

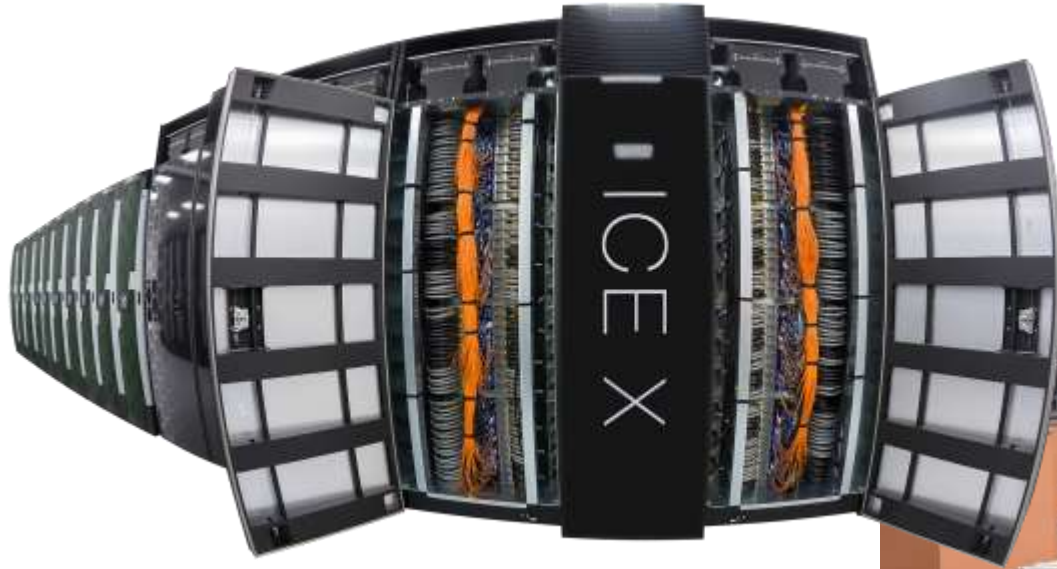
# Image Data Processing in Medicine

Tomas Karasek Ph.D.



# Anselm and Salomon

IT4Innovations  
national@13#50  
supercomputing  
center@4014101





**TOP 500 CERTIFICATE**  
The List.

Salomon - SGI ICE X, Xeon E5-2680v3 12C 2.5GHz, Infiniband FDR, Intel Xeon Phi 7120P  
IT4Innovations National Supercomputing Center, VSB-Technical University of Ostrava,  
Czech Republic

is ranked

**No. 40**

among the World's TOP500 Supercomputers

with 1.46 Pflop/s Linpack Performance

in the 45<sup>th</sup> TOP500 List published at ISC15 in Frankfurt, Germany, July 13th, 2015.

