Introduction to

Forensic Facial Reconstruction

with Free Software

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Welcome!

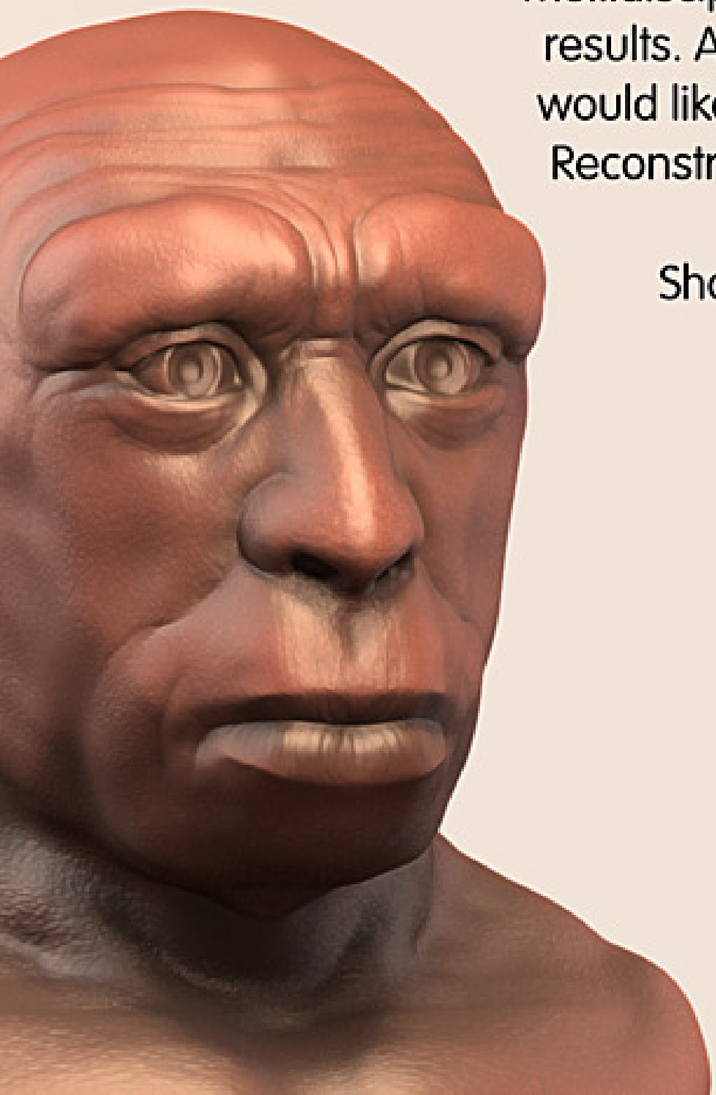
With technological advances we experience nowadays, it becomes possible for professionals from different areas to join efforts and apply knowledge with common goals: computer-aided Facial Reconstruction, whether in academic or forensic context. In teamwork developed with forensic Dentist Dr. Paulo Miamoto, as well as other professionals in the field of Archaeology, Museology, Anthropology and related areas, we could combine a multidisciplinary approach to the use of open-source software, with promising results. Aiming to share this knowledge among interested professionals, we would like to bring you a preview of the course Introduction to Forensic Facial Reconstruction with Open-source Software. More information coming soon.

