

Subject card

Subject name and code	Digital Image Processing Algorithms, PG_00168144						
Field of study	Informatics						
Date of commencement of studies	October 2024		Academic year of realisation of subject		2024/2025		
Education level	Master's studies		Subject group		Obligatory subject group in the field of study Optional subject group		
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		6.0		
Learning profile	academic		Assessment form		exam		
Conducting unit							
Name and surname of lecturer (lecturers)	Subject supervisor		dr inż. Agnieszka Rowińska-Schwarzweller				
	Teachers		dr inż. Agnieszka Rowińska-Schwarzweller				
Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	0.0	30.0	0.0	0.0	60
	E-learning hours included: 0.0						
	Additional information: The basic principles, methods and algorithms are explained in lectures. In the lab exercises which take place in parallel, theoretical and practical tasks are solved (methods and algorithms are applied and possibly implemented in an exemplary manner based on ImageJ and/or Python and/or Java).						
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		0.0		0.0	60
Subject objectives	Qualification aim of this module is to impart methods for digital image processing as subset of digital signal processing: algorithms for image reconstruction, enhancement, filtering, correlation, object feature detection, segmentation, classification and pattern recognition.						

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[INFMU2_U01] can apply mathematical knowledge to formulate, analyze and solve tasks related to computer science	The student is able to apply mathematical methods to operations on digital images, such as convolution and the Fourier transform. The student is able to use mathematical tools for image analysis and processing, including transforms, filtering methods, and mathematical morphology, and knows examples of algorithms used for segmentation and compression.	[SU4] test/exam - oral or written
	[INFMU2_W03] has in-depth knowledge of programming paradigms and advanced programming constructs; knows current trends in programming languages	The student is able to design and implement a simple image processing algorithm and assess its correctness. The student is able to select appropriate algorithms to solve a specific problem related to image analysis, such as noise reduction, edge detection, or segmentation.	[SW4] test/exam - oral or written [SW2] presentation/project/paper/report
Subject contents	1. Human visual perception / color space models 2. Image representation (image as a two-dimensional signal, resolution change, color palette change - dithering) 3. Image digitization (sampling, Nyquist-Shannon theorem, quantization) 4. Discretization in signal and systems theory (DFT, DFC, FFT) 5. Point operators (based on histogram, arithmetic and logical operations on images) 6. Linear filters in the image domain (convolution) and in the frequency domain 7. Nonlinear filters 8. Image correlation 9. Morphological operations 10. Detection of object features in images (edges, ridges, angles, texture) 11. Segmentation of objects in the image (decomposition into semantic units) 12. Classification 13. Neural networks in image processing 14. Applications (measurement techniques, biometric technologies)		
Prerequisites and co-requisites			
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
		51.0%	50.0%
		51.0%	50.0%
Recommended reading	Basic literature	"Cyfrowe przetwarzanie obrazów", 2008, W. Malina, M. Smiatacz "Digital Image Processing Second Edition", 2019, Gonzalez, Faisal "Basics of Image Processing", 2025, V. Mazet (Université de Strasbourg)	
	Supplementary literature	"Digital Signal Processing", A.V. Oppenheim, R. Schafer	
	eResources addresses		
Example issues/ example questions/ tasks being completed			
Work placement	Not applicable		

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