GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	IT1- Artificial Intelligence and Machine Learning, PG_00066977		
Field of study	Smart Renewable Energy Engineering		
Date of commencement of studies	October 2025	Academic year of realisation of subject	2025/2026
Education level	second-cycle studies	Subject group	Specialty 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	English
Semester of study	2	ECTS credits	2.0
Learning profile	general academic profile	Assessment form	assessment
Conducting unit	Department of Multimedia Systems -> Faculty of Electronics Telecommunications and Informatics -> Wydziały Politechniki Gdańskiej		
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. inż. Piotr Szczuko	
	Teachers		

Lesson types and methods 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	4.0	16.0	50

Subject objectives

Familiarize the student with the basic paradigms of artificial intelligence and their practical application in intelligent analysis of measurement data.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K7_K02] recognizes technological innovations in the field of wind energy, is ready to adapt to and implement new technologies in energy systems	The student is able to define the requirements, identify recommended methods and use them to prepare data for machine learning, select a model and train it, evaluate the model performance.	[SK5] Assessment of ability to solve problems that arise in practice
[K7_W04] knows the specifics of designing, constructing, and operating onshore/offshore wind farms, as well as the technical and logistical challenges involved in their implementation, including measurement and diagnostic technologies	The student is able to define the requirements, identify recommended methods and use them to prepare data for machine learning, select a model and train it, evaluate the model performance.	[SW1] Assessment of factual knowledge
[K7_U02] is capable of creating and analyzing digital models of renewable energy systems, including wind power systems, and utilizes digital tools for project analysis, evaluation, supervision, and optimization	The student is able to independently search and analyse current world literature in the area of the application of machine learning methods to solve various engineering problems concerning the construction of digital wind farm models.	[SU5] Assessment of ability to present the results of task [SU4] Assessment of ability to use methods and tools

Subject contents	Lecture topics: knowledge representation and inference, Bayesian networks. Machine learning: gradient algorithms, Artificial neural networks: supervised learning, recurrent networks, decision tree algorithms, time series processing and prediction algorithms, generalisation problems. Unsupervised learning: search for cluster centres and self-organising feature maps. Elements of deep learning: convolutional networks, autoencoding. Laboratory topics: Preparation of training, validation and test datasets, data preprocessing, normalisation and augmentation of training data, selection of machine learning methods in the context of the requirements of the problem being solved, artificial intelligence training algorithms and methodology, methods of selecting hyperparameters of machine learning algorithms, testing and evaluation of effectiveness and performance of AI models.
Prerequisites and co-requisites	Basic knowledge of Python programming language and Jupyter interactive notebooks.

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
Written colloquium	51.0%	50.0%
Laboratory reports	51.0%	50.0%

Recommended reading

Basic literature	1. Gareth J., et al., Introduction to Statistical Learning with Applications in Python, Springer 2024. https://www.statlearning.com/ 2. Hyndman RJ, Athanasopoulos G., Forecasting: Principles and Practice, 3rd ed., oTexts 2021. https://otexts.com/fpp3/ 3. Goodfellow I., Bengio Y., Courville A., Deep Learning. Systemy uczące się. Helion 2019.
Supplementary literature	1. Scardapane S., Alices Adventures in a differentiable wonderland. A primer on designing neural networks. Vol. I - A tour of the land. https://arxiv.org/abs/2404.17625
eResources addresses	

Example issues/ example questions/ tasks being completed

1. Preparation of training, validation and test datasets,
2. Data preprocessing, normalisation and augmentation of training data
3. Selection of machine learning methods in the context of the requirements of the problem being solved
4. training algorithms and validation methodology
5. selecting hyperparameters of machine learning algorithms
6. testing and evaluation of effectiveness and performance of AI models

Work placement

Not applicable

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