UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

SYLLABUS DEL CORSO

Medical Imaging & Big Data

2021-2-F9101Q028-F9101Q029M

Aims

Medical images are one of the largest and fastest growing resources of information and present some of the _____

The explosion in data collection from different sources makes their unaided processing and interpretation by _____

Moreover, medical-imaging devices (such as magnetic resonance imaging or positron emission tomography) do not _____

The aim of the course is to present computational methods for the analysis and integration of medical images and clinical data, ranging from the theory and design of algorithms to the development of advanced methods for the extraction, selection and classification of the most informative features from medical images that can be used to efficiently support the clinical diagnostic process and to predict disease prognosis and response to therapies, from a personalized medicine perspective.

Contents

The course will present several image processing methods and their potential for managing big medical-imaging data, facing dimensionality problems by extracting image features relevant to clinical needs as candidate disease biomarkers and applying advanced statistics and machine learning algorithms to medical images and other big clinical data for the personalized diagnosis, prognosis and therapy of diseases.

Each topic will be addressed in two parallel sessions, i.e., academic lessons and laboratory activities.

Detailed program

- Objectives of medical imaging

- Medical imaging techniques

- Medical image segmentation techniques

- Medical image quantification techniques

-From medical images to disease biomarkers

-Texture analysis

-Radiomics

-Statistical Parametric Mapping

- Machine learning techniques applied to medical images

-Techniques for extraction and selection of characteristics applied to medical images

- Practices by applying programming codes to medical data and images

Prerequisites

During the course (practical sessions) and the implementation of the final projects, we will make use of Matlab (The MathWorks). Because of this, students are required to download and install Matlab on their laptops.

Teaching form

Each topic will be addressed in two parallel sessions, i.e., theorical lessons and laboratory activities.

Attendance is mandatory (roughly > 75%, especially for laboratory activities). However, special needs can be discussed.

Textbook and teaching resource

Semester

Second semester

Assessment method

The exam is composed of a practical session and a theoretical session.

The practical session consists in completing and presenting a project. For this task, students will be divided into groups, which will be evaluated based on the project development and implementation and on the final presentation. A score will be assigned to each group (not to each student individually).

The theoretical session consists in an oral examination with questions regarding the theoretical lessons of the course and a scientific paper. The evaluation of this session will be individual.

A final score will be assigned to each student individually, considering both the evaluation of the practical session and the oral examination.

Office hours

Normally on Tuesdays from 12:30 to 13:30