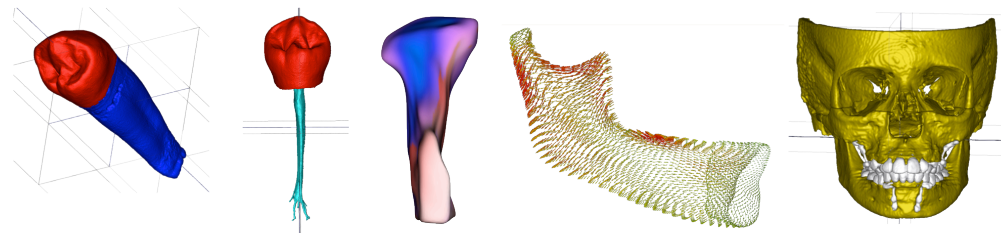


# CMF Extensions

NAMIC Project Week 2016  
Slicer Extensions Birds of a Feather

Beatriz Paniagua, Jean-Baptiste Vimort, Laura Pascal



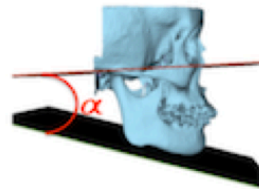
Dental and Craniofacial Bionetwork for Image Analysis- DCBIA



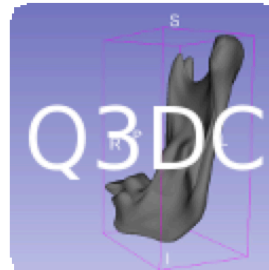
# Science and technology in Slicer



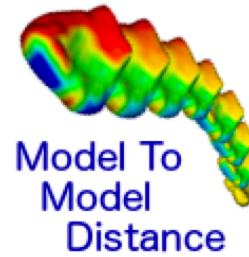
MeshStatisticsExtens..  
Lucie Macron (Universi...



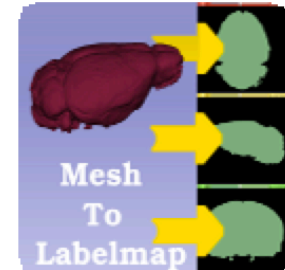
AnglePlanesExtension  
Julia Lopinto (Universit...



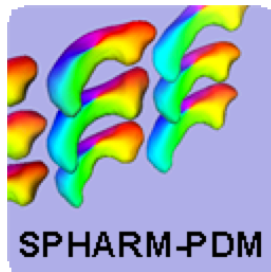
Q3DC  
Lucie Macron (Universi...



ModelToModelDistan..  
Francois Budin (UNC), ...



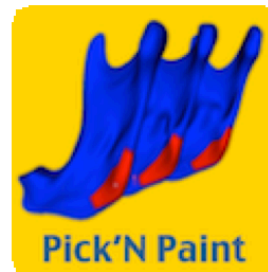
MeshToLabelMap  
Francois Budin (UNC)



SPHARM-PDM  
Beatriz Paniagua (UNC...



ShapePopulationView..  
Alexis Girault (NIRAL, U...



PickAndPaintExtensi..  
Lucie Macron (Universi...



EasyClip  
Julia Lopinto (Universit...

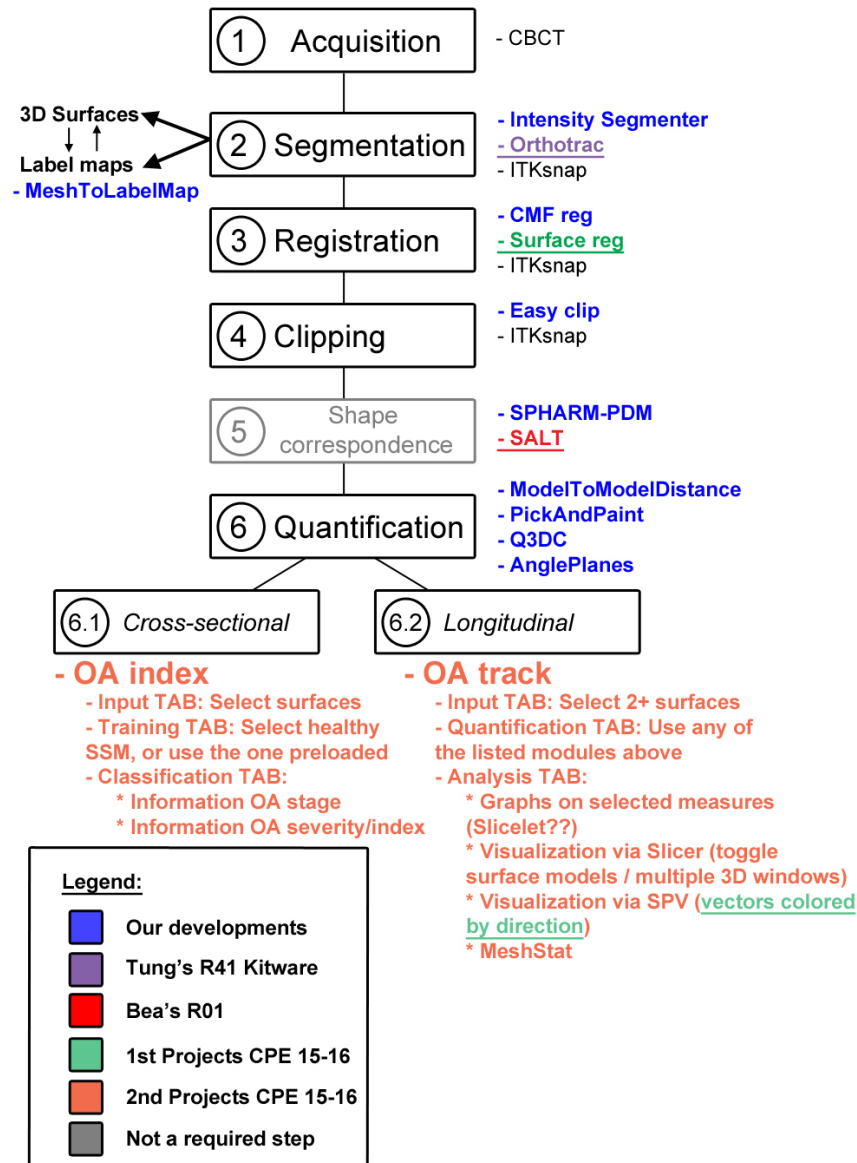


CMFreg  
Vinicius Boen (Univ of M.

