Package 'romic'

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Type Package

Title R for High-Dimensional Omic Data

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Description Represents high-dimensional data as tables of features, samples and measurements, and a design list for tracking the meaning of individual variables. Using this format, filtering, normalization, and other transformations of a dataset can be carried out in a flexible manner. 'romic' takes advantage of these transformations to create interactive 'shiny' apps for exploratory data analysis such as an interactive heatmap.

Depends R (>= 3.2.3)

biocViews

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`add_pcs` *Add PCA Loadings*

Description

Add Principal Components Analysis Loadings to a tidy or triple omics dataset.

Usage

```
add_pcs(
  tomic,
  value_var = NULL,
  center_rows = TRUE,
  npcs = NULL,
  missing_val_method = "drop_samples",
  label_percent_varex = TRUE,
  verbose = TRUE
)
```

Arguments

`tomic`	Either a `tidy_omic` or `triple_omic` object
`value_var`	An abundance value to use with `hclust`
`center_rows`	center rows before performing PCA

`npcs`	number of principal component loadings to add to samples (default is number of samples)
`missing_val_method`	Approach to remove missing values: **drop_features** Drop features with missing values **drop_samples** Drop samples which are missing all features, then drop features **impute** Impute missing values
`label_percent_varex`	If true then PCs will be labelled by the percent of variability they explain.
`verbose`	extra reporting messages

Value

A `tomic` object with principal components added to samples.

Examples

```
add_pcs(brauer_2008_triple, npcs = 5)
```

`app_flow` *Flow*

Description

Using `shiny` comb through datasets by iterating between plotting steps, and lassoing steps to select points of interest.

Usage

```
app_flow(tomic)
```

Arguments

`tomic`	Either a `tidy_omic` or `triple_omic` object

Value

A `shiny` app

Examples

```
if (interactive()) {
  # library(reactlog)
  # reactlog_enable()
  app_flow(brauer_2008_triple)
  # shiny::reactlogShow()
}
```

`app_heatmap` *Interactive Heatmap*

Description

Generate a `shiny` interactive heatmap that allows for on demand filtering, ordering and faceting by variables of interest.

Usage

```
app_heatmap(tomic)
```

Arguments

`tomic`	Either a `tidy_omic` or `triple_omic` object

Value

A `shiny` app

Examples

```
if (interactive()) {
  app_heatmap(brauer_2008_tidy)
}
```

app_pcs *PC Plot*

Description

Generate a Shiny interactive scatter plot which allows visualization of features, measurements, and samples (with principal components added).

Usage

```
app_pcs(tomic)
```

Arguments

tomic	Either a `tidy_omic` or `triple_omic` object

Value

A `shiny` app

Examples

```
if (interactive()) {
  app_pcs(brauer_2008_tidy)
}
```

brauer_2008 *Brauer 2008*

Description

An RNA expression (microarray) dataset looking at how yeast gene expression changes as nutrient sources and nutrient richness changes.

`brauer_2008` formatted as a tidy_omic object

`brauer_2008` formatted as a triple_omic object

Usage

```
brauer_2008

brauer_2008_tidy

brauer_2008_triple
```

Format

A tibble with 18,000 rows and 8 columns:

name Common gene name

BP Gene ontology biological process of the gene

MF Gene ontology molecular function of the gene

sample Sample name

nutrient Which nutrient limits growth (Glucose, Nitrogen, Phosphorous, Sulfur, Uracil, Leucine

DR Dilution rate of the culture - basically how fast the cells are growing

expression Expression level of the gene, log2 observation relative to a replicate of G0.3

An object of class `tidy_omic` (inherits from `tomic`, `general`) of length 2.

An object of class `triple_omic` (inherits from `tomic`, `general`) of length 4.

Details

This version of the dataset contains only 500 genes randomly selected from the ~6K genes in the complete dataset.

Source

`https://pubmed.ncbi.nlm.nih.gov/17959824/`

`center_tomic` *Center T* Omic*

Description

Center each measurement by subtracting the mean.

Usage

```
center_tomic(tomic, measurement_vars = "all")
```

Arguments

`tomic`	Either a `tidy_omic` or `triple_omic` object
`measurement_vars`	measurement variables to center

Value

A `tomic` object where one or more measurements have been centered on a feature-by-feature basis.

Examples

```
center_tomic(brauer_2008_tidy)
```

check_tidy_omic *Check Tidy Omic*

Description

Check a tidy omic dataset for consistency between the data and design and validate that the dataset follows the `tidy_omic/tomic` specification.

Usage

```
check_tidy_omic(tidy_omic, fast_check = TRUE)
```

Arguments

`tidy_omic`	an object of class tidy_omic produced by `create_tidy_omic`
`fast_check`	if TRUE then skip some checks which are slow and that are generally only needed when a `tomic` object is first created.

