GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Basics of deep learning, PG_00063889		
Field of study	Informatics		
Date of commencement of studies	October 2024	Academic year of realisation of subject	2026/2027
Education level	first-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	3	Language of instruction	Polish
Semester of study	5	ECTS credits	2.0
Learning profile	general academic profile	Assessment form	assessment
Conducting unit	Department of Computer Architecture -> Faculty of Electronics, Telecommunications and Informatics		
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Jan Cychnerski	
	Teachers	mgr inż. Karol Draszawka	

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	2.0	18.0	50

Subject objectives

Introduction to theory and practice of deep learning.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K6_W11] knows and understands to an advanced degree the general principles of the creation and development of economic entities, forms of individual entrepreneurship and conducting enterprises and the fundamental dilemmas of modern civilization, as well as the basic economic, legal and other conditions of various types of activities related to the field of study, including the basic concepts and principles of industrial property protection and copyright law	A student knows the basics of systems based on deep neural networks, the core of most modern artificial intelligence systems.	[SW1] Assessment of factual knowledge
[K6_U09] can carry out a critical analysis of the functioning of existing technical solutions and assess these solutions, as well as apply experience related to the maintenance of technical systems, devices and facilities typical for the field of studies, gained in the professional engineering environment	Based on the analysis of the problem, the available training data, a student is able to select the appropriate architecture of a deep neural network and the training algorithm of this model to solve the problem. He/She can determine the quality of the prepared system.	[SU4] Assessment of ability to use methods and tools [SU1] Assessment of task fulfilment
[K6_U11] can plan and organise individual and team work	Student: - performs an indivdual assignment - takes part in a group assignment	[SU1] Assessment of task fulfilment

Subject contents

1. Fundamentals of supervised machine learning
2. Fundamentals of artificial neural networks - basic models, layers, training algorithms
3. Convolutional neural networks
4. Recurrent neural networks
5. Transformer-like neural networks
6. Methods of regularization of neural networks
7. Practical tips for projects using deep neural networks

<table>
<tr><td>Prerequisites and co-requisites</td><td colspan="2"></td></tr>
<tr><td>Assessment methods and criteria</td><td colspan="2"><table>
<tr><th>Subject passing criteria</th><th>Passing threshold</th><th>Percentage of the final grade</th></tr>
<tr><td>Practical exercise</td><td>50.0%</td><td>50.0%</td></tr>
<tr><td>Midterm colloquium</td><td>50.0%</td><td>50.0%</td></tr>
</table></td></tr>
<tr><td rowspan="3">Recommended reading</td><td>Basic literature</td><td>Ian Goodfellow, Yoshua Bengio and Aaron Courville, Deep Learning, MIT Press, 2016

Michael Nielsen, Neural Networks and Deep Learning</td></tr>
<tr><td>Supplementary literature</td><td>Andrew Ng, Machine Learning Yearning

Tutorials on deep learning frameworks (e.g. PyTorch, Keras)</td></tr>
<tr><td>eResources addresses</td><td>Podstawowe
http://neuralnetworksanddeeplearning.com/ - http://neuralnetworksanddeeplearning.com/
http://www.deeplearningbook.org/ - http://www.deeplearningbook.org/
Uzupełniające
Adresy na platformie eNauczanie:</td></tr>
<tr><td>Example issues/ example questions/ tasks being completed</td><td colspan="2">• Describe the architecture of convolutional neural networks, indicate their advantages over MLP networks and their typical applications.
• During the development of a project using deep model learning, the developer observed a low training error, but high validation error. What could be the reason for this? Consider several scenarios. Suggest ways to improve.</td></tr>
<tr><td>Work placement</td><td colspan="2">Not applicable</td></tr>
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