- 3D Slicer as dissemination vehicle for tools needed for 3D imaging dental research: fast quantification, cropping, registration



# Clinical workflow for Dental Image Analysis





# CMF Registration

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- Packaging existing Slicer functionality into a new module
- Uses BRAINSFit as registration core
- Easy way for clinicians to do region-based registration
  - Apply masks
  - Calculate and apply transforms for affine and rigid registration
  - Familiar terminology



# CMF Registration

- Surface registration module
- Packaging existing functionality and adding some features to improve usability

Moving Model: AH2m

Landmarks

Fixed landmarks: AH1\_fiducials  On Surface

Moving landmarks: AH2\_fiducials  On Surface

▼ Add Landmarks

add landmarks

Model:  Fixed  Moving

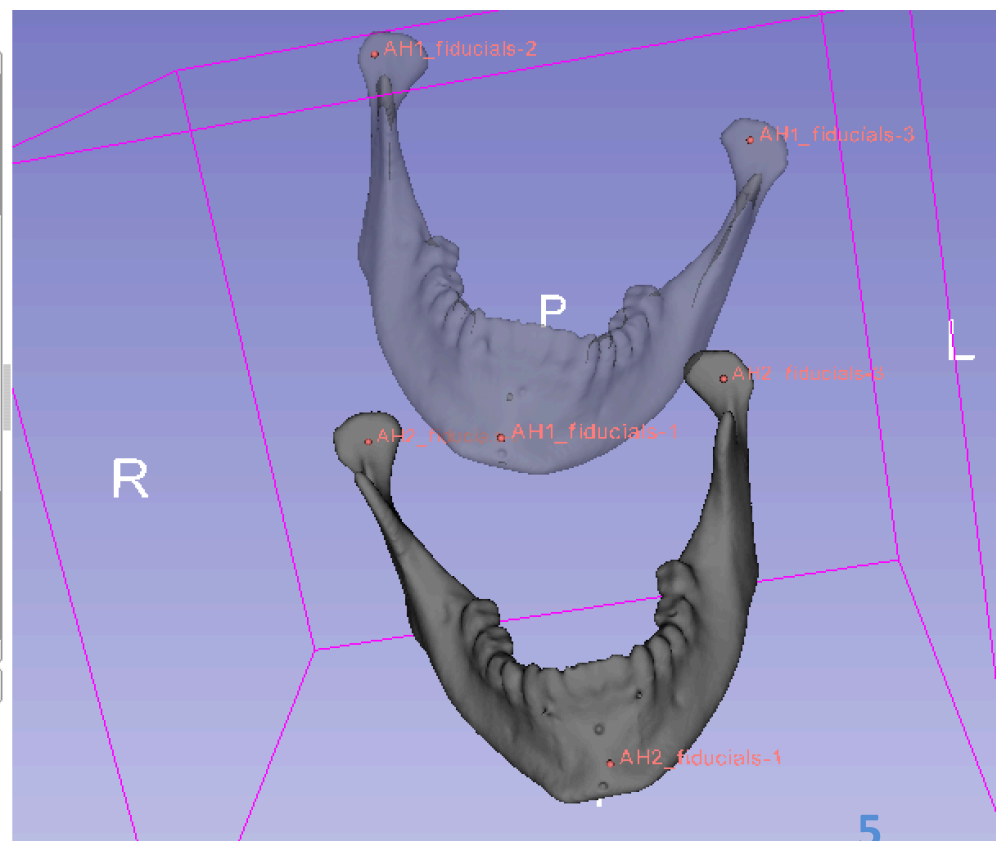
Add

Landmark Modification

Selected Landmark: AH2\_fiducials-3

Scale:  2.00  On Surface

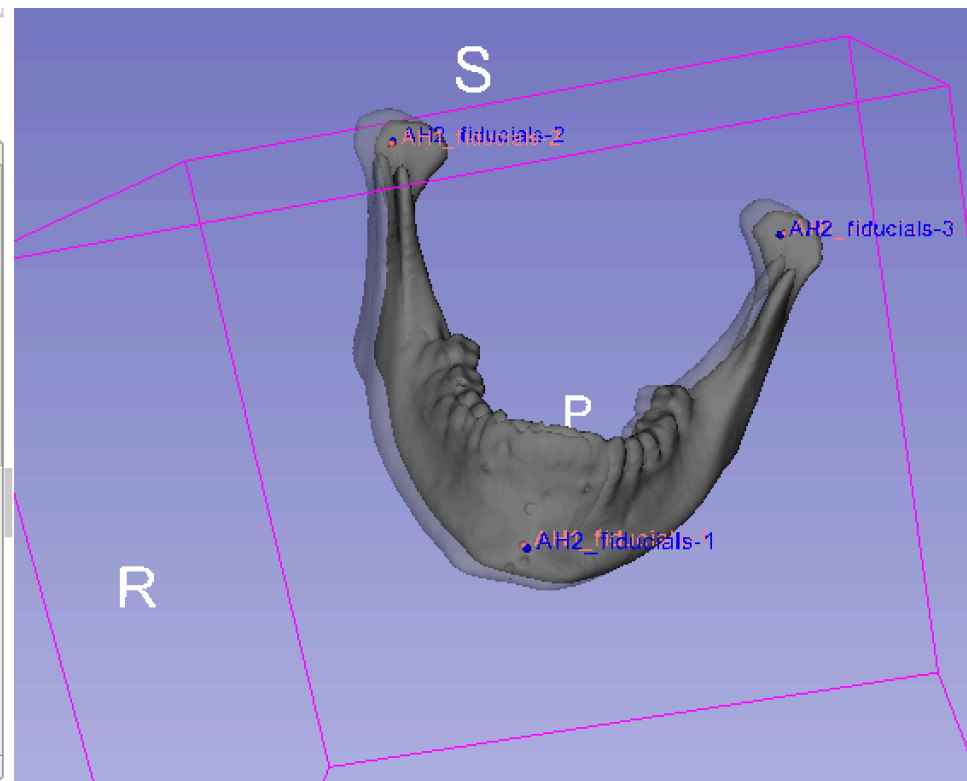
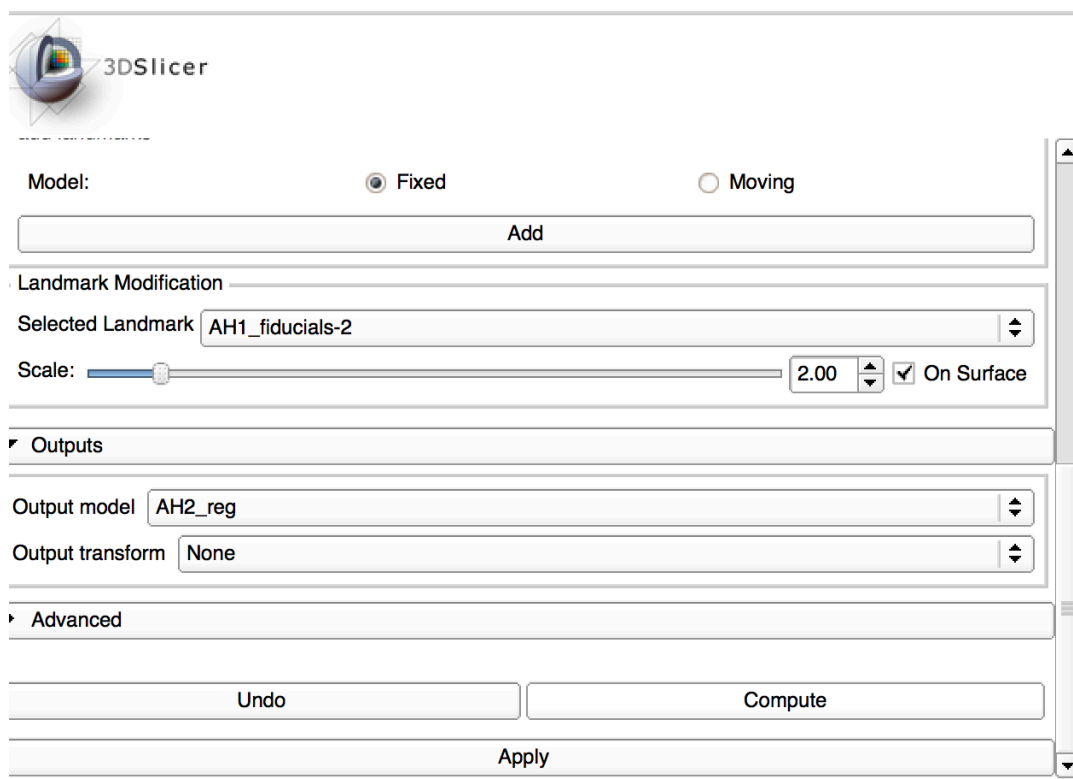
▼ Data Probe





# CMF Registration

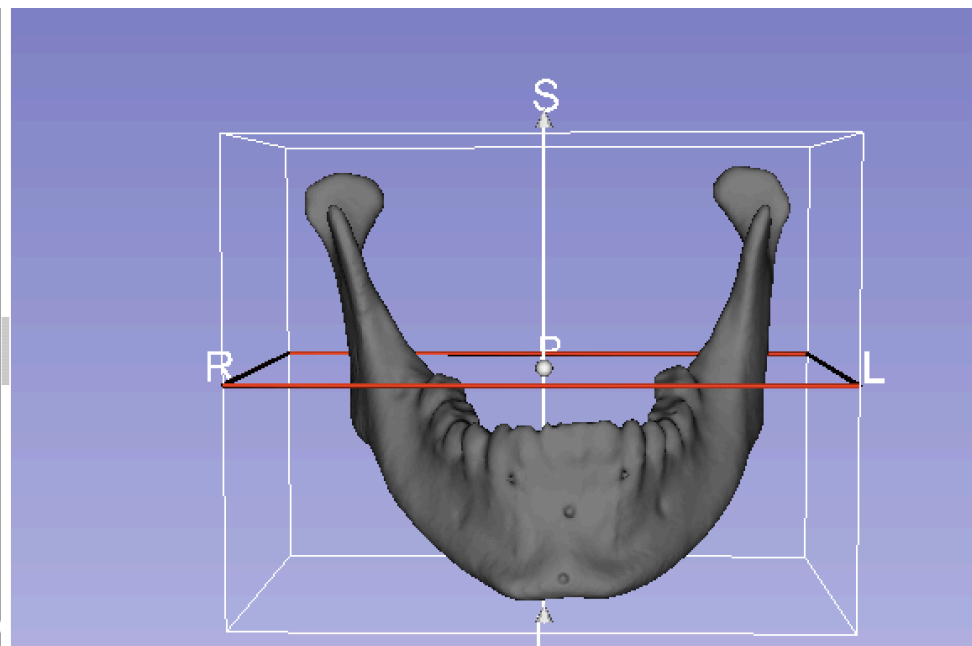
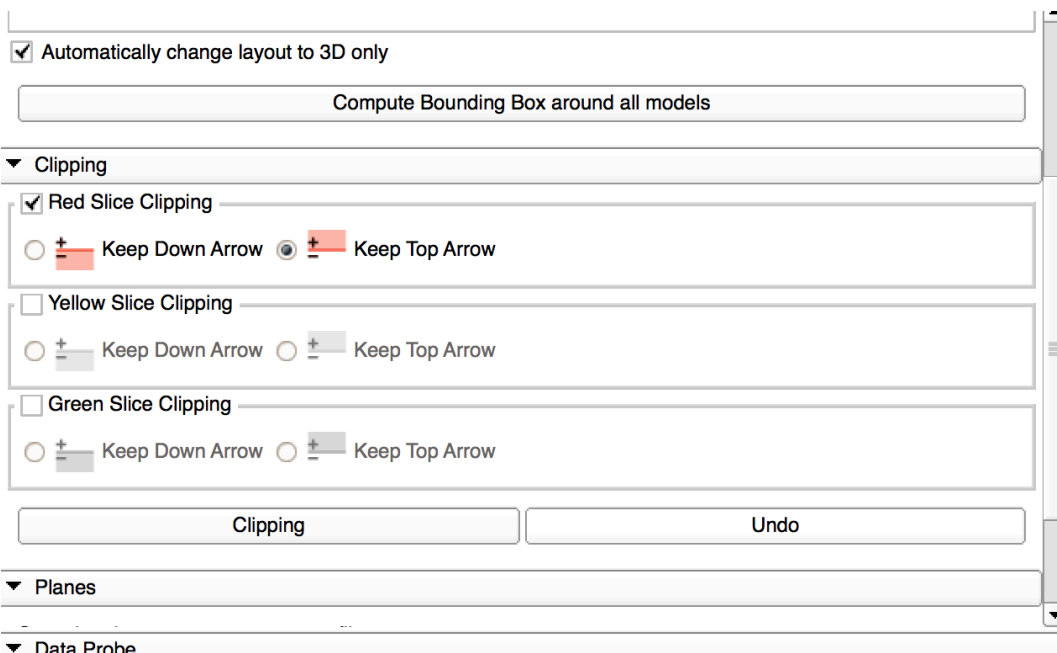
- Surface registration module
- Packaging existing functionality and adding some features to improve usability





