

# CIP TCGA Radiology Initiative

The [Cancer Genome Atlas \(TCGA\)](#) began in 2006 as a three-year pilot jointly sponsored by the National Cancer Institute (NCI) and National Human Genome Research Institute (NHGRI). The TCGA pilot project (focused initially on glioblastoma, ovary, and lung cancers) confirmed that an atlas of genomic changes could be constructed for specific cancer types. It also showed that national networks of research and technology teams working on related projects could pool their efforts, create an economy of scale, and develop an infrastructure for making the data publicly accessible. The success of that pilot encouraged the National Institutes of Health (NIH) to invest in TCGA's efforts to collect and characterize more than 20 additional tumor types and make findings freely accessible for researchers to download.

The genomic, clinical and histopathology images from the project are available via NCI's [Genomic Data Commons](#). NCI's Cancer Imaging Program subsequently leveraged the agreements with TCGA Tissue Source Sites to collect clinical diagnostic images from these subjects and make them available on TCIA. By combining the imaging data from TCIA with the other data types collected by TCGA a research community focused on connecting cancer phenotypes to genotypes was formed, resulting in over one hundred peer-reviewed publications about these data.

## Data Access

Radiology data for TCGA patients are hosted on TCIA. Pathology images were collected prior to TCIA's involvement in the project, and are hosted on NCI's [Genomic Data Commons](#) along with the genomic and clinical data from these studies. Use the links in the table to access each type of imaging data.

| Collection                | Tumor Type   | Locations | Modalities                                      | Radiology (Subjects) | Pathology (Subjects) |
|---------------------------|--|-----------|---|----------------------|----------------------|
| <a href="#">TCGA-BLCA</a> | Bladder Endothelial Carcinoma                                    | Bladder   | CT, CR, MR, PT, DX, Pathology                   | <a href="#">120</a>  | <a href="#">412</a>  |
| <a href="#">TCGA-BRCA</a> | Breast Cancer  | Breast    | MR, MG, Pathology                               | <a href="#">139</a>  | <a href="#">1098</a> |
| <a href="#">TCGA-CESC</a> | Cervical Squamous Cell Carcinoma and Endocervical Adenocarcinoma | Cervix    | MR, Pathology                                   | <a href="#">54</a>   | <a href="#">307</a>  |
| <a href="#">TCGA-COAD</a> | Colon Adenocarcinoma   | Colon     | CT, Pathology                                   | <a href="#">25</a>   | <a href="#">460</a>  |
| <a href="#">TCGA-ESCA</a> | Esophageal Carcinoma   | Esophagus | CT, Pathology                                   | <a href="#">16</a>   | <a href="#">183</a>  |
| <a href="#">TCGA-GBM</a>  | Glioblastoma Multiforme  | Brain     | MR, CT, DX, Pathology                           | <a href="#">262</a>  | <a href="#">606</a>  |
| <a href="#">TCGA-HNSC</a> | Head and Neck Squamous Cell Carcinoma                            | Head-Neck | CT, MR, PT, RTSTRUCT, RTPLAN, RTDOSE, Pathology | <a href="#">227</a>  | <a href="#">520</a>  |
| <a href="#">TCGA-KICH</a> | Kidney Chromophobe   | Kidney    | CT, MR, Pathology                               | <a href="#">15</a>   | <a href="#">113</a>  |
| <a href="#">TCGA-KIRC</a> | Kidney Renal Clear Cell Carcinoma                                | Renal     | CT, MR, CR, Pathology                           | <a href="#">267</a>  | <a href="#">537</a>  |
| <a href="#">TCGA-KIRP</a> | Kidney Renal Papillary Cell Carcinoma                            | Renal     | CT, MR, PT, Pathology                           | <a href="#">33</a>   | <a href="#">288</a>  |
| <a href="#">TCGA-LGG</a>  | Low Grade Glioma   | Brain     | MR, CT, Pathology                               | <a href="#">199</a>  | <a href="#">515</a>  |

