

MedShapeNet: A Large-Scale Dataset of 3D Medical Shapes for Computer Vision

<https://medshapenet-ikim.streamlit.app/>



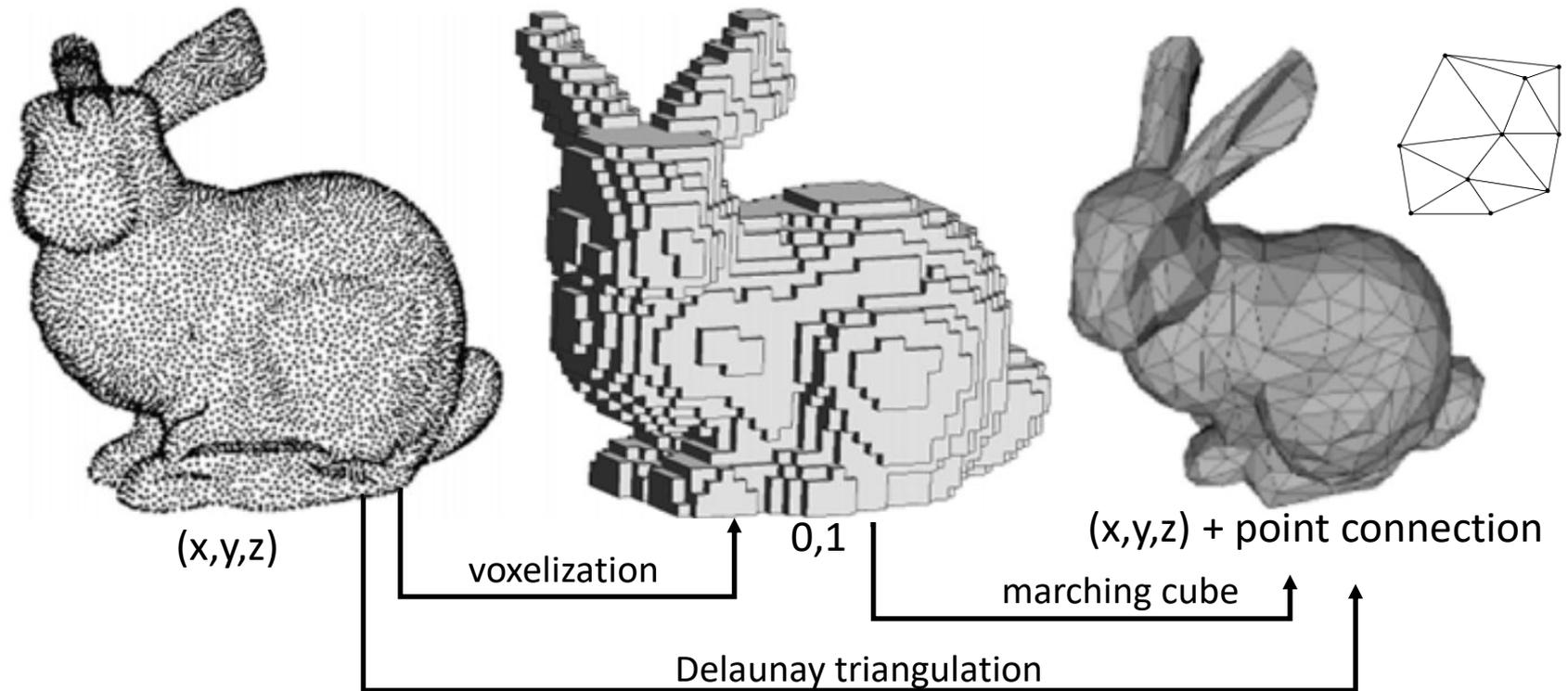
project logo

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3D Shape Representations

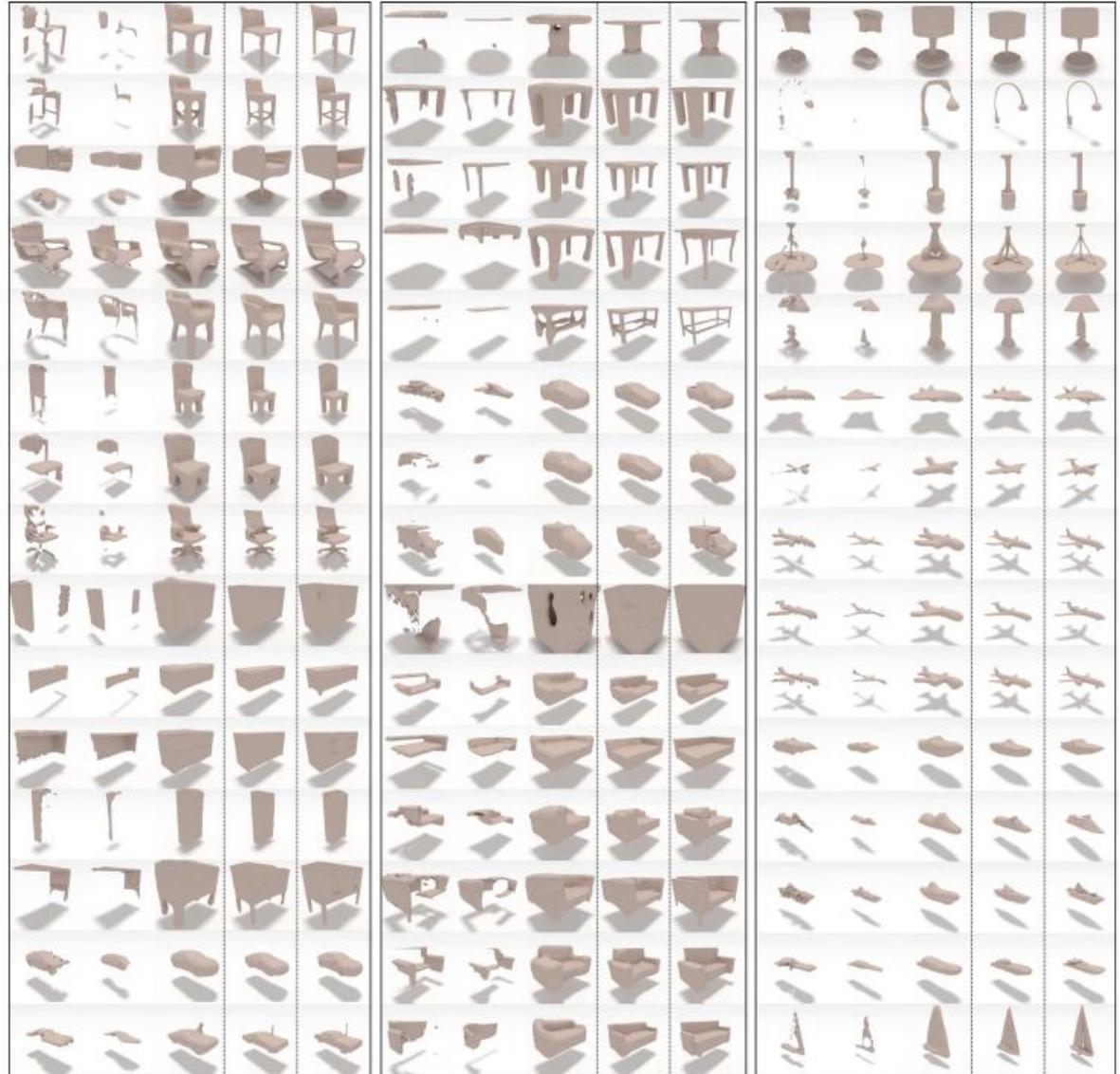
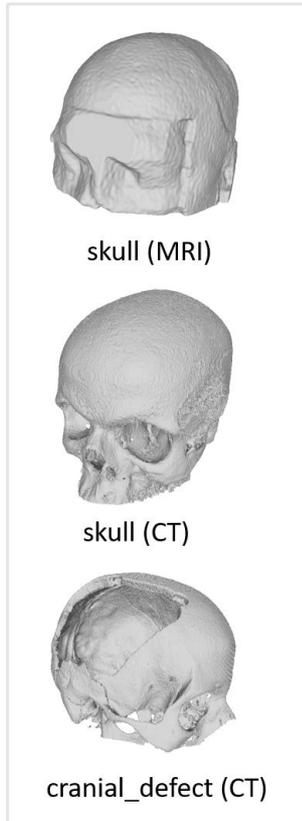


From left: The Stanford bunny model represented as **point cloud**, **voxel occupancy grid** and **mesh** [1]

[1] Hoang, L., Lee, S.H., Kwon, O.H. and Kwon, K.R., 2019. A deep learning method for 3D object classification using the wave kernel signature and a center point of the 3D-triangle mesh. Electronics, 8(10), p.1196.

