

# TeethNet Dataset overview Document

## Background- ISO Teeth Naming Standing

Teeth Naming has a naming standard for 32 model teeth models (enumerated by ISO naming standard) (Figure 1) . Dental professionals, in writing or speech, use several different dental notation systems for associating information with a specific tooth. The three most common systems are the FDI World Dental Federation notation (ISO 3950), the Universal Numbering System, and the Palmer notation. The FDI notation is used worldwide, and the Universal is used widely in the United States. The FDI notation can be easily adapted to computerized charting.

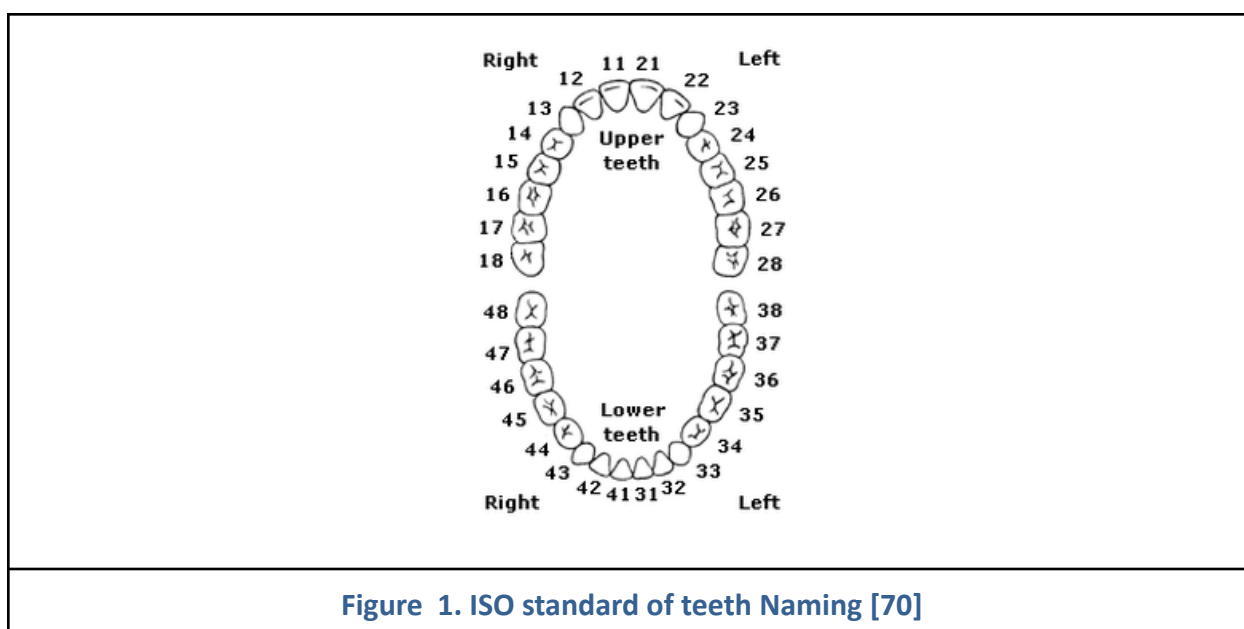


Figure 1. ISO standard of teeth Naming [70]

