

。 GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Digital Image Processing Methods in Remote Sensing, PG_00063911							
Field of study	Informatics							
Date of commencement of studies	February 2025		Academic year of realisation of subject		2024/2025			
Education level	second-cycle studies		Subject group			Optional 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	1		Language of instruction		Polish			
Semester of study	1		ECTS credits		4.0			
Learning profile	general academic profile		Assessment form		assessment			
Conducting unit	Department of Geoinformatics -> Faculty of Electronics, Telecommunications and Informatics							
Name and surname of lecturer (lecturers)	Subject supervisor Teachers		dr hab. Marcin Ciecholewski dr hab. Marcin Ciecholewski					
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Projec	t	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		8.0		62.0		100
Subject objectives	The aim of the cours algorithms ofdigital i	e is to familiaris mage processin	se students, bo ig in remote se	oth theoretically ensing using op	and pra tical and	ctically radar a	, with the met apparatus.	thods and

Learning outcomes	Course outcome	Subject outcome	Method of verification	
	[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	The student knows and understands the principles of software using digital image processing. The student understands the interrelationships between the processing steps.	[SW1] Assessment of factual knowledge	
	[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	The student is able to explain the operation of digital image processing algorithms and methods. Including being able to give the advantages and limitations of the presented approaches.	[SW1] Assessment of factual knowledge	
	[K7_U07] can apply advanced methods of process and function support, specific to the field of study	The student is able to use advanced libraries during the development of proprietary software.	[SU4] Assessment of ability to use methods and tools	
	[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	Students is be able to write, run and test programmes implementing algorithms and methods for processing digital images.	[SU1] Assessment of task fulfilment	
Subject contents				
	1 Introduction to imaging methods up Filtering: convolution and discrete con noise: filtering based on arithmetic a applications of mathematical morpho extraction, image reconstruction. 6.0 gradient methods in shape extraction as applied to remote sensing: global using clustering and superpixels, seg	sed in remote sensing. 2. Point trans orrelation.4. Noise in optical and rada nd geometric mean, median filtering, ology for greyscale and binary image: Gradient approximation methods in di n in digital images. 8.Selected topics and local binarization methods, area gmentation using graph cuts, watersh	formations of digital images 3. r images, methods of reducing adaptive filtering. 5. Methods and s: noise reduction, edge and shape gital images. 7. Application of in segmentation of digital images growing method, segmentation hed segmentation.	
Prerequisites and co-requisites				
Assessment methods	Subject passing criteria	Passing threshold	Percentage of the final grade	
and criteria	Collection of laboratory tasks	50.0%	50.0%	
Recommended reading	Written colloquium Basic literature Supplementary literature	50.0% 1. Gonzalez R.C., Woods R.E.: Digital Image Processing, 4rd ed.,Pearson, 2018. 2. Parker, Jim R. Algorithms for image processing and computer vision. John Wiley & Sons, 2010. 3. Szeliski, R. (2022). Image Processing. In: Computer Vision. Texts in Computer Science. Springer, Cham 4. Serra, J., & Soille, P. (Eds.). (2012). Mathematical morphology and its applications to image processing (Vol. 2). Springer Science & Business Media.		
	eResources addresses	Adresy na platformie eNauczanie		

Example issues/ example questions/ tasks being completed	1. Explain and derive relationships for point operations in digital images such as equalization, normalization and histogram adjustment.2. Computationally efficient algorithms for determining dilation and erosion for binary and greyscale images.3. Implement morphological reconstruction methods for binary and greyscale images.4. Give global and local binarization methods and explain their operation. For which image classes is it best to apply the specified methods?5 Explain the operation of k-means and superpixel methods for segmentation of digital images.6. Implement and compare the results of watershed segmentation and graph cut methods.
Work placement	Not applicable

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