Congratulations from the TOP500 Editors



Erich Strohmaier  
NERSC/Berkeley Lab



Jack Dongarra  
University of Tennessee



Horst Simon  
NERSC/Berkeley Lab



Martin Meuer  
Prometeus

# International Projects

## FP7 projects



## H2020 projects

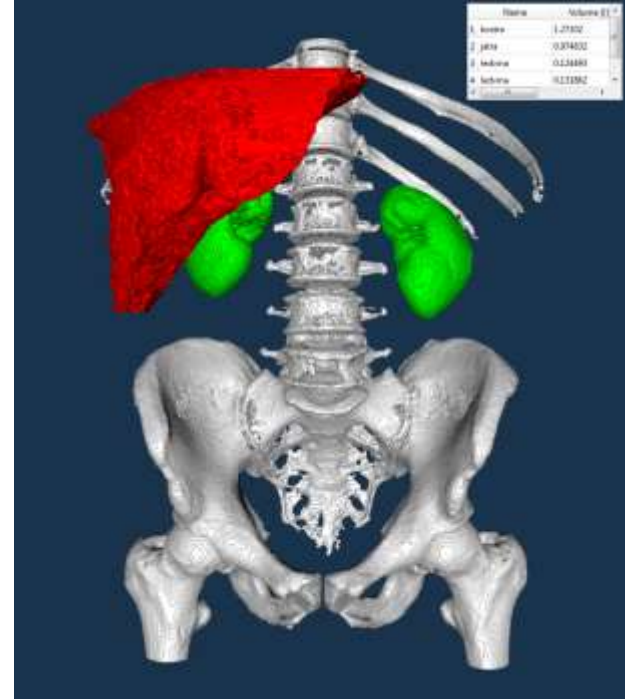
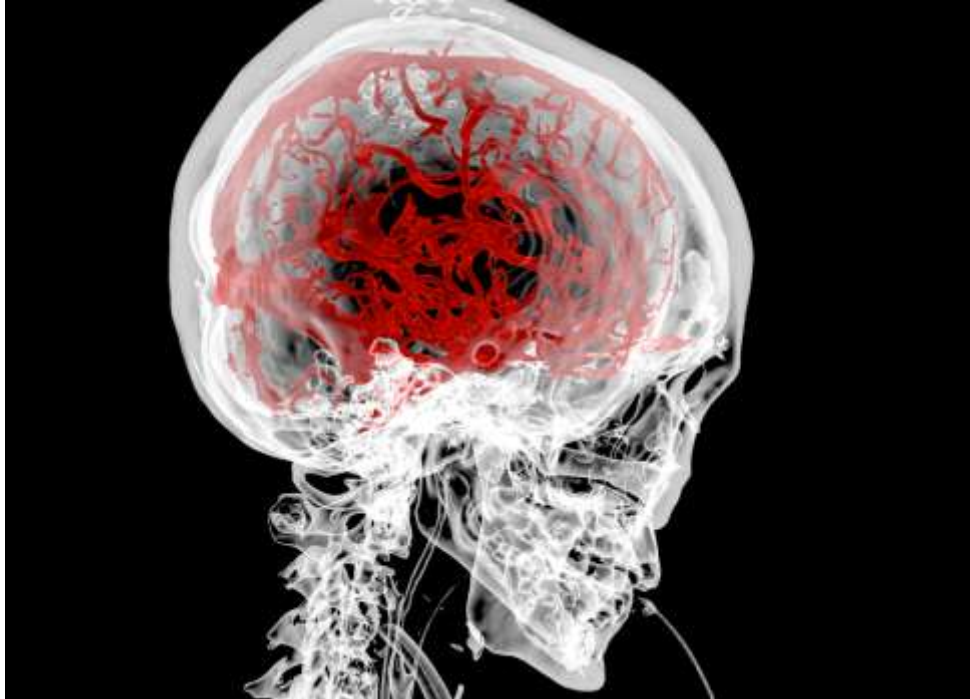
- SESAME NET (Training SMEs in HPC skills: HPC Wales, ICHEC, Fraunhofer, GRNET, ...)
- READEX (Run-time Exploitation of Application Dynamism for Energy-efficient eXascale computing : NTNU, ICHEC, TUM, TUD, Intel, ...)
- 2x H2020 MC – ITN

