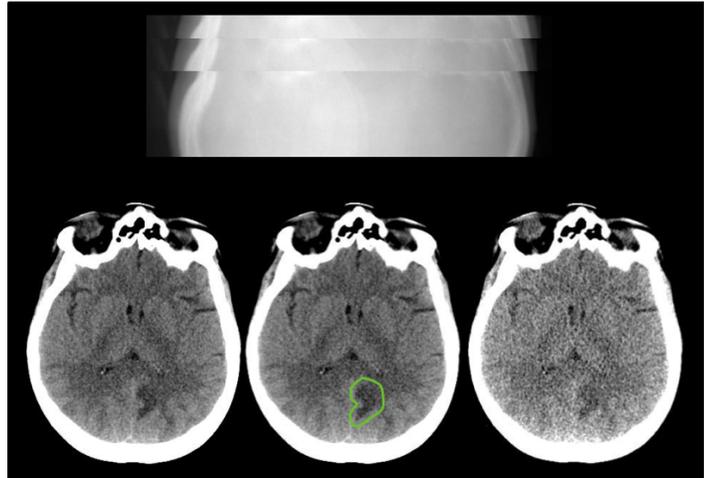


Low Dose CT Image and Projection Data (LDCT-and-Projection-data)

Summary

Investigators at the Mayo Clinic, with funding from the National Institute of Biomedical Imaging and Bioengineering (EB 017095 and EB 017185), have built a library of CT patient projection data in an open and vendor-neutral format. This format, referred to as DICOM-CT-PD (1), is an extended DICOM format that contains CT projection data and acquisition geometry. The de-identified patient projection data in the library were decoded with help of the manufacturer and have been converted into an open standardized format.

Reconstructed images, patient age and gender, and pathology annotation are also provided for these de-identified data sets. The library consists of scans from various exam types, including non-contrast head CT scans acquired for acute cognitive or motor deficit, low-dose non-contrast chest scans acquired to screen high-risk patients for pulmonary nodules, and contrast-enhanced CT scans of the abdomen acquired to look for metastatic liver lesions.



Acknowledgements

This work would not have been possible without the support and efforts of many individuals and organizations.

- A complete list of acknowledgements can be found [here](#).

Data Access

Data Access

Click the **Download** button to save a ".tcia" manifest file to your computer, which you must open with the [NBIA Data Retriever](#) . Click the **Search** button to open our Data Portal, where you can browse the data collection and/or download a subset of its contents.

Data Type	Download all or Query/Filter
Images (DICOM, 952 GB)	<div style="display: flex; gap: 10px;"> <div style="background-color: #007bff; color: white; padding: 5px 10px; border-radius: 3px; display: inline-block;"> ↓ Download </div> <div style="background-color: #ffc107; color: white; padding: 5px 10px; border-radius: 3px; display: inline-block;"> 🔍 Search </div> </div> <p>(Requires NBIA Data Retriever .)</p>
Images (DICOM, 2.0 GB) - Phantom Object Only	<div style="background-color: #007bff; color: white; padding: 5px 10px; border-radius: 3px; display: inline-block;"> ↓ Download </div>
DICOM-CT-PD User Manual Version 3 (.pdf)	<div style="background-color: #007bff; color: white; padding: 5px 10px; border-radius: 3px; display: inline-block;"> ↓ Download </div>
Matlab DICOM-CTPD data dictionary (.txt)	<div style="background-color: #007bff; color: white; padding: 5px 10px; border-radius: 3px; display: inline-block;"> ↓ Download </div>
Matlab DICOM-CTPD reader script (.txt)	<div style="background-color: #007bff; color: white; padding: 5px 10px; border-radius: 3px; display: inline-block;"> ↓ Download </div>

Clinical Data (CSV, zip)	
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Click the Versions tab for more info about data releases.

Important information about the GE patient cases (included in Version 1, not currently available).

An incorrect value was found in the RescaleIntercept DICOM tag (0028,1052) in the GE data. Additionally, we have been asked by users to determine and add PhotonStatistics values to DICOM tag (7033,1065). Hence, access to the GE data (149 cases) has been temporarily suspended while we address these issues.