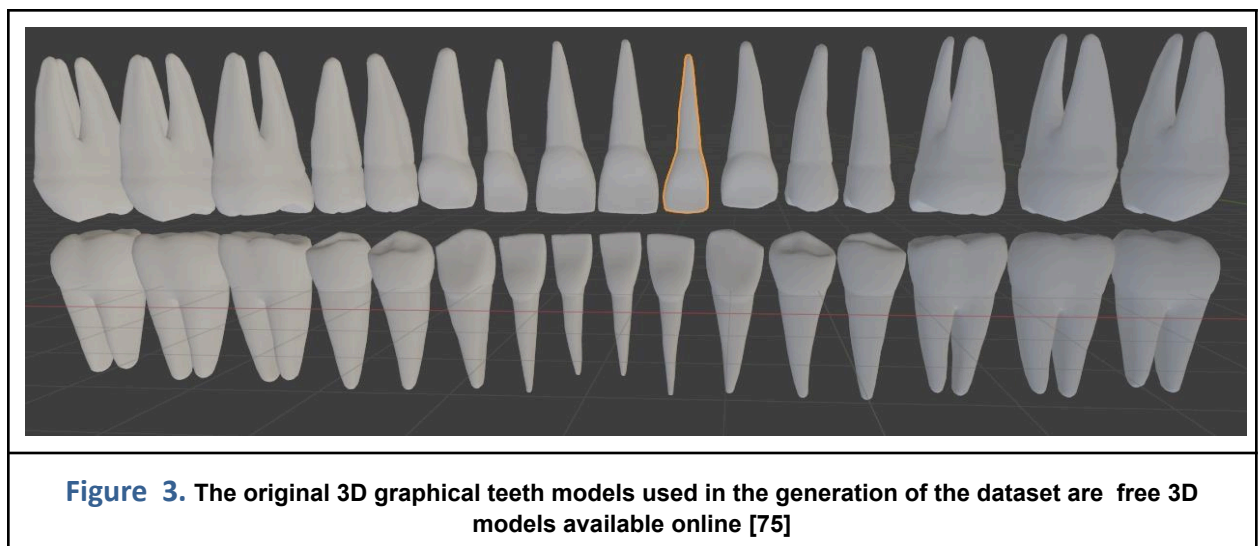
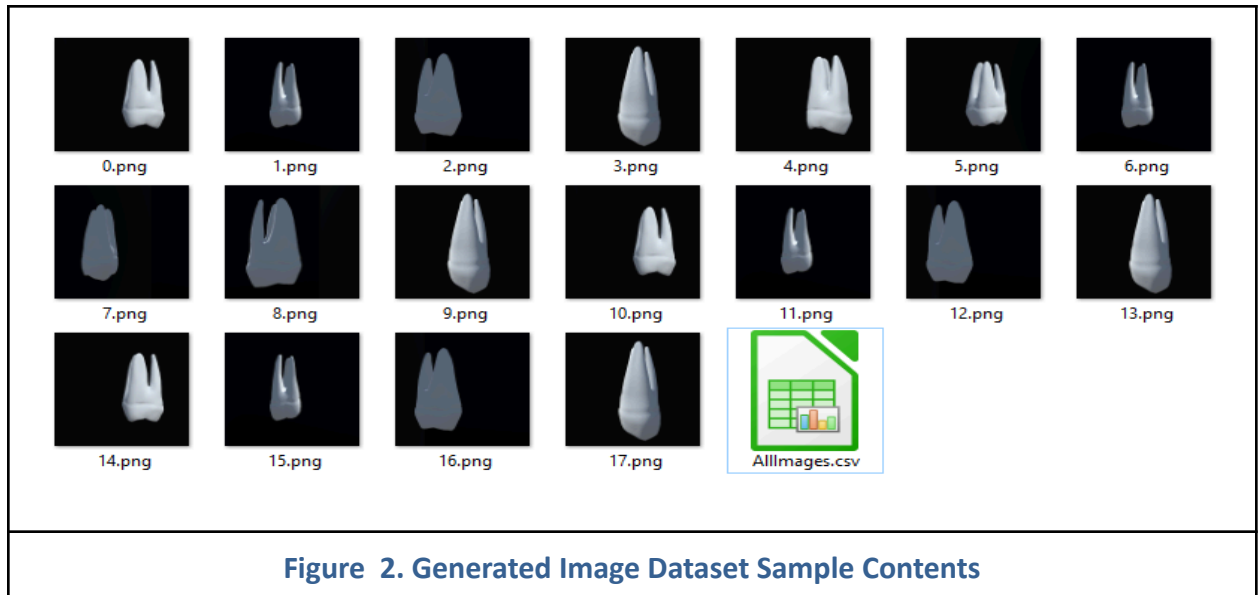
Due to a lack of teeth X-ray datasets online, the team started to create a graphical dataset simulation for the teeth dataset to be used for initial testing. The generated multiview dataset is available here:

<https://drive.google.com/drive/folders/1T3fGGXuWqzoERUj6bYAw-CLrPJKIZy-?usp=sharing>