# Easy Clip

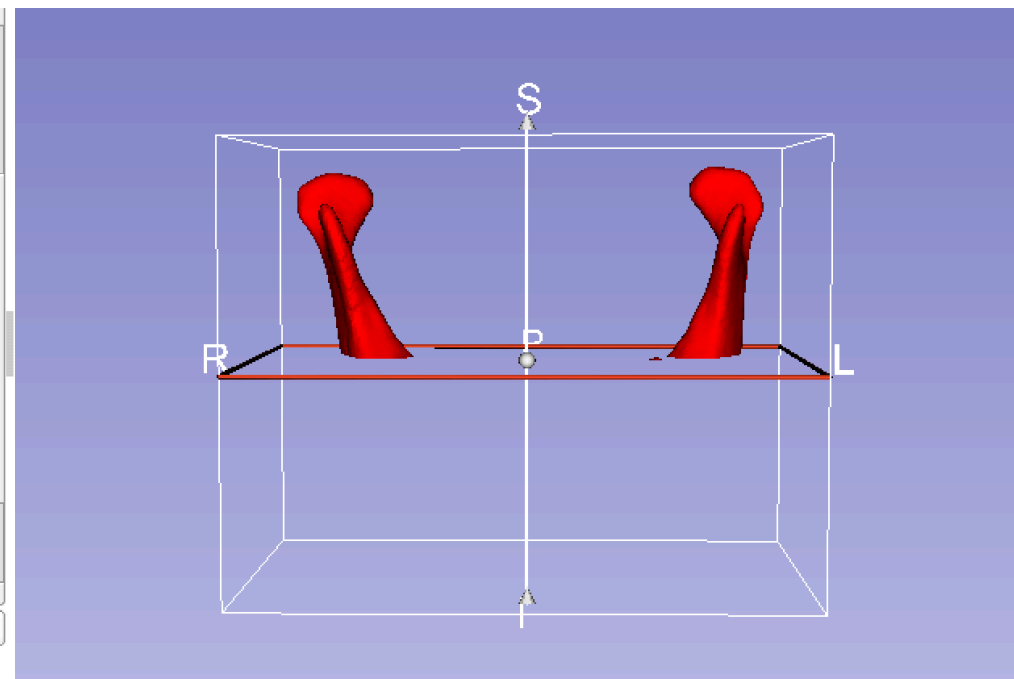
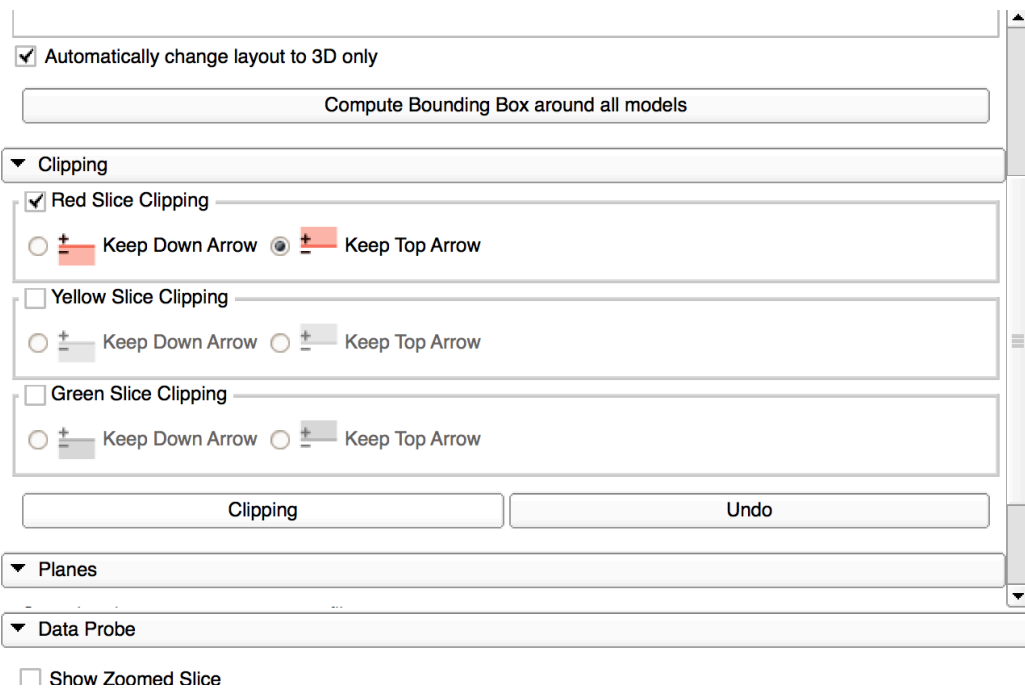
- All new functionality
- Clip and close models using Slicer planes





