University of Gdańsk

Subject card

Subject name and code	Computational Intelligence, PG_00204173						
Field of study	Informatics						
Date of commencement of studies	October 2026		Academic year of realisation of subject		2027/2028		
Education level	Bachelor's studies		Subject group		Obligatory subject group in the field of study Subject group related to practical vocational preparation		
Mode of study	full-time studies		Mode of delivery		at the university		
Year of study	2		Language of instruction		Polish		
Semester of study	4		ECTS credits		6.0		
Learning profile	practical		Assessment form		exam		
Conducting unit	Division of Artificial Intelligence -> Institute of Informatics -> Faculty of Mathematics, Physics and Informatics -> Rector						
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		90.0	150
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
[INFPL3_U01] can apply mathematical knowledge to formulate, analyse and solve tasks related to computer science, design and analyze algorithms in terms of their correctness and computational complexity	- is able to express practical problems in a formalized way (can choose the appropriate model from the field of computational intelligence); - is able to prepare documentation of the completed project, present research results, and describe the method used and its justification (project related to computational intelligence).	[SU2] presentation/project/paper/ report [SU5] implementation of a problem task [SU8] observation of student's independent or team work
[INFPL3_U04] is able to use the acquired knowledge when creating, running and testing programs using dedicated tools and design patterns	- is able to prepare documentation of the completed project, present research results, and describe the method used and its justification (project related to computational intelligence).	[SU2] presentation/project/paper/ report [SU5] implementation of a problem task
[INFPL3_K02] is ready to recognize the importance of knowledge in solving cognitive problems and practical and seeking opinions experts in case of difficulties with independent problem solving	- understands the necessity of systematic work on computational intelligence issues, which have a long time horizon	[SK2] presentation/project/paper/ report [SK8] observation of student's independent or team work
[INFPL3_W02] knows and understands advanced concepts in artificial intelligence, formal languages, and numerical methods.	- knows selected algorithms in the field of computational intelligence; - knows techniques for analyzing and optimizing algorithms in the field of computational intelligence.	[SW4] 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.
- Basics of reinforcement learning.
- Fuzzy logic.

Prerequisites and co-requisites

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
Solving tasks	51.0%	25.0%
Projects	51.0%	50.0%
Exam	51.0%	25.0%

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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