GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Basics of Deep Learning, PG_00055236		
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	English
Semester of study	2	ECTS credits	3.0
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 hab. inż. Julian Szymański	
	Teachers	dr hab. inż. Julian Szymański 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	8.0	37.0	75

Subject objectives	The aim of the course is to familiarize students with the methods of deep learning for advanced data analysis. Typical areas of application of these types of methods include: image classification, speech recognition and natural language understanding.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K7_U42] can solve engineering and research problems including design, assessment and maintenance of information systems and applications, using experimental methods and management techniques	Student is able to quantitatively measure the performance of a deep model in a given problem and is able to suggest changes to the architecture of the model that can potentially improve this performance.	[SU2] Assessment of ability to analyse information [SU1] Assessment of task fulfilment
[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 knows advantages and disadvantages of neural networks distributed knowledge representation.	[SW1] Assessment of factual knowledge
[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	Based on analysis of a problem, student is able to choose a suitable programming language, libraries, frameworks and IDE, which make the solution to the problem much easier to implement.	[SU4] Assessment of ability to use methods and tools
[K7_U06] can analyse the operation of components, circuits and systems related to the field of study; measure their parameters; examine technical specifications; interpret obtained results and draw conclusions	Student is able to quantitatively measure the performance of a deep model in a given problem and is able to suggest changes to the architecture of the model that can potentially improve this performance.	[SU1] Assessment of task fulfilment
[K7_W05] Knows and understands, to an increased extent, methods of process and function support, specific to the field of study.	Student knows machine learning methodology and, based on that, is able to adjust parameters of a particular neural network model to optimize its performance in a given problem.	[SW1] Assessment of factual knowledge

Subject contents

1. Machine learning and artificial neural networks basics

2. Image data analysis with convolutional neural networks

3. Sequence analysis with recurrent neural networks

4. Natural language neural models

5. Generalization improvement techniques

6. Deep learning optimization techniques

7. Practical methodology and tips for deep learning

Prerequisites and co-requisites

Basic knowledge of linear algebra and statistics.

Intermediate programming skills in Python.

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
Multiple choice written test	50.0%	50.0%
Project	50.0%	50.0%

Recommended reading	Basic literature	Ian Goodfellow, Yoshua Bengio and Aaron Courville, Deep Learning, MIT Press, 2016, url: http://www.deeplearningbook.org/ Michael Nielsen, “Neural Networks and Deep Learning”, http://neuralnetworksanddeeplearning.com/
	Supplementary literature	Andrew Ng, “Machine Learning Yearning”, http://www.mlyearning.org/ Tutorials on deep learning frameworks pages, such as: https://www.tensorflow.org/tutorials, http://torch.ch/docs/tutorials.html
	eResources addresses	Adresy na platformie eNauczanie:
Example issues/ example questions/ tasks being completed	Present the architecture of a convolutional neural network, show its advantages over traditional networks and describe typical applications. During the development of a deep learning project, a satisfactory level of training error was observed, but at the same time the testing error was unacceptable. What could be the reason for this? Consider several scenarios. Suggest ways to improve.	
Work placement	Not applicable	