UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

COURSE SYLLABUS

Image Processing

2526-3-E3101Q118

Aims

The course aims to give students the theoretical and practical skills for the design and development of algorithms and systems for the processing, segmentation, analysis and classification of digital images and videos.

Knowledge and understanding
Knowledge of the fundamental concepts of image processing.
Knowledge of basic and advanced techniques for improving, processing, and interpreting image content.

Applied knowledge and understanding
Ability to apply acquired knowledge to develop image analysis algorithms
Ability to correctly use the techniques and tools presented

Judgment and decision-making
Ability to choose and apply the most appropriate techniques depending on the problem to be addressed

Communication skills
Ability to clearly present, document, and justify choices made in project activities

Learning skills
Ability to independently explore advanced aspects of image processing
Ability to extend and apply acquired skills to different real-world problems

Contents

The student will acquire specific skills that will put him in a position to understand the chain of processing, analysis and classification of images and videos. The student will also acquire the skills needed to design, develop and

integrate specific modules in complex application systems .

Detailed program

1 A background on visual perception, human vision vs. artificial vision, color perception. Image sampling and quantization.

2 Image enhancement using intensity transformation functions.

3 Spatial image filtering using liner and non-liner filters "

4 Color spaces. Color image processing.

5 Region-based and edge-based image segmentation

6 Mathematical morphology. Texture analysis

7 Image description and representation (regions, contours, polygonal approximation)

8 Image recognition; supervised and unsupervised image classification.

9. Introduction to deep convolutional neural networks

Prerequisites

none

Teaching form

Lectures (48) in presence with delivery and interactive mode. Exercises/lab (MATLAB) (20) with discussion of case studies, in-presence with interactive and delivery mode

Textbook and teaching resource

Digital Image Processing, 3rd Edition, Gonzalez & Woods I S B N n u m b e r : 9 7 8 0 1 3 1 6 8 7 2 8 8 , 2 0 0 8 , http://www.imageprocessingplace.com/index.htm

PDF of the slides provided by the professors.

Semester

first semester

Assessment method

The exam is composed of two parts,

The Written exam is composed of closed-ended questions, and open-ended questions related to the topics covered in the course.

The practical part concerns the Implementation and discussion of a project concerning the processing and analysis of images. Group of at most 3 persons with individual evaluation.

The final grade is the average of the written and project scores.

Some, non mandatory, assignments will be provided. Submitting them will provide extra points on the final evaluation.

Office hours

after each lessons, and by request

Sustainable Development Goals

QUALITY EDUCATION