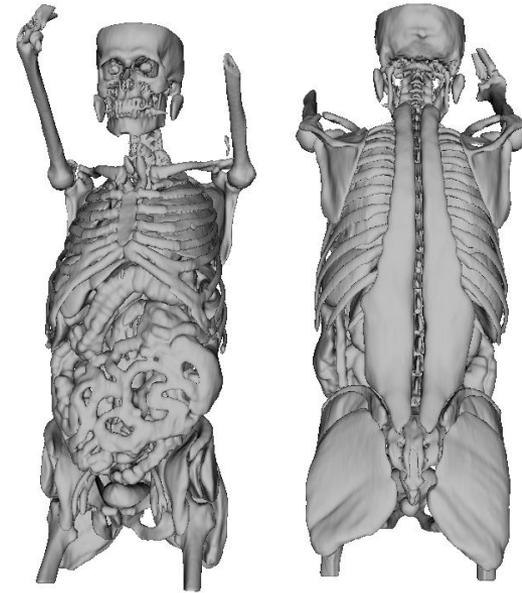
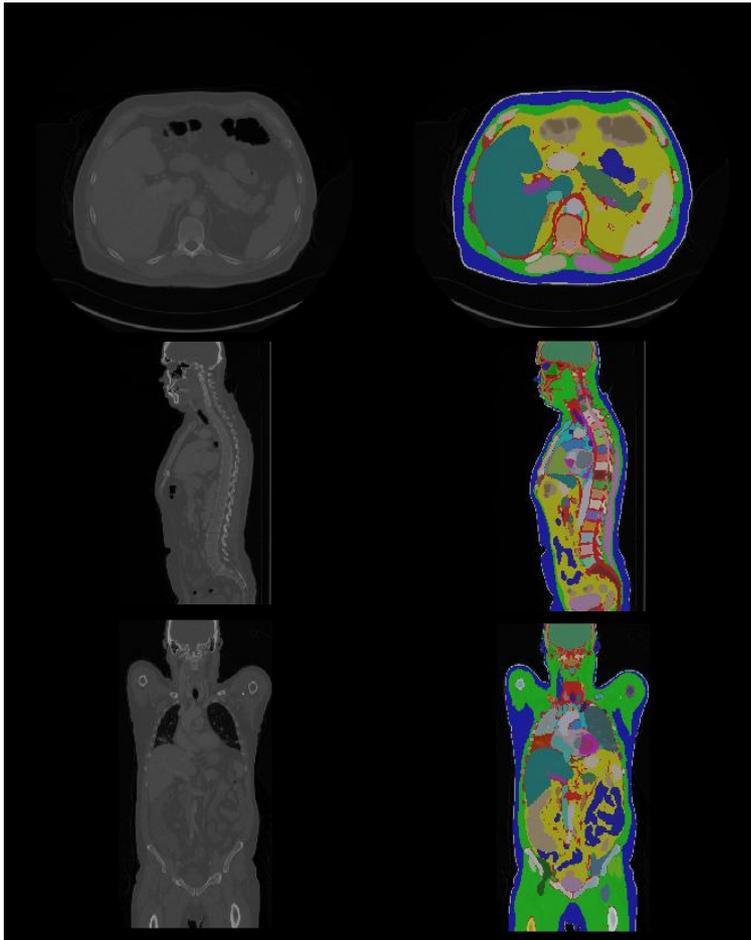
3D Medical Shapes

ShapeNet: shape completion, retrieval/recognition, reconstruction, etc



a large collection of the 3D CAD models of real-world objects: chair, desk, car, airplane, etc.

