

HTAN data in the NCI Cancer Research Data Commons



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Disclosure Information

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Erin Beck

I am a full-time paid employee of the NIH/NCI. I have no financial relationships to disclose.



HTAN Data Access: CRDC (1)

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Data	Data Access	Status
De-identified clinical and biospecimen data, and assay metadata	Open	Available via the HTAN Portal, Synapse and Google BigQuery (ISB-CGC).
Level 1-2 Sequencing Data	Access Controlled	Available via Cancer Data Service (CDS) and Seven Bridges Cancer Genomics Cloud (SB-CGC).
Level 3-4 Data	Open	Available via the HTAN Portal, Synapse, CellxGene, and BigQuery (ISB-CGC).
Image Browsing	Open	Available via the HTAN Portal, Synapse, Imaging Data Commons (IDC).
Image Processing	Open	Available via the Cancer Data Service (CDS) and Seven Bridges Cancer Genomics Cloud (SB-CGC).

Cancer Research Data Commons (CRDC)

NCI's primary data science platform for cancer research







CRDC is Based on Standards





CRDC Data Access: Data Commons

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Features

- Serves a specific research community
- Analysis tools specific to the data types stored
- Allows for more granular cohort building
- Instructions on how to transition from the portal to the CRDC Cloud Resources



CRDC Data Access: Data Commons (cont'd)



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- Access to large cancer data sets without need to download or move data
- Access to workspaces, analysis tools, and workflows/pipelines
- Bring your own data and tools: collaborative pre-publication workspaces
- Funds to get you started as a new user: \$300



ISB's Cancer Gateway in the Cloud

Great for command-line, BigQuery, Specialty DBs



Broad's FireCloud, Terra

Great for running production pipelines

CANCER GENOMICS CLOUD

Seven Bridges' Cancer Genomics Cloud, Velsera

Great for non-technical user interface, visual displays





HTAN Data Access: CRDC (2)

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HTAN Data Access: CRDC (3)

Data	Data Access	Status
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Image Processing	Open	Available via the Cancer Data Service (CDS) and Seven Bridges Cancer Genomics Cloud (SB-CGC).



HTAN Data Access: CRDC (4)

- Data Commons
 - Cancer Data Service (CDS)
 - Level 1 & 2 Access- Controlled Sequencing data and Open Access Imaging data (CC BY 4.0).
 - Access control for the sequencing data is managed through dbGaP (Study Accession: phs002371).
 - Imaging Data Commons (IDC)
 - Open Access Imaging data (CC BY 4.0) in DICOM-TIFF format
- Cloud Resources
 - ISB CGC
 - Metadata and derived data
 - SB CGC (Same as CDS)
 - Level 1 & 2 Access- Controlled Sequencing data and Open Access Imaging data (CC BY 4.0).



HTAN Data Access: CRDC (5)

- Data Commons
 - Cancer Data Service (CDS)
 - Level 1 & 2 Access- Controlled Sequencing data and Open Access Imaging data (CC BY 4.0).
 - Access control for the sequencing data is managed through dbGaP (Study Accession: phs002371).
 - Imaging Data Commons (IDC)
 - Open Access Imaging data (CC BY 4.0) in DICOM-TIFF format
- Cloud Resources
 - ISB CGC
 - Metadata and derived data
 - SB CGC (Same as CDS)
 - Level 1 & 2 Access- Controlled Sequencing data a





IDC Portal

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https://portal.imaging.datacommons.cancer.gov/



HTAN Data Access: CRDC (6)

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Data Commons

- Cancer Data Service (CDS)
 - Level 1 & 2 Access- Controlled Sequencing data and Open Access Imaging data (CC BY 4.0).
 - Access control for the sequencing data is managed through dbGaP (Study Accession: phs002371).
- Imaging Data Commons (IDC)
 - Open Access Imaging data (CC BY 4.0) in DICOM-TIFF format
- Cloud Resources
 - ISB CGC
 - Metadata and derived data (accessible through Google BigQuery)
 - SB CGC
 - Level 1 & 2 Access- Controlled Sequencing data and Open Access Imaging data (CC BY 4.0).