# Easy Clip

- All new functionality
- Clip and close models using Slicer planes







# Angle Planes

- Measuring distances between anatomically designed landmarks is crucial in cephalometrics
- No existing software to do it in 3D

Compute Bounding Box around all models

▼ Manage planes

Add new plane

▶ Define middle point between two landmarks

▼ Choose planes

Select plane 1: Red

Select plane 2: Yellow

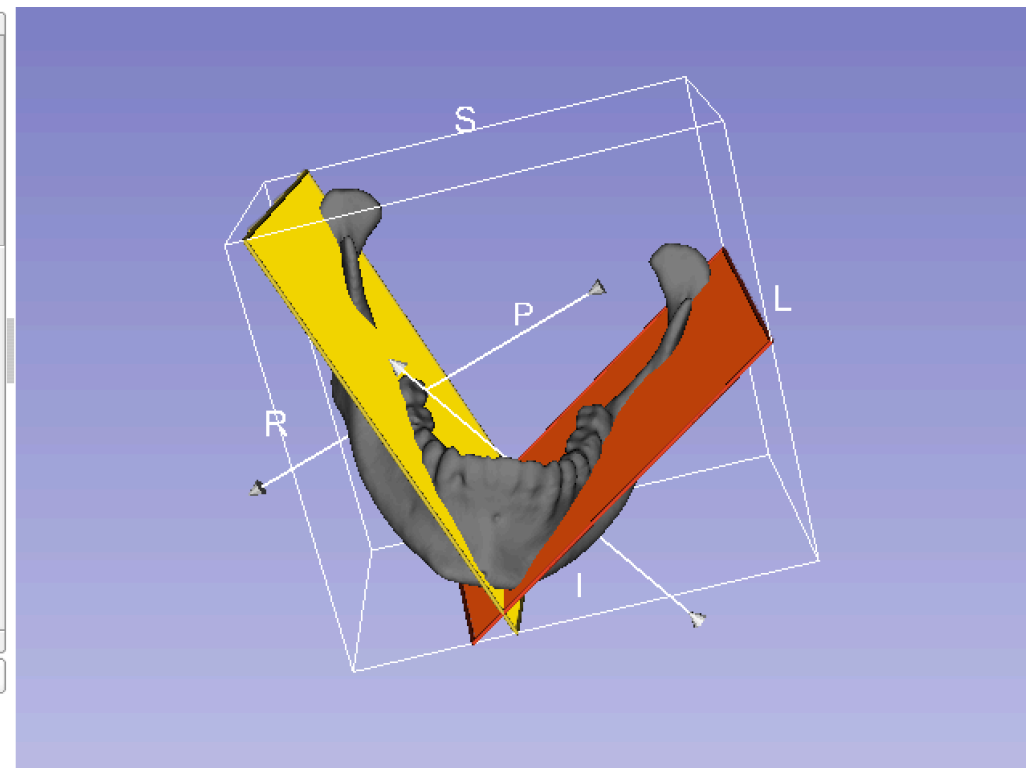
▼ Results

Results

	View	Angle	Complementary angle
1	R-L View	168.18	11.82
2	S-I View	10.53	169.47

▶ Save

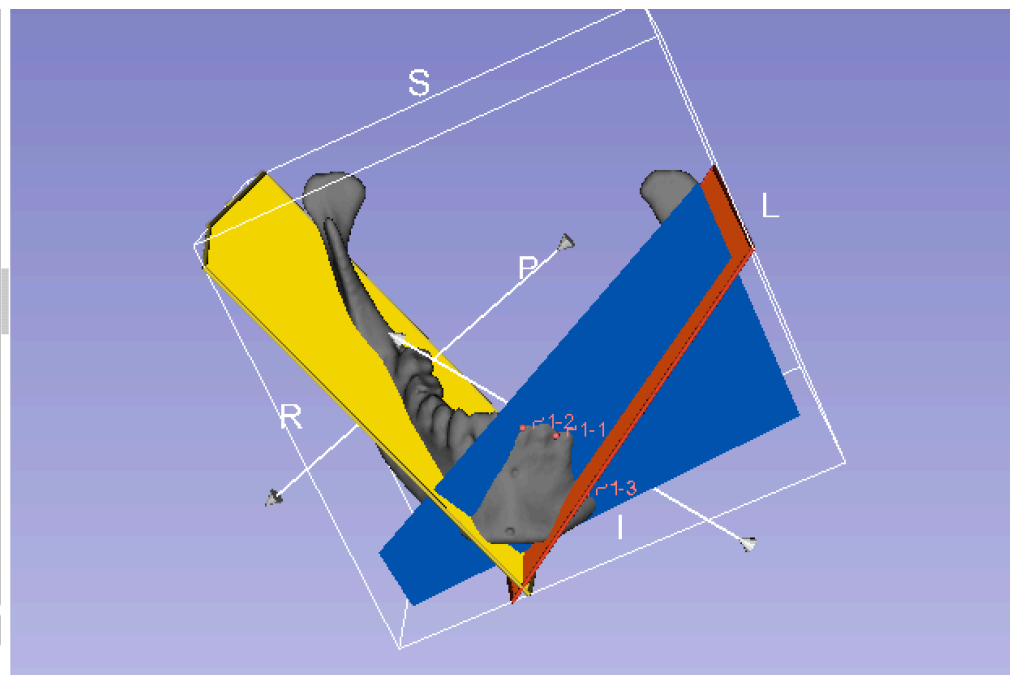
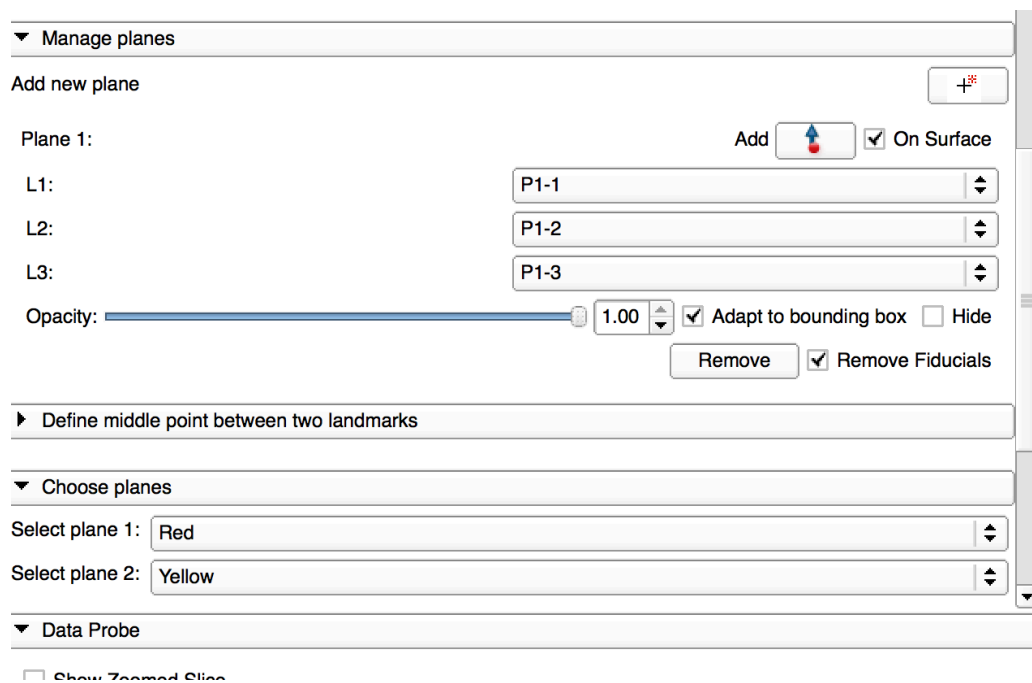
▼ Data Probe





