



Subject card

Subject name and code	Natural Language Processing, PG_00068332						
Field of study	Automatic Control, Cybernetics and Robotics						
Date of commencement of studies	October 2026	Academic year of realisation of subject			2029/2030		
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	4	Language of instruction			Polish		
Semester of study	7	ECTS credits			2.0		
Learning profile	general academic profile	Assessment form			exam		
Conducting unit	Department of Intelligent Interactive Systems -> Faculty of Electronics Telecommunications and Informatics -> Faculties of Gdańsk University of Technology						
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. inż. Jan Daciuk					
	Teachers	dr hab. inż. Jan Daciuk					
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						
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	2.0	18.0	50		
Subject objectives	The purpose of this subject is to familiarize students with basic techniques used in computational linguistics and to to prepare them for work on development of applications for that domain.						
Learning outcomes	Course outcome	Subject outcome			Method of verification		
	[K6_W10] knows and understands, to an advanced extent, the parameters, functions, and methods of analysis, design, and optimization of electronic circuits and systems, the definitions of error and measurement uncertainty, measurement methods, including time, frequency, and phase measurements, the properties of converters, and methods of digital signal processing, as well as the basic processes occurring in the life cycle of technical devices, objects, and systems, and methods of supporting processes and functions, specific to the field of study	Is able to measure effectiveness of applied methods and to measure their precision.			[SW3] Assessment of knowledge contained in written work and projects		
	[K6_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	Is capable of using acquired knowledge about natural language and speech processing as well as to select appropriate methods and programming tools to develop software for natural language and speech processing applications.			[SU3] Assessment of ability to use knowledge gained from the subject [SU1] Assessment of task fulfilment		

Subject contents	<p>Course content – lecture</p> <p>Lecture:</p> <ol style="list-style-type: none"> 1. Introduction: language, speech and language processing, applications. 2. Text and language data representations, segmentation, normalization. 3. Word and document representations: bag of words (BoW), TF-IDF, embeddings: Word2Vec, GloVe, FastText. 4. N-grams and probabilistic models. 5. Text retrieval. 6. Document classification. 7. Sentiment analysis, topic identification. 8. Document clasterization. 9. Shallow syntactic processing, syntax, parsing. 10. RNN architectures and their applications in sequence analysis (GRU, LSTM). 11. Transformer models (e.g. BERT, GPT) and their application to advanced NLP tasks. 12. Speech: phonetics, phonology, prosody. 13. Automatic speech recognition (ASR). 14. Speech synthesis (TTS). 15. Intent extraction from speech, dialog systems. <p>Laboratory:</p> <ol style="list-style-type: none"> 1. Introduction. (1h) 2. Text data formats, segmentation and normalization. 3. Text retrieval. 4. Parsing, named entity recognition. 5. Text classification, sentiment analysis, topic identification. 6. Speech analysis tools. 7. Speech recognition and synthesis. 8. Dialog system. 											
Prerequisites and co-requisites	Programming skills (mainly Python).											
Assessment methods and criteria	<table border="1"> <thead> <tr> <th data-bbox="453 911 794 943">Subject passing criteria</th> <th data-bbox="794 911 1139 943">Passing threshold</th> <th data-bbox="1139 911 1492 943">Percentage of the final grade</th> </tr> </thead> <tbody> <tr> <td data-bbox="453 949 794 981">exam</td> <td data-bbox="794 949 1139 981">50.0%</td> <td data-bbox="1139 949 1492 981">50.0%</td> </tr> <tr> <td data-bbox="453 981 794 1010">laboratory</td> <td data-bbox="794 981 1139 1010">50.0%</td> <td data-bbox="1139 981 1492 1010">50.0%</td> </tr> </tbody> </table>			Subject passing criteria	Passing threshold	Percentage of the final grade	exam	50.0%	50.0%	laboratory	50.0%	50.0%
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exam	50.0%	50.0%										
laboratory	50.0%	50.0%										
Recommended reading	Basic literature	<ol style="list-style-type: none"> 1. Daniel Jurafsky, James Martin, Speech and Language Processing. An Introduction to Natural Language Processing, Computational Linguistics, and Speech Recognition, Third Edition, draft. 2. Marcin Woliński, Automatyczna analiza składnikowa języka polskiego, Wydawnictwa Uniwersytetu Warszawskiego, 2019. 3. Bartosz Ziółko, Mariusz Ziółko, Przetwarzanie mowy, Wydawnictwa AGH, Kraków 2011. 										
	Supplementary literature	<ol style="list-style-type: none"> 1. Alicja Nagórko, Zarys gramatyki polskiej, Wydawnictwo Naukowe PWN, Warszawa, 1996. 2. Ashish Bansal, Advanced Natural Language Processing with TensorFlow 2. Build effective real-world NLP applications using NER, RNNs, seq2seq models, Transformers, and more, Packt, 2021. 3. Rajesh Arumugam, Rajalingappaa Shanmugamani, Hands-On Natural Language Processing with Python. A practical guide to applying deep learning architectures to your NLP applications, Packt, 2018. 4. Zhiyuan Liu, Yankai Lin, Maosong Sun, Representation Learning for Natural Language Processing, Springer, 2020. 5. Piotr Wróblewski, Machine learning i natural language processing w programowaniu, Helion, 2024. 6. Cathy Pearl, Projektowanie głosowych interfejsów użytkownika, Helion, 2021. 7. Sowmya Vajjala, Bodhisattwa Majumderand, Anuj Gupta, Harshit Surana, Przetwarzanie języka naturalnego w praktyce. Przewodnik po budowie rzeczywistych systemów NLP, Helion, 2023. 8. Lewis Tunstall, Leandro von Werra, Thomas Wolf, Przetwarzanie języka naturalnego z wykorzystaniem transformerów, Helion, 2024. 9. Paul Deitel, Harvey Deitel, Python dla programistów z analizami przypadków wprowadzającymi w tematykę sztucznej inteligencji, Helion, 2020. 10. Lior Gazit and Meysam Ghaffari, Zaawansowane techniki przetwarzania języka naturalnego, Helion, 2025. 11. Marek Wiśniewski, Zarys fonetyki i fonologii współczesnego języka polskiego, Wydawnictwo Uniwersytetu Mikołaja Kopernika, wydanie IV, Toruń 2001. 										
	eResources addresses											
Example issues/ example questions/ tasks being completed												
Practical activites within the subject	Not applicable											

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