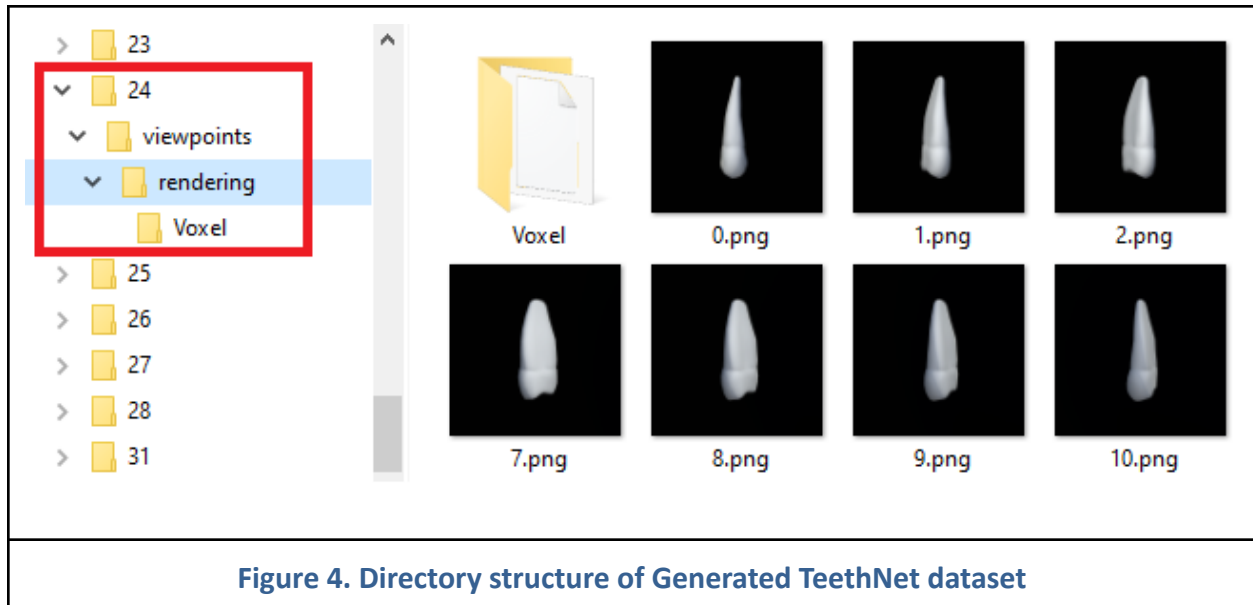
The dataset contains the following (Figure 2):

- Thirty-two folders (each folder is named after the corresponding tooth iso name) contain 18 images of different views generated by Unity 3D c# scripts
- Ground truth **OBJ 3D** format [73]: 3D format for each tooth as Mesh OBJ files. contains 32 models.
- Ground truth **Binvox 3D** format [74]: 3D voxel format for each tooth. It contains 32 models.

Figure 3 shows the original 3D models used to capture the images [75].

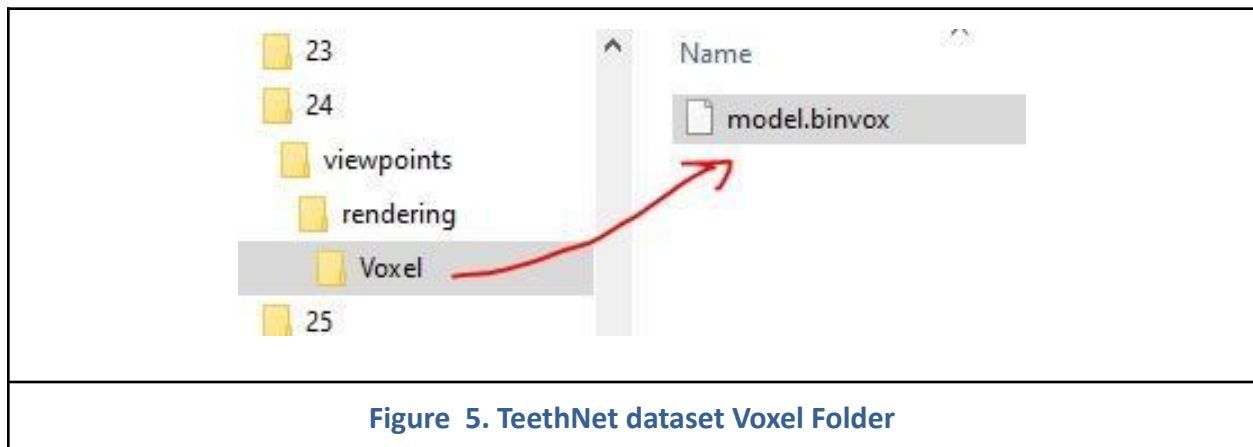


This dataset is developed using Unity 3D. Our Custom Dataset (we call it “**TeethNet**” ) : our custom dataset has a **similar metadata** structure to the original **Shapenet** dataset [78] (Figure 4) .