# Angle Planes

- Measuring distances between anatomically designed landmarks is crucial in cephalometrics
- No existing software to do it in 3D





# Pick and Paint & MeshStats

- Select ROIs in surface(s) meshes

▼ Selection Region of Interest:

Model of Reference: sample00\_pp\_surfSPHARM

Connected landmarks lala  On Surface

Landmarks

Add Scale: 2.00  On Surface

Region of interest

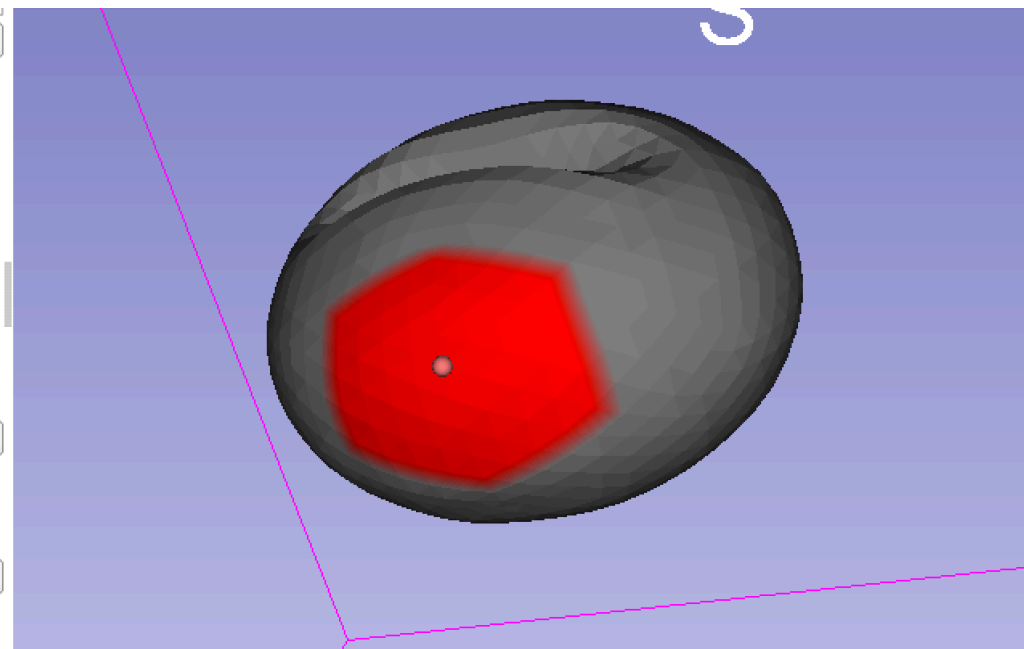
Select a Landmark: lala-1

Value of radius 4.00 Clean mesh

► Propagation:

▼ Data Probe

Show Zoomed Slice



- Compute basic statistics

# Q3DC



- Computing linear distances and angles in 3D

Model of Reference: AH2m

Define middle point between two landmarks

.landmark A: 1

.landmark B: 2

On Surface Define middle point

Calculate distance between two landmarks:

