

Subject card

Subject name and code	Advanced Data Analysis and Exploration: Methods, Algo, PG_00179447						
Field of study	Mathematical Modeling and Data Analysis						
Date of commencement of studies	October 2023		Academic year of realisation of subject		2025/2026		
Education level	Bachelor's studies		Subject group				
Mode of study	full-time studies		Mode of delivery		at the university		
Year of study	3		Language of instruction		Polish		
Semester of study	6		ECTS credits		6.0		
Learning profile	academic		Assessment form		credit		
Conducting unit							
Name and surname of lecturer (lecturers)	Subject supervisor		dr Adrian Karpowicz				
	Teachers						
Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	0.0	0.0	0.0	0.0	30.0	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		0.0		0.0	30
Subject objectives	Preparation by the student of a paper discussing selected methods, algorithms, and tools for data analysis and exploration.						

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[MMiADL3_W13] knows and understands the basic concepts and principles of industrial property protection and copyright, is able to use patent information resources	The student knows and understands the basic concepts and principles of industrial property protection and copyright law, and is able to use patent information resources.	[SW1] oral statement/conversation/discussion
	[MMiADL3_W12] has a basic knowledge and understanding of legal and ethical conditions related to scientific and didactic activities	The student knows and understands the legal and ethical conditions related to scientific and educational activities.	[SW1] oral statement/conversation/discussion
	[MMiADL3_U15] can speak about mathematical problems in understandable colloquial language	The student is able to explain selected methods, algorithms, and tools for data analysis and exploration in a clear and accessible manner	[SU2] presentation/project/paper/report [SU3] text preparation/written work
	[MMiADL3_K04] is ready to understand and appreciate the importance of intellectual honesty in own and other people's actions; is ready to act ethically	The student understands and values the importance of intellectual honesty and ethical conduct.	[SK1] oral statement/conversation/discussion
	[MMiADL3_K06] is ready to formulate opinions on basic mathematical issues	The student compares different methods and algorithms for data analysis and exploration and discusses their theoretical foundations.	[SK3] text preparation/written work
	[MMiADL3_K02] is ready to precisely formulate questions to deepen his/her own understanding of a given topic or to find missing elements of reasoning	The student engages in discussions about selected methods, algorithms, and tools for data analysis and exploration.	[SK1] oral statement/conversation/discussion [SK2] presentation/project/paper/report
	[MMiADL3_K01] is ready to accept the limitations of his/her own knowledge and understands the need for further education	The student is willing to acknowledge the limitations of their own knowledge and is ready to pursue further learning.	[SK1] oral statement/conversation/discussion
	[MMiADL3_U14] has the ability to prepare oral presentations in Polish and at least one foreign language about selected mathematical issues using various sources of knowledge	The student is able to prepare and present a report on selected methods and algorithms for data analysis and exploration.	[SU2] presentation/project/paper/report [SU3] text preparation/written work
	[MMiADL3_K10] is ready to analyse data and communicate the conclusions of such analysis in an accessible form	The student analyzes and discusses algorithms and methods related to data analysis and exploration.	[SK1] oral statement/conversation/discussion [SK2] presentation/project/paper/report
	[MMiADL3_K09] is ready to critically evaluate arguments, find gaps in reasoning, and constructively criticise other people's reasoning	The student critically evaluates the results obtained from data analysis and exploration. They discuss the selection of appropriate methods, algorithms, or tools.	[SK1] oral statement/conversation/discussion [SK2] presentation/project/paper/report [SK3] text preparation/written work
Subject contents	1. Data cleaning and transformation methods using Power Query. 2. Data modeling and analysis with Power Pivot. 3. Modern analytical tools in Excel, including dynamic array functions, advanced lookup, sorting and filtering techniques, and integration with Python. 4. Regression models in machine learning and their application to prediction. 5. Classification models and clustering algorithms in machine learning. 6. Application of selected Python libraries for data analysis and exploration. 7. Automation of work in Excel through the use of macros, scripts, and AI tools. 8. Automation of work in Excel through the use of macros, scripts, and AI tools.		
Prerequisites and co-requisites			

Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Written paper.	51.0%	70.0%
	Presentation of the report.	51.0%	20.0%
	Active participation during class.	51.0%	10.0%
Recommended reading	Basic literature	1. George Mount, Nowoczesna analiza danych w Excelu. Power Query, Power Pivot i inne narzędzia Helion, 2025. 2. Hong Zhou, Eksploracja danych za pomocą Excela. Metody uczenia maszynowego krok po kroku Helion, 2024. 3. R. Johansson, Matematyczny Python. Obliczenia naukowe i analiza danych z użyciem NumPy, SciPy i Matplotlib, Helion, 2021.	
	Supplementary literature	Books and articles independently selected by the student in connection with the written paper they are preparing.	
	eResources addresses		
	Example issues/ example questions/ tasks being completed	1. Preparation of a written paper on the implementation of selected clustering methods in Excel and Python. 2. Preparation of a written paper on the application of AI tools in Excel.	
Work placement	Not applicable		

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