COURSE DESCRIPTION CARD - SYLLABUS

Course name

Analiza danych wizyjnych - Visual data analysis

Course

Field of study
Teleinformatics

Year/Semester
1/1

Area of study (specialization)

Profile of study
general academic

Level of study
second-cycle studies

Course offered in
Polish

Form of study
full-time

Requirements
compulsory

Number of hours

Lecture
15

Laboratory classes
30

Other (e.g. online)

Tutorials
0

Projects/seminars
0/0

Number of credit points

3

Lecturers

Responsible for the course/lecturer:

dr inż. Sławomir Maćkowiak

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Responsible for the course/lecturer:

Prerequisites

- Knowledge of a basic university course in mathematics (statistical analysis, calculus of probability).
- It has a structured, mathematically grounded knowledge of acquisition, human perception, quality assessment human perception, quality assessment, processing, digital representation, compression and transmission of of image, speech and sound signals for application in multimedia systems

- The ability to program in a programming language (C++, Python)
- Can freely communicate in English, can talk in English about professional matters, can use professional literature in English with understanding.

- He knows the limitations of his knowledge and abilities, understands the necessity of further training.
- He/she is able to carry out team projects.

Course objective

C1. Presentation of methodologies for data analysis and recognition, aiming at the identification of content contained in images and video sequences in various application areas (satellite data, medical, video surveillance, quality control). Determination of low-level image metadata. Elements of exploratory data analysis.

C2. Familiarising students with regression and classification methods using machine learning techniques (perceptron, Adaline model, SVM), including deep learning methods (CNN). Generative modelling on the basis of visual data.

C3. Acquisition by students of practical skills in independent and team work, preparing reports, analysing obtained results, data visualisation, etc.

C4. Analysis of video content in the field of applications: detection, classification, object tracking, including with the use of neural networks.

Course-related learning outcomes

Knowledge

K7W_01 - Has basic theoretical knowledge of digital processing and analysis of static images and video signals
K7W_06 - Knows trends and developments in the design and programming of image analysis, medical, surveillance and biometric systems

Skills

K7U_07 - Is able to carry out basic geometric, algebraic, logical, point and morphological transformations on digital images
K7U_09 - Can realise automatic analysis and processing of images in order to detect selected elements in static images and track selected elements in dynamic images
K7U_06 - Is able to work independently and in a team, as well as to prepare a report on the realization of exercises.

Social competences

K7K_05 - Behaves actively in class, asks questions.
K7K_02 - Has a sense of responsibility for the designed electronic and ICT systems

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Laboratory classes: assessment of the ability to solve problems and to present obtained results - credit for each laboratory exercise.

Lecture: evaluation of mastering the teaching material being the subject of the lecture - oral or written credit.

The adopted grading scale: very good (A) - 5.0; good plus (B) - 4.5; good (C) - 4.0; sufficient plus (D) - 3.5; sufficient (E) - 3.0; fail (F) - 2.0

Programme content

RANSAC and DISTRAT techniques.
Machine learning (LSE linear regression, perceptron, Adaline model), SVM data classification, neural networks, weave networks.
Generative modelling of data based on image analysis.
Video content analysis of applications: detection, classification, object tracking, including with the use of neural networks (AlexNet, Inception, ResNet, R-CNN, MaskR50, Detectron, JDE).

Low level image metadata extraction (corner detectors), floating point and fixed point descriptors.
Outlier data elimination.
Exploratory data analysis.
Concept of regression, analysis of data distributions.

Teaching methods

Laboratory exercises:
Prepared with instructions for analysis software codes in Python language. Independent tasks, implementation of solutions in Python language. Discussions on how to solve a given problem.

Conversational lecture with elements of discussion.

Bibliography

Basic

- Sonka, M., Hlavac, V. and Boyle, R. (2014) Image Processing, Analysis, and Machine Vision. Cengage Learning, Stamford, USA
- Domański M., Obraz cyfrowy, WKŁ, Warszawa 2010
- Szeliski R., Computer Vision: Algorithms and Applications. Springer, 2010
- Brandt, Analzia danych. Metody statystyczne, Wydawnictwa Naukowe PWN

Additional

- Klonecki W.: Statystyka dla inżynierów. Wydawnictwo Naukowe PWN SA, Warszawa, 1999 - Sobczyk M.: Statystyka. Wydawnictwo Naukowe PWN SA, Warszawa, 2002
- Zięba, Analiza danych w naukach ścisłych i technicznych, Wydawnictwo naukowe PWN, Warszawa, 2013.
- Wawrzyński P., Podstawy sztucznej inteligencji, Oficyna Wydawnicza Politechniki Warszawskiej, 2019

Breakdown of average student's workload

	Hours	ECTS
Total workload	86	3.0
Classes requiring direct contact with the teacher	45	2.0
Student's own work (preparation for tests, preparation for laboratory classes, literature studies)	41	1.0