Value

0 invisibly

check_tomic *Check T*Omic*

Description

Check a tidy or triple 'omic object for common pathologies, such as a mismatch between data and schema and non-uniqueness of primary keys.

Usage

```
check_tomic(tomic, fast_check = TRUE)
```

Arguments

`tomic`	Either a `tidy_omic` or `triple_omic` object
`fast_check`	if TRUE then skip some checks which are slow and that are generally only needed when a `tomic` object is first created.

Value

0 invisibly

Examples

```
check_tomic(brauer_2008_triple)
```

`check_triple_omic` *Check Triple Omic*

Description

Check a triple omic dataset for consistency between the data and design and validate that the dataset follows the `triple_omic/tomic` specification.

Usage

```
check_triple_omic(triple_omic, fast_check = TRUE)
```

Arguments

`triple_omic`	an object of class triple_omic produced by `create_triple_omic`
`fast_check`	if TRUE then skip some checks which are slow and that are generally only needed when a `tomic` object is first created.

Value

0 invisibly

`convert_wide_to_tidy_omic` *Convert Wide to Tidy Omic*

Description

Convert a wide dataset of species' abundances (gene product, metabolites, lipids, ...) into a triple_omic dataset (one observation per row)

Usage

```
convert_wide_to_tidy_omic(
  wide_df,
  feature_pk,
  feature_vars = NULL,
  sample_var = "sample",
  measurement_var = "abundance",
  omic_type_tag = "general",
  verbose = TRUE
)
```

Arguments

`wide_df`	a data.frame (or tibble) containing 1+ columns of feature attributes and many columns of samples
`feature_pk`	A unique identifier for features
`feature_vars`	a character vector of additional feature-level variables (or NULL if there are no additional variables)
`sample_var`	variable name to use for samples
`measurement_var`	variable name to use for measurements
`omic_type_tag`	an optional subtype of omic data: metabolomics, lipidomics, proteomics, genomics, general
`verbose`	extra reporting messages

Value

A `tidy_omic` object as produced by `create_tidy_omic`.

Examples

```
library(dplyr)

wide_measurements <- brauer_2008_triple[["measurements"]] %>%
  tidyr::spread(sample, expression)

wide_df <- brauer_2008_triple[["features"]] %>%
  left_join(wide_measurements, by = "name")

convert_wide_to_tidy_omic(wide_df,
  feature_pk = "name",
  feature_vars = c("BP", "MF", "systematic_name")
)
```

`create_tidy_omic` *Create Tidy Omic*

Description

A tidy omics object contains a formatted dataset and a summary of the experimental design.

Usage

```
create_tidy_omic(
  df,
  feature_pk,
  feature_vars = NULL,
  sample_pk,
  sample_vars = NULL,
  omic_type_tag = "general",
  verbose = TRUE
)
```

Arguments

`df`	a data.frame (or tibble) containing some combination of feature, sample and observation-level variables
`feature_pk`	A unique identifier for features
`feature_vars`	a character vector of additional feature-level variables (or NULL if there are no additional variables)
`sample_pk`	A unique identifier for samples
`sample_vars`	a character vector of additional sample-level variables (or NULL if there are no additional variables)
`omic_type_tag`	an optional subtype of omic data: metabolomics, lipidomics, proteomics, genomics, general
`verbose`	extra reporting messages

Value

An S3 `tidy_omic/tomic` object built on a `list`:

data A tibble with one row per measurement (i.e., features x samples)

design A list which organized the dataset's meta-data:

- **feature_pk** variable specifying a unique feature
- **sample_pk** variable specifying a unique sample
- **features** tibble of feature attributes
- **samples** tibble of sample attributes
- **measurements** tibble of measurement attributes

Examples

```
library(dplyr)

measurement_df <- tidyr::expand_grid(
  feature_id = 1:10,
  sample_id = LETTERS[1:5]
) %>%
  dplyr::mutate(value = rnorm(n()))

feature_df <- tibble(
  feature_id = 1:10,
  feature_group = rep(c("a", "b"), each = 5)
)
sample_df <- tibble(
  sample_id = LETTERS[1:5],
  sample_group = c("a", "a", "b", "b", "b")
)

triple_omic <- create_triple_omic(
  measurement_df, feature_df, sample_df,
  "feature_id", "sample_id"
)
raw_tidy_omic <- triple_to_tidy(triple_omic)$data

create_tidy_omic(raw_tidy_omic,
  feature_pk = "feature_id",
  feature_vars = "feature_group", sample_pk = "sample_id",
  sample_vars = "sample_group"
)
```

`create_triple_omic` *Create Triple Omic*

Description

A triple omics class contains three data.frames, one for features, one for samples, and one for abundances. This is a good format when there is a large amount of meta data associated with features or samples.

