GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Computational Intelligence, PG_00048471		
Field of study	Automatic Control, Cybernetics and Robotics		
Date of commencement of studies	February 2022	Academic year of realisation of subject	2021/2022
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	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. Tomasz Białaszewski	
	Teachers	dr inż. Tomasz Białaszewski	

Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	15.0	15.0	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	Widening the students knowledge about the selected methods of artificial intelligence

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K7_W03] Knows and understands, to an increased extent, the construction and operating principles of components and systems related to the field of study, including theories, methods and complex relationships between them and selected specific issues - appropriate for the curriculum.	Student explains learning methods of parameters of Bayesian networks	[SW1] Assessment of factual knowledge [SW3] Assessment of knowledge contained in written work and projects
K7_K02	Student uses learning methods for example tasks.	[SK5] Assessment of ability to solve problems that arise in practice
[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	Student apply radial artificial neural networks in machine learning problems Student prepares programs in the LISP language	[SU1] Assessment of task fulfilment [SU4] Assessment of ability to use methods and tools
[K7_W01] Knows and understands, to an increased extent, mathematics to the extent necessary to formulate and solve complex issues related to the field of study.	Student explains the genetic programing method	[SW1] Assessment of factual knowledge [SW3] Assessment of knowledge contained in written work and projects
[K7_W21] Knows and understands, to an advanced extent, methods and techniques of design and operation of automatic control systems, control and robotics systems, as well as the use of computers in the control and monitoring of dynamic objects	Student explains learning methods of structure of Bayesian networks Student explains learning methods of Bayesian networks based on the pattern	[SU1] Assessment of task fulfilment [SU4] Assessment of ability to use methods and tools [SW1] Assessment of factual knowledge [SW3] Assessment of knowledge contained in written work and projects

Subject contents

1. Organization of the course and assessment criteria 2. Modern research trends in computational intelligence – symbolic and connectionist paradigms 3. Overview of scope and schedule of lectures, practice and laboratory 4. LISP – introduction 5. LISP – advanced construction of language 6. LISP – application in artificial intelligence 7. Genetic programming – basic algorithms 8. Genetic programming – representation of programs in LISP language 9. Genetic programming – examples and application 10. Bayesian networks – inference methods 11. Bayesian networks – parameters learning 12. Bayesian networks – parameters learning with incomplete data 13. Bayesian networks – structure learning. 14. Radial artificial neural networks - basic concepts. 15. Radial artificial neural networks - applications in machine learning problems.

Prerequisites and co-requisites

No requirements

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
Laboratory	25.0%	40.0%
Exam	50.0%	60.0%

Recommended reading

Basic literature	1. Neapolitan R.:Learning Bayesian Networks, Prentice Hall, 2003 2. Koza J., et al: Genetic Programming IV, Spriger, 2005 3. http://www.scheme.com/tspl4/ The Scheme Programming LanguageFourth Edition R. Kent Dybvig 4. https://racket-lang.org/ 5. http://www.genetic-programming.org/ 6. https://www.mathworks.com/help/deeplearning/ug/radial-basisneural-networks.html
Supplementary literature	https://htdp.org/
eResources addresses	

Example issues/ example questions/ tasks being completed

1. Explain a mechanism of mutation by changing the intermediate node in genetic programming?. Showan example of the situation. Write a mutant program as a s-expressions of LISP.
2. Define the procedure power-list, which takes a nonnegative integer n and an list of numbers and returns a new list, each element of which is the number of the power n
3. Explain the Bayes network parameter learning algorithm for incomplete data.

Work placement

Not applicable