UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

SYLLABUS DEL CORSO

Multimedia Data Processing

2425-1-F9201P211

Aims

This course provides an introduction to digital signals, such as multimedia signals (image, video, and audio) and other signals that can be used in human-machine interaction, such as physiological signals and neural signals.
During the course, the transition from analog to digital signal will be analyzed, introducing in particular the concepts of sampling and quantization. The main methods of signal processing (contrast modification, filtering, and feature extraction), lossy and lossless coding and compression will then be explained. Jpeg and mpeg compression will be presented in more detail as examples of the application of different compression algorithms. The different types of image formats and their field of use will also be analyzed. Affective computing, and its fields of application, especially in the area of human-machine interaction, will be introduced.

Contents

The course provides the basis for digitizing and encoding analogic signals: images, audio and videos, physiological and electrophysiological signals. It will provide skills for learning the applications of affective computing especially in the area of human-machine interaction. It will also provide skills for developing algorithms for processing digital signals, their encoding and compression.

Detailed program

1. Definition of one-dimensional signals, two-dimensional signals, N-dimensional signals

- Analog signal
- Digital signal

2 Analog to digital conversion

- Sampling theorem
- Filter Anti-Aliasing
- Quantization

3 Digital signals: sampling and quantization:

- Images
- Audio
- Video
- physiological and elettroficiological signals

4 Image processing

- Contrast enhancement
- High and low pass filtering
- White balance

5 Compression

- Main compression loss-less and lossy algorithms
- Audio Compression
- Image Compression (particularly JPEG)
- Video Compression (in particular MPEG)
- Main image Formats

6 Affective Computing
- definition
- models of emotions
- applications in the field of human machine interaction

Prerequisites

No prerequisite

Teaching form

The course consists of lectures (28 hours), and practical activities (24 hours). Several exercises will be carried out during the practical activities to verify the new expertise acquired. The course is taught in English.

The lectures will be delivered as follows:
14 hours of didactics, in remote asynchronous mode.
14 hours of didactics in presence.

24 hours of laboratory in interactive teaching mode.

Textbook and teaching resource

slides published on the web site of the course

codes and exercises of the practical activities

TEXTBOOK

R. Gonzalez, R. Woods, Digital Image Processing, Pearson International Edition

Semester

second semester

Assessment method

Examination:
Oral exam + practical activities (4 mandatory) + final project (optional)

Evaluation Type:
Final mark out of thirty

Oral exam
The exam (oral) consists of open questions about digitalization and compression of multimedia signals and signal processing mainly in the case of images. This part verifies the competencies acquired and it is based on what taught during the lessons, available on the slides and on the indicated text books.

Assignements
The practical activity is a fundamental part of the course. Periodic assignemts are proposed during the practical activity. These assignements remain valid for the academic year in which the teaching is delivered. **Four assignments are mandatory** to pass the axam.

Final Project (optional)
A final project in matlab (optional) will provide up to 2 points for the final exam.

Office hours

Friday from 11.00 to 12.00.

Sustainable Development Goals

INDUSTRY, INNOVATION AND INFRASTRUCTURE