University of Gdańsk

Subject card

Subject name and code	Machine Learning and Artificial Intelligence, PG_00203641						
Field of study	Informatics						
Date of commencement of studies	October 2026		Academic year of realisation of subject		2027/2028		
Education level	Master's studies		Subject group		Obligatory subject group in the field of study 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	2		Language of instruction		Polish		
Semester of study	3		ECTS credits		5.0		
Learning profile	academic		Assessment form		credit		
Conducting unit							
Name and surname of lecturer (lecturers)	Subject supervisor		mgr Grzegorz Madejski				
	Teachers						
Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	0.0	30.0	0.0	0.0	60
	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	60		0.0		65.0	125
Subject objectives	The aim of the course is to familiarize students with the possibilities and techniques of computational intelligence. It is assumed that the participant will learn the basic techniques and acquire the ability to select appropriate models and algorithms for tasks and discuss solutions.						

Learning outcomes

Course outcome	Subject outcome	Method of verification
[INFMU2_W09] knows and understands formal models of data representation and structures (e.g. graphs, relational and non-relational models), knows the applications of mathematical models and data structures in solving practical problems, understands the connections between theory (e.g. graphs) and practical data processing systems (e.g. databases, Big Data systems)	Knows formal data-representation models used in machine learning (feature spaces, vector, sequential, image and graph data) and understands their links with practical data-processing and analysis systems.	[SW4] test/exam - oral or written [SW2] presentation/project/paper/ report
[INFMU2_W05] has in-depth knowledge of artificial intelligence algorithms and techniques, their properties and importance in practical applications	Knows artificial-intelligence and machine-learning algorithms and techniques — metaheuristics (including the genetic algorithm), supervised and unsupervised learning, artificial neural networks and deep learning, reinforcement learning and fuzzy logic — their properties and practical significance.	[SW4] test/exam - oral or written [SW2] presentation/project/paper/ report
[INFMU2_U06] can formulate and test hypotheses related to simple research problems using artificial intelligence algorithms and tools	Is able to formulate a problem, select an appropriate model and algorithm, carry out an experiment, evaluate the quality of the solution (metrics, validation), and formulate and verify research hypotheses.	[SU2] presentation/project/paper/ report [SU4] test/exam - oral or written

Subject contents

- Biologically inspired metaheuristic algorithms, with particular emphasis on the genetic algorithm.
- Supervised machine learning. Classification and regression tasks.
- Unsupervised machine learning. Clustering and association rule mining.
- Artificial neural networks.
- Deep learning: networks processing images, text, generative. B
- asics of reinforcement learning.
- Fuzzy logic.

Prerequisites and co-requisites

- basics of programming in Python
- basics of algebra, statistics, and probability calculus

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
Projects	51.0%	60.0%
test	51.0%	40.0%

Recommended reading

Basic literature	• David E. Goldberg: Algorytmy genetyczne i ich zastosowanie, WNT 2003 • Marcin Szeliga: Praktyczne uczenie maszynowe, PWN 2019 • Joel Grus: Data science od podstaw, Helion 2018 • Drew Conway, John Myles White: Uczenie maszynowe, Helion 2015 • Marcin Szeliga: Data Science i Uczenie Maszynowe, PWN 2017 • Sebastian Raschka, Vahid Mirjalili: Python. Uczenie Maszynowe, wyd. 2, Helion 2019 • Seth Weidman: Uczenie głębokie od zera. Podstawy implementacji w Pythonie, Helion 2020 • Jacek Tabor, Marek Śmieja, Łukasz Struski Przemysław: Uczenie głębokie. Wprowadzenie, Helion 2022 • Maciej Wenerski: Podstawy logiki rozmytej i wnioskowania rozmytego, 2013 • Internet tutorials
Supplementary literature	-
eResources addresses	

Example issues/ example questions/ tasks being completed	• Solving the knapsack problem using the genetic algorithm. • Finding an appropriate algorithm for diagnosing diabetes in individuals with given medical parameters (classification in medicine). • Creating a system based on fuzzy logic to calculate tips. • Creating a neural network to recognize whether there is a dog or a cat in a photo. • Q-Learning/DQN for controlling an agent in a virtual environment (Gymnasium).
Work placement	Not applicable

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