Shape Acquisition: Whole-body CT Segmentations



~ 130 anatomies per case / over 500 cases

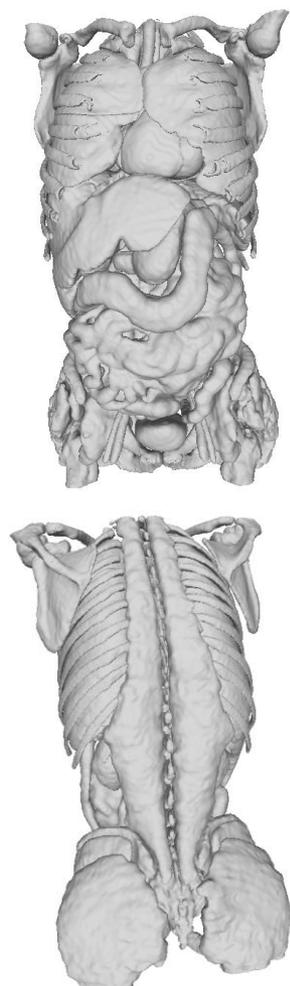
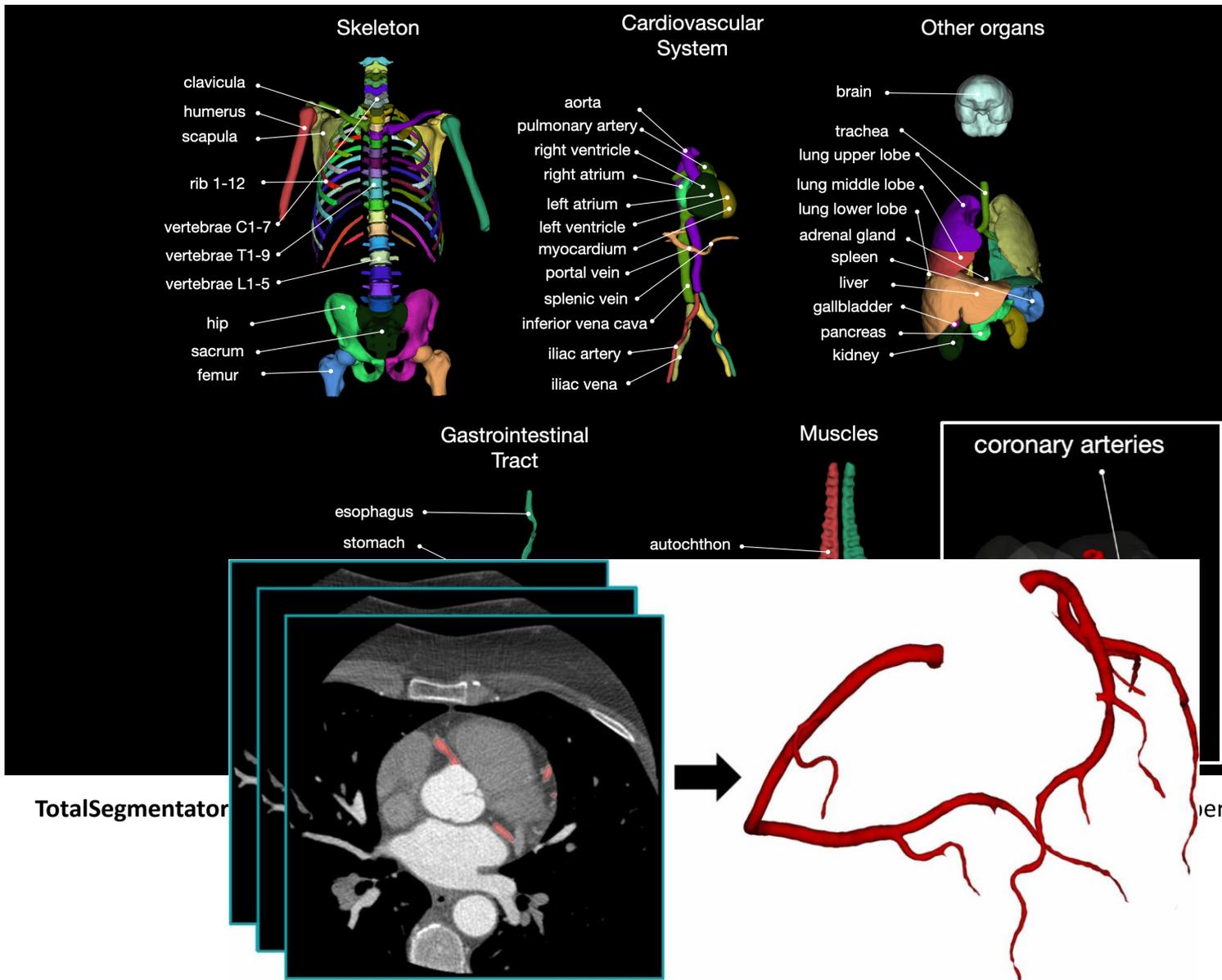
dense annotation ✘

pseudo-labeling ✔

[1] Seibold, Constantin, et al. "Accurate Fine-Grained Segmentation of Human Anatomy in Radiographs via Volumetric Pseudo-Labeling." arXiv:2306.03934 (2023).

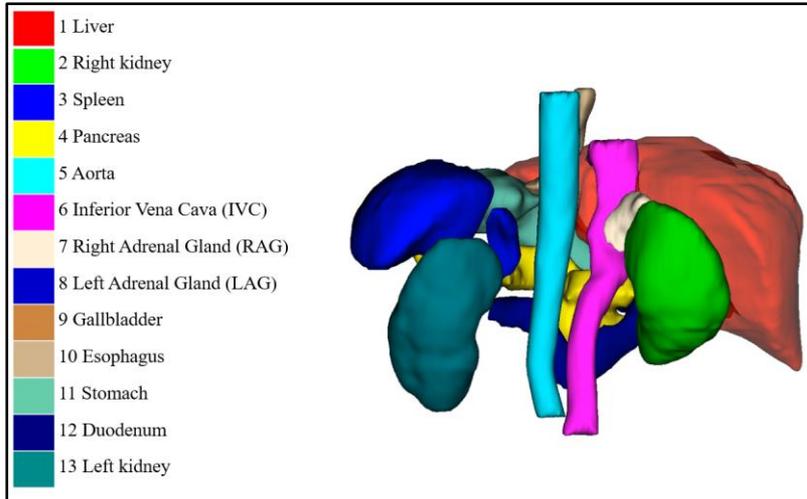
[2] Seibold, Constantin, et al. "Reference-guided pseudo-label generation for medical semantic segmentation." Proceedings of the AAAI conference. Vol. 36. No. 2. 2022.

