studies	October 2022	Academic year of realisation of subject	2022/2023
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	4.0
Learning profile	general academic profile	Assessment form	exam
Conducting unit	Department of Decision Systems and Robotics -> Faculty of Electronics, Telecommunications and Informatics		
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Jerzy Dembski	
	Teachers	dr inż. Jerzy Dembski dr hab. inż. Julian Szymański	

Lesson types and methods of instruction

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	12.0	0.0	15.0	0.0	0.0	27

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	27	10.0	63.0	100

Subject objectives

The goal of the course is to provide knowledge and skills in the area of knowledge representation and transformation methods in computer systems and in Internet

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K7_K02] is ready to provide critical evaluation of received content and to acknowledge the importance of knowledge in solving cognitive and practical problems	The student is able to choose the most appropriate method in solving a specific problem among all the methods presented in the lecture and in the literature.	[SK5] Assessment of ability to solve problems that arise in practice
[K7_U07] can apply advanced methods of process and function support, specific to the field of study	The student is able to use artificial intelligence methods in the implementation of complex IT tasks.	[SU1] Assessment of task fulfilment
[K7_W05] Knows and understands, to an increased extent, methods of process and function support, specific to the field of study.	The student has extensive knowledge in the field of artificial intelligence and intelligent services allowing the use of programming methods in logic, optimization, learning and data classification in the way most appropriate to the IT problem being solved.	[SW1] Assessment of factual knowledge
[K7_U03] can design, according to required specifications, and make a complex device, facility, system or carry out a process, specific to the field of study, using suitable methods, techniques, tools and materials, following engineering standards and norms, applying technologies specific to the field of study and experience gained in the professional engineering environment	The student knows how to use modern tools of artificial intelligence for building systems that meet the required requirements. At the same time, he can choose the most suitable tools and methodology for these systems creation.	[SU1] Assessment of task fulfilment

Subject contents	Programming in logic: Prolog language Search methods: - gradient descent methods - random search and simulated annealing - genetic algorithms - advanced genetic techniques: selection of assessment function, genetic programming Fuzzy systems Reinforcement learning: - multi-stage decision-making process - environment - features and types - Markov Decision Proces (MDP) - dynamic programming, Bellman equations - Monte-Carlo method - temporal differences method - methods for coding states and actions - methods for approximating the functions of utility in problems with continuous parameters Data classification methods: - classification problems - teaching and generalizing - decision trees - support vectors machines (SVM) method - Adaboost method - artificial neural networks with deep learning
Prerequisites and co-requisites	

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
laboratory	60.0%	40.0%
lecture - exam	60.0%	60.0%

Recommended reading

Basic literature	David E. Goldberg, Genetic algorithms in search optimization and machine learning, Addison-Wesley Longman Publishing Co., Inc. Boston, MA, 1989. Richard Sutton, Andrew G. Barto, Reinforcement Learning: An Introduction, MIT Press, Cambridge, MA, 1998.http://www.cs.ualberta.ca/~sutton/book/the-book.html Stuart J.Russel, Peter Norvig, Artificial Intelligence, Prentice-Hall, London, 2003, str. 598-645. Mitchell T. M.: Machine Learning, McGraw-Hill, 1997. Burges C.: A tutorial on support vector machines for pattern recognition, Data Mining and Knowledge Discovery, v. 2(2), s.121-167, 1998. Hertz J., Krogh A., Palmer R.: Introduction To The Theory Of Neural Computation, Westview Press, 1991. Goodfellow I., Bengio Y, Courville A: Deep Learning, MIT Press, http://www.deeplearningbook.org, 2016.
Supplementary literature	Smola A., Bartlett P., Scholkopf B., Schuurmans D.: Advances in Large Margin Classifiers, MIT Press, 1999. Viola P., Jones M.: Robust Real-Time Face Detection, International Journal of Computer Vision 57(2), pp. 137--154, 2004.
eResources addresses	Adresy na platformie eNauczanie:

Example issues/ example questions/ tasks being completed	Provide all solutions after providing given query for a given program in Prolog. For the given error function map and the starting point, draw points corresponding to the next solutions obtained by: a. gradient method, b. random search method, c. simulated annealing. Describe the standard genetic algorithm and explain the elite model. For the given rules, fuzzy sets and input values, present the process of fuzzy inference and give his numerical result. Discuss the method of time difference in reinforcement learning. Give its advantages and disadvantages in relation to dynamic programming and Monte-Carlo methods. For the given state graph and environment model, find the optimal strategy and provide all action values for this strategy. For the given classification problem, draw the decision boundaries available when using: decision tree, SVM with linear kernel function, Adaboost method and artificial neural network with single layer. What should be changed for each classifier when the problem happens not linearly separable by adding additional learning examples?
Work placement	Not applicable