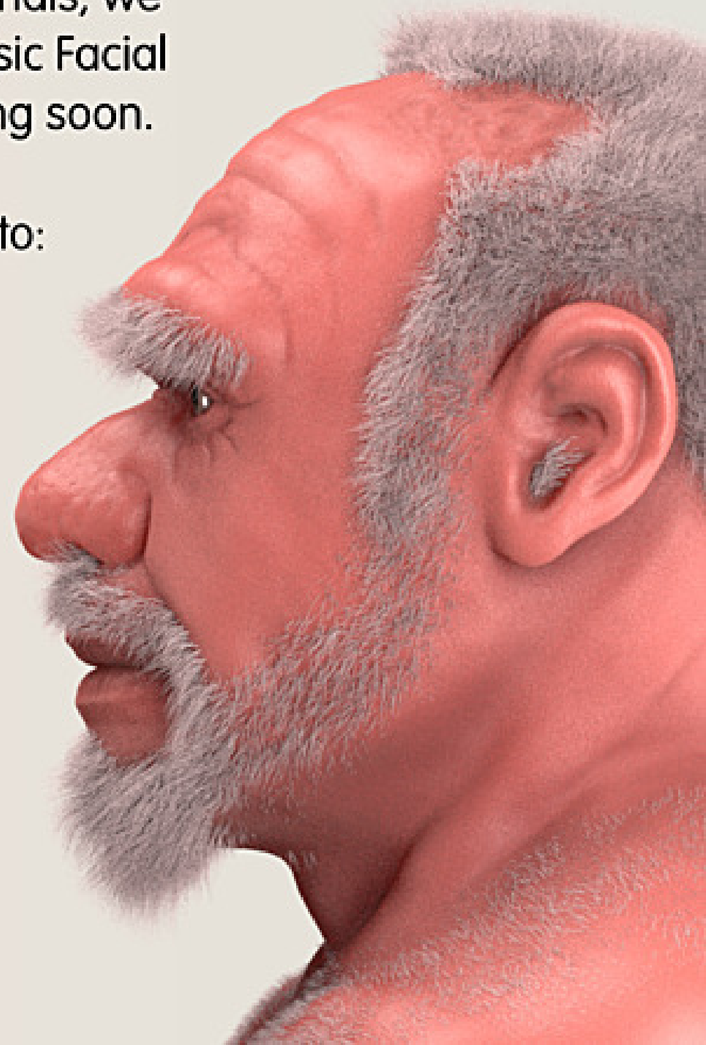
Should you be interested in the course, please send an email to:
contato@ciceromoraes.com.br

Greetings to everyone!

Sincerely,

Cícero Moraes and Paulo Miamoto.