Shape Acquisition: Whole-body CT Segmentations

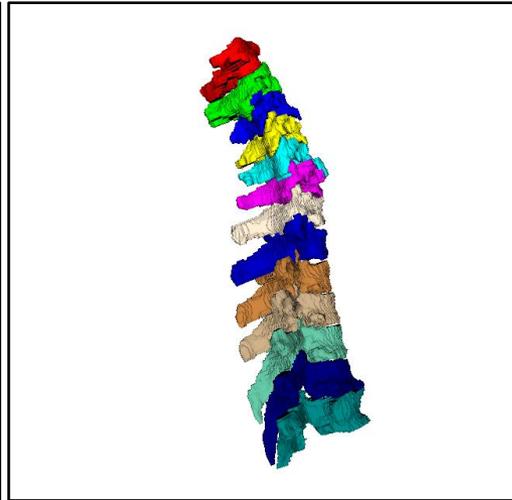


Slice-wise coronary vessels annotation (Ramtin Gharleghi et al., CMIG, 2022)

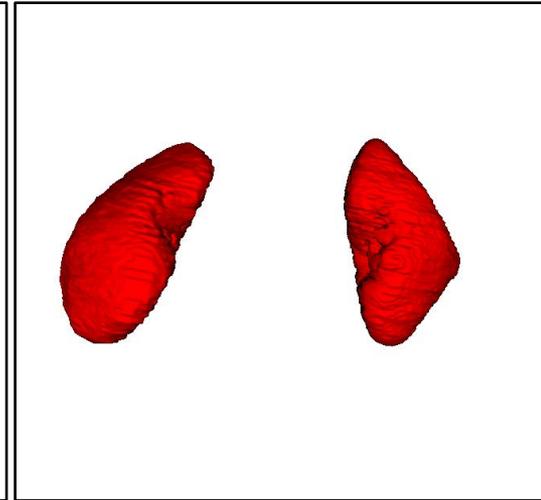
Shape Acquisition: Medical Image Segmentations



