



Subject card

Subject name and code	Data Processing and Machine Learning, PG_00060677						
Field of study	Przetwarzanie danych i uczenie maszynowe						
Date of commencement of studies	October 2023		Academic year of realisation of subject		2025/2026		
Education level	first-cycle studies		Subject group		Optional 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	3		Language of instruction		Polish		
Semester of study	6		ECTS credits		3.0		
Learning profile	general academic profile		Assessment form		assessment		
Conducting unit	Division of Applied Computer Science -> Institute of Naval Architecture -> Faculty of Mechanical Engineering and Ship Technology -> Faculties of Gdańsk University of Technology						
Name and surname of lecturer (lecturers)	Subject supervisor		dr inż. Tacjana Niksa-Rynkiewicz				
	Teachers						
Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	0.0	0.0	30.0	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		3.0		27.0	75
Subject objectives	The aim of the course is to introduce students to fundamental methods of data processing and selected machine learning algorithms that are applicable in the analysis of transport and logistics data. Students will acquire the ability to design simple analytical models, train them, and interpret the results.						
Learning outcomes	Course outcome		Subject outcome		Method of verification		
	[K6_U06] can use appropriate methods and tools in accordance with the formulated specification; can perform a simple engineering task in the field of design, manufacture and operation of transport means and systems		The student is able to program and implement a simple artificial intelligence model (e.g., classifier) using Python and libraries such as scikit-learn, NumPy, and pandas to solve data analysis tasks in transport and logistics.		[SU1] Ocena realizacji zadania [SU2] Ocena umiejętności analizy informacji		
	[K6_W04] has well established knowledge in the field of computer science, electronics, automation and control, information technology and computer graphics, useful for understanding the possibilities of applying them in transport		The student has structured knowledge of basic data processing methods and machine learning algorithms, including regression, classification, and clustering, and understands their practical applications in transport and logistics data analysis.		[SW3] Ocena wiedzy zawartej w opracowaniu tekstowym i projektowym		
	[K6_U01] can obtain information from literature, databases and other sources; verify and systematize the information obtained, interpret it and draw conclusions, formulate and justify opinions		The student is able to work in a project team, take on various roles, and communicate effectively to collaboratively complete a task involving AI applications.		[SU5] Ocena umiejętności zaprezentowania wyników realizacji zadania		

Subject contents	Course content – lecture Course Content (Lecture 15h): 1. Introduction to Data Processing and Machine Learning The role of data in transport and logistics What is machine learning and artificial intelligence 2. Data Representation and Preparation Data types (numerical, categorical) Missing values, outliers, normalization, and standardization 3. Exploratory Data Analysis (EDA) Charts, correlations, descriptive statistics Detecting patterns and relationships 4. Supervised Learning Linear and logistic regression Decision trees, k-nearest neighbors, SVM Introduction to neural networks 5. Unsupervised Learning Clustering (k-means) Dimensionality reduction (PCA) 6. Model Evaluation Data splitting: training, validation, testing Metrics: accuracy, precision, recall, F1, confusion matrix ROC curve 7. Applications of AI in Transport and Logistics Real-world use cases Challenges and limitations of ML systems Course Content (Project 30h): 1. Team Formation and Project Topic Selection Example topics: delay classification, route analysis, demand forecasting 2. Data Acquisition and Preprocessing Reading and cleaning data using Python (pandas, NumPy) Handling missing or inconsistent data 3. Exploratory Analysis and Visualization Creating visualizations (matplotlib, seaborn) Describing datasets and drawing insights 4. Machine Learning Model Development Choosing suitable algorithms Training and testing models with scikit-learn 5. Evaluation and Optimization Cross-validation Hyperparameter tuning 6. Presentation and Documentation Final project report with code, results, and conclusions Group presentation and discussion
Prerequisites and co-requisites	

Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	project	60.0%	90.0%
	activiti	80.0%	10.0%
Recommended reading	Basic literature	• Uczenie maszynowe z użyciem Scikit-Learn, Keras i TensorFlow. Wydanie III, Aurélien Géron • Python Machine Learning. Machine Learning and Deep Learning with Python, scikit-learn, and TensorFlow - Second Edition Sebastian Raschka, Vahid Mirjalili • Python Data Science Handbook. Essential Tools for Working with Data Jake VanderPlas	
	Supplementary literature	Daniel T. Larose, Chantal D. Larose, <i>Data Mining and Predictive Analytics</i>, Wiley, 2nd ed., 2015. Przystępne wprowadzenie do eksploracji danych z naciskiem na metody predykcyjne, zawiera wiele przykładów z praktyki. Tom M. Mitchell, <i>Machine Learning</i>, McGraw-Hill, 1997. Klasyczna, teoretyczna pozycja wprowadzająca w podstawowe algorytmy ML i ich matematyczne podstawy. Trevor Hastie, Robert Tibshirani, Jerome Friedman, <i>The Elements of Statistical Learning</i>, Springer, 2009 (dostępna bezpłatnie online). Zaawansowane i matematycznie ugruntowane podejście do uczenia maszynowego. David Barber, <i>Bayesian Reasoning and Machine Learning</i>, Cambridge University Press, 2012 (dostępna online). Dla zainteresowanych probabilistycznym podejściem do ML. François Chollet, <i>Deep Learning with Python</i>, Manning, 2nd ed., 2021. Praktyczne wprowadzenie do głębokiego uczenia z użyciem Keras i TensorFlow, z przykładami w Pythonie.	
	eResources addresses		
	Example issues/ example questions/ tasks being completed	Comparing two classifiers on a real dataset	
Practical activites within the subject	Not applicable		

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