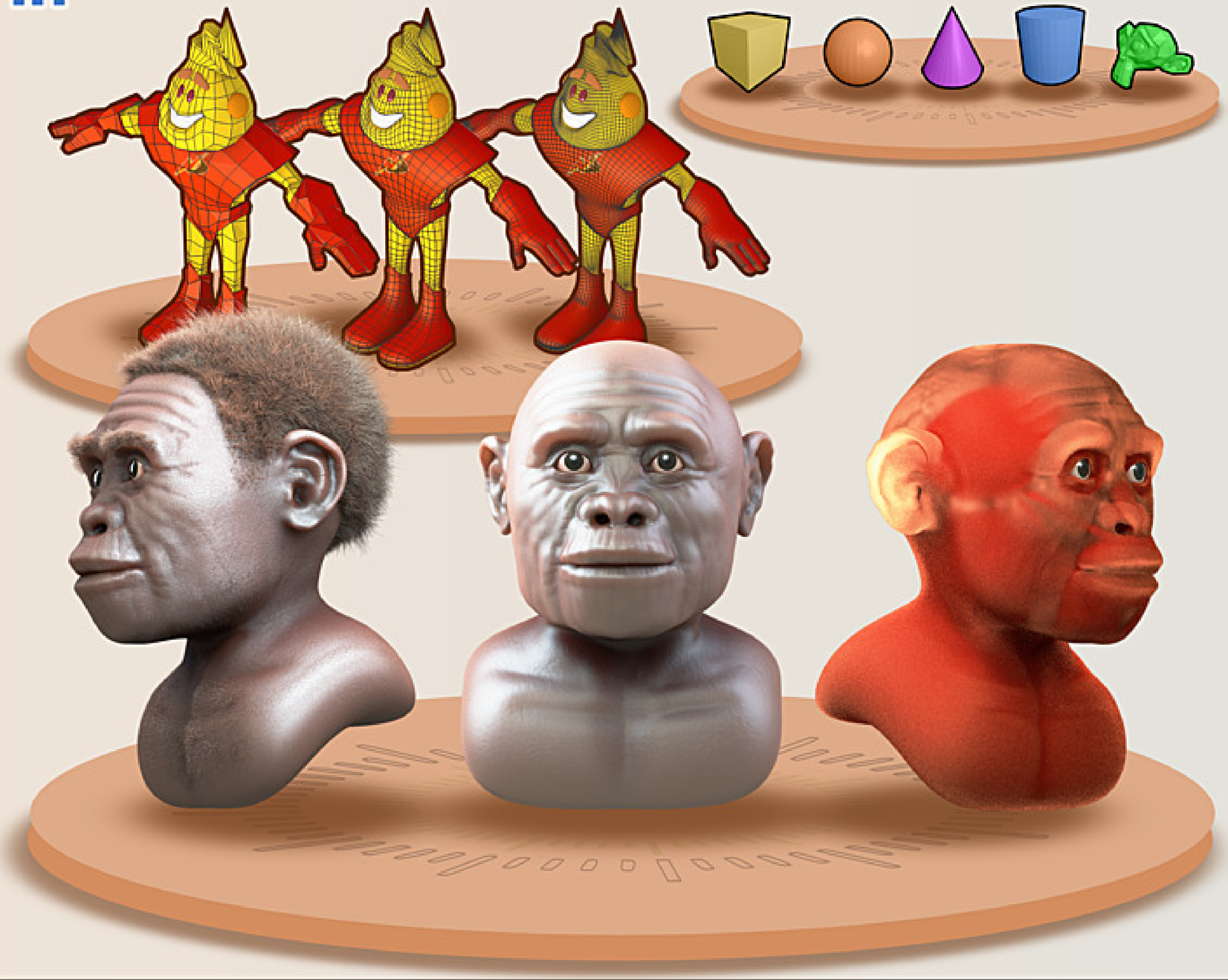
Basic principles in 3D modeling

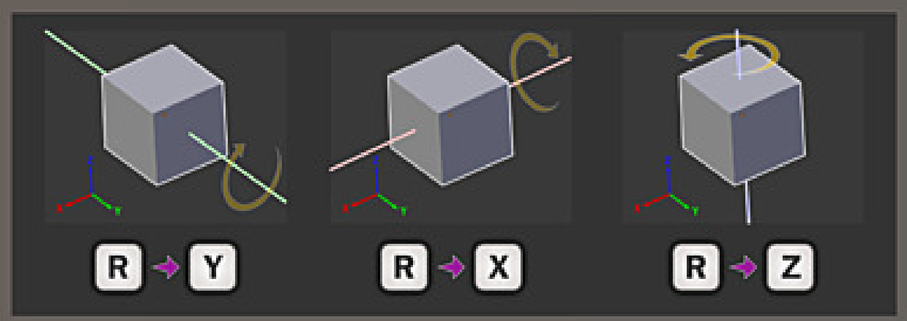
In this module the students will learn about the operation of 3D computer graphics, initially from a general point of view and gradually move into more specific contents.

How to manipulate objects, create new elements, change their colors, place lights in the scene and generate images are some of the topics covered.

The prime goal is to demystify 3D modeling, regarded as extremely complex, especially for beginners.

Using tutorials and practical exercises the students should have an understanding and get familiar with the tools intended their learning.





Tested and approved in Brazil

This module is the result of six years of practical activities in 3D computer graphics in 12 Brazilian states, from lectures to extension courses. Over this period a number of instructional materials have been developed and improved with two concerns: to be informative and, at the same time easily assimilated by students.

3D scanning with photographs

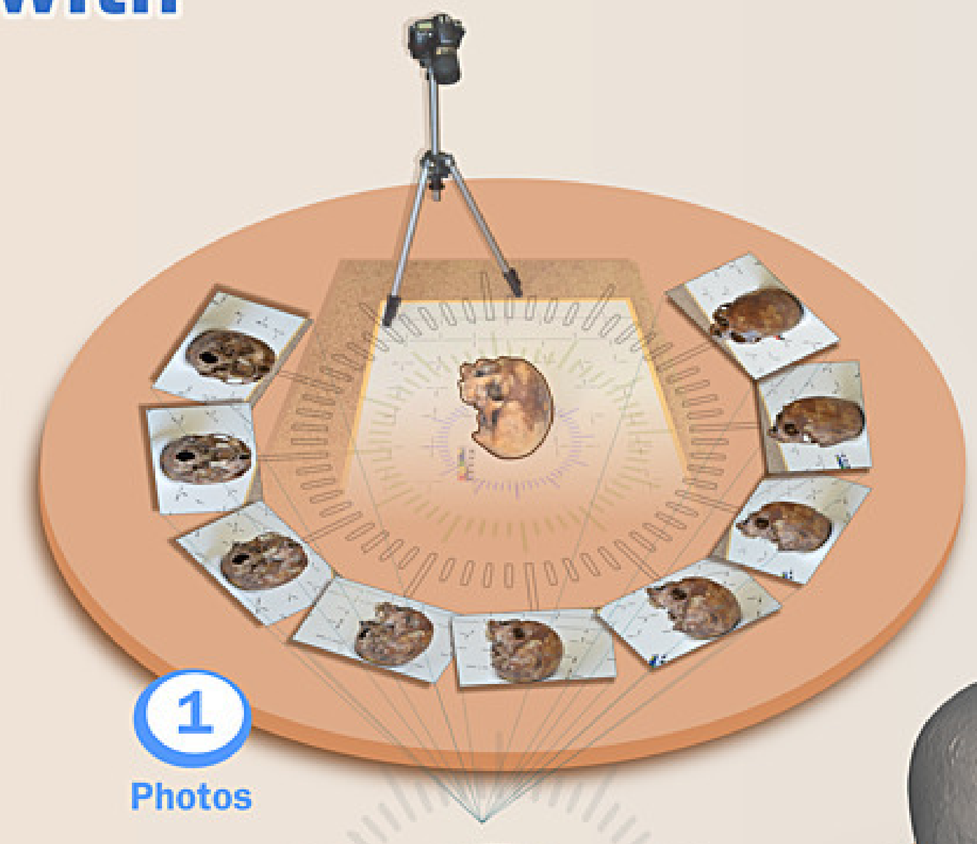
Learn how to make 3D models from a series of photographs with **Python Photogrammetry Toolbox** (PPT-GUI).