# Intel® Parallel Computing Center

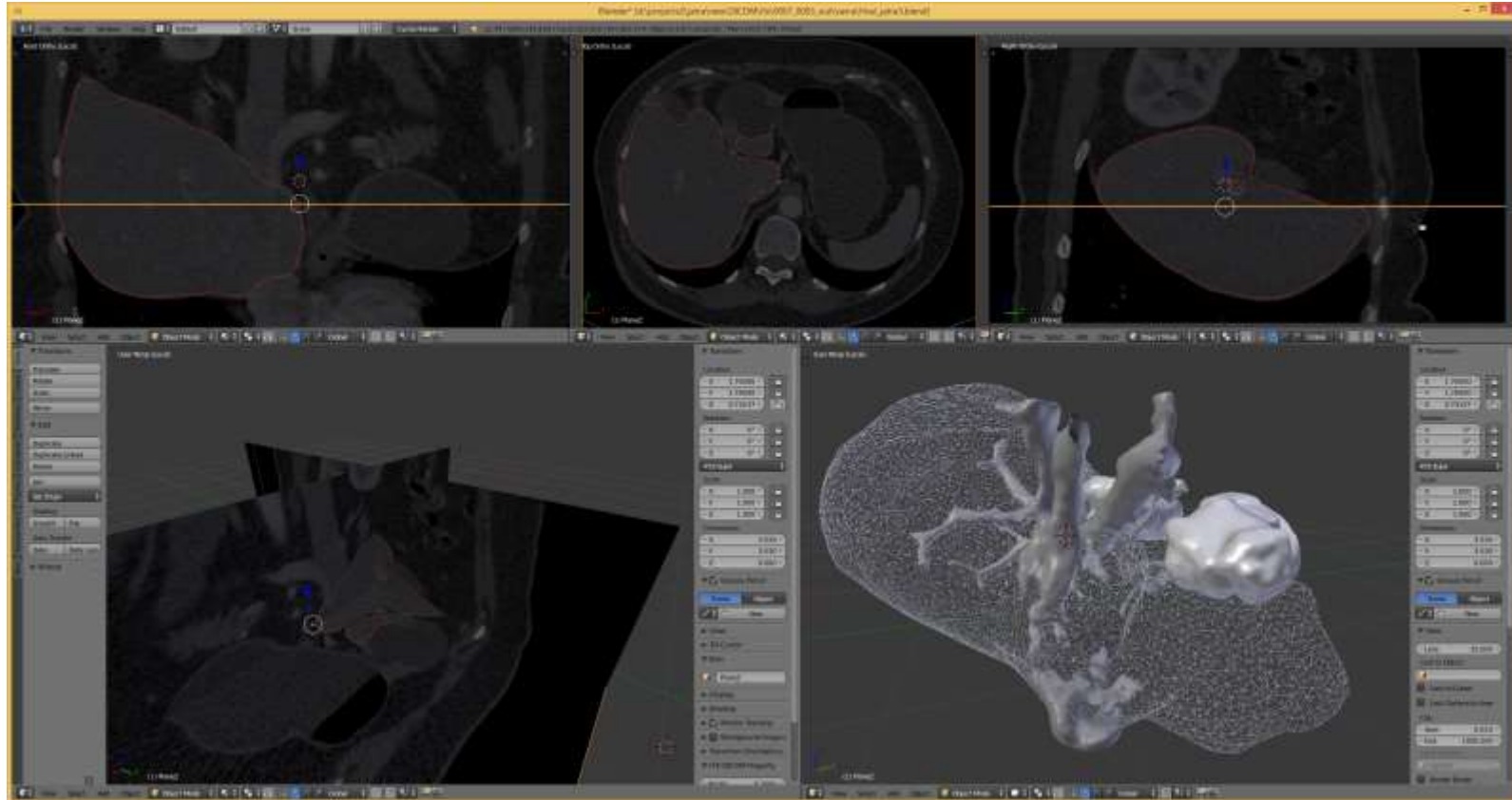
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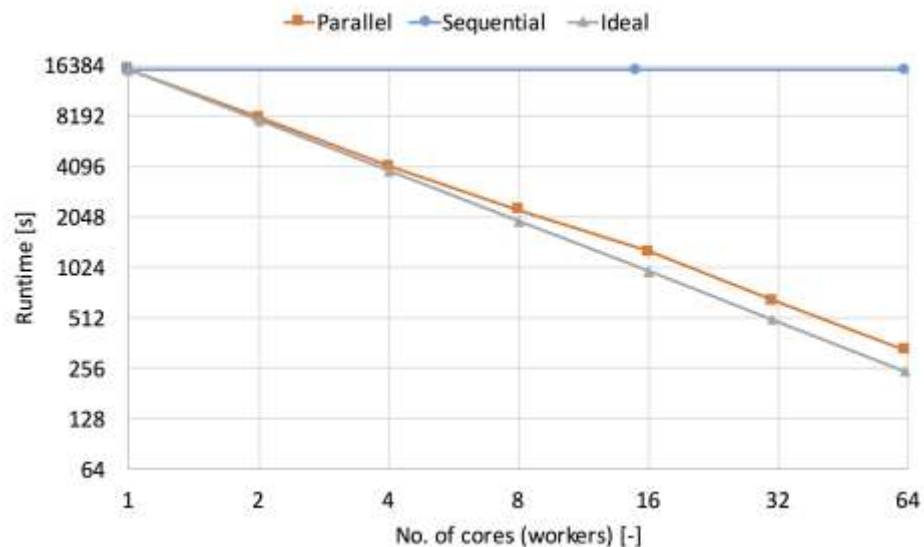
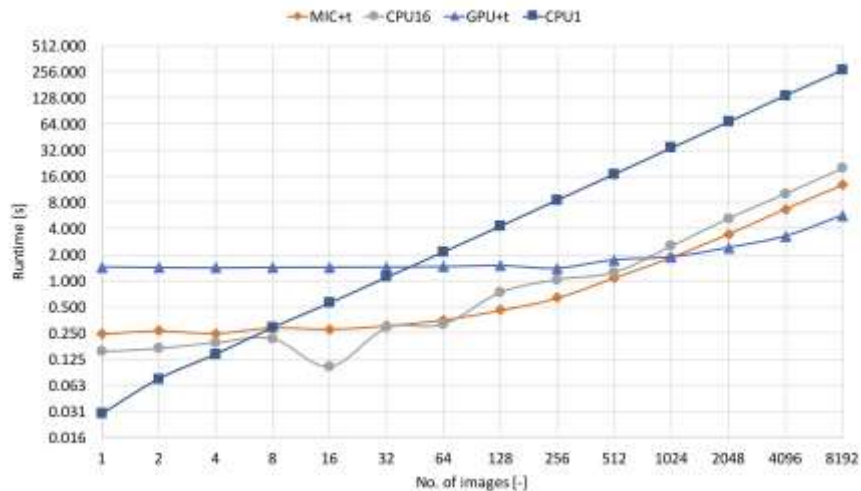
# Image Processing: Data Analysis



