GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Deep learning, PG_00053375		
Field of study	Biomedical Engineering, Biomedical Engineering, Biomedical Engineering		
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	4.0
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 dr inż. Tomasz Kocejko mgr inż. Natalia Szarwińska	

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	51.0	100

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_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
	[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_U05] can plan and conduct experiments related to the field of study, including computer simulations and measurements; interpret obtained results and draw conclusions	The effect of the learning process is the student acquiring the ability to use deep learning algorithms in practice, in particular convolutional and recursive networks, in particular by designing DNN models and planning experiments related to training and validation of models.	[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

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
Exam	50.0%	40.0%
Lab	50.0%	50.0%
Assignments	0.0%	10.0%

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: Z_24_25 Uczenie głębokie - Moodle ID: 40485 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=40485
Example issues/ example questions/ tasks being completed		

Work placement	Not applicable

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