Package 'terraTCGAdata'

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Type Package

Title OpenAccess TCGA Data on Terra as MultiAssayExperiment

Version 1.16.0

Description Leverage the existing open access TCGA data on Terra with well-established Bioconductor infrastructure. Make use of the Terra data model without learning its complexities. With a few functions, you can copy / download and generate a MultiAssayExperiment from the TCGA example workspaces provided by Terra.

Depends AnVILGCP, MultiAssayExperiment

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Imports AnVIL, BiocFileCache, dplyr, GenomicRanges, methods, RaggedExperiment, readr, S4Vectors, stats, tidyr, TCGAutils, utils

Suggests AnVILBase, GCPtools, knitr, rmarkdown, BiocStyle, withr, testthat (>= 3.0.0)

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BugReports https://github.com/waldronlab/terraTCGAdata/issues

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`.getWorkspaceTable` *Obtain the table of datasets from the Terra platform*

Description

The datasets include all TCGA datasets that do not come from the Genomic Data Commons Data Repository because those data use a different data model.

Usage

```
.getWorkspaceTable(project = "^TCGA", cancerCode = ".*")
```

Arguments

`project`	character(1) A prefix for the regex search across all public projects on the terra platform (default: ‘"^TCGA"‘). Usually, this does not change.
`cancerCode`	character(1) Corresponds to the TCGA cancer code (e.g, "ACC" for AdrenoCortical Carcinoma) of interest. The default value of (‘.*‘) provides all available cancer datasets.

Value

A ‘tibble‘ ‘data.frame‘ that match the project in put; by default, TCGA workspaces.

getAssayData *Obtain assay datasets from Terra*

Description

Obtain assay datasets from Terra

Usage

```
getAssayData(
  assayName,
  sampleCode = "01",
  tablename = .DEFAULT_TABLENAME,
  workspace = terraTCGAworkspace(),
  namespace = .DEFAULT_NAMESPACE,
  metacols = .PARTICIPANT_METADATA_COLS,
  sampleIdx = TRUE
)
```

Arguments

assayName	character() The name of the assay dataset column from getAssayTable to import into the current workspace.
sampleCode	character(1) The sample code used to filtering samples e.g., "01" for Primary Solid Tumors, see data("sampleTypes", package = "TCGAutils") for reference
tablename	The Terra data model table from which to extract the clinical data (default: "sample")
workspace	character(1) The Terra Data Resources workspace from which to pull TCGA data (default: see terraTCGAworkspace()). This is set to a package-wide option.
namespace	character(1) The Terra Workspace Namespace that defaults to "broad-firecloud-tcga" and rarely needs to be changed.
metacols	The set of columns that comprise of the metadata columns. See the .PARTICIPANT_METADATA_COLS global variable
sampleIdx	numeric() index or TRUE. Specify an index for subsetting the assay data. This argument is mainly used for example and vignette purposes. To use all the data, use the default value (default: TRUE)

Value

Either a matrix or RaggedExperiment depending on the assay selected

See Also

getAssayTable()

Examples

```
if (
    GCPtools::gcloud_exists() &&
    identical(AnVILBase::avplatform_namespace(), "AnVILGCP") &&
    nzchar(AnVILGCP::avworkspace_name())
)
  getAssayData(
    assayName = "protein_exp__mda_rppa_core__mdanderson_org__Level_3__protein_normalization__data",
      sampleCode = c("01", "10"),
      workspace = "TCGA_ACC_OpenAccess_V1-0_DATA"
  )
```

---

getAssayTable *Obtain a reference table for assay data in the Terra data model*

Description

The column names in the output can be used in the `getAssayData` function.

