



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		

Subject contents	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.		
Prerequisites and co-requisites	Basic knowledge of object-oriented programming		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	interview	50.0%	100.0%
Recommended reading	Basic literature	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	
	Supplementary literature	A. Géron, Hands-on Machine Learning with Scikit-Learn, Keras, and TensorFlow, O'Reilly, 2020	
	eResources addresses	Adresy na platformie eNauczanie:	
Example issues/ example questions/ tasks being completed	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.		
Work placement	Not applicable		

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