SYLLABUS

Name: ***Computer Vision and Pattern Recognition (InfAAu>SM1CVaPR19)***
Name in Polish:
Name in English: ***Computer Vision and Pattern Recognition***

Information on course:

Course offered by department: Faculty of Automatic Control, Electronics and Computer Science
Course for department: Silesian University of Technology

Default type of course examination report:

EGZ

Language:

English

Course homepage:

https://platforma2.polsl.pl/rau2/course/view.php?id=960

Short description:

The course concerns the issues of designing computer vision and pattern recognition systems. It is focused on image processing and the classification of vision data.

Description:

ECTS:4
Total workload: 120 (60 contact hours / 60 student's own work hours)
Lecture: 30
Laboratory: 15
Project: 15

Student's own work: preparation for the lab classes, implementation of the project task

Lecture
o Image representation – binary, monochromatic, color and mult/hyperispectral images
o Contrast enhancement based on the point operations.
o Spatial filtering – convolution and nonlinear approaches.
o Fourier transform.
o Edge detection.
o Mathematical morphology for binary and grayscale images.
o Image segmentation - thresholding, mean shift, watershed, clustering.
o Image feature extraction – geometrical features, histogram of oriented gradients, local binary patterns.
o Supervised and unsupervised classification: techniques utilizing probability distributions (optimal Bayes classifier, empirical classifier based on parametric and nonparametric estimation, nearest neighbors method), support vector machines, division and dendrogram concepts, hierarchical and division algorithms
o Deep learning in computer vision.
o 3D vision: camera model, internal and external parameters, camera calibration, stereovision, 3D reconstruction
Lab
• image preprocessing
• supervised and unsupervised classification
• segmentation of biomedical images,
• stereovision.

Project: Designing and implementation of vision systems for various practical issues.

Bibliography:

R.O. Duda, P.E.Hart, D.G. Stork: Pattern classification and scene analysis. Wiley, New York, 2000
Ch. Bishop: Pattern recognition and machine learning. Springer Berlin 2006
R.C. Gonzalez, R.E. Woods: Digital image processing, Prentice-Hall, N.Y., 2002
E. Trucco, A. Verri: Introductory techniques for 3D computer vision, Prentice Hall, N.J., 19
K. Stapor: Metody klasyfikacji obiektów w wizji komputerowej. PWN, Warszawa 2011

Learning outcomes:

Knowledge: a student knows and understands
K2_W04 advanced concepts and algorithms used in digital image processing and recognition.
Skills: a student can
K2_U01 formulate and solve complex and unusual problems, and perform tasks innovatively under unpredictable conditions by: appropriately selecting sources and the information derived from them, conducting evaluation, critical analysis, synthesis, as well as creative interpretation and presentation of this information, selecting and applying appropriate methods and tools, including advanced information and communication technologies
construction of classifiers for real applications with different approaches
K2_U04: Use the English language at the B2+ level of the Common European Framework of Reference for Languages (CEFR) and at a higher level with regard to specialist IT terminology
K2_U07 Plan and carry out experiments in the field of computer science, including measurements and computer simulations, interpret the obtained results, and draw conclusions.
K2_U09 In identifying and formulating the specifications of engineering tasks and in solving them: make use of analytical, simulation, and experimental methods, recognize their systemic and non-technical aspects, perform a preliminary economic assessment of the proposed solutions and undertaken engineering activities

Assessment methods and assessment criteria:

Lecture:
Two-stage written exam containing theoretical questions and computational tasks.

Lab:
Finishing the tasks during the classes and the report

Project
Presentations during project meetings and report

The syllabus is valid from academic year 2025/2026 and its content cannot be changed during the semester.

Course credits in various terms:

<without a specific program>

Type of credits	Number	First term	Last term
European Credit Transfer System (ECTS)	4	2020/2021-Z	