



Subject card

Subject name and code	Programming languages for artificial intelligence, PG_00053334						
Field of study	Biomedical Engineering, Biomedical Engineering, Biomedical Engineering						
Date of commencement of studies	February 2022	Academic year of realisation of subject				2021/2022	
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	1	ECTS credits				2.0	
Learning profile	general academic profile	Assessment form				assessment	
Conducting unit	Department of Biomedical Engineering -> Faculty of Electronics, Telecommunications and Informatics						
Name and surname of lecturer (lecturers)	Subject supervisor		dr inż. Paweł Syty				
	Teachers		mgr inż. Natalia Kowalczyk dr inż. Paweł Syty				
Lesson type and method of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	0.0	15.0	0.0	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		3.0		17.0	50
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	
	K7_U04		The student is able to configure the work environment and select the appropriate tools and programming methods to solve the given problem.			[SU4] Assessment of ability to use methods and tools [SU2] Assessment of ability to analyse information	
	[K7_W04] Knows and understands, to an advanced extent, the principles, methods and techniques of programming and the principles of computer software development or programming devices or controllers using microprocessors or programmable elements or systems specific to the field of study, and organisation of systems using computers or such devices		The student is able to use the selected programming language to implement selected artificial intelligence algorithms.			[SW3] Assessment of knowledge contained in written work and projects	
	[K7_U01] can apply mathematical knowledge to formulate and solve complex and non-typical problems related to the field of study by:n-appropriate selection of source information and its critical analysis, synthesis, creative interpretation and presentation,n-application of appropriate methods and toolsn		The student is able to use his mathematical knowledge to solve basic problems of artificial intelligence,			[SU1] Assessment of task fulfilment	
	K7_K02		The student is able to critically refer to the practical issues that arise in the subject matter.			[SK5] Assessment of ability to solve problems that arise in practice	

Subject contents	<p>Lecture</p> <ul style="list-style-type: none"> • 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 one-way, 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 (e.g. related to the processing of biomedical data). <p>Laboratory</p> <ul style="list-style-type: none"> • Preparation and cleaning of data with the use of programming libraries. Visualization of data and results. (e.g. Pandas, NumPy, Matplotlib) • Using programming libraries in machine learning tasks (e.g. SciKit) • Creating and using neural network models in a programming environment (eg TensorFlow, Pytorch) - part 1. • Creating and using neural network models in the programming environment (eg TensorFlow, Pytorch) - part 2. Using programming libraries for model evaluation. • Use of programming libraries in machine learning for multimedia data (image, signal / sequence) 											
Prerequisites and co-requisites												
Assessment methods and criteria	<table border="1"> <thead> <tr> <th data-bbox="456 913 794 943">Subject passing criteria</th> <th data-bbox="799 913 1137 943">Passing threshold</th> <th data-bbox="1142 913 1481 943">Percentage of the final grade</th> </tr> </thead> <tbody> <tr> <td data-bbox="456 949 794 994">passing the laboratory part (projects)</td> <td data-bbox="799 949 1137 994">50.0%</td> <td data-bbox="1142 949 1481 994">60.0%</td> </tr> <tr> <td data-bbox="456 1001 794 1030">passing the lecture part</td> <td data-bbox="799 1001 1137 1030">50.0%</td> <td data-bbox="1142 1001 1481 1030">40.0%</td> </tr> </tbody> </table>			Subject passing criteria	Passing threshold	Percentage of the final grade	passing the laboratory part (projects)	50.0%	60.0%	passing the lecture part	50.0%	40.0%
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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											