HTAN Data Access: ISB - CGC





HTAN Data Access: ISB-CGC

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	MSK	Transition to Metastatic State: Lung Cancer, Pancreatic Cancer and Brain Metastasis	888	¥	127	293	58	12		1	
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	TNP SARDANA	Compare imaging methods across centers	8	¥	2	80	251		25		
	Vanderbilt	Colon Molecular Atlas Project	888	*	156	362	162	4	4		1
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HTAN Data Access: ISB - CGC BigQuery (1)

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https://www.isb-cgc.org/





HTAN Data Access: ISB – CGC BigQuery (2)

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Contains HTAN clinical & biospecimen and processed-omics data

Data	Brov	vsers

BigQuery Table Search

Browse BigQuery tables of metadata and molecular cancer data from the Genomic Data Commons and other sources. Jump directly to a table to perform discovery and computation via SQL.

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121 💿	3-CGC Data Browsers + Resources + Documentation	About Publica	itions Help -) Sign Ir	n		
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HTAN Data Access: ISB – CGC BigQuery (3)

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https://www.isb-cgc.org/





HTAN Data Access: ISB – CGC BigQuery (4)

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Computational Notebooks

- Illustrate how to perform analysis and generate results using HTAN Google BQ tables
- Include a narrative and executable code for computing and plotting
- Easy to share



Explore_HTAN_Clinical_Biospecimen_Assay_Metadata.Rmd – illustrates how to make use of HTAn Google BigQuery metadata tables to tabulate and plot available HTAN clinical, biospecimen, and assay metadata

Investigating_Single_Cell_HTAN_Data.ipynb – illustrates how to query HTAN single-cell RNA sequencing data for cell content and gene expression

Building_AnnData_with_Subset_of_Cells_from_BQ.ipynb – illustrates how to query HTAN single-cell RNA sequencing data for specific cell types and construct an Scanpy Anndata object from the result.

□ isb-cgc / Community-Notebooks
 Public
 <> Code ⊙ Issues
 11 Pull requests
 ⊙ Actions
 □ Projects
 □ Security
 ▷ Insights



HTAN Data Access: SB – CGC (1)

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CRDC / SB-CGC Analysis Workflow

Search

- HTAN Portal
- CDS Portal

Download DRS Manifest





https://www.cancergenomicscloud.org/





HTAN Data Access: SB – CGC (2)

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	MSK	Transition to Metastatic State: Lung Cancer, Pancreatic Cancer and Brain Metastasis	888	۸	127		293	58		12		1
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1	Stanford	Multi-omic Characterization of Transformation of Familial Adenomatous Polyposis	888	*	39		271	7				
2	TNP TMA	Generate spatially resolved cell type/state census from tissue microarray breast FFPE specimens		¥	51		1571	1293			528	
0	TNP SARDANA	Compare imaging methods across centers	8	*	2		80	251			25	
0	Vanderbilt	Colon Molecular Atlas Project	888	*	156		362	162		4	4	1
5	WUSTL	Washington University Human Tumor Atlas Research Center	88888	*	276		1021	167				

Video demo of accessing HTAN data via SB-CGC:

https://nci.rev.vbrick.com/sharevideo/b88691a6-9963-4d1f-b4ce-1565a83b07d7



HTAN Data Access: SB – CGC (3)

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		Walk through the QuickStart.					
		Create a project.					
		Invite a collaborator.					

Video demo of accessing HTAN data via SB-CGC:

https://nci.rev.vbrick.com/sharevideo/9230e5ec-591d-4e29-8ad3-ab4a9cf78484



Vitessce on the SB-CGC.

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- A visual integration tool for exploration of spatial single cell experiments http://vitessce.io/
- Vitessce is developed by the <u>HiDIVE Lab</u> at Harvard Medical School.



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Vitessce as an ipywidget in JupyterLab



Vitessce on the SB - CGC

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Public projects you can access to analyse your data

Start your analysis by copying one of our publicly available projects with all of the required resources

Integrative Single-cell Data Visualization with Vitessce: User Guide

Integrative Single-cell Data Visualization with Vitessce: User Guide This project serves as a comprehensive tutorial for users interested in leveraging Vitessce for the visualization and analysis of single-cell data. It features one Data Studio interactive analysis, written in Python, with step-

P Copy project

Cancer Data Aggregator (CDA) with CGC: Usage Guide

Cancer Data Aggregator (CDA) with CGC: Usage Guide This project contains two data studio analyses for querying and processing data from the CDA database and importing them to your CGC project(8). - The _CDA Release 3 - Import Data to CGC__analysis demonstrates usage of cda-python release 3 library, SS6 python API and

