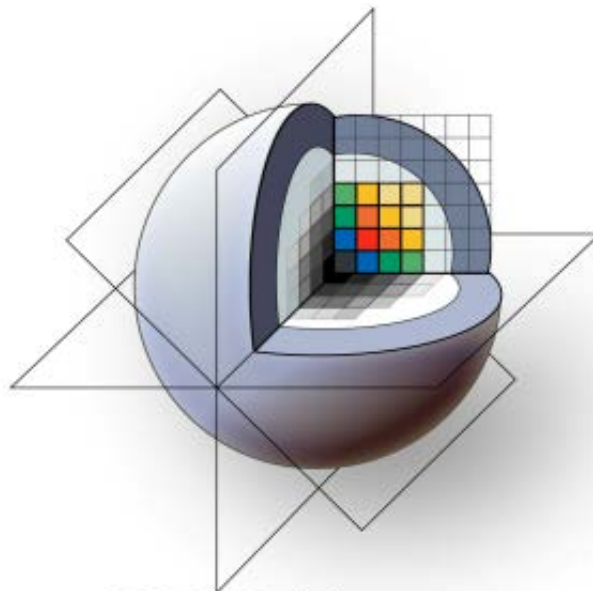




Training program engineers

MACbioDi



3DSlicer

Course description.

Context

This 3D Slicer course is developed within the framework of the *MACbioIDi* project for engineers of the African countries of Cape Verde, Senegal and Mauritania.

Course Format

The course will consist of lectures, exercises, midterm assessments, and the final results of working in collaboration with the developers of the *MACbioIDi* project in two workshops. Contents and lecture exercises will be provided through an e-learning platform. All course work will be hosted on the private user account and on the private GitHub for the engineering professionals.

Course Workflow

The progress of the proposed activities will be monitored in a joint project. It is critical that engineers set up a private repository to upload their results and their frequent contact with the developers. Repositories will be private but users can share with others any question or solution they consider useful. The engineers of the *MACbioIDi* project will provide comments to questions, proposals or any suggested issue.

Final Project

The main goal of the final project is to participate in the next NA-MIC project weeks in joint or isolate projects. Methods and methodologies will be illustrated with code and images. Topics include technical concepts as: medical imaging, data analysis, visualization toolkit, compilation and installation processes as well as programming.

Expected Learning Outcomes

- Learning and understand how 3D Slicer and Open Anatomy work, and their philosophy.
- Understand the use of these applications and their data models.
- Understand the concept of compilation and installation of the libraries and tools needed.
- Work with examples to create solutions.
- Work in a proposed plan to develop some tasks in training and research projects.
- Propose research projects.

Course Introduction

Medical imaging technology has become an indispensable tool in many branches of the biomedical, the health area and the research, and is vitally important the training of professionals in these fields. The technical professional profiles, such as software engineers and developers are crucial in the advance of these technologies. It is not only about the tools, methodologies and knowledge provided but also about the community that this training project proposes. The main objective of this course is to understand the way these tools work and how to develop new functionalities through practical examples drawn from a variety of scientific and engineering disciplines. The progressive collaboration with other research and development groups would be another important objective after the training.

Medical Imaging Technology.

[https://mt4sd.ulpgc.es/slicer-](https://mt4sd.ulpgc.es/slicer-int/index.php/CI%C3%ADnicos_3D_Slicer)

[int/index.php/CI%C3%ADnicos_3D_Slicer\)](https://mt4sd.ulpgc.es/slicer-int/index.php/CI%C3%ADnicos_3D_Slicer)

MODULE 1. Exploring medical datasets.

LESSON 1. Medical technology. 3D Slicer.

General view. Objectives.

Imaging modalities. Acquisition.

- Radiography

- Magnetic resonance imaging (MRI)

- Ultrasound

- Computerized tomography

- PET (Positron Emission Tomography)

Archiving

- DICOM

- Other formats

3D Slicer.

- Functionalities.

- Image types.

Graphic User Interface description (GUI).

- Main components.

- Menus and toolbars.

- Lateral panel: GUI module, Slice controller, 3D views controller.

- 2D and 3D visualization panel.

- 2D anatomical viewers: axial, coronal and sagittal views.

- Progress bar and error log.

Welcome panel.

Loading a scene

3D visualization.

Open Anatomy introduction.

- Graphic User Interface description (GUI)

- 3D visualization.

Exercises.

LESSON 2. 3D Slicer. Volumes.

General view. Objectives.

Dataset. Introduction. Features.

Load and visualization of multiple volumes.

DICOM. Characteristics.

Modules and extensions.

LESSON 3. 3D Slicer. Load and visualization of segmented structures and 3D models.

Segmentation and label maps (label maps). Description and features.

Multiple volume visualization.

3D Visualization.

3D Models.



Lightbox viewer. Clipping. Layout.
Saving data.
Creating Scene Snapshots.
Exercises.

Medical Imaging Computing. (https://mt4sd.ulpgc.es/slicer-int/index.php/Ingenier%C3%ADa_3DSlicer)

MODULE 1. Medical Imaging Technology. 3D Slicer.

LESSON 1. Medical technology.

General view (Web platform - Git). Objectives.
Imaging modalities. Acquisition.
Archiving formats.

LESSON 2. 3D Slicer.

General view. Objectives.
Informatic systems.
Data analysis.
3D Slicer. GUI.
3D Slicer. Modules and extensions.

LESSON 3. Object Oriented Programming.

General concepts.
Python.
Python Numpy.
MatPlot
Exercises.

LESSON 4. 3D Slicer. Libraries.

Qt.
VTK.

LESSON 5. 3D Slicer. Development

Integration of a Python Module.
Creation of a Python Module/Extension using the wizard.

LESSON 6. Environment.

GitHub.
IDE's

MODULE 2. Installation and Compilation Processes.

LESSON 1. Getting deeper into 3D Slicer.

Installation process.
Common prerequisites.



Compilation process.