Usage

```
getAssayTable(
  tablename = .DEFAULT_TABLENAME,
  metacols = .PARTICIPANT_METADATA_COLS,
  workspace = terraTCGAworkspace(),
  namespace = .DEFAULT_NAMESPACE
)
```

Arguments

`tablename`	The Terra data model table from which to extract the clinical data (default: "sample")
`metacols`	The set of columns that comprise of the metadata columns. See the `.PARTICIPANT_METADATA_COLS` global variable
`workspace`	character(1) The Terra Data Resources workspace from which to pull TCGA data (default: see `terraTCGAworkspace()`). This is set to a package-wide option.
`namespace`	character(1) The Terra Workspace Namespace that defaults to "broad-firecloud-tcga" and rarely needs to be changed.

Value

A tibble of pointers to resources within the Terra data model

Examples

```
if (
    GCPtools::gcloud_exists() &&
    identical(AnVILBase::avplatform_namespace(), "AnVILGCP") &&
    nzchar(AnVILGCP::avworkspace_name())
)
  getAssayTable(workspace = "TCGA_COAD_OpenAccess_V1-0_DATA")
```

`getClinical` *Obtain clinical data*

Description

The participant table may contain curated demographic information e.g., sex, age, etc.

Usage

```
getClinical(
  columnName,
  participants = TRUE,
  tablename = .DEFAULT_TABLENAME,
  workspace = terraTCGAworkspace(),
  namespace = .DEFAULT_NAMESPACE,
  verbose = TRUE,
  metacols = .PARTICIPANT_METADATA_COLS,
  participantIds = NULL
)
```

Arguments

`columnName`	The name of the column to extract files, see `getClinicalTable` table. If not provided, the first column in the table will be used to obtain the clinical information.
`participants`	logical(1) Whether to merge the participant table from `avtable("participant")` to the clinical data
`tablename`	The Terra data model table from which to extract the clinical data (default: "sample")
`workspace`	character(1) The Terra Data Resources workspace from which to pull TCGA data (default: see `terraTCGAworkspace()`). This is set to a package-wide option.
`namespace`	character(1) The Terra Workspace Namespace that defaults to "broad-firecloud-tcga" and rarely needs to be changed.
`verbose`	logical(1) Whether to output additional information regarding the workspace and namespace (default: `TRUE`).

metacols	The set of columns that comprise of the metadata columns. See the .PARTICIPANT_METADATA_COLS global variable
participantIds	character() TCGA participant identifiers usually in the form of "TCGA-AB-1234". By default, all available participant identifiers will be used. (default: NULL)

Value

A DataFrame with clinical information from TCGA. The metadata i.e., metadata(object) includes the columnName used to obtain the data.

Examples

```
if (
    GCPtools::gcloud_exists() &&
    identical(AnVILBase::avplatform_namespace(), "AnVILGCP") &&
    nzchar(AnVILGCP::avworkspace_name())
)
  getClinical(
      workspace = "TCGA_ACC_OpenAccess_V1-0_DATA",
      participantIds = c("TCGA-OR-A5J1", "TCGA-OR-A5J2",
          "TCGA-OR-A5J3", "TCGA-OR-A5J4")
  )
```

---

getClinicalTable *Obtain the reference table for clinical data*

Description

The column names in the output table can be used in the getClinical function.

Usage

```
getClinicalTable(
  tablename = .DEFAULT_TABLENAME,
  metacols = .PARTICIPANT_METADATA_COLS,
  workspace = terraTCGAworkspace(),
  namespace = .DEFAULT_NAMESPACE,
  verbose = TRUE
)
```

Arguments

tablename	The Terra data model table from which to extract the clinical data (default: "sample")
metacols	The set of columns that comprise of the metadata columns. See the .PARTICIPANT_METADATA_COLS global variable

workspace	character(1) The Terra Data Resources workspace from which to pull TCGA data (default: see terraTCGAworkspace()). This is set to a package-wide option.
namespace	character(1) The Terra Workspace Namespace that defaults to "broad-firecloud-tcga" and rarely needs to be changed.
verbose	logical(1) Whether to output additional information regarding the workspace and namespace (default: TRUE).

Value

A tibble of Google Storage resource locations e.g., gs://firecloud...