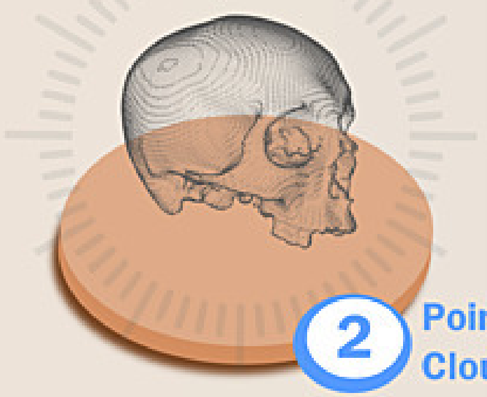
Upon photographing and processing the photos of the skull, a point cloud is generated and converted into a 3D mesh with **MeshLab** software.

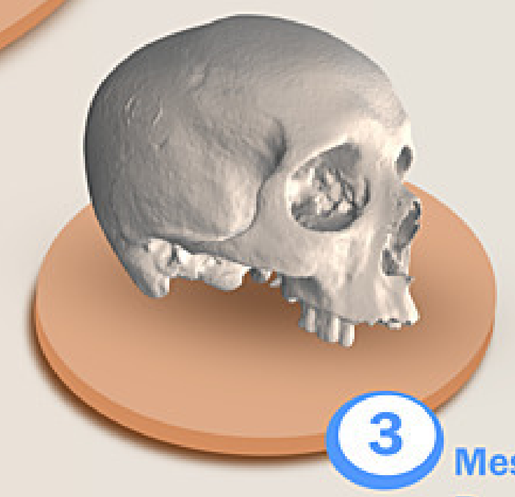
Afterwards, the 3D model will be automatically colored using information obtained directly from the photographs, improving shape and size data of the mesh with texture and color.

The accuracy of models generated using the protocol can achieve tenths of millimeters.

Named photogrammetry, this is an extremely affordable technique because nowadays it is quite simple to get digital cameras, and one can create 3D models without the need to use advanced hardware such as laser scanners, CT scanners or other.







