UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

COURSE SYLLABUS

Ai for Signal and Image Processing

2324-1-F9102Q004-F9102Q035M

Aims

The aim of this course is to provide theoretical foundations and practical skills on designing algorithmic techniques and artificial intelligence approaches for signal and image processing.

Contents

The course consists of a theoretical part and a part of practical exercises. The theoretical part analyzes algorithmic techniques and artificial intelligence approaches for signal and image processing. The exercises provide the skills for designing and implementing the treated signal and image processing methods by using state-of-the-art programming languages.

Detailed program

- Image and signal acquisition devices characterization
- Concepts of signal processing, including sampling, convolution, z-transform, frequency analysis, and filtering
- Concepts of image processing, including convolution, histogram manipulation, frequency analysis, morphological operators, local feature extraction, and filtering
- Signal and image quality assessment
- AI techniques for image segmentation, object localization and detection
- Implementation of signal and image processing for AI on FPGA-based, GPU-based and embedded architectures

Prerequisites

AI foundations, Mathematical foundations, Statistic foundations

Teaching form

Lectures and assisted exercises.
Lessons will be held in presence, unless further COVID-19 related restrictions are imposed.
Attendance at both lectures and exercises is warmly recommended.

Textbook and teaching resource

- James H. McClellan, Ronald Schafer, Mark Yoder, Digital Signal Processing First, 2nd Global Edition, Pearson, 2017
- Rafael C. Gonzalez, Richard E. Woods, Digital Image Processing, 4th edition, Pearson, 2018
- Slides of the lessons published on the course site
- Handouts published on the course site

Semester

First

Assessment method

Written exam aimed at verifying the student's knowledge, understanding of the subject, and capability of applying the obtained knowledge. The written exam consists of closed-ended questions, open-ended questions, and exercises. The duration of the exam is 2:00h. The mark is expressed in thirtieths and the grading will consider the correctness, completeness, and clarity of the answers to the questions and exercises. The exam is closed book. An additional oral discussion can be requested by the lecturer.

Office hours

By video- or audio-conference on appointments taken by email (fastest way, every day).
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Sustainable Development Goals

QUALITY EDUCATION