# Image Processing: Tools



# Image Processing: HPC

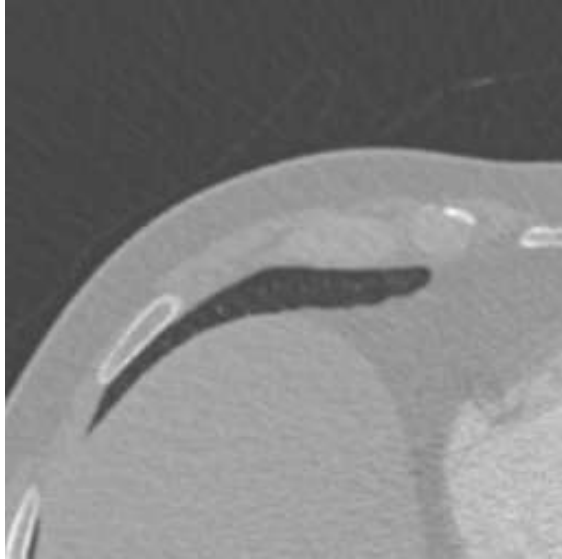




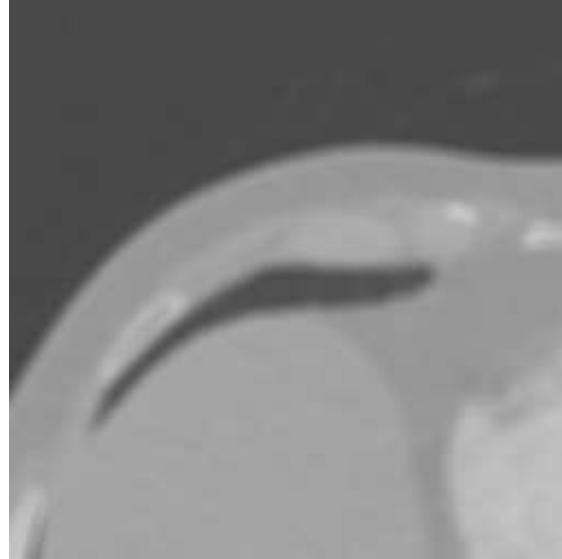
# Image Processing: 3D Models

- Image denoising
  - Gaussian smoothing filter
  - BM3D filter
- Image segmentation
  - Image tresholding
  - K-means clustering
- Boundary extraction and normals enumeration
- Surface reconstruction
  - Poisson method
  - Metaballs method

