EE-451

Image analysis and pattern recognition

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Cursus	Sem.	Type
Civil & Environmental Engineering		Opt.
Data Science	MA2, MA4	Opt.
Electrical and Electronical Engineering	MA2, MA4	Opt.
Life Sciences Engineering	MA2, MA4	Opt.
Minor in Imaging	E	Opt.
Neuro-X minor	E	Opt.
Neuro-X	MA2, MA4	Opt.
Physics of living systems minor	E	Opt.
Robotics, Control and Intelligent Systems		Opt.
Robotics	MA2, MA4	Opt.

Language of teaching	English
Credits	4
Session	Summer
Semester	Spring
Exam	During the semester
Workload	120h
Weeks	14
Hours	**4 weekly**
Lecture	2 weekly
Practical work	2 weekly
Number of positions	

Summary

This course gives an introduction to the main methods of image analysis and pattern recognition.

Content

Introduction
Digital image acquisition and properties.
Pre-processing: geometric transforms, linear filtering, image restoration.
Introduction to Mathematical Morphology
Examples and applications
Segmentation and object extraction
Thresholding, edge detection, region detection.
Segmentation by active contours. Applications in medical image segmentation.
Shape representation and description
Contour-based representation, region-based representation. Morphological skeletons
Shape recognition
Statistical shape recognition, Bayesian classification, linear and non-linear classifiers, perceptrons, neural networks and unsupervised classifiers.
Applications.
Practical works and mini-project on computers

Keywords

image processing, image analysis, image segmentation, feature extraction, introduction to machine learning, pattern recognition.

Learning Outcomes

By the end of the course, the student must be able to:

- Use Image Pre-processing methods
- Use Image segmentation methods
- Choose shape description methods appropriate to a problem
- Use classification methods appropriate to a problem

Transversal skills

- Use a work methodology appropriate to the task.
- Assess one's own level of skill acquisition, and plan their on-going learning goals.
- Identify the different roles that are involved in well-functioning teams and assume different roles, including leadership roles.
- Make an oral presentation.
- Summarize an article or a technical report.

Teaching methods

Ex cathedra and practical work and oral presentation by the students

Assessment methods

Continuous control : oral exam during the semester + graded reports and mini-poject

Resources

Références suggérées par la bibliothèque

- Image processing, Analysis and Machine Vision / Sonka
- Reconnaissance des formes et analyse de scènes / Kunt

Moodle Link

- https://go.epfl.ch/EE-451

Prerequisite for

Semester project, Master project, doctoral thesis