.landmark A: 1

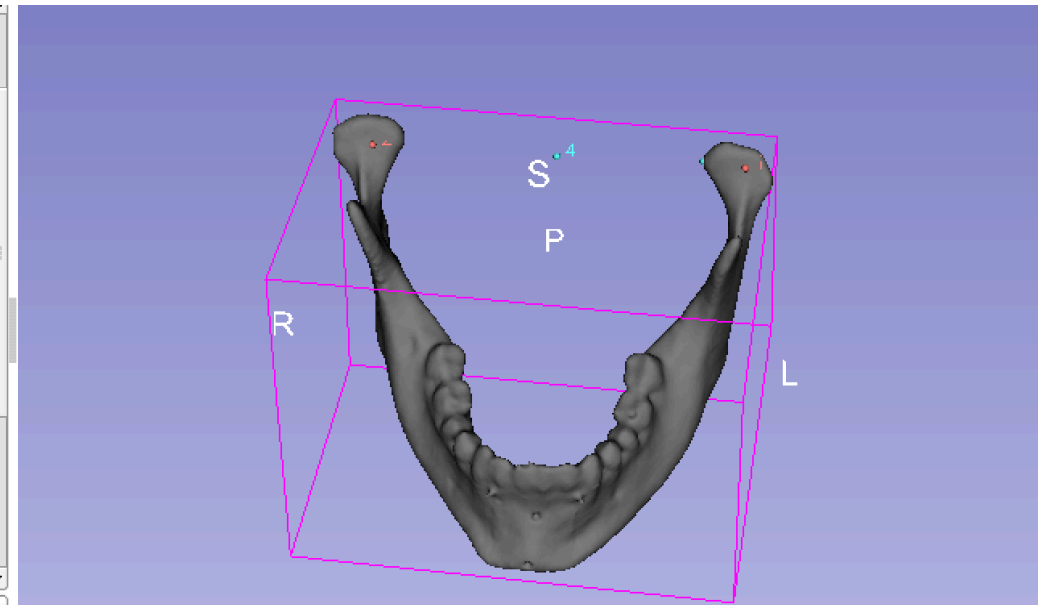
.landmark B: 2

Calculate

	R-L Component	A-P Component	S-I Component	3D Distance
1 1 - 2	97.858	-0.509	-3.043	97.907

/Applications Export

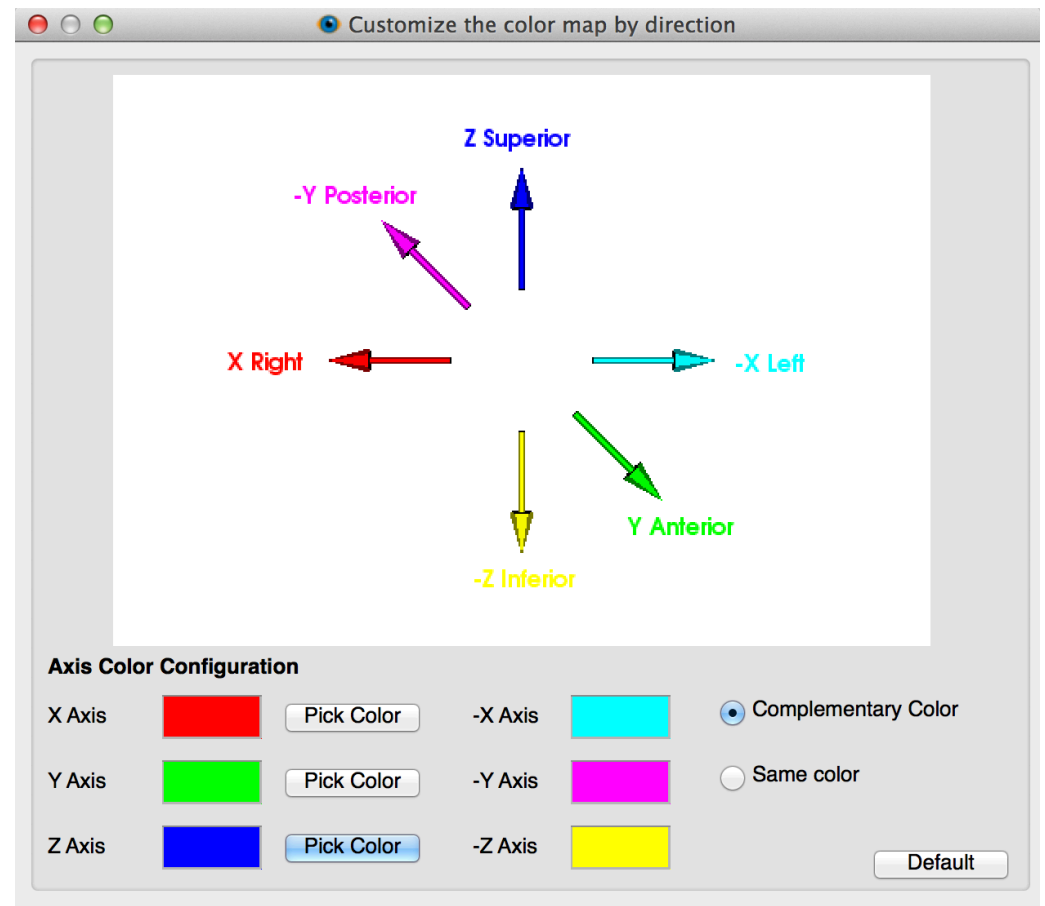
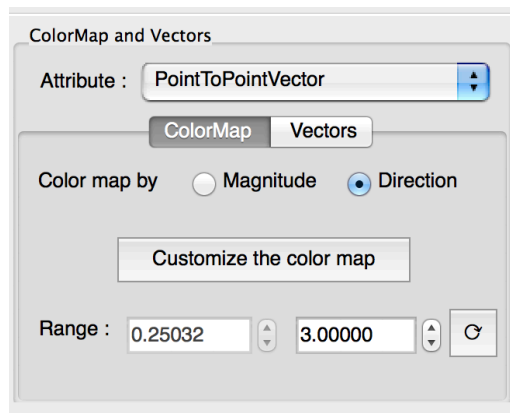
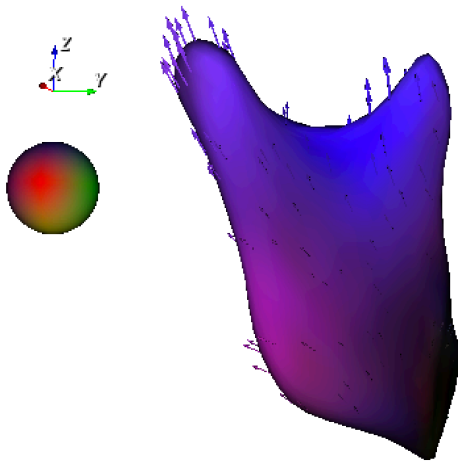
Calculate angle between two lines:





# Shape Population Viewer

- Functionality to display RGB colormaps
- Color-coding vector maps based to their direction





- **Aim 1.** Determine a 3D morphology index for aiding diagnosis of TMJ osteoarthritis.
- **Aim 2.** Assess effectiveness of treatment in TMJ osteoarthritis longitudinal cohorts using imaging biomarkers.
- Tools for OA developed in 3D Slicer
- *“The successful completion of the proposed aims will provide a solid platform for wide applicability of this novel quantification methodology in dentistry”*