FLARE: Abdomen organs



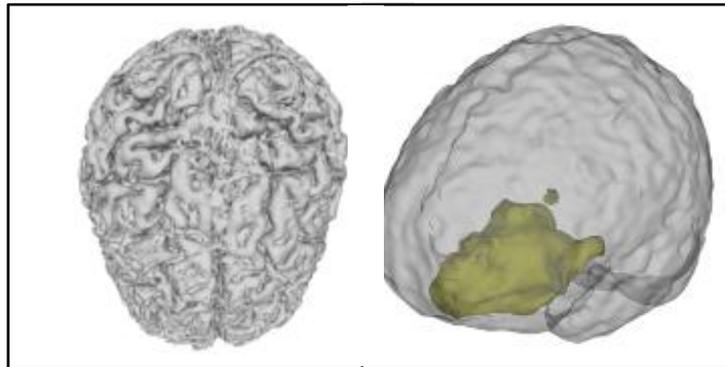
VERSE: Vertebrae



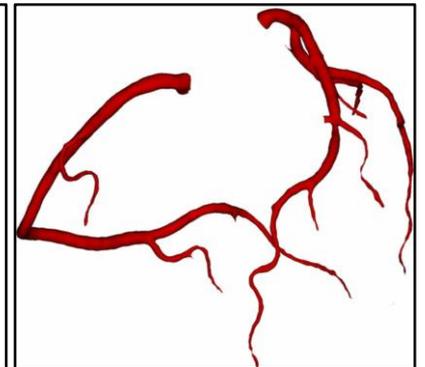
KiTS: kidney tumor



AutoImplant: healthy & defective skull

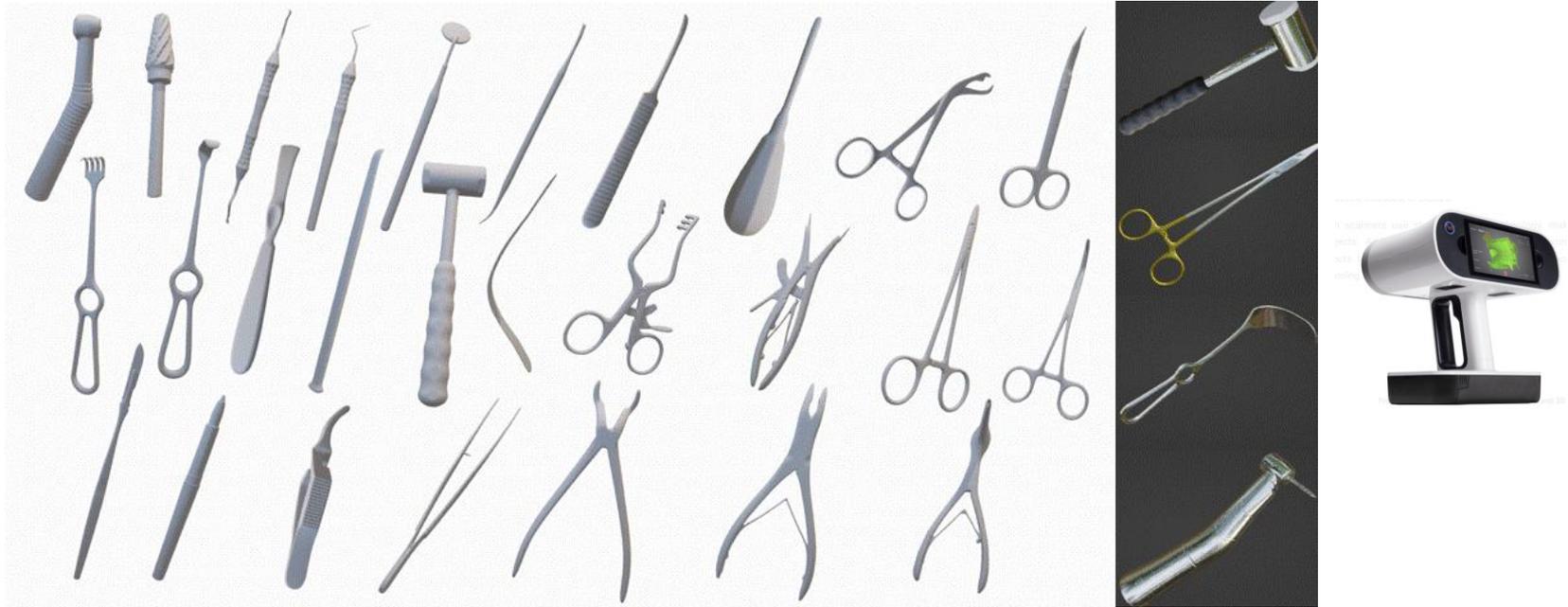


Healthy & tumorous brain

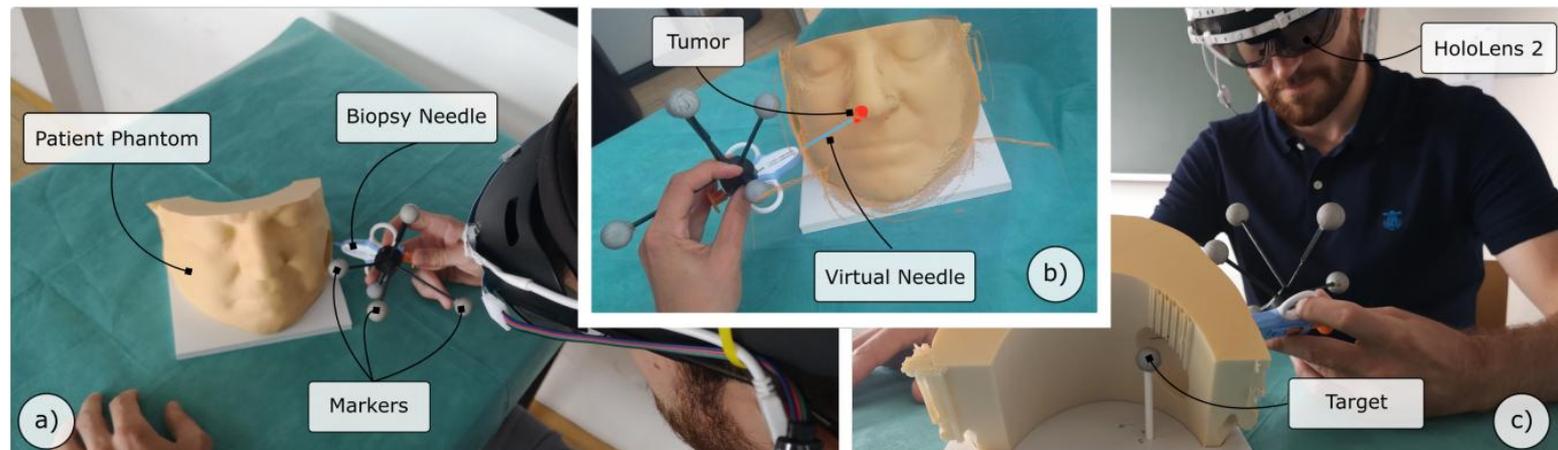


ASOCA: healthy & diseased coronary artery

Shape Acquisition: 3D Surgical Instrument Models



100 instrument models acquired using structured light 3D scanners (<https://xrlab.ikim.nrw/>)



surgical tool tracking in augmented reality (C. Gsaxner, J.Li., et al. 2021, 27th ACM VRST)

User Interface: search, inspect and download medical shapes

A

Search and View Shapes:

- s1273_liver.nii.g_1.stl
- s1272_liver.nii.g_1.stl
- s1271_liver.nii.g_1.stl
- s1270_liver.nii.g_1.stl
- s1269_liver.nii.g_1.stl
- s1267_liver.nii.g_1.stl
- s1264_liver.nii.g_1.stl

B

Search and View Shapes:

**C**

Home

Download

Impressum

Terms Of Use

Select your category:

Mark category for download

If you need a faster, more stable download, save your selection to `.txt` and use `wget` :

```
wget -i selection.txt
```

Export selection

D Download

To download the full dataset click the button below:

Download dataset

If you prefer using `wget` , download the `.txt` and use:

```
wget -i MedShapeNetDataset.txt
```

