UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

SYLLABUS DEL CORSO

Imaging

2526-1-H4104D004-H4104D00403

Aims

The aim of the course is to provide students with the theoretical and practical knowledge necessary to **understand and analyze the characteristics of medical images**. In particular, the course aims to:

- provide basic knowledge related to medical image generation technologies and their working principles;
- provide an understanding of the characteristics and main formats of digital images, with particular reference to the DICOM format;
- illustrate the main techniques for image processing, aimed at enhancing image features;
- present some tools for visualization and pre-processing of medical images;
- introduce the fundamentals of machine learning and deep learning applied to image analysis, with a focus on the segmentation and classification of biological structures;
- introduce the concept of image rendering and present its main application contexts.

At the end of the course, students will be able to recognize the main characteristics of a medical image and apply, through free software, processing techniques to improve the quality and interpretation of medical images.

Contents

The course introduces principles of visual perception, the working principles of medical imaging systems, the characteristics of medical images, image processing techniques and software use, with an overview of artificial intelligence, rendering, and visualization.

Detailed program

- Eye, visual system, perception of shapes and colors, image.
- Characteristics (brightness, optical density, contrast, resolution) and standards (JPG, … DICOM) of digital medical images.
- Operating principles of medical image generation devices (X-ray, computed tomography, magnetic resonance imaging, and ultrasound instruments).
- Image processing: main operations for improving image quality.
- Use of software applications for solving practical problems and for 3D representation.
- Fundamentals of artificial intelligence techniques applied to medical images: segmentation and classification.
- Rendering and visualization.

Prerequisites

Basic knowledge in mathematics, algebra and physics.

Teaching form

Lessons in class, demonstrations by the use of digital image processing software and quantitative solution of simple problems.

Textbook and teaching resource

Suggested textbook: The Image Processing Handbook, Seventh Edition, John C. Russ,? F. Brent Neal, CRC Press ISBN-10: 149874026X.

Open-source software for DICOM image visualization and processing.

Slides of the course will be transmitted to the students using the e-learning platform.

Semester

First semester

Assessment method

The assessment consists of a written exam with open and/or multiple-choice questions.

Office hours

Monday afternoon, from 2:00 p.m. to 4:00 p.m., at the Unibg Campus in Dalmine, Building C, Room 405, or via online connection.

Sustainable Development Goals

GOOD HEALTH AND WELL-BEING | QUALITY EDUCATION | GENDER EQUALITY