|                                     |                                      |  |                           |                     |                     |
|-------------------------------------|--------------------------------------|--|---------------------------|---------------------|---------------------|
| <a href="#">TCG<br/>A-<br/>LIHC</a> | Liver Hepatocellular Carcinoma       | Liver                                    | MR, CT, PT, Pathology     | <a href="#">97</a>  | <a href="#">377</a> |
| <a href="#">TCG<br/>A-<br/>LUAD</a> | Lung Adenocarcinoma                  | Chest                                    | CT, PT, NM, Pathology     | <a href="#">69</a>  | <a href="#">514</a> |
| <a href="#">TCG<br/>A-<br/>LUSC</a> | Lung Squamous Cell Carcinoma         | Lung                                     | CT, NM, PT, Pathology     | <a href="#">37</a>  | <a href="#">495</a> |
| <a href="#">TCG<br/>A-<br/>OV</a>   | Ovarian Serous Cystadenocarcinoma    | Ovary                                    | CT, MR, Pathology         | <a href="#">143</a> | <a href="#">590</a> |
| <a href="#">TCG<br/>A-<br/>PRAD</a> | Prostate Cancer                      | Prostate                                 | CT, PT, MR, Pathology     | <a href="#">14</a>  | <a href="#">496</a> |
| <a href="#">TCG<br/>A-<br/>READ</a> | Rectum Adenocarcinoma                | Rectum                                   | CT, MR, Pathology         | <a href="#">3</a>   | <a href="#">171</a> |
| <a href="#">TCG<br/>A-<br/>SARC</a> | Sarcomas                             | Chest-Abdomen-<br>Pelvis, Leg,<br>TSpine | CT, MR, Pathology         | <a href="#">5</a>   | <a href="#">261</a> |
| <a href="#">TCG<br/>A-<br/>STAD</a> | Stomach Adenocarcinoma               | Stomach                                  | CT, Pathology             | <a href="#">46</a>  | <a href="#">440</a> |
| <a href="#">TCG<br/>A-<br/>THCA</a> | Thyroid Cancer                       | Thyroid                                  | CT, PT, Pathology         | <a href="#">6</a>   | <a href="#">506</a> |
| <a href="#">TCG<br/>A-<br/>UCEC</a> | Uterine Corpus Endometrial Carcinoma | Uterus                                   | CT, CR, MR, PT, Pathology | <a href="#">65</a>  | <a href="#">560</a> |

## Frederick National Lab Research Efforts

Imaging Source Site (ISS) Groups were organized by the [Cancer Imaging Informatics Lab](#) within the [Frederick National Laboratory for Cancer Research](#). The groups were governed by participants from institutions which provided imaging data to the archive for each TCGA cancer type. Modeled after the TCGA genomic analysis groups, ISS groups were given a one year embargo window after 100 cases were accrued to publish a marker paper for a given cancer type. This increased incentive among source sites to contribute their patients' images, which would ultimately become a public resource to enable radiogenomic research. The ISS groups included:

| <b>Group Name</b>                                     | <b>Tumor Type</b>  |
|---|--|
| <a href="#">TCGA Bladder Phenotype Research Group</a> | <a href="#">Urothelial Bladder Carcinoma (BLCA)</a>          |
| <a href="#">TCGA Breast Phenotype Research Group</a>  | <a href="#">Breast invasive carcinoma (BRCA)</a>             |
| <a href="#">TCGA Glioma Phenotype Research Group</a>  | <a href="#">Glioblastoma (GBM), lower grade glioma (LGG)</a> |
| <a href="#">TCGA Renal Phenotype Research Group</a>   | <a href="#">Kidney renal clear cell carcinoma (KIRC)</a>     |
| <a href="#">TCGA Ovarian Phenotype Research Group</a> | <a href="#">Ovarian serous cystadenocarcinoma (OV)</a>       |

## TCGA Collections Publication Guidelines

Historically TCIA had implemented publication guidelines derived from the policy outlined by the The Cancer Genome Atlas, TCGA. These were followed **in addition** to the publication policy of the TCGA Data Portal: <http://cancergenome.nih.gov/abouttcga/policies/publicationguidelines>. **As of 10/30/2018 all cancer types are now available for use without any special restrictions.** Please be sure to follow TCIA's regular [Data Usage Policies and Restrictions](#), and to also provide attribution recognizing the TCGA data collection efforts. An example of a proper attribution is:

"The results <published or shown> here are in whole or part based upon data generated by the TCGA Research Network: <http://cancergenome.nih.gov/>."

## References

The following links contain publications from the main TCGA project as well as their posted publication guidelines:

- [TCGA Publications](#)
- [TCGA Publication Guidelines](#)

Included below are some posters and presentations which help summarize the CIP TCGA Radiology Initiative and its supporting components such as TCIA.

- [TCIA Workshop at 2014 TCGA Symposium](#) - Presented at TCGA Scientific Symposium, May 12, 2014 in Washington, DC.
- [Imaging and Genomics: Is There a Synergy?](#) - Published in *Radiology* 2012 ,264:329–31.
- [A Scalable Methodology for Correlating Clinical Imaging Features with TCGA Data](#) - Presented at TCGA Network Symposium, November 17–18, 2011 Washington, DC.
- [The Cancer Imaging Archive: a Repository of Advanced Imaging Information Correlated with TCGA Samples](#) - Presented at TCGA Network Symposium, November 17–18, 2011 Washington, DC.