University of Gdańsk

Subject card

Subject name and code	Introduction to Machine Learning, PG_00207084		
Field of study	Mathematical Modeling and Data Analysis		
Date of commencement of studies	October 2026	Academic year of realisation of subject	2026/2027
Education level	Master's studies	Subject group	Obligatory subject group 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	2	ECTS credits	5.0
Learning profile	academic	Assessment form	exam
Conducting unit			
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. inż. Marek Krośnicki	
	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	3.0	62.0	125

Subject objectives

Familiarization with advanced machine learning methods.

Acquiring the ability to use machine learning algorithms - working in the Python environment

Learning outcomes

Course outcome	Subject outcome	Method of verification
[MMiADM2_U05] is able to apply new or adapt existing methods and tools from a selected field of mathematics and information and communication technologies in related fields	1. The student is able to assess the effectiveness of the algorithm 2. The student is able to create models for data of various types (images, texts, chemical compounds)	[SU1] oral statement/conversation/ discussion [SU2] presentation/project/paper/ report
[MMiADM2_W04] knows and understands in depth the theoretical foundations of computational methods and information technology techniques used to solve problems in a selected field of mathematics or its applications	1. The student is able to solve programming problems using mathematical knowledge, design and analyze algorithms in terms of their correctness using dedicated tools and design patterns 2. The student is able to perform actual preprocessing of data	[SW4] test/exam - oral or written [SW1] oral statement/ conversation/discussion [SW2] presentation/project/paper/ report

<table>
<tr><td>Subject contents</td><td>1. Introduction to basic terminology and notation. Strategy for creating a machine learning system

2. Python in machine learning. Using Python for machine learning: Anaconda, Jupyter, NumPy, Pandas, Matplotlib, SciPy.

3. Data preprocessing. Best practices for model evaluation.

4. Data analysis using regression analysis, cluster analysis

5. Support Vector Machines

6. Decision trees

7. Training neural networks using torch library

8. Auroencoders

9. Data compression and data dimension reduction

10. Unsupervised learning methods (e.g. k-means algorithm)

11. Application examples: Modeling sequential data using recurrent neural networks, working with text, working with images, working with molecular graphs</td></tr>
<tr><td>Prerequisites and co-requisites</td><td>Knowledge of programming basics, algorithms and complexity, object-oriented programming languages and paradigms in the languages chosen by the student.</td></tr>
<tr><td>Assessment methods and criteria</td><td><table>
<tr><th>Subject passing criteria</th><th>Passing threshold</th><th>Percentage of the final grade</th></tr>
<tr><td>oral exam</td><td>51.0%</td><td>30.0%</td></tr>
<tr><td>projects</td><td>100.0%</td><td>70.0%</td></tr>
</table></td></tr>
<tr><td>Recommended reading</td><td><table>
<tr><td>Basic literature</td><td>1. G. James, D. Witten, T. Hastie, R. Tibshirani, J. Taylor n Introduction to Statistical Learning with applications in Python, 2023, https://www.statlearning.com/
2. S. Raschka, V. Mirjalili, Python Machine Learning, Packt 2019</td></tr>
<tr><td>Supplementary literature</td><td>N/A</td></tr>
<tr><td>eResources addresses</td><td></td></tr>
</table></td></tr>
<tr><td>Example issues/ example questions/ tasks being completed</td><td></td></tr>
<tr><td>Work placement</td><td>Not applicable</td></tr>
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