- *If you have already downloaded the GE data, you will want to download the updated data when it is again available.*
- *The GE data are readily recognized, as they have only 3 series per patient case (Siemens data have 4).*
- *The GE data can also be identified using the DICOM tag (0008,0070).*
- *If you have already started a project with the GE data, please contact the Mayo team to discuss the issues in greater detail to discern if they impact your work. Please send your inquiry to CTCIC@mayo.edu and the team will follow up with you.*

Detailed Description

Detailed Description

Image Statistics	
Modalities	CT
Number of Participants	151
Number of Studies	301
Number of Series	601
Number of Images	10,112,591
Images Size (TB)	1.23

For each patient CT scan, three types of data are provided: DICOM-CT-PD projection data, DICOM image data, and Excel clinical data reports. CT projection data are provided for both full and simulated lower dose levels and CT image data reconstructed using the commercial CT system are provided for the full dose projection data. For patients scanned on the SOMATOM Definition Flash CT scanner from Siemens Healthcare, CT image data reconstructed using the commercial CT system are also provided for the lower dose projection data. All CT images were reconstructed using a filtered back projection method. Several instructional documents are provided to help users extract needed information from the DICOM-CT-PD files, including a dictionary file for the DICOM-CT-PD format, a DICOM-CT-PD reader, and a user manual.

This collection comprises 99 head scans (labeled N for neuro), 100 chest scans (labeled C for chest), and 100 abdomen scans (labeled L for liver). Fifty cases for each scan type are from a SOMATOM Definition Flash CT scanner (Siemens Healthcare, Forchheim, Germany). Forty-nine head cases, 50 chest cases, and 50 abdomen cases are from a Lightspeed VCT CT scanner (GE Healthcare, Waukesha, WI). Together, these data will greatly facilitate the development and validation of new CT reconstruction and/or denoising algorithms, including those associated with machine learning or artificial intelligence.

Acquisition protocol

All CT scans were acquired at routine dose levels for the practice at which they were obtained using standard-clinical protocols for the anatomical region of interest. Each clinical case was processed to include a second projection dataset at a simulated lower dose level. Head and abdomen cases are provided at 25% of the routine dose and chest cases are provided at 10% of the routine dose.

¹Additional information regarding the CT projection data format: Chen B, Duan X, Yu Z, Leng S, Yu L, McCollough CH. Technical Note: Development and validation of an open data format for CT projection data. Med Phys. 2015;42(12):6964. (doi: <https://doi.org/10.1118/1.4935406>.)

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:

Data Citation

McCollough, C.H., Chen, B., Holmes, D., III, Duan, X., Yu, Z., Yu, L., Leng, S., Fletcher, J. (2020). Data from Low Dose CT Image and Projection Data [Data set]. The Cancer Imaging Archive. <https://doi.org/10.7937/9npb-2637>

Grant Citation

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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)

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 2 (Current): Updated 2020/08/11

Data Type	Download all or Query/Filter
Images (DICOM, 952 GB)	<div style="display: flex; justify-content: space-around;"> <div style="background-color: #007bff; color: white; padding: 5px 10px; border-radius: 3px; display: inline-block;"> Download</div> <div style="background-color: #ffc107; color: white; padding: 5px 10px; border-radius: 3px; display: inline-block;"> Search</div> </div> <p>(Requires NBIA Data Retriever .)</p>

Images (DICOM, 2.0 GB) Phantom Object Only	
DICOM-CT-PD User Manual Version 3 (.pdf)	
Matlab DICOM-CTPD data dictionary (.txt)	
Matlab DICOM-CTPD reader script (.txt)	
Clinical Data (CSV, zip)	

Important information about the GE patient cases.

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Version 1: Updated 2020/04/22

Data Type	Download all or Query/Filter
Images (DICOM, 1.23 TB)	 (Requires NBIA Data Retriever .)
Images (DICOM, 2.0 GB) Phantom Object Only	
DICOM-CT-PD User Manual Version 3 (.pdf)	
Matlab DICOM-CTPD data dictionary (.txt)	

Matlab DICOM-CTPD reader script (.txt)	 Download
Clinical Data (CSV, zip)	 Download