Download.txt

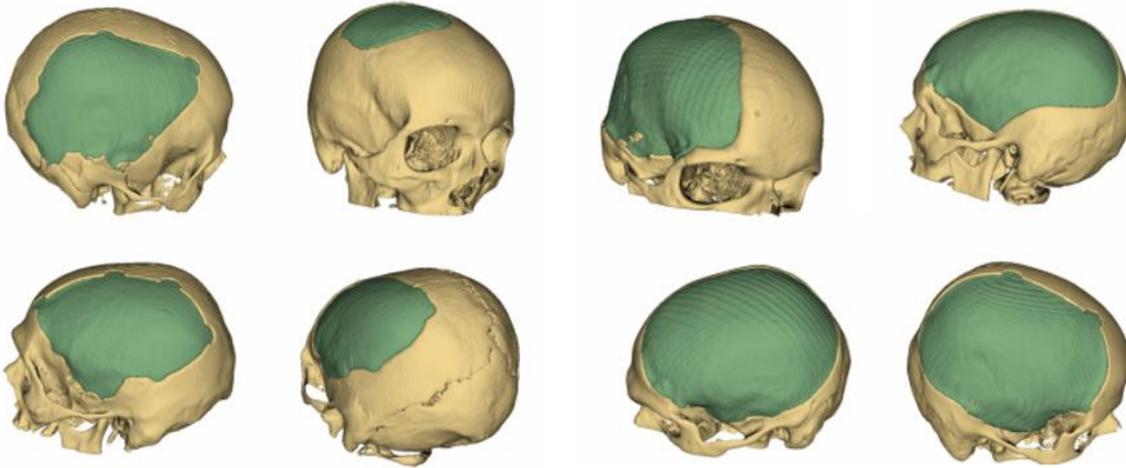
E Overview

	Name	Category	URL
0	s0000_colon.nii.g_1.stl	colon	https://
1	s0000_femur_left.nii.g_1.stl	femur_left	https://
2	s0000_femur_right.nii.g_1.stl	femur_right	https://
3	s0000_gluteus_maximus_left.nii.g_1.stl	gluteus_maximus_left	https://
4	s0000_gluteus_maximus_right.nii.g_1.stl	gluteus_maximus_right	https://
5	s0000_gluteus_medius_left.nii.g_1.stl	gluteus_medius_left	https://

Shape storage: Sciebo (<https://hochschulcloud.nrw/>) (2TB)

Server host: Streamlit (<https://streamlit.io/>) (1GB)