Faces of Evolution

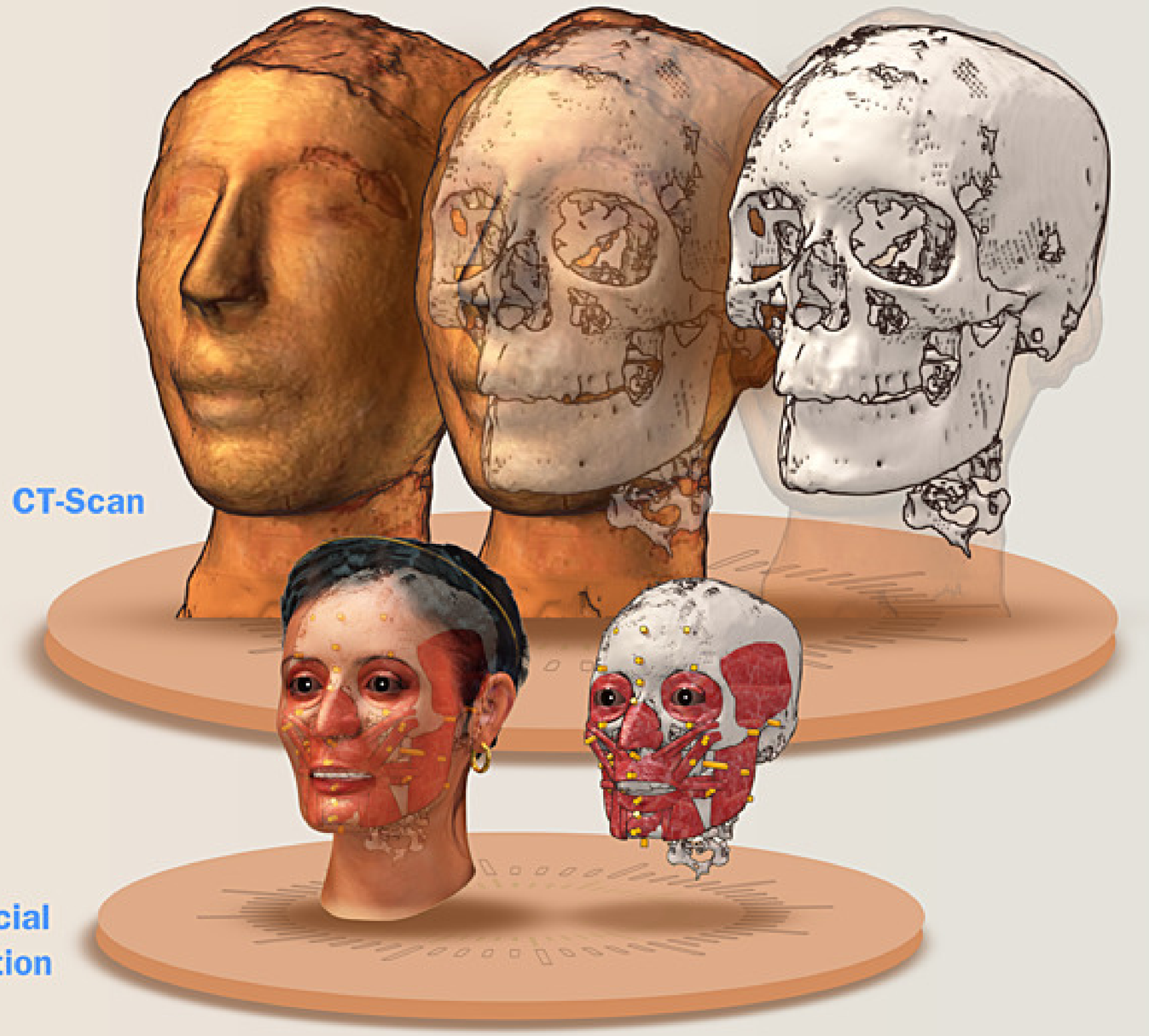
Most of the hominid skulls reconstructed in this exhibition displayed at the Egyptian and Rosicrucian Museum of Curitiba - Brazil were obtained by using the technique of photogrammetry. The images were captured by Archaeologist Dr. Moacir Elias Santos and shared on the internet so that they could be downloaded and processed.

Reconstruction from CT scans

CT scans and other imaging exams are potentially useful in 3D forensic facial reconstruction, therefore knowing how to use them to reconstruct bones or other tissues may be crucial to perform a forensic facial reconstruction.

With the aid of InVesalius viewer for DICOM files (image files originated from medical and dental imaging exams), students will learn how to isolate regions of interest and visualize them in 3D. Furthermore, these regions will be converted into virtual meshes that are exportable as 3D objects.

The course will also cover the topic of converting single images into DICOM files and the consequent 3D reconstruction of those.