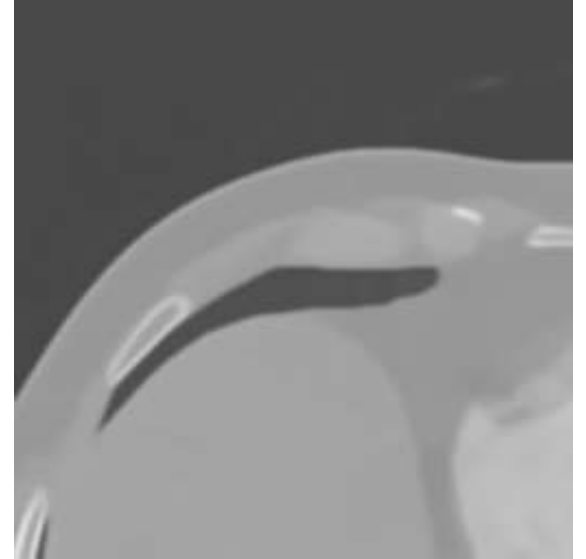
# Image Denoising



Original image

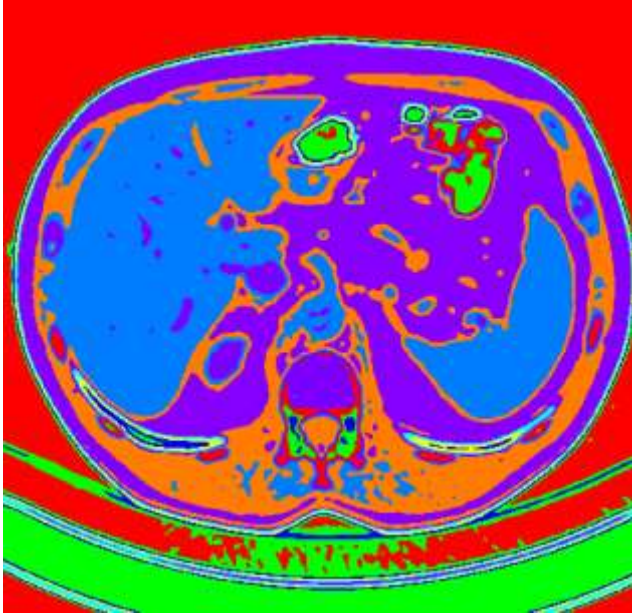


Gaussian



BM3D

# Image Segmentation

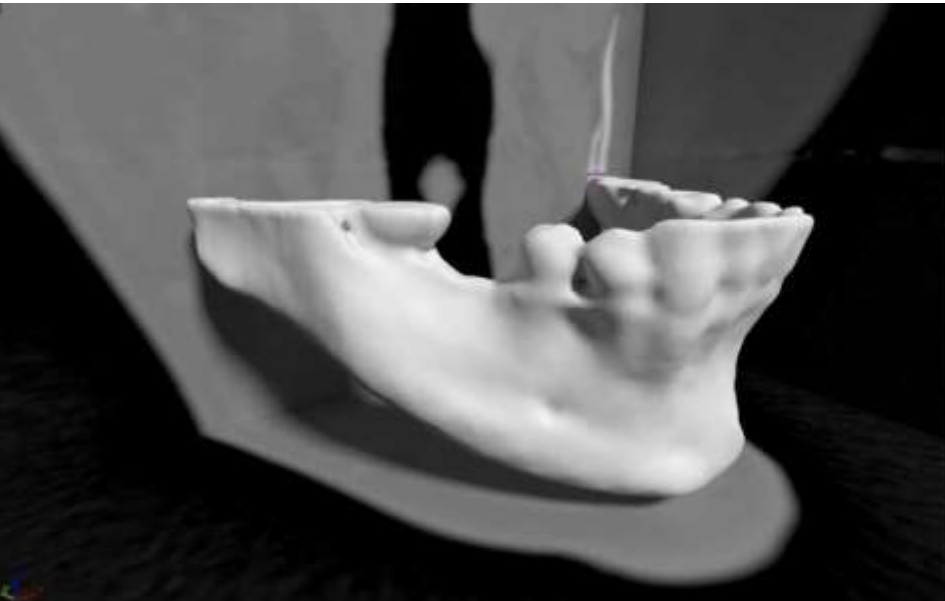


K-means

