

# Stanford DRO Toolkit: Digital Reference Objects for Standardization of Radiomic Features (DRO Toolkit)

## Summary

This is a sample collection of synthetic 3D Digital Reference Objects (DROs) intended for standardization of quantitative imaging feature extraction pipelines. We have developed a [software toolkit](#) for the creation of DROs with customizable size, shape, intensity, texture, and margin sharpness values. Using user-supplied input parameters, these objects are defined mathematically as continuous functions, discretized, and then saved as DICOM objects. This collection includes objects with a range of values for the various feature categories and many combinations of these categories.

## Acknowledgements

We would like to acknowledge the individuals and institutions that contributed to the development and creation of these digital reference objects:

- Stanford University School of Medicine, Stanford, California, USA - Akshay Jaggi B.S. and Sandy Napel PhD from the Department of Radiology
- University of California, Los Angeles School of Medicine, Los Angeles, California, USA - Michael McNitt-Gray PhD from the Department of Radiology
- The University of Western Ontario, Department of Medical Biophysics - Sarah Mattonen PhD
- The National Cancer Institute Quantitative Imaging Network (QIN)

## Data Access

### Data Access

Click the **Download** button to save the data.

Data Type	Download all or Query/Filter
Images and Segmentations (DICOM, 5.0 GB)	<div style="display: flex; gap: 10px;"> <div style="background-color: #007bff; color: white; padding: 5px 10px; border-radius: 5px; display: inline-block;">  Download         </div> <div style="background-color: #ffc107; color: white; padding: 5px 10px; border-radius: 5px; display: inline-block;">  Search         </div> </div> <p>(Requires <a href="#">NBIA Data Retriever</a> .)</p>
Images and Segmentations (NIFTI, zip)	<div style="background-color: #007bff; color: white; padding: 5px 10px; border-radius: 5px; display: inline-block;">  Download         </div>

Click the Versions tab for more info about data releases.

## Third Party Analyses of this Dataset

TCIA encourages the community to [publish your analyses of our datasets](#). Below is a list of such third party analyses published using this Collection:

- [Standardization in Quantitative Imaging: A Multi-center Comparison of Radiomic Feature Values](#)

## Detailed Description

### Detailed Description

Image Statistics	
Modalities	CT, SEG
Number of Participants	32

Number of Studies	32
Number of Series	64
Number of Images	9632
Images Size (GB)	5.0 GB

The detailed description table applies to the DICOM files only. The NIFTI data is not included in this table.

### Citations & Data Usage Policy

## Citations & Data Usage Policy

Users of this data must abide by the [Creative Commons Attribution 3.0 Unported License](#) under which it has been published. Attribution should include references to the following citations:

### **i** Data Citation

Jaggi, A., Mattonen, S., McNitt-Gray, M., & Napel, S. (2020). *Data from the **Stanford DRO Toolkit: Digital Reference Objects for Standardization of Radiomic Features*** [Data set]. The Cancer Imaging Archive. <https://doi.org/10.7937/t062-8262>

### **i** Publication Citation

Jaggi, A., Mattonen, S., McNitt-Gray, M., Napel, S (2020). **Stanford DRO Toolkit: Digital Reference Objects for Standardization of Radiomic Features**. (In Press) Tomography, Feb. 2020

### **i** TCIA Citation

Clark K, Vendt B, Smith K, Freymann J, Kirby J, Koppel P, Moore S, Phillips S, Maffitt D, Pringle M, Tarbox L, Prior F. **The Cancer Imaging Archive (TCIA): Maintaining and Operating a Public Information Repository**, Journal of Digital Imaging, Volume 26, Number 6, December, 2013, pp 1045-1057. DOI: [10.1007/s10278-013-9622-7](https://doi.org/10.1007/s10278-013-9622-7)

### **i** Grant Citations




- David Geffen School of Medicine at UCLA - U01CA181156
- Stanford University School of Medicine – U01CA187947 and U24CA180927
- University of Michigan - U01CA232931
- University of Washington – R50CA211270, U01CA148131
- University of South Florida - U24CA180927, U01CA200464
- Moffitt Cancer Center – U01CA143062, U01CA200464, P30CA076292
- UC San Francisco - U01CA225427
- BC Cancer Research Centre - NSERC Discovery Grant: RGPIN-2019-06467
- Columbia University- U01CA225431
- Center for Biomedical Image Computing and Analytics at the University of Pennsylvania - U24CA189523, R01NS042645
- Massachusetts General Hospital- U01CA154601, U24CA180927

## Other Publications Using This Data

TCIA maintains [a list of publications](#) which leverage TCIA data. If you have a manuscript you'd like to add please [contact the TCIA Helpdesk](#).

### Versions

#### Version 1 (Current): Updated 2020/04/09

Data Type	Download all or Query/Filter
Images and Segmentations (DICOM, 5.0 GB)	<div>  </div> <div>  </div> <p>(Requires <a href="#">NBIA Data Retriever</a> .)</p>
Images (NIfTI, zip)	<div>  </div>