Usage

```
create_triple_omic(
  measurement_df,
  feature_df = NULL,
  sample_df = NULL,
  feature_pk,
  sample_pk,
  omic_type_tag = "general"
)
```

Arguments

`measurement_df`	A data.frame (or tibble) of measurements - one row for each combination of feature and sample
`feature_df`	A data.frame (or tibble) of features - one row per feature
`sample_df`	A data.frame (or tibble) of samples - one row per sample
`feature_pk`	A unique identifier for features
`sample_pk`	A unique identifier for samples
`omic_type_tag`	an optional subtype of omic data: metabolomics, lipidomics, proteomics, genomics, general

Details

for now primary keys are unique (rather than allowing for a multi-index)

Value

An S3 `triple_omic`/`tomic` object built on a `list`:

features A tibble of feature meta-data (one row per feature)

samples A tibble of sample meta-data (one row per sample)

measurements A tibble with one row per measurement (i.e., features x samples)

design A list which organized the dataset's meta-data:

- **feature_pk** variable specifying a unique feature
- **sample_pk** variable specifying a unique sample
- **features** tibble of feature attributes
- **samples** tibble of sample attributes
- **measurements** tibble of measurement attributes

Examples

```
library(dplyr)

measurement_df <- tidyr::expand_grid(
  feature_id = 1:10,
  sample_id = LETTERS[1:5]
) %>%
  dplyr::mutate(value = rnorm(n()))

feature_df <- tibble(
  feature_id = 1:10,
  feature_group = rep(c("a", "b"), each = 5)
)
sample_df <- tibble(
  sample_id = LETTERS[1:5],
  sample_group = c("a", "a", "b", "b", "b")
)

triple_omic <- create_triple_omic(
  measurement_df, feature_df, sample_df,
  "feature_id", "sample_id"
)
```

`downsample_heatmap` *Downsample Heatmap*

Description

Combine rows to speed up rendering of large heatmaps

Usage

```
downsample_heatmap(
  tidy_data,
  value_var,
  design,
  max_display_features = 1000,
  verbose = TRUE
)
```

Arguments

`tidy_data`	The data frame from a `tidy_omic` object containing ordered feature and sample primary keys defined by ordered_featureId and ordered_sampleId.
`value_var`	which variable in "measurements" to use for quantification.
`design`	a list summarizing the design of the tidy dataset
`max_display_features`	aggregate and downsample distinct feature to this number to speed to up heatmap rendering.
`verbose`	extra reporting messages

Value

tidy_data with rows collapsed if the number of distinct features is greater than `max_display_features`

`export_tomic_as_tidy` *Export T*Omic in Tidy Format*

Description

Export a data table including all fields from features, samples and measurements.

Usage

```
export_tomic_as_tidy(tomic, dir_path, name_preamble, verbose = TRUE)
```

Arguments

`tomic`	Either a `tidy_omic` or `triple_omic` object
`dir_path`	path to save outputs
`name_preamble`	start of output file name
`verbose`	extra reporting messages

Value

Export one table which is one row per peak, which includes all feature and sample attributes.

Examples

```
if (interactive()) {
  export_tomic_as_tidy(brauer_2008_triple, "/tmp", "brauer")
}
```

`export_tomic_as_triple` *Export T*Omic as Triple*

Description

Export features, samples and measurements tables

Usage

```
export_tomic_as_triple(tomic, dir_path, name_preamble, verbose = TRUE)
```

Arguments

`tomic`	Either a `tidy_omic` or `triple_omic` object
`dir_path`	path to save outputs
`name_preamble`	start of output file name
`verbose`	extra reporting messages

Value

Export three tables:

- features: one row per features measured (i.e., a metabolite)
- sample: one row per sample
- measurements: one row per measurement (i.e., one metabolite in one sample)

Examples

```
if (interactive()) {
  export_tomic_as_triple(brauer_2008_triple, "/tmp", "brauer")
}
```

`export_tomic_as_wide` *Export T*Omic as Wide Data*

Description

abundances form a matrix with metabolites as rows and samples as columns. Use transpose to treat samples as rows filename

Usage

```
export_tomic_as_wide(
  tomic,
  dir_path,
  name_preamble,
  value_var = NULL,
  transpose = FALSE,
  verbose = TRUE
)
```

Arguments

`tomic`	Either a `tidy_omic` or `triple_omic` object
`dir_path`	path to save outputs
`name_preamble`	start of output file name
`value_var`	measurement variable to use for the matrix
`transpose`	if TRUE then samples will be stored as rows
`verbose`	extra reporting messages

Value

Export one table which contains metabolites as rows and samples as columns.

Examples

```
if (interactive()) {
  export_tomic_as_wide(brauer_2008_triple, "/tmp", "brauer")