GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Deep learning with reinforcement, PG_00048248		
Field of study	Informatics		
Date of commencement of studies	February 2024	Academic year of realisation of subject	2024/2025
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	2	ECTS credits	2.0
Learning profile	general academic profile	Assessment form	assessment
Conducting unit	Department of Algorithms and Systems Modelling -> Faculty of Electronics, Telecommunications and Informatics		
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Paweł Kowalski	
	Teachers	dr inż. Paweł Kowalski	

Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	0.0	0.0	15.0	0.0	30
	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	30	4.0	16.0	50

Subject objectives	
	Introduces Machine Learning methods for optimal behavior using Reinforcement Learning. **Shows how to scale Reinforcement Learning to complex problems using Deep Neural Networks.** **Show most successful Deep Reinforcement Learning methods using Value Function approximation and Policy Gradient.**

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[K7_U04] can apply knowledge of programming methods and techniques as well as select and apply appropriate programming methods and tools in computer software development or programming devices or controllers using microprocessors or programmable elements or systems specific to the field of study, making assessment and critical analysis of the prepared software as well as a synthesis and creative interpretation of information presented with it	is able to reproduce reinforcement learning algorithm	[SU2] Assessment of ability to analyse information [SU4] Assessment of ability to use methods and tools
	[K7_K02] is ready to provide critical evaluation of received content and to acknowledge the importance of knowledge in solving cognitive and practical problems	is able to pick the reinforcement learning algorithm for practical problem	[SK4] Assessment of communication skills, including language correctness [SK5] Assessment of ability to solve problems that arise in practice
	[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.	Is able to create efficient reinforcement algorithm for existing system /problem	[SW2] Assessment of knowledge contained in presentation [SW3] Assessment of knowledge contained in written work and projects
	[K7_U42] can solve engineering and research problems including design, assessment and maintenance of information systems and applications, using experimental methods and management techniques	is able to propose parameters for deep network for selected reinforcement learning algorithm	[SU2] Assessment of ability to analyse information [SU4] Assessment of ability to use methods and tools
	[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.	Knows theoretical model for reinforcement learning: Marcov's process Knows algorithms used for reinforced learning	[SW1] Assessment of factual knowledge [SW3] Assessment of knowledge contained in written work and projects

Subject contents	**Imitation learning** **Reinforcement Learning Introduction** **Markov Decision Process** **Dynamic Programming Methods** **Model Free Learning** **Deep Learning using value function approximation** **Deep Learning using policy gradient methods** **Practical aspects of Deep Reinforcement Learning**
Prerequisites and co-requisites	**Knowledge of Python programming language** **Basic calculus, linear algebra and probabilistic theory** **Machine Learning and Deep Learning fundamentals**

Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Project	50.0%	40.0%
	Test	50.0%	35.0%
	asignment	50.0%	25.0%
Recommended reading	Basic literature	**“Reinforcement Learning”, Richard S. Sutton and Andrew G. Barto** **"Neural Networks and Deep Learning",Michael A. Nielsen**	
	Supplementary literature	**"Deep Reinforcement Learning Hands-On", Maxim Lapan**	
	eResources addresses	Adresy na platformie eNauczanie:	
Example issues/ example questions/ tasks being completed			
Work placement	Not applicable		