UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

COURSE SYLLABUS

Visual Information Processing and Management

2425-2-F1801Q148

Aims

The student will acquire the skills to faithfully capture, process and interpret pictorial media including with Deep Learning based techniques. He/she will also acquire the skills to integrate image and video content-based search systems into apps and multimedia information systems.

Contents

The course provides the theoretical and practical fundamentals for:

- image acquisition and reproduction (the skills acquired will be useful in the areas of cultural heritage, fashion and design, medical image analysis and telemedicine, virtual and augmented reality, ...)
- image post-processing (e.g. increased readability, fog removal, removal of compression artifacts, ...)
- semantic segmentation (e.g. in automotive: pedestrian, car, road, sidewalk, ... in medical: healthy tissue vs. tumor tissue)
- automatic localization, description, and recognition of objects even in complex scenes
- automatic annotation of images and videos with keywords (tagging)
- browsing and similarity search of images and videos in multimedia archives

Detailed program

Objective color perception and measurement, colorimetry, color appearance models

- Basic principles of image reproduction in graphic devices, such as digital cameras, monitors and video projectors, and printers

- Image acquisition and processing chain in digital cameras (with recap of image processing fundamentals)
- Adaptive algorithms for image post processing (contrast modification, noise reduction, localization artifact removal, image composition, ...)
- Subjective and objective methods for image quality assessment
- Recognition and classification of objects and images using traditional learning techniques based on pictorial and visual features
- Localization, recognition and classification of objects and images with techniques based on deep learning
- Methods for indexing and retrieval of pictorial data in multimedia information systems
  The exercises will be conducted in the laboratory, in MATLAB language, and include a series of exercises such as image color transfer, image panorama creation, consumer photo classification, object detection,...

Prerequisites

None. Having taken an image or signal processing course is not a mandatory prerequisite. The course is self-contained.

Teaching form

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

Textbook and teaching resource

Articles and Notes given by the Professor.
The lecturers provide additional materials (handouts and videos) pertaining to image processing to those who wish.

Semester

first semester

Assessment method

Discussion of a project that can be done in a group of up to three people, with individual evaluation.

Office hours

just after the lessons or by request

Sustainable Development Goals