



## Subject card

Subject name and code	Applications of Artificial Intelligence in E&T, PG_00066222						
Field of study	Electronics and Telecommunications						
Date of commencement of studies	February 2027	Academic year of realisation of subject	2026/2027				
Education level	second-cycle studies	Subject group					
Mode of study	Full-time studies	Mode of delivery	at the university				
Year of study	1	Language of instruction	Polish				
Semester of study	1	ECTS credits	3.0				
Learning profile	general academic profile	Assessment form	assessment				
Conducting unit	Department of Multimedia Systems -> Faculty of Electronics Telecommunications and Informatics -> Faculties of Gdańsk University of Technology						
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. inż. Piotr Szczuko					
	Teachers	dr hab. inż. Piotr Szczuko mgr inż. Mateusz Groth dr hab. inż. Łukasz Kulas dr inż. Bartosz Czaplewski prof. dr hab. inż. Andrzej Czyżewski dr inż. Krzysztof Cwalina					
Lesson types	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	0.0	0.0	45		
Subject objectives	The aim of the subject is to familiarise students with the applications of machine learning and artificial intelligence in broadly understood scientific and technical fields related to telecommunications and electronics. The subject will present selected modern, important and popular technologies and trends in the development of artificial intelligence, including: large language models, deep neural networks, convolutional networks, and will discuss their applications in: knowledge processing and acquisition, image and signal data analysis, detection, segmentation and classification of objects in images, and others. Directions and trends in the development of knowledge engineering systems, human-computer interfaces, prediction, recommendation, diagnostics will be discussed. Problems of data preparation for machine learning, assessing the accuracy of models, building and training them correctly, ethical and responsible implementation will be addressed.						

Learning outcomes	Course outcome	Subject outcome	Method of verification
	<p>[K7_W11] knows and understands, to an increased extent, the general principles of creation and development of forms of individual entrepreneurship and the economic, legal and other conditions of various types of activities related to the awarded qualification, including the principles of protection of industrial property and copyright law</p>	<p>Has in-depth knowledge and understanding of the principles of creating and developing individual entrepreneurship in the area of artificial intelligence and teleinformatics technologies, including business models based on AI.</p> <p>Understands the economic, legal, and ethical conditions of activities related to the implementation of AI systems, particularly in the context of industrial property protection and copyright in relation to models, algorithms, and data.</p> <p>Is familiar with current regulations, legal challenges, and ethical issues related to the practical application of artificial intelligence in engineering practice.</p>	<p>[SW1] Assessment of factual knowledge</p>
	<p>[K7_W10] knows and understands, to an increased extent, the basic processes occurring in the life cycle of equipment, objects and technical systems, as well as methods of supporting processes and functions, specific to the field of study</p>	<p>Has in-depth knowledge and understanding of the basic processes taking place in the life cycle of technical systems based on AI — from the design phase, through data preparation, model creation and training, deployment in technical systems, to maintenance, monitoring, and further development.</p> <p>Understands the methods supporting analytical, decision-making, and diagnostic processes in telecommunications and electronics using artificial intelligence systems.</p> <p>Is aware of the specific characteristics and challenges associated with integrating AI solutions with existing technical systems and the impact of such solutions on the product and service life cycle.</p>	<p>[SW1] Assessment of factual knowledge</p>
	<p>[K7_U12] is able, to an increased extent, to analyze the operation of components and systems related to the field of study, as well as to measure their parameters and study their technical characteristics, and to plan and carry out experiments related to the field of study, including computer simulations, interpret the obtained results and draw conclusions</p>	<p>Is able to thoroughly analyze the operation of AI-based components, circuits, and systems used in telecommunications and electronics, such as machine learning models and neural networks.</p> <p>Can measure and assess parameters and technical characteristics of AI models (e.g., accuracy, precision, sensitivity, response time, resource consumption), both in real-world environments and simulation conditions.</p> <p>Is capable of planning and conducting experiments related to the implementation and testing of AI systems — including computer simulations of image and signal data processing, as well as predictive and classification analyses.</p> <p>Can interpret the results of experiments and draw conclusions regarding the effectiveness, reliability, and usability of the examined solutions, taking into account technical, practical, and ethical aspects.</p>	<p>[SU1] Assessment of task fulfilment [SU3] Assessment of ability to use knowledge gained from the subject [SU4] Assessment of ability to use methods and tools</p>

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Subject contents	<p>Course content – lecture</p> <p>Introduction to AI, overview of popular AI tools</p> <p>Application of AI in audio and video processing and analysis</p> <p>Preparation of data for AI learning and testing</p> <p>Ethical and energy aspects and problems of AI development and deployment</p> <p>Application of AI in radio communication</p> <p>Application of AI in data communication systems</p> <p>Neural network architectures, model decision explanations</p> <p>AI in sensing for biomedical and environmental purposes</p> <p>AI in wireless embedded systems</p> <p>AI in situational awareness systems of autonomous vehicles</p>									
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Example issues/ example questions/ tasks being completed	<p>Explain the differences between classical neural networks and convolutional networks (CNNs). What are the applications of convolutional networks in image and signal data analysis?</p> <p>List and characterise methods for evaluating the quality of machine learning models. Give examples for classification, segmentation and text generation tasks.</p> <p>Discuss the importance of ethical, legal and technical aspects in implementing AI solutions.</p>									
Practical activities within the subject	Not applicable									

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