GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Deep Processing Text and Speech Signal, PG_00054193			
Field of study	Informatics			
Date of commencement of studies	February 2024	Academic year of realisation of subject		2024/2025
Education level	second-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	1	Language of instruction		Polish
Semester of study	2	ECTS credits		3.0
Learning profile	general academic profile	Assessment form		assessment
Conducting unit	Department of Multimedia Systems -> Faculty of Electronics, Telecommunications and Informatics			
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. inż. Piotr Szczuko		
	Teachers	dr hab. inż. Piotr Szczuko dr inż. Arkadiusz Harasimiuk mgr inż. Szymon Zaporowski dr inż. Sebastian Cygert		

Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	0.0	30.0	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	2.0	28.0	75

Subject objectives	The course is dedicated to important theoretical and practical aspects of text analysis and speech sound processing. The included topics are: modelling meaning and context, graph neural networks, attention in neural networks, GPT networks. For speech processing following will be presented: emission and perception of speech, registration and processing aimed at machine learning applications, AI methods for text and speech, analysis and recognition, feature extraction, applications of wavenet and tacotron architectures. Example tools and libraries in Python will be presented and used in practice

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[K7_U01] can apply mathematical knowledge to formulate and solve complex and non-typical problems related to the field of study by:n-appropriate selection of source information and its critical analysis, synthesis, creative interpretation and presentation,n-application of appropriate methods and toolsn	Student is able to correctly choose tools for text and speech preprocessing; properly defines goals and research problems and applies data processing adequate to the defined aims.	[SU3] Assessment of ability to use knowledge gained from the subject [SU1] Assessment of task fulfilment
	[K7_U05] can plan and conduct experiments related to the field of study, including computer simulations and measurements; interpret obtained results and draw conclusions	Student properly analyses results of the training and evaluation of chosen machine learning methods, dedicated to text and speech processing; is able to draw conclusions, and critically summarise the results.	[SU4] Assessment of ability to use methods and tools [SU2] Assessment of ability to analyse information [SU1] Assessment of task fulfilment
	[K7_W02] Knows and understands, to an increased extent, selected laws of physics and physical phenomena, as well as methods and theories explaining the complex relationships between them, constituting advanced general knowledge in the field of technical sciences related to the field of study	Student is able to describe phenomena related to speech emission and perception, chooses tools and methods for correct registration and processing of the signals aimed at machine learning applications.	[SW1] Assessment of factual knowledge

Subject contents	
	• Tools, best practices • Digital signals, speech representation, parameterisation • Fundamentals of speech acoustics, signal acquisition and processing, practical issues in ML • NLP applications with GPT models • Principles and applications of Wavenet architecture • Deep learning-based voice synthesisers • Speaker recognition • Style transfer for speech • Graph neural networks • Boosted decision trees in speech processing • Voice Biometrics

Prerequisites and co-requisites	

Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Laboratory reports	51.0%	50.0%
	Colloquium	51.0%	50.0%

Recommended reading	Basic literature	Bengio Yoshua, Courville Aaron, Goodfellow Ian, Deep Learning, 2018 Lane Hobson, Cole Howard, Hannes Hapke, Natural Language Processing in Action: Understanding, Analyzing, and Generating Text with Python, Manning 2019
	Supplementary literature	Teaching materials for sound and vision processing: https://sound.eti.pg.gda.pl/student/materialy.html
	eResources addresses	Adresy na platformie eNauczanie:

Example issues/ example questions/ tasks being completed	

Work placement	Not applicable