GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Advanced AI Techniques, PG_00068334		
Field of study	Informatics		
Date of commencement of studies	February 2026	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	1	Language of instruction	English
Semester of study	1	ECTS credits	4.0
Learning profile	general academic profile	Assessment form	exam
Conducting unit	Department of Computer Architecture -> Faculty of Electronics Telecommunications and Informatics -> Faculties of Gdańsk University of Technology		
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. inż. Julian Szymański	
	Teachers	dr hab. inż. Julian Szymański	

Lesson types

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	15.0	0.0	15.0	0.0	0.0	30

E-learning hours included: 0.0

eNauczanie source address: https://enauczanie.pg.edu.pl/2025/course/view.php?id=4525

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	8.0	62.0	100

Subject objectives

The aim of the course is to familiarize students with selected advanced methods and algorithms of artificial intelligence, with particular emphasis on modern neural network models and tools enabling their practical application.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K7_W08] knows and understands, to an increased extent, the fundamental dilemmas of modern civilisation, the main development trends of scientific disciplines relevant to the field of education	The student is able to apply selected artificial intelligence models, in particular transformer-based models, large language models (LLMs), and graph neural networks, using modern programming tools and libraries.	[SW1] Assessment of factual knowledge
[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 knows the contemporary directions of development of artificial intelligence methods and their significance for the development of information systems.	[SU1] Assessment of task fulfilment [SU4] Assessment of ability to use methods and tools
[K7_W04] knows and understands, to an increased extent, the principles, methods and techniques of programming and the principles of computer software development or programming devices or controllers using microprocessors or other elements or programmable devices specific to the field of study, and organization of work of systems using computers or such devices	The student understands the operation and applications of artificial intelligence models, in particular, modern neural network architectures such as transformers and graph neural networks.	[SW1] Assessment of factual knowledge

Subject contents

Course content – lecture

- Introduction to large language models and the Hugging Face library.
- Introduction to natural language processing.
- Methods for text representation and classification.
- Encoder-type models and named entity recognition tasks.
- Retrieval-augmented generation methods.
- Graph neural networks

Course content – laboratory

- Running and configuring large language models (LLMs).
- Chat-based models and conducting dialogue with large language models.
- Fine-tuning large language models.
- Text classification.
- Token classification and named entity recognition (NER).
- Retrieval-augmented generation (RAG) systems.
- Graph neural networks (GNNs).

Prerequisites and co-requisites

Knowledge of the Python programming language and basic concepts of neural networks, in particular training using the backpropagation algorithm.

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
Laboratory grade	50.0%	50.0%
Exam grade (lectures)	50.0%	50.0%

Recommended reading

Basic literature	• *Natural Language Processing with Transformers, Revised Edition* Lewis Tunstall, Leandro von Werra, Thomas Wolf • *Dive into Deep Learning* Aston Zhang, Zachary Lipton, Mu Li, Alex Smola • *Graph Representation Learning* William L. Hamilton
Supplementary literature	• *Speech and Language Processing* Daniel Jurafsky, James H. Martin
eResources addresses	

Example issues/ example questions/ tasks being completed

- use of large language models for text generation
- implementation of text classification using transformer-based models
- named entity recognition in text
- fine-tuning language models for a selected NLP task

Practical activites within the subject

Not applicable