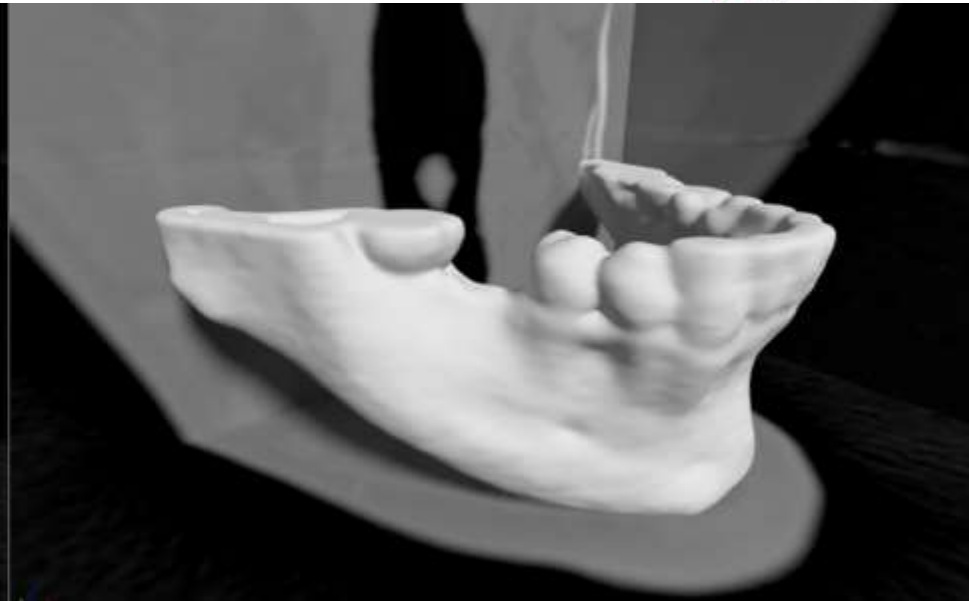


Tresholding

# Surface Reconstruction



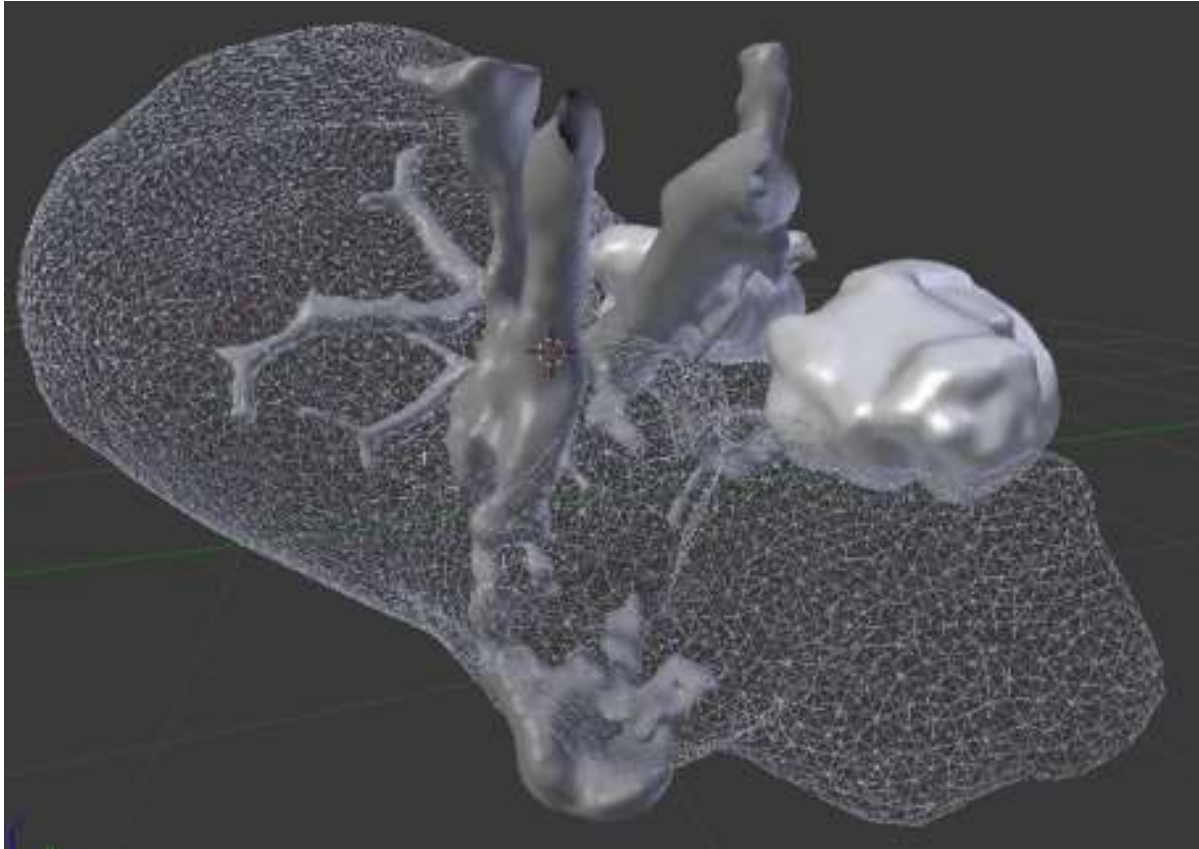
Poisson



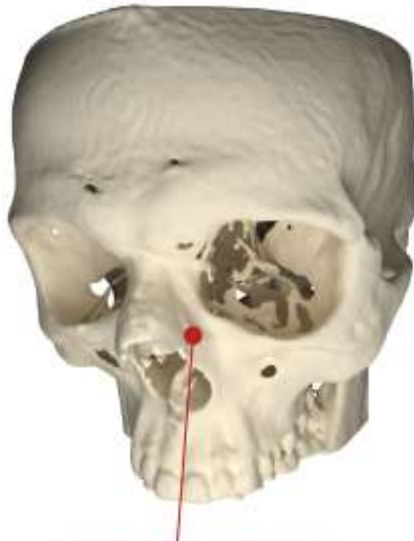
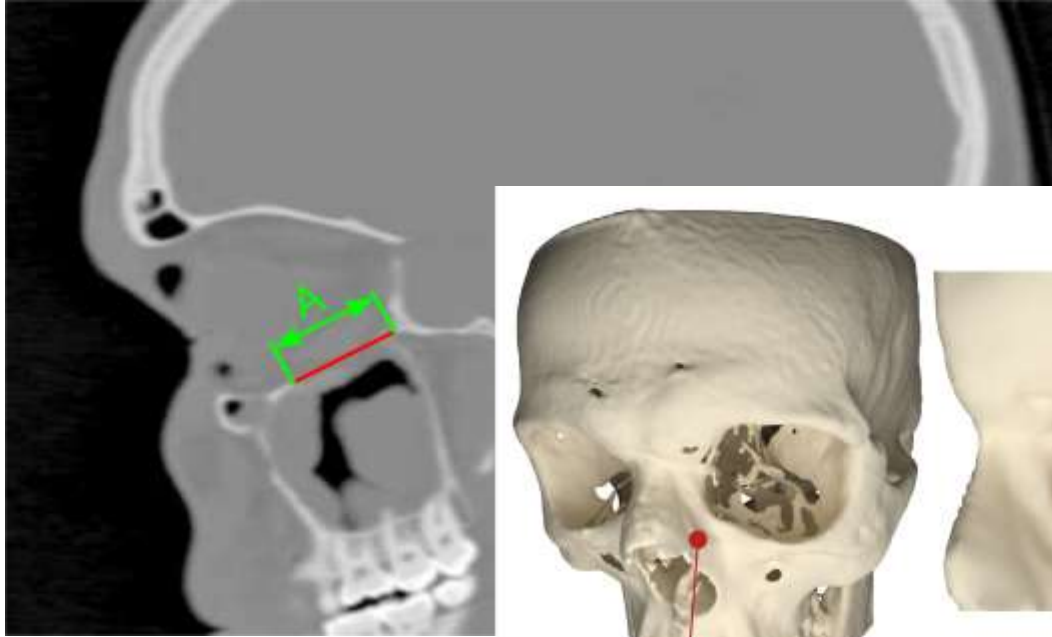
Metaballs