Examples

```
if (
    GCPtools::gcloud_exists() &&
    identical(AnVILBase::avplatform_namespace(), "AnVILGCP") &&
    nzchar(AnVILGCP::avworkspace_name())
)
    getClinicalTable(
        workspace = "TCGA_ACC_OpenAccess_V1-0_DATA"
    )
```

---

getTCGAdatalist *Import Terra TCGA data as a list*

Description

Import Terra TCGA data as a list

Usage

```
getTCGAdatalist(
  assayNames,
  sampleCode,
  workspace = terraTCGAworkspace(),
  namespace = .DEFAULT_NAMESPACE,
  tablename = .DEFAULT_TABLENAME,
  sampleIdx = TRUE,
  verbose = TRUE
)
```

Arguments

assayNames	character() A vector of assays selected from the colnames of getAssayTable.
sampleCode	character(1) The sample code used to filtering samples e.g., "01" for Primary Solid Tumors, see data("sampleTypes", package = "TCGAutils") for reference
workspace	character(1) The Terra Data Resources workspace from which to pull TCGA data (default: see terraTCGAworkspace()). This is set to a package-wide option.
namespace	character(1) The Terra Workspace Namespace that defaults to "broad-firecloud-tcga" and rarely needs to be changed.
tablename	The Terra data model table from which to extract the clinical data (default: "sample")
sampleIdx	numeric() index or TRUE. Specify an index for subsetting the assay data. This argument is mainly used for example and vignette purposes. To use all the data, use the default value (default: TRUE)
verbose	logical(1L) Whether to output additional details of the data facilitation.

Value

A list of assay datasets

Examples

```
if (
    GCPtools::gcloud_exists() &&
    identical(AnVILBase::avplatform_namespace(), "AnVILGCP") &&
    nzchar(AnVILGCP::avworkspace_name())
)
  getTCGAdatalist(
    assayNames = c("protein_exp__mda_rppa_core__mdanderson_org__Level_3__protein_normalization__data",
    "snp__genome_wide_snp_6__broad_mit_edu__Level_3__segmented_scna_minus_germline_cnv_hg18__seg"),
      sampleCode = c("01", "10"),
      workspace = "TCGA_COAD_OpenAccess_V1-0_DATA"
  )
```

---

sampleTypesTable *Get an overview of the samples available in the workspace*

Description

The function provides an overview of samples from the avtables("sample") table for the current workspace. Along with the sample codes and frequencies, the output provides a description for each code and the short letter codes.

Usage

```
sampleTypesTable(
  workspace = terraTCGAworkspace(),
  namespace = .DEFAULT_NAMESPACE,
  tablename = .DEFAULT_TABLENAME,
  verbose = TRUE
)
```

Arguments

workspace	character(1) The Terra Data Resources workspace from which to pull TCGA data (default: see terraTCGAworkspace()). This is set to a package-wide option.
namespace	character(1) The Terra Workspace Namespace that defaults to "broad-firecloud-tcga" and rarely needs to be changed.
tablename	The Terra data model table from which to extract the clinical data (default: "sample")
verbose	logical(1) Whether to output additional information regarding the workspace and namespace (default: TRUE).

Value

A tibble of sample codes and frequency along with their definition and short letter code

Examples

```
if (
    GCPtools::gcloud_exists() &&
    identical(AnVILBase::avplatform_namespace(), "AnVILGCP") &&
    nzchar(AnVILGCP::avworkspace_name())
)
  sampleTypesTable(workspace = "TCGA_COAD_OpenAccess_V1-0_DATA")
```

---

terraTCGAdata *Obtain a MultiAssayExperiment from the Terra workspace*

Description

Workspaces on Terra come pre-loaded with TCGA Data. The examples in the documentation correspond to the TCGA_COAD_OpenAccess_V1 workspace that can be found on app.terra.bio.