P Copy project

MCMICRO - End to End Microscopy Image Processing

A - wormanzelia -

MCMICRO - End to End Microscopy image Processing Public Project **MCMICRO** is an end-to-end processing pipeline for multiplexed whole slide imaging and tissue microarrays. It comprises stitching and registration, segmentation, and singlecell feature extraction. Note that this is a CVU, wrapper designed by Seven

P Copy project

Projects - Data - Public Apps - Public Projects Developer - Staff -

Integrative Single-cell Data Visualization with Vitessce: User Guide

This project serves as a comprehensive tutorial for users interested in leveraging Vitessce for the visualization and analysis of single-cell data. It features one Data Studio interactive analysis, written in Python, with step-by-step demonstrations and examples showcasing the integrative capabilities of Vitessce Python API.

Vitessee is a powerful tool for visualizing and analyzing single-cell data, offering integrative capabilities for exploring multimodal and spatially-resolved datasets. With Vitessee, users can interactively visualize their single-cell data in a spatial context, enabling deeper insights into cellular interactions and spatial relationships.

More information about Vitessce can be found in the official documentation, while the latest vitessce-python package, along with additional tutorial notebooks, can be found on the GitHub page.

Copying the analysis to your project.

Data Studio analyses are available under the Data Studio tab in this project. To copy the analysis to one of your projects, click the additional actions (three dots) button to the right of **Vitessce Demo Notebook**, click **Copy** and select the target project. You should be able to choose any of the projects you are a part of and in which you have at least *Write* access.

Copying the entire project.

It is also possible to copy the entire project. That way, all Data Studio analyses, as well as Apps, Tasks and Files will be copied. To copy the entire project, click on the information circle next to the public project title (in the top-center of the screen). Then, enter the name for your copy of the project, and select the billing group it will be assigned to.



Vitessce on the SB-CGC.

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What can we use Vitessce for?





- Synapse + Seven Bridges Cancer Genomics Cloud
 - Creating comprehensive DRs Manifest
 - Containing both Synapse and CRDC data sets
 - Allowing for a more seamless importing workflow between Synapse and the SB-CGC



Infrastructure ensures FAIR principles are adopted across the CRDC.



CRDC participates and implements GA4GH standards such as DRS and Passports.



AACR Cancer Research Series

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A four-part invited series published online in March 2024 highlighting the CRDC's accomplishments from the past 10 years.

- LESSONS LEARNED AND FUTURE STATE
- RESOURCES TO SHARE KEY CANCER DATA
- CLOUD-BASED ANALYTICAL RESOURCE
- CORE-STANDARDS AND SERVICES



Learn more about the series on the CRDC Website



Resources and Tutorials: ISB - CGC

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 <u>https://isb-cancer-genomics-</u> cloud.readthedocs.io/



<u>https://www.isb-cgc.org/videotutorials/</u>



On Request







<u>feedback@isb-cgc.org</u>



Resources and Tutorials: SB - CGC

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Documentation

<u>https://docs.cancergenomicscloud.org/</u>



<u>https://www.youtube.com/@Velsera/playlists</u>



Every Week:







•

- 10:00 am ET Tuesday
- 2:00 pm ET Thursday



<u>Support@Velsera.com</u>

NCI HTAN Team



- Chamelli Jhappan, PhD
- Erika Kim, PhD
- Erin Beck, MS
- Indu Kohaar, PhD
- Jerry Li, PhD
- Justin Benavidez, PhD
- Miguel Ossandon, PhD
- Nick Hodges, PhD
- Richard Mazurchuk, PhD

- Sean Hanlon, PhD
- Shannon Hughes, PhD
- Sharmi Ghosh-Janjigian, PhD
- Sidney Fu
- Sudhir Srivastava

NCI CRDC Team



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- Jill Barnholtz-Sloan
- Tanja Davidsen
- Allison Dennis
- Erika Kim
- Kanakadurga Addepalli
- Esmeralda Casas-Silva
- Heather Creasy
- Ina Felau
- Granger Sutton
- Zhining Wang
- James Warfe

All CBIIT contractors

All partners throughout NCI/NIH and externally in CBIIT programs