

Subject card

Subject name and code	Data Analysis Laboratory 2, PG_00174268						
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	5		ECTS credits		6.0		
Learning profile	academic		Assessment form		exam		
Conducting unit	Institute of Mathematics -> Faculty of Mathematics, Physics and Informatics -> Rector						
Name and surname of lecturer (lecturers)	Subject supervisor		dr Szymon Myga				
	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		0.0	60
Subject objectives	The goal of the course is to learn the most popular machine learning algorithms, understand the theoretical foundations of how they work, and finally test and analyze their practical implementations.						
Learning outcomes	Course outcome		Subject outcome		Method of verification		
	[MMiADL3_U11] knows how to arrange and analyse an algorithm in accordance with the specification and save it in the selected programming language		The student knows how basic machine learning algorithms work and understands their limitations.		[SU2] presentation/project/paper/report [SU5] implementation of a problem task		
	[MMiADL3_W09] knows and understands the basics of computational and programming techniques supporting mathematician's work and understands their limitations		The student knows how basic machine learning algorithms work, understands their applications and limitations.		[SW4] test/exam - oral or written [SW2] presentation/project/paper/report		
	[MMiADL3_U10] is able to recognise problems, including practical issues, that can be solved algorithmically; can make a specification of such a problem		The student is able to use existing implementations and make appropriate modifications to them.		[SU2] presentation/project/paper/report [SU4] test/exam - oral or written [SU8] observation of student's independent or team 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 knows the basic theoretical frameworks and concepts of machine learning, so they can ask questions using its terminology. They have the tools to evaluate model quality.		[SK2] presentation/project/paper/report [SK8] observation of student's independent or team work		

Subject contents	• Variable selection in regression models PCR, PLS, LASSO, ridge regression. • Classification using optimal separating hyperplanes, SVM. • Learning methods using the aggregation of multiple models bagging, AdaBoost, GBM, Random Forests, stacking, LASSO post-processing. • The curse of dimensionality, dimensionality reduction methods. • Model diagnostics: cross-validation, information criteria, model errors, optimism. • Theoretical aspects loss functions, variance-bias trade-off, basis expansion models. • Presenting the English nomenclature for the course.		
Prerequisites and co-requisites	Finished course Pracownia Analizy Danych		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Assessment of the student's attitude	51.0%	0.0%
	Oral or written exam and/or project and/or tests and/or homework	51.0%	100.0%
Recommended reading	Basic literature	1. Trevor Hastie, Robert Tibshirani, Jerome Friedman, <i>The Elements of Statistical Learning</i>, Springer Series in Statistics, Springer New York, NY, 2009. 2. Bishop, Christopher M, <i>Pattern recognition and machine learning</i>. Inf. Sci. Stat. Springer, New York, 2006.	
	Supplementary literature	1. Kevin P. Murphy, <i>Probabilistic Machine Learning: An introduction</i>, MIT Press, 2022.	
	eResources addresses		
Example issues/ example questions/ tasks being completed	1. Understanding the difference between training error and test error, and the ability to estimate them. 2. Building and interpreting several prediction models on a large dataset.		
Work placement	Not applicable		

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