The mummy baby

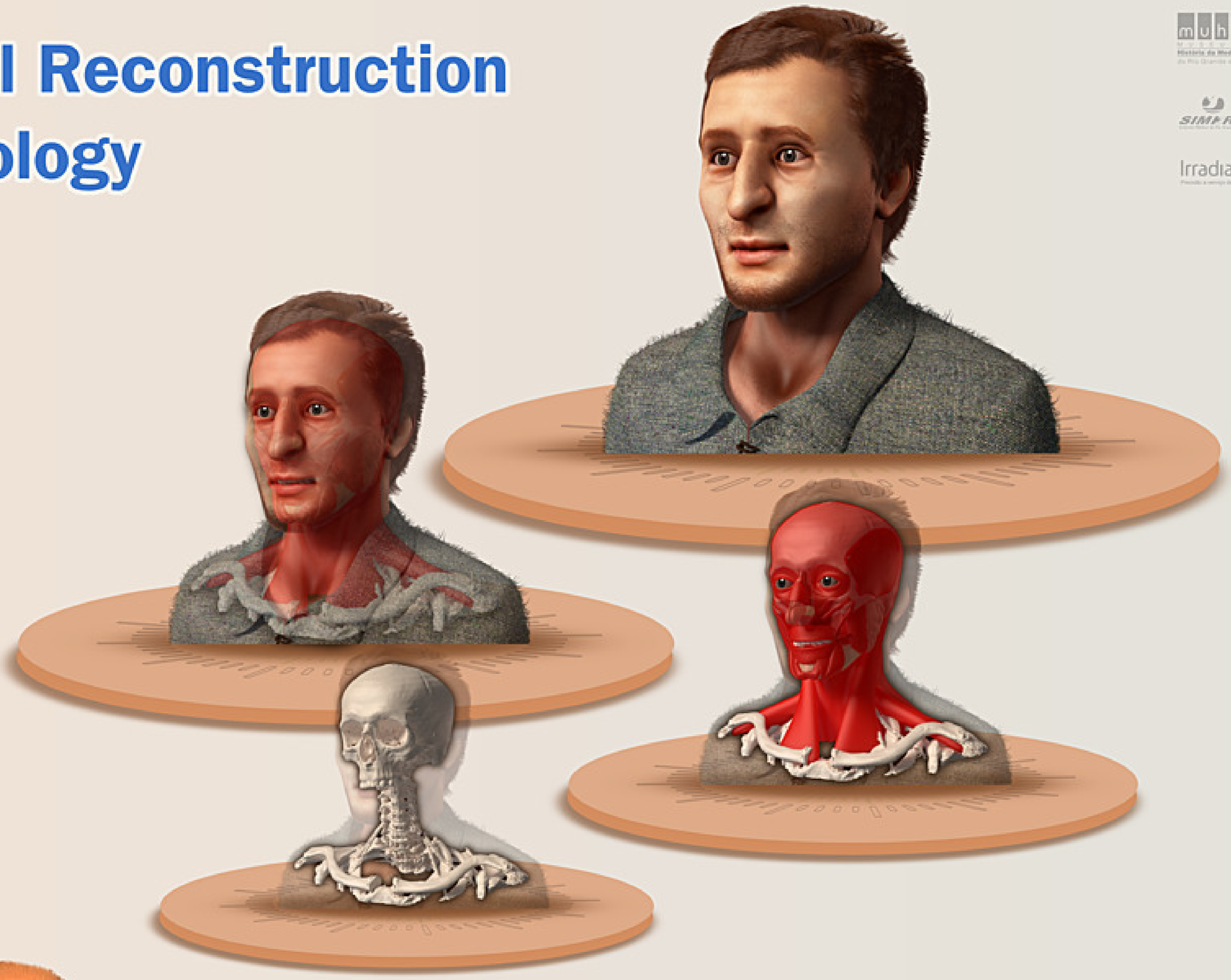
In this case, a CT scan was obtained by capturing a video made shared by the School of Medicine at University of Washington. The video frames were converted into images and later into DICOM files with the help of IMG2DCM software. Then the bones were isolated and the face reconstructed. Clothing was modelled under the advice of Egyptologist Dr. Moacir Elias Santos.

Forensic Facial Reconstruction
Quick methodology

Instead of modeling the face "from scratch" at each reconstruction, the student will start from template files, adapting those until they suit the anatomical framework determined by the dry skull together with the average soft tissue depth tables, specified for the anthropological type of the individual.