# 3D Models in Medicine

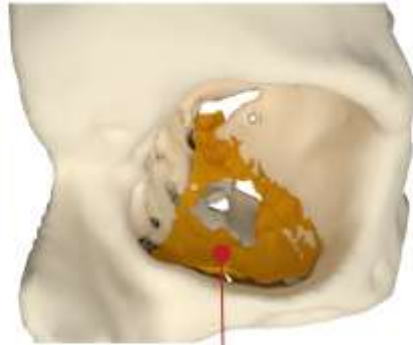
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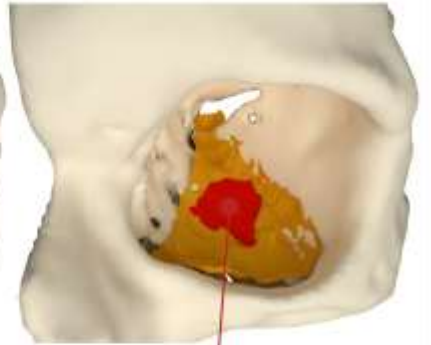
# 3D Models in Medicine



Bone reconstruction

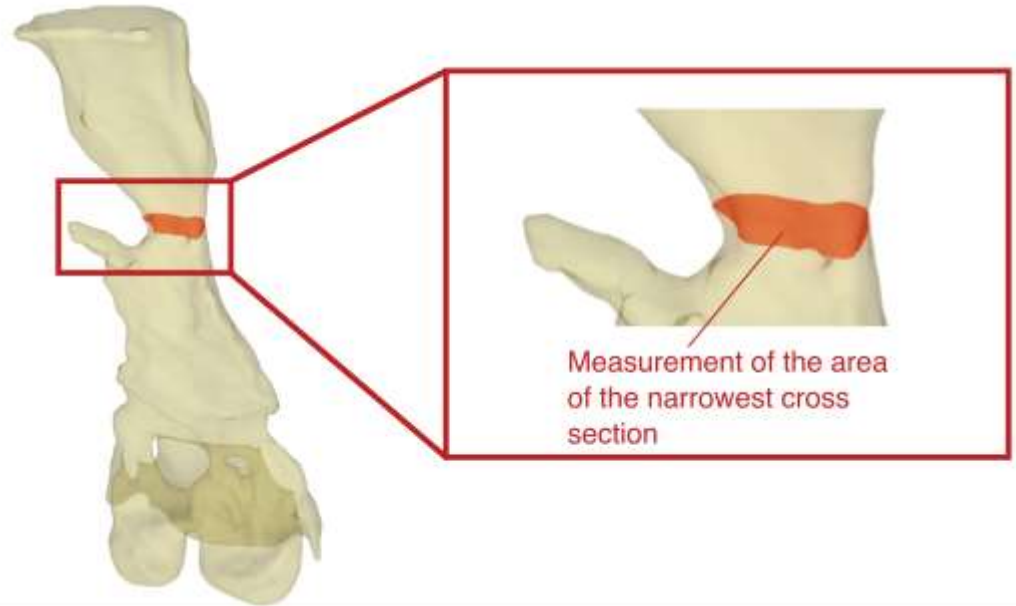
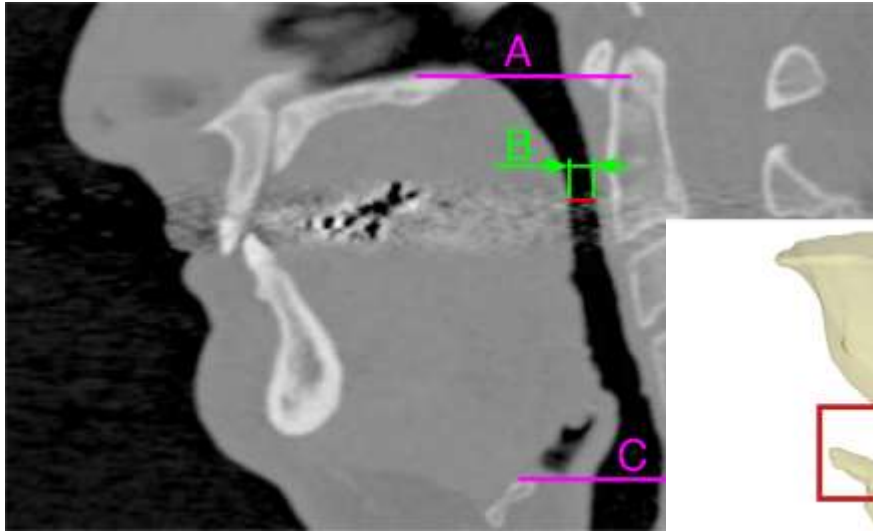