Usage

```
terraTCGAdata(
  clinicalName,
  assays,
  participants = TRUE,
  sampleCode = NULL,
  split = FALSE,
  workspace = terraTCGAworkspace(),
  namespace = .DEFAULT_NAMESPACE,
  tablename = .DEFAULT_TABLENAME,
  verbose = TRUE,
  sampleIdx = TRUE
)
```

Arguments

clinicalName	character(1) The column name taken from `getClinicalTable()` and downloaded to be included as the `colData`.
assays	character() A character vector of assay names taken from `getAssayTable()`
participants	logical(1) Whether to merge the participant table from `avtable("participant")` to the clinical data
sampleCode	character() A character vector of sample codes from `sampleTypesTable()`. By default, (NULL) all samples are downloaded and kept in the data.
split	logical(1L) Whether or not to split the `MultiAssayExperiment` by sample types using `splitAssays` helper function (default FALSE).
workspace	character(1) The Terra Data Resources workspace from which to pull TCGA data (default: see `terraTCGAworkspace()`). This is set to a package-wide option.
namespace	character(1) The Terra Workspace Namespace that defaults to "broad-firecloud-tcga" and rarely needs to be changed.
tablename	The Terra data model table from which to extract the clinical data (default: "sample")
verbose	logical(1) Whether to output additional information regarding the workspace and namespace (default: `TRUE`).
sampleIdx	numeric() index or TRUE. Specify an index for subsetting the assay data. This argument is mainly used for example and vignette purposes. To use all the data, use the default value (default: `TRUE`)

Value

A `MultiAssayExperiment` object with n number of assays corresponding to the `assays` argument.

Examples

```
if (
    GCPtools::gcloud_exists() &&
```

```
    identical(AnVILBase::avplatform_namespace(), "AnVILGCP")
)
  terraTCGAdata(
      clinicalName = "clin__bio__nationwidechildrens_org__Level_1__biospecimen__clin",
    assays = c("protein_exp__mda_rppa_core__mdanderson_org__Level_3__protein_normalization__data",
     "rnaseqv2__illuminahiseq_rnaseqv2__unc_edu__Level_3__RSEM_genes_normalized__data"),
      workspace = "TCGA_COAD_OpenAccess_V1-0_DATA",
      sampleCode = NULL,
      sampleIdx = 1:4,
      split = FALSE
  )
```

`terraTCGAworkspace` *Obtain or set the Terra Workspace Project Dataset*

Description

Terra allows access to about 71 open access TCGA datasets. A dataset workspace can be set using the `terraTCGAworkspace` function with a `projectName` input. Use the `selectTCGAworkspace` function to select a TCGA data workspace from an interactive table.

Usage

```
terraTCGAworkspace(projectName = getOption("terraTCGAdata.workspace", NULL))

selectTCGAworkspace(
  projectName = getOption("terraTCGAdata.workspace", NULL),
  verbose = FALSE,
  ...
)
```

Arguments

`projectName`	character(1) A project code usually in the form of `TCGA_CODE_OpenAccess_V1-0_DATA`. See `selectTCGAworkspace` to interactively select from a table of project codes.
`verbose`	logical(1) Whether to provide more informative messages when an the "terraTCGAdata.workspace" option is set.
`...`	further arguments passed down to lower level functions, not intended for the end user.

Details

Note that GDC workspaces are not supported and are excluded from the search results. GDC workspaces use a Terra workflow to download TCGA data rather than providing Google Bucket storage locations for easy data retrieval. To reset the `terraTCGAworkspace`, use `terraTCGAworkspace(NULL)` and you will be prompted to select from a list of TCGA workspaces. You may also check the current active workspace by running `terraTCGAworkspace()` without any inputs.

Value

A Terra TCGA Workspace name

Functions

- `selectTCGAworkspace()`: Function to interactively select from the available TCGA data workspaces in Terra. The ‘projectName‘ argument and ’terraTCGAdata.workspace’ option must be ‘NULL‘ to enable the interactive gadget.

Examples

```
if (
    GCPtools::gcloud_exists() &&
    identical(AnVILBase::avplatform_namespace(), "AnVILGCP") &&
    nzchar(AnVILGCP::avworkspace_name())
) {
  selectTCGAworkspace()
  terraTCGAworkspace()
}
```

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