# Bone texture extension

← → Manage Extensions (0) Install Extensions

## Slicer Extensions

Categories

- All
- Cardiac (1)
- Converters (1)
- Developer Tools (3)
- Diffusion (1)
- Editor Effects (1)
- Examples (4)



BoneTexture  
UofM and UNC

★★★★★

**INSTALL**



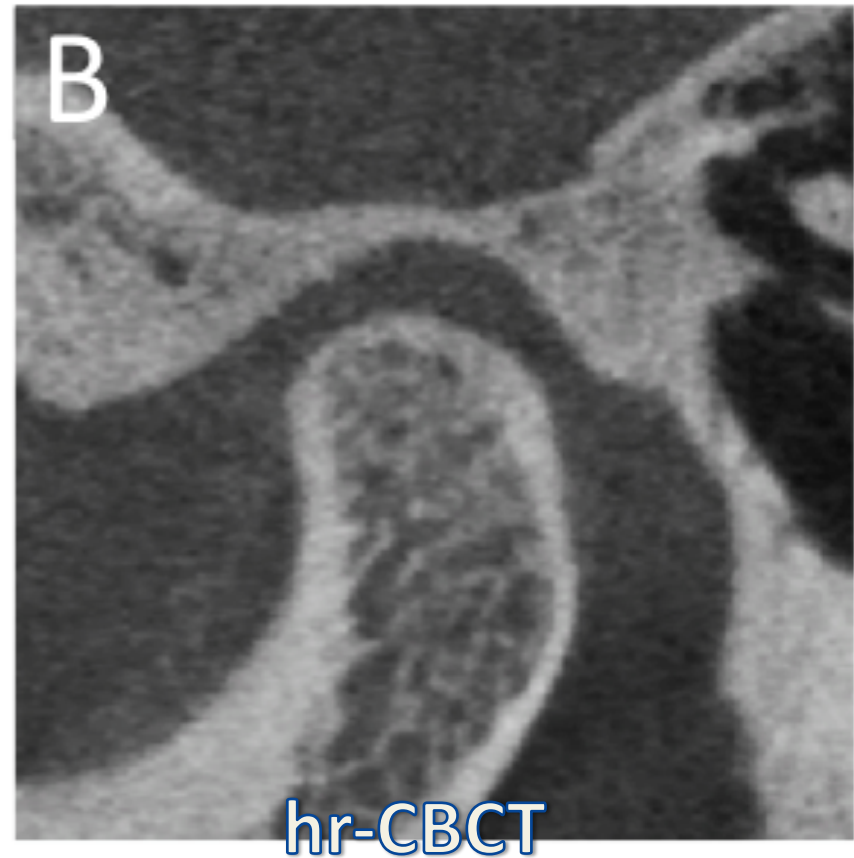
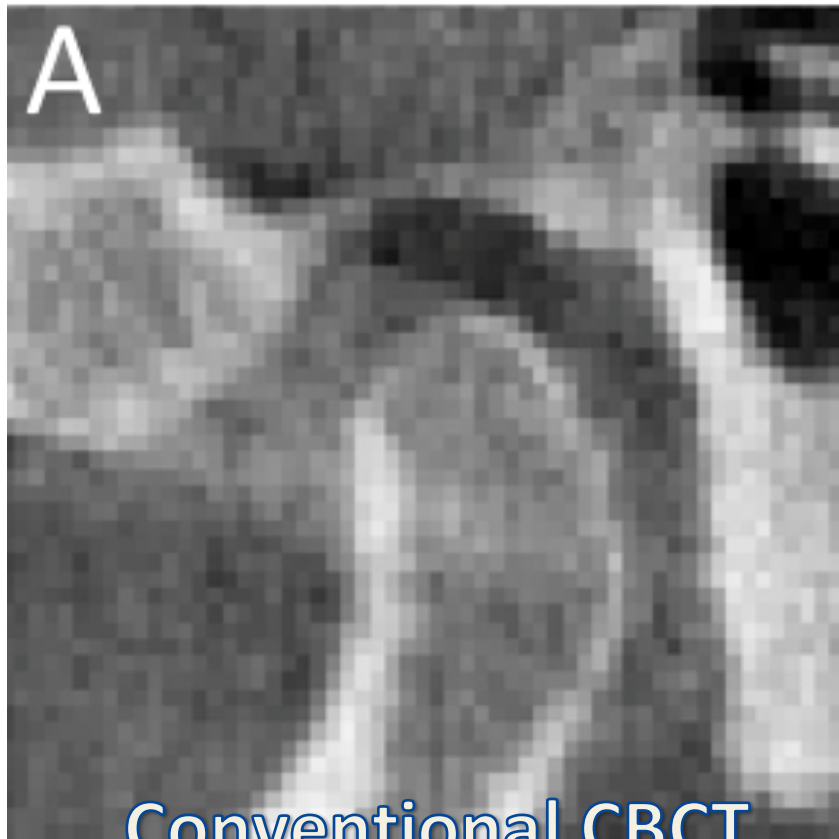
# Imaging subchondral bone

- 3D imaging in dentistry has evolved:

<b>Image modality</b>	<b>Advantages</b>	<b>Disadvantages</b>
<b>Computed tomography (CT)</b>	Great contrast in low- and high-density bone	Higher radiation dose for the patient
<b>micro-CT</b>	Same than for CT Very high resolution (few microns)	High radiation doses make it suitable to scan bone specimens
<b>Cone beam CT</b>	High resolution Low radiation dose	Reconstruction algorithm introduces an averaging-blur effect
<b>hr-CBCT</b>	Low radiation dose Better contrast in low- and high-density bone	



# Imaging subchondral bone





# SlicerCMF

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- Specialized and customized version of 3DSlicer for dental researchers that we named SlicerCMF (Cranio Maxillo Facial).
- Remove clutter from the user interface and only expose the set of functionality that is needed.
- *Available for download at our website.*