In addition to two important files that were in the shapenet dataset, we made the same ones in ours:

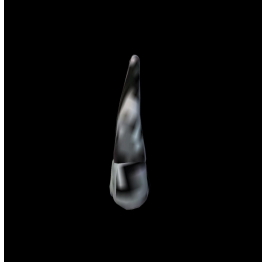
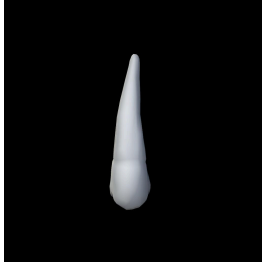
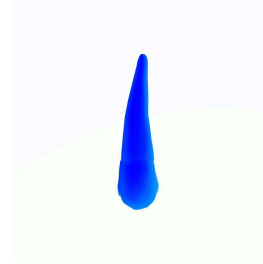

- 1- The **renderings.txt** file, which contains the names of the 24 images
- 2- The **rendering\_metadata.txt** file, which contains 5 columns azimuth, elevation, in-plane rotation, distance, and field of view. As in shapenet <sup>1</sup>. Each teeth images have the corresponding binVox 3d voxel model as in the following (Figure 5)




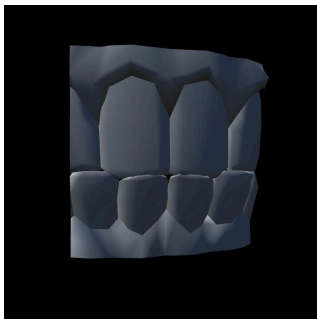
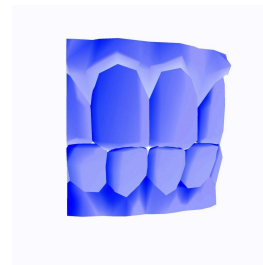

this custom dataset is divided into 2 sections:

1. **Single Teeth views**: which contains 4 categories of generations for each teeth (Figure 6). The Dataset is available at :  
[https://drive.google.com/drive/u/1/folders/1iQZg4KQCwBmXcEJoK\\_94JC-xAzNinM5Q](https://drive.google.com/drive/u/1/folders/1iQZg4KQCwBmXcEJoK_94JC-xAzNinM5Q)

<sup>1</sup> <https://www.photopills.com/articles/understanding-azimuth-and-elevation>

			
Normal with Texture	normal without texture	Negative without texture	Negative with texture
<b>Figure 6. Types of Generated images in TeethNet (Single View)</b>			

2. **Multi Teeth views:** which contains multiple teeth in the same view to be closer to real life captures images (Figure 7). The Dataset is available at:  
<https://drive.google.com/drive/folders/1USlvZNF3GoODrOCMT4wCYawt1-WeBTJQ?usp=sharing>

			
Normal with Texture	normal without texture	Negative without texture	Negative with texture
<b>Figure 7. Types of Generated images in TeethNet (Multi-View)</b>			

## References

- [71] [https://en.wikipedia.org/wiki/Dental\\_notation](https://en.wikipedia.org/wiki/Dental_notation)
- [72] <https://www.dentalfearcentral.org/faq/tooth-numbering-systems/>
- [73] obj 3D : [https://en.wikipedia.org/wiki/Wavefront\\_.obj\\_file](https://en.wikipedia.org/wiki/Wavefront_.obj_file)
- [74] binvox <https://www.patrickmin.com/binvox/binvox.html>
- [75] <https://www.turbosquid.com/3d-models/human-teeth-3d-model-1043018>
- [76] <https://stackoverflow.com/questions/8812073/ray-and-square-rectangle-intersection-in-3d>
- [77] <https://pyimagesearch.com/2016/11/07/intersection-over-union-iou-for-object-detection/>

[78] Shapenet dataset: <https://shapenet.org>