GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Introduction to the implementation of selected artificial intelligence algorithms, PG_00064471		
Field of study	Technical Physics		
Date of commencement of studies	October 2021	Academic year of realisation of subject	2024/2025
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	4	Language of instruction	Polish
Semester of study	7	ECTS credits	1.0
Learning profile	general academic profile	Assessment form	assessment
Conducting unit	Division of Theoretical Physics and Quantum Informaton -> Institute of Physics and Applied Computer Science -> Faculty of Applied Physics and Mathematics		
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Paweł Syty	
	Teachers	dr inż. Paweł Syty	

Lesson types and methods of instruction

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	15.0	0.0	0.0	0.0	0.0	15

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	15	0.0	0.0	15

Subject objectives

Introduction to the implementation of artificial intelligence algorithms in selected programming languages and with the use of selected tools and libraries.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K6_K05] Can present own work results, transfer information in a commonly understandable manner, communicate and self-evaluate, as well as constructively evaluate the effects of other persons' work.	The student is able to use the selected programming language to implement selected artificial intelligence algorithms and present the results of their work.	[SK2] Assessment of progress of work
[K6_U10] Can determine their own study field interests and develop them.	The student is able to configure the work environment and select the appropriate tools and methods of programming tools and methods to solve the given problem.	[SU4] Assessment of ability to use methods and tools
[K6_U08] can prepare written works and speeches in Polish and English, concerning detailed issues of physics and related fields, and scientific disciplines	The student is able to use the selected programming language to implement selected artificial intelligence algorithms.	[SU3] Assessment of ability to use knowledge gained from the subject
[K6_U07] presents facts within the scope of physics and other scientific disciplines in a clear manner	The student is able to refer in a popular way to practical issues that arise in the subject matter.	[SU5] Assessment of ability to present the results of task
[K6_W02] Has systematized knowledge of the basics of physics, including mechanics, thermodynamics, electricity and magnetism, optics, atomic and particle physics, solid-state physics, nuclear and elementary particle physics.	The student is able to use his/her mathematical knowledge to solve basic artificial intelligence problems.	[SW3] Assessment of knowledge contained in written work and projects

<table>
<tr><td>Subject contents</td><td>Introduction to the implementation of artificial intelligence algorithms. General overview of the programming languages most commonly used for programming artificial intelligence (eg Python, Prolog, R, Julia, MTT). Configuration of the development environment and basic tools, including configuration management.
Data preparation (e.g. using the Pandas package). Data visualization (e.g. using Matplotlib package). Basic statistics research (e.g. using NumPy package).
Implementation of selected supervised and unsupervised learning algorithms and machine learning classifiers, e.g. using scikit-learn, SciPy libraries.
Implementation (from scratch) of a simple perceptron with training supervised by the gradient method (e.g. using the NumPy package).
The use of selected programming libraries (eg TensorFlow / Keras) for the implementation of a oneway, multi-layer neural network.
Tools for viewing the learning process in real time (e.g. TensorBoard library). Techniques of data augmentation and the use of generators. Evaluation of models.
Elements of parallel programming and the use of GPU in machine learning. Optimization of programs and algorithms. Good programming practices. Complete case studies.</td></tr>
<tr><td>Prerequisites and co-requisites</td><td>Basic knowledge of object-oriented programming</td></tr>
<tr><td>Assessment methods and criteria</td><td><table><tr><th>Subject passing criteria</th><th>Passing threshold</th><th>Percentage of the final grade</th></tr><tr><td>interview</td><td>50.0%</td><td>100.0%</td></tr></table></td></tr>
<tr><td>Recommended reading</td><td><table><tr><td>Basic literature</td><td>M.Lutz, Learning Python, 5th Edition, O'Reilly, 2020
J. Nunez-Iglesias, S. van der Walt, H. Dashnow, Elegant SciPy - THE ART OF SCIENTIFIC PYTHON, O'Reilly, 2017
F. Nelli, Python Data Analytics: With Pandas, NumPy, and Matplotlib,Apres, 2018
M. Gorelick, I. Ozsvald, High Performance Python. Practical Performant Programming for Humans.(2nd ed.), O'Reilly, 2021</td></tr><tr><td>Supplementary literature</td><td>A. Géron, Hands-on Machine Learning with Scikit-Learn, Keras, and TensorFlow, O'Reilly, 2020</td></tr><tr><td>eResources addresses</td><td>Adresy na platformie eNauczanie:</td></tr></table></td></tr>
<tr><td>Example issues/ example questions/ tasks being completed</td><td>List the metrics used to evaluate the machine models. Describe one of them in one sentence, and the method of its calculation in Python.
Implement a simple perceptron in Python using the Tensorflow library and the Keras interface.</td></tr>
<tr><td>Work placement</td><td>Not applicable</td></tr>
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