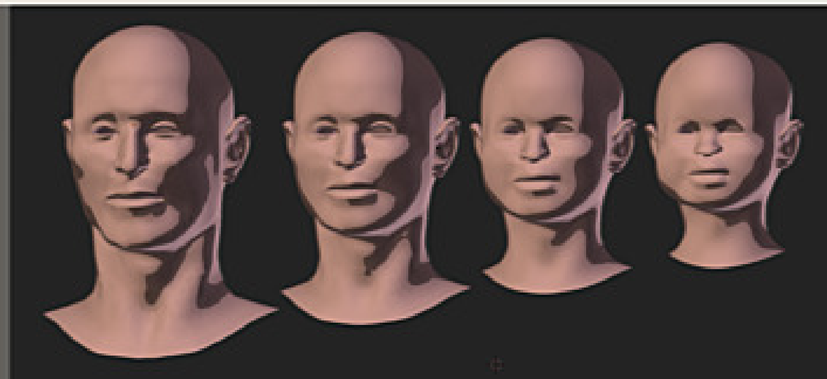
It is not necessary for the student to have a background on artistic training to understand and apply this methodology. Instead, a solid base on anatomical knowledge of the head and neck is required, besides complying with the precepts of the reference literature and constant practice are the most important. Thus, students will be familiar with the tools and be able to take full advantage of them.

The goal is to complete a reconstruction within in a few hours, always giving priority to anatomical particularities inherent in each individual during the modeling phase.



Flexibility

All examples shown here were modeled from a single template, adapted into characteristics estimated by forensic anthropological and dental examination of the skull, such as gender, age and ancestry.



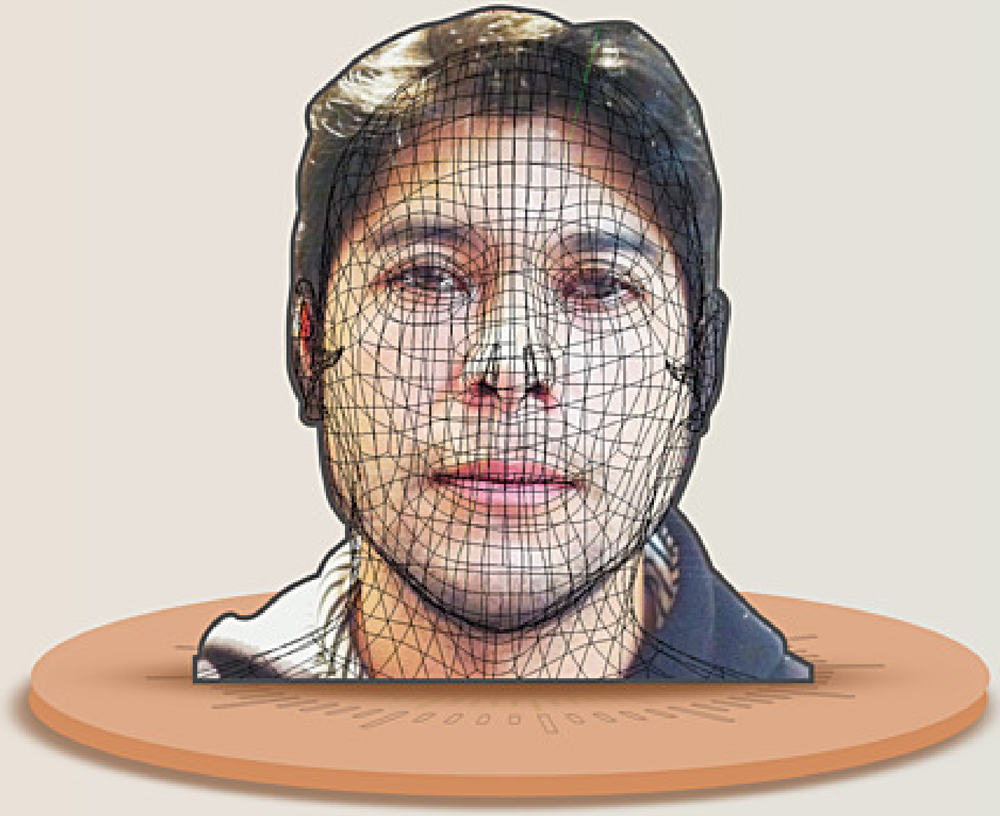
Processing and comparing 3D meshes

Use **CloudCompare** open-source software and learn how to compare the distances between the reconstructed face and the actual face, obtained by CT scans or laser, optical or mixes scannings.

