GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Fundamentals of Machine Learning, PG_00053348		
Field of study	Biomedical Engineering, Biomedical Engineering, Biomedical Engineering		
Date of commencement of studies	February 2025	Academic year of realisation of subject	2025/2026
Education level	second-cycle studies	Subject group	Optional 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	2	Language of instruction	Polish
Semester of study	3	ECTS credits	2.0
Learning profile	general academic profile	Assessment form	exam
Conducting unit	Department of Biomedical Engineering -> Faculty of Electronics, Telecommunications and Informatics		
Name and surname of lecturer (lecturers)	Subject supervisor	prof. dr hab. inż. Jacek Rumiński	
	Teachers	prof. dr hab. inż. Jacek Rumiński	

Lesson types and methods of instruction

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	30.0	0.0	15.0	0.0	0.0	45

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	45	2.0	10.0	57

Subject objectives

The aim of the course is to familiarize students with the basics of machine learning, in particular with data classification algorithms, linear and logistic regression, and the practical use of artificial neural networks.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K7_U04] can apply knowledge of programming methods and techniques as well as select and apply appropriate programming methods and tools in computer software development or programming devices or controllers using microprocessors or programmable elements or systems specific to the field of study, making assessment and critical analysis of the prepared software as well as a synthesis and creative interpretation of information presented with it	The student is able to use programming libraries and software to solve machine learning problems. The student is able to train the model using a data set and assess the quality of the model using properly selected measures.	[SU1] Assessment of task fulfilment
[K7_W03] knows and understands, to an increased extent, the construction and operating principles of components and systems related to the field of study, including theories, methods and complex relationships between them and selected specific issues - appropriate for the curriculum	The student knows and understands the principles of operation of selected machine learning algorithms. The student knows and understands the principles of model training with the use of a data set, and knows and understands the methods of assessing the quality of the model using properly selected measures.	[SW1] Assessment of factual knowledge
[K7_W01] knows and understands, to an increased extent, mathematics to the extent necessary to formulate and solve complex issues related to the field of study	The student knows and understands the mathematical foundations related to selected machine learning algorithms.	[SW1] Assessment of factual knowledge

<table>
<tr><td>Subject contents</td><td colspan="3">Introduction - scope of the subject and literature. Definitions of artificial intelligence and machine learning. Types of machine learning. Preprocessing - data cleansing. Data transformation. Feature selection and decision trees. Random forests and ensambles of classifiers. Support vector machine. Unsupervised classification. Genetic algorithms. Basics and characteristics of genetic algorithms. Selection methods, crossing, mutation. Rule-based systems. Fuzzy logic. Fuzzy reasoning: Mamdani and Sugeno's inference. Rough sets. Linear and logistic regression. Artificial neural networks - gradient method. Artificial neural networks - model training and testing. Artificial neural networks - autocoders. Introduction to deep networks and convolutional neural networks. Practical use of convolutional networks in image classification.</td></tr>
<tr><td>Prerequisites and co-requisites</td><td colspan="3">Basics of computer programming and linear algebra.</td></tr>
<tr><td>Assessment methods and criteria</td><td colspan="3"><table>
<tr><th>Subject passing criteria</th><th>Passing threshold</th><th>Percentage of the final grade</th></tr>
<tr><td>laboratory exercises</td><td>51.0%</td><td>50.0%</td></tr>
<tr><td>exam</td><td>51.0%</td><td>50.0%</td></tr>
</table></td></tr>
<tr><td rowspan="3">Recommended reading</td><td>Basic literature</td><td colspan="2">Sebastian Raschka, Vahid Mirjalili, Python Machine Learning, Packt, 2021

François Chollet, Deep Learning with Python, Second Edition, Manning, 2021</td></tr>
<tr><td>Supplementary literature</td><td colspan="2">Aurélien Géron, Hands-On Machine Learning with Scikit-Learn and TensorFlow: Concepts, Tools, and Techniques to Build Intelligent Systems, O'Reilly, 2019</td></tr>
<tr><td>eResources addresses</td><td colspan="2">Adresy na platformie eNauczanie:</td></tr>
<tr><td>Example issues/ example questions/ tasks being completed</td><td colspan="3"></td></tr>
<tr><td>Work placement</td><td colspan="3">Not applicable</td></tr>
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