GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Artificial Intelligence in Wireless Communication, PG_00069768		
Field of study	Artificial Intelligence in Wireless Communication		
Date of commencement of studies	February 2025	Academic year of realisation of subject	2025/2026
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	English
Semester of study	2	ECTS credits	2.0
Learning profile	general academic profile	Assessment form	assessment
Conducting unit	Department of Radiocommunication Systems and Networks -> Faculty of Electronics Telecommunications and Informatics -> Faculties of Gdańsk University of Technology		
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Krzysztof Cwalina	
	Teachers	dr inż. Krzysztof Cwalina mgr inż. Alicja Olejniczak	

Lesson types

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

E-learning hours included: 0.0

eNauczanie source addresses:
Moodle ID: 1510 Artificial Intelligence in Wireless Communication
https://enauczanie.pg.edu.pl/2025/course/view.php?id=1510

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

The course aims to familiarize students with the applications of artificial intelligence, machine learning, and neural networks in radiocommunication systems and networks. Students will learn about modern methods and applications, along with current trends in the development of artificial intelligence in wireless communications. The differences between the application of artificial intelligence methods in wireless communications and well-known and popular areas of application in other fields will also be discussed, along with the issues of model robustness and sensitivity.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[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	Designs, implements and optimizes machine learning methods, in particular neural network learning, for use in radio communication systems and networks depending on requirements.	[SU4] Ocena umiejętności korzystania z metod i narzędzi [SU3] Ocena umiejętności wykorzystania wiedzy uzyskanej w ramach przedmiotu [SU1] Ocena realizacji zadania
[K7_W03] knows and understands, to an increased extent, the construction and operating principles of components and systems related to the field of study, including theories, methods and complex relationships between them and selected specific issues - appropriate for the curriculum	Knows and understands methods of training neural networks and their application in radio communication systems and networks.	[SW1] Ocena wiedzy faktograficznej

Subject contents	Course content – lecture Introduction to wireless communication Introduction to artificial intelligence, machine learning and neural networks Modern AI methods and applications in the physical layer of the radio interface Modern AI methods and applications in the data link layer of the radio interface Differences and issues of usage known AI methods in wireless communication Models sensitivity Models resistance Course content – project Modern Artificial Intelligence Methods and Applications in Radio Interface Layers Model Robustness and Sensitivity
Prerequisites and co-requisites	Knowledge of the basics of artificial intelligence algorithms, machine learning and neural networks as well as basic issues related to wireless communication and radio link implementation.

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
	50.0%	50.0%
	50.0%	50.0%

Recommended reading

Basic literature	**Deep Learning,** Ian Goodfellow, Yoshua Bengio, Aaron Courville MIT Press Ltd, 2016 **Unlocking Artificial Intelligence,** Christopher Mutschler, Christian Münzenmayer, Norman Uhlmann, Alexander Martin, Springer 2024 Chen, Wei, Ruisi He, Gongpu Wang, et al. **AI Assisted PHY in Future Wireless Systems: Recent Developments and Challenges**, China Communications 18, 2021 Letaief, K. B., Chen, W., Shi, Y., Zhang, J., & Zhang, Y. J. A., **The roadmap to 6G: AI empowered wireless networks**. IEEE communications magazine, 57(8), 2019 Wang, Jun, Rong Li, Jian Wang, Yi-qun Ge, Qi-fan Zhang, and Wu-xian Shi, **Artificial Intelligence and Wireless Communications,** Frontiers of Information Technology & Electronic Engineering 21 (10), 2020 Van Huynh, Nguyen, Jiacheng Wang, Hongyang Du, et al., **Generative AI for Physical Layer Communications: A Survey,** IEEE Transactions on Cognitive Communications and Networking 10 (3), 2024
Supplementary literature	**Advanced Wireless Communication and Artificial Intelligence Breakthroughs in Electronics and Communication Engineering**, Satti Sudha Mohan Reddy, Parul Awasthi, Vishal Awasthi, Ch Santhi Rani, IIP Iterative International Publishers, 2025 **Principles of Data Science**, Sinan Ozdemir, 2016 Packt Publishing
eResources addresses	

Example issues/ example questions/ tasks being completed	
Practical activites within the subject	Not applicable

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