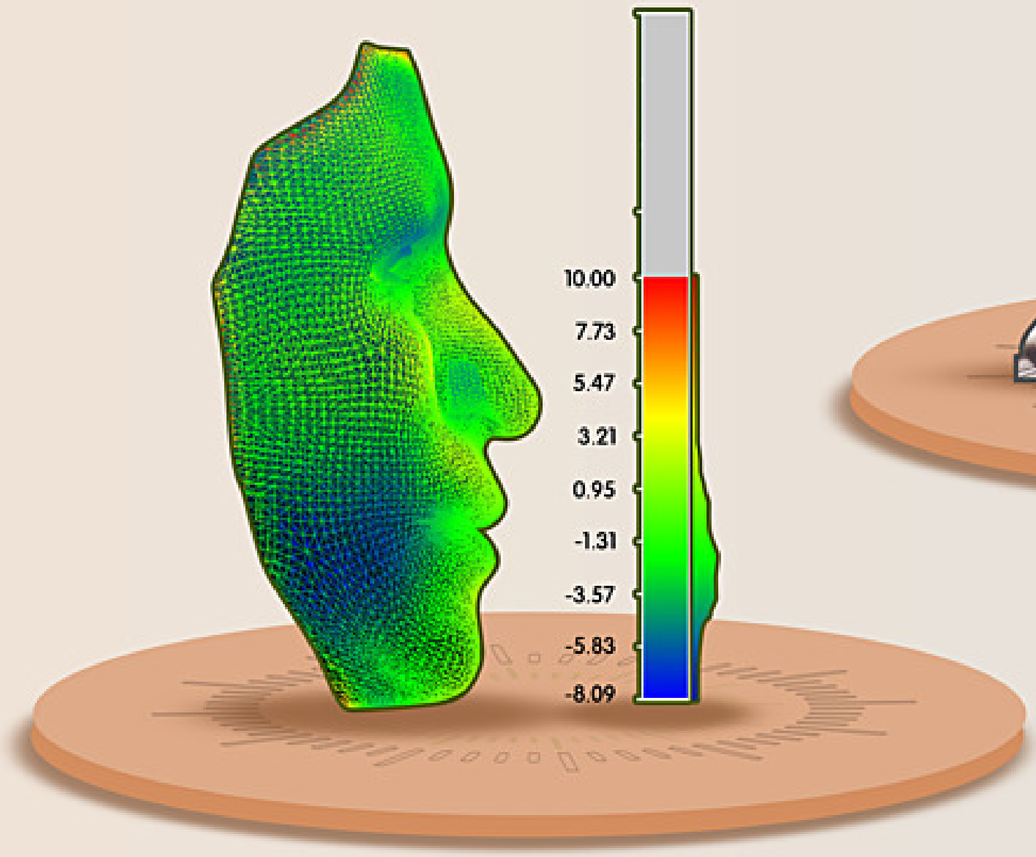
Align 3D models in order to assemble one object or generate new comparisons.

Compare 3D models of skulls scanned by photographs versus other techniques described above.

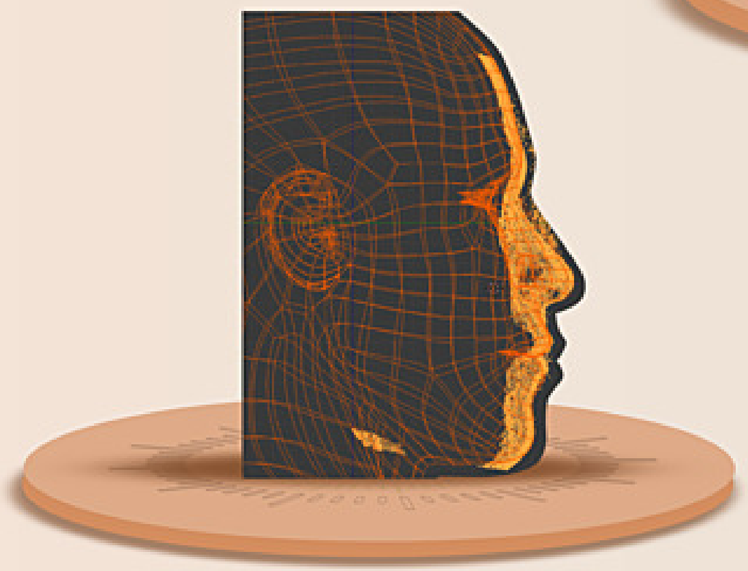
Make overlays virtual faces on photographs quickly and and intuitively.



3D FFR vs. Photo



3D FFR vs. Laser Scan



3D FFR vs. Cone Beam

Alignment

MeshLab offers a wide range of tools intended for 3D models, such as the possibility of aligning partially scanned objects, such as this cone beam CT.