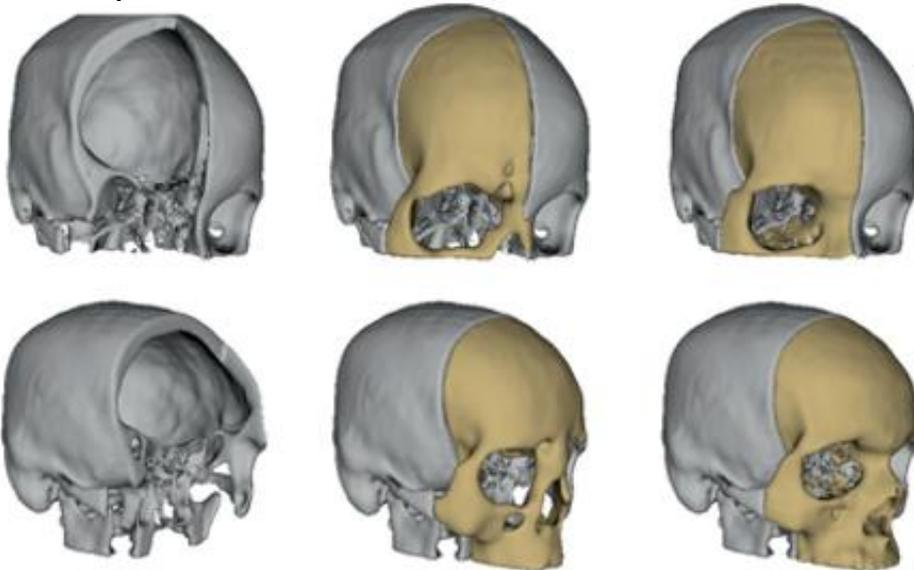
Use Cases: Craniofacial Implant Design



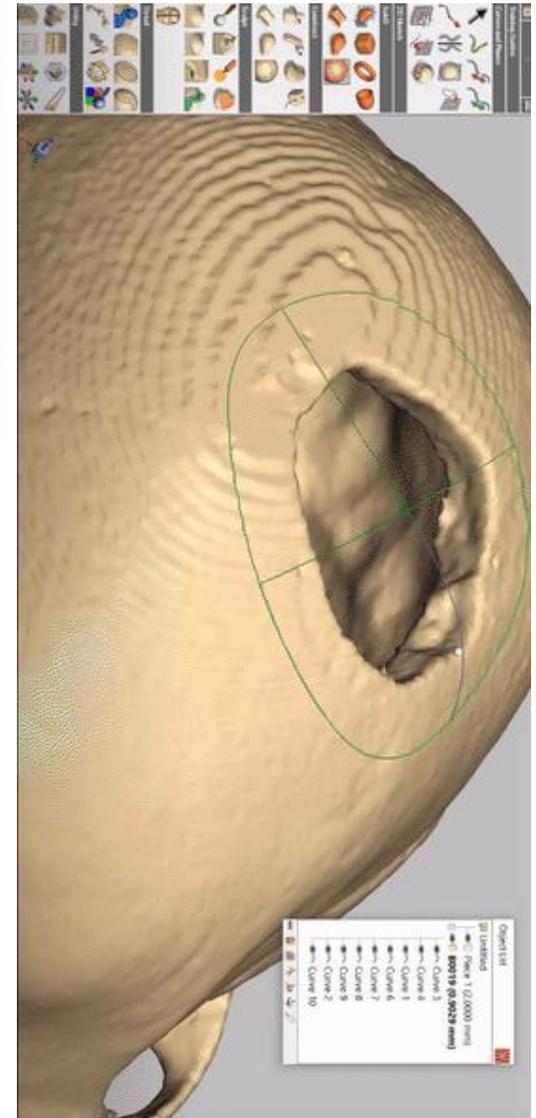
input

reconstruction

groundtruth

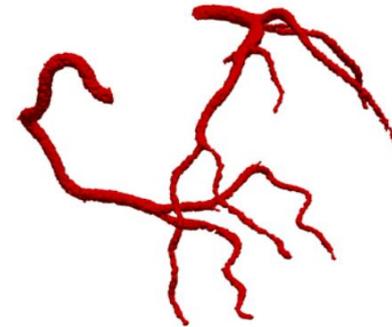
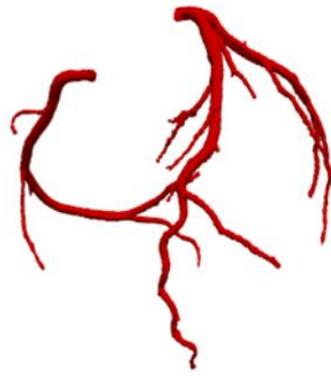
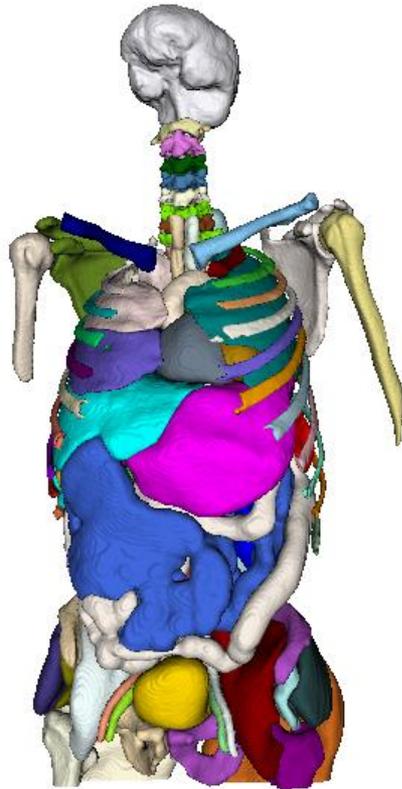


data-driven automatic design

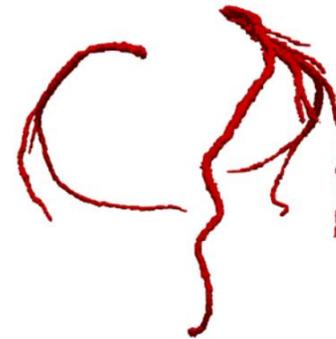
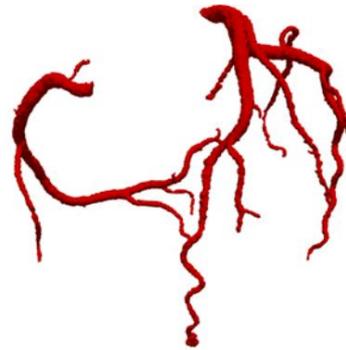


manual design

Use Cases: Anatomy Education



normal



diseased



lung



heart



spleen



stomach



pancreas



spine



rib cage



liver



kidney



aorta



autochthon
muscles



pulmonary
artery

Use Cases: Statistical Shape Models

Conclusion

- MedShapeNet is an alternative for common shape benchmarks, like ShapeNet, for computer vision research.
- MedShapeNet is also a unique, general-purpose dataset for a variety of medical problems, such as implant design and instrument tracking.
- MedShapeNet facilitates the translation of vision algorithms to medical problems, and bridges the gap between the two disciplines.

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<https://medshapenet-ikim.streamlit.app/>

<https://github.com/Jianningli/medshapenet-feedback>



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