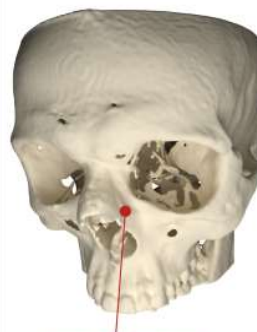
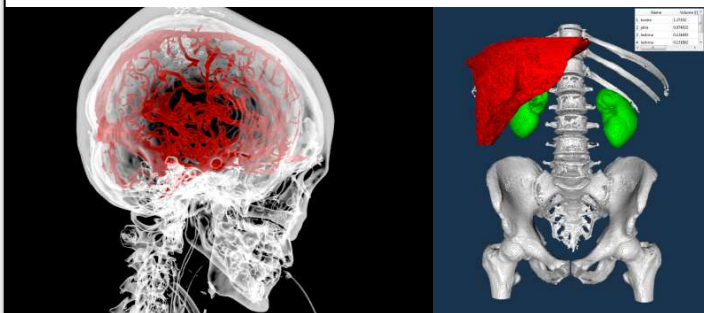
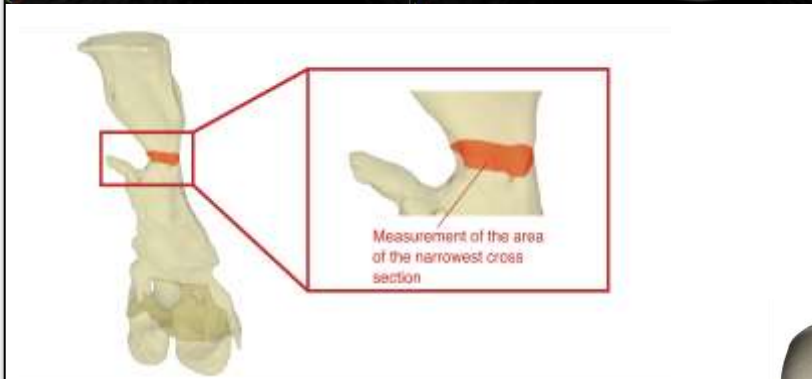
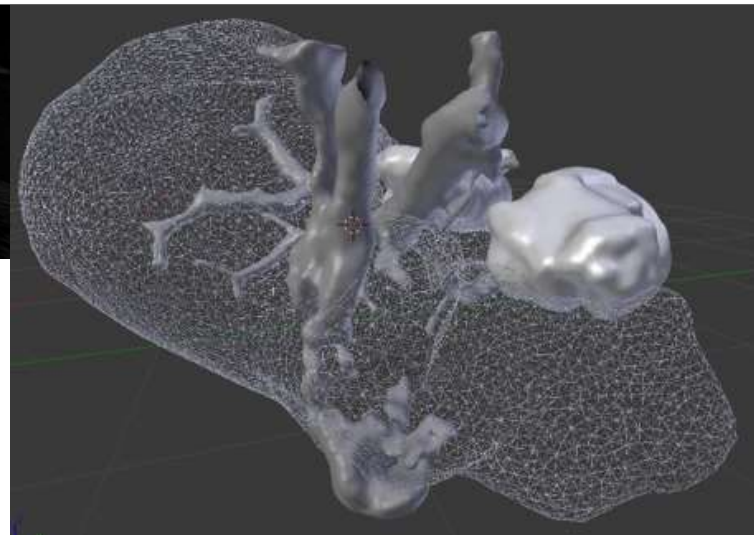
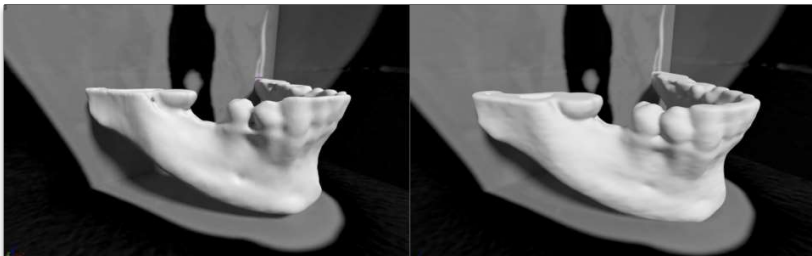
Size of the orbital floor



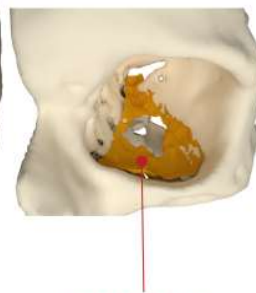
Size of the orbital floor fracture

# 3D Models in Medicine

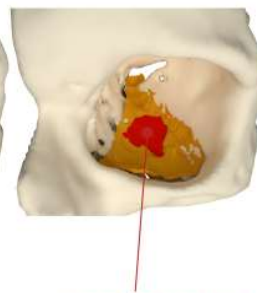




Bone reconstruction



Size of the orbital floor



Size of the orbital floor fracture