GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Deep learning, PG_00064441						
Field of study	Biomedical Engineering, Biomedical Engineering, Biomedical Engineering						
Date of commencement of studies	February 2025		Academic year of realisation of subject	2025/2026			
Education level	second-cycle studies		Subject group	Optional subject group Specialty 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	3.0			
Learning profile	general academic profile		Assessment form	exam			
Conducting unit	Department of Biomedical Engineering -> Faculty of Electronics, Telecommunications and Informatics						
Name and surname of lecturer (lecturers)	Subject supervisor		prof. dr hab. inż. Jacek Rumiński				
	Teachers		prof. dr hab. inż. Jacek Rumiński				
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	0.0	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		4.0	26.0	75	
Subject objectives	The aim of the course is to provide students with knowledge in the field of deep, artificial neural networks and to develop practical skills in this field.						

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[K7_U12] is able, to an increased extent, to analyze the operation of components and systems related to the field of study, as well as to measure their parameters and study their technical characteristics, and to plan and carry out experiments related to the field of study, including computer simulations, interpret the obtained results and draw conclusions	The result of the learning process is that the student acquires the skills to conduct experiments using deep learning and interpret the results.	[SU1] Assessment of task fulfilment
	[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	The result of the learning process is that the student acquires the ability to practically apply deep learning algorithms, in particular convolutional and recurrent networks, in particular through the implementation of network model software, their training, testing and interpreting the results.	[SU1] Assessment of task fulfilment
	[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	The effect of the learning process is the student gaining knowledge in the field of understanding the definition of deep learning algorithms, in particular convolutional and recursive networks related patterns and problems related to the deep network learning process.	[SW1] Assessment of factual knowledge
	[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	The effect of the learning process is the acquisition of knowledge by the student in the field of deep learning methods, in particular in the field of data classification tasks, object detection and other tasks related to the field of study.	[SW1] Assessment of factual knowledge

Subject contents	Introduction to deep learning Convolution operation and its importance CNN layers and their versions Convolutional neural networks (types of layers, learning) Classification with the use of convolutional networks Problems with learning deep networks (overfitting, fading gradient, etc.) Methods of counteracting problems related to learning deep networks (regularization, augmentation, dropout, early stopping, etc.) Transfer learning RNN models Development of RNN models (including LSTM etc.) The use of RNN models in NLP Generational models Autoencoders Application of generation models Reinforcement learning Reinforcement learning with the use of deep models part 1 Reinforcement learning with the use of deep models part 2
Prerequisites and co-requisites	Implementation of the subjects from the first semester.

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
Lab	50.0%	50.0%
Assignments	0.0%	10.0%
Exam	50.0%	40.0%

Recommended reading

Basic literature	Bengio Yoshua, Courville Aaron, Goodfellow Ian, Deep Learning, Systemy uczące się, PWN 2018 Andrew W. Trask, Zrozumieć głębokie uczenie, PWN, 2019
Supplementary literature	brak
eResources addresses	Adresy na platformie eNauczanie:

Example issues/ example questions/ tasks being completed	
Work placement	Not applicable

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