



Subject card

Subject name and code	, PG_00066267						
Field of study	Widzenie komputerowe						
Date of commencement of studies	October 2024		Academic year of realisation of subject		2025/2026		
Education level	second-cycle studies		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	2		Language of instruction		Polish		
Semester of study	3		ECTS credits		4.0		
Learning profile	general academic profile		Assessment form		assessment		
Conducting unit	Institute of Physics and Applied Computer Science -> Faculty of Applied Physics and Mathematics -> Wydziały Politechniki Gdańskiej						
Name and surname of lecturer (lecturers)	Subject supervisor		dr inż. Bartosz Reichel				
	Teachers		dr inż. Bartosz Reichel				
Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	0.0	45.0	0.0	0.0	60
	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	60		5.0		35.0	100
Subject objectives	The aim of the course is to familiarize students with the methods, techniques and algorithms of computer vision.						
Learning outcomes	Course outcome		Subject outcome		Method of verification		
	[K7_W07] describes well symbolic computation software package and statistical data processing package.		Can use machine learning packages.		[SW3] Ocena wiedzy zawartej w opracowaniu tekstowym i projektowym		
	[K7_W03] demonstrates knowledge advanced computation techniques, supporting the work of a mathematician and understand their limitations.		Can use the functionalities of the OpenCV package to create their own solutions.		[SW3] Ocena wiedzy zawartej w opracowaniu tekstowym i projektowym		
	[K7_U10] understands the mathematical foundations of the analysis of algorithms and computational processes, constructs algorithms with good numerical properties, used to solve typical and unusual mathematical problems		Can use the functionalities of the OpenCV package to create their own solutions.		[SU1] Ocena realizacji zadania		
	[K7_U09] constructs mathematical models used in specific advanced applications of mathematics, can use stochastic processes as a tool for modeling phenomena and analyzing their evolution, constructs mathematical models used in specific advanced applications of mathematics, uses stochastic processes as a tool for modeling phenomena and analyzing their evolution, recognizes mathematical structures in physical theories		Can model a phenomenon using functions available in computer vision packages.		[SU1] Ocena realizacji zadania		

Subject contents	Image Creation and Filtering. Review of concepts in optics: lenses, cameras, and sensors. Light and color and their representation. Selected optical filters. Frequency domain analysis. Image binarization. Image feature detection and matching. Detection of edges, characteristic points, and corners. Local image features. Motion detection. Stereography. Image object recognition. Recognition of faces, instances, scenes, and categories in images. Recognition of two-dimensional and three-dimensional objects. Machine Learning. Introduction to Machine Learning. Neural Networks: Structure and Applications: Simple Perceptron, Activation Function, Learning Algorithms, Backpropagation Method, Momentum Technique. Methods for Automatic Content Categorization (Clustering) of Digital Images. Kmeans and Hierarchical Clustering Algorithms. Image Classification Methods: K-NN, CART Trees, Ensemble Methods. Classification Quality Assessment. Content-Based Image Search (CBIR). Lab (sample topics) Implementing a selected image filtering function and using it to create hybrid images. Introduction to the OpenCV library. Using the OpenCV library for image recognition. Implementing your own artificial neural network and using it for image recognition. Using libraries: TensorFlow, Keras, Scikit-learn, and others for image recognition and classification. Augmented Reality (AR)		
Prerequisites and co-requisites	Knowledge of programming in any popular programming language		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Pytania (ustne)	50.0%	50.0%
	Projekt	50.0%	50.0%
Recommended reading	Basic literature	A. Géron, Hands-On Machine Learning with Scikit-Learn and PyTorch: Concepts, Tools, and Techniques to Build Intelligent Systems 1st Edition	
	Supplementary literature	Joseph Howse, Joe Minichino, Learning OpenCV 4 Computer Vision with Python 3: Get to grips with tools, techniques, and algorithms for computer vision and machine learning, 3rd Edition 3rd ed. Edition	
	eResources addresses		
Example issues/ example questions/ tasks being completed	What methods do you know for detecting edges in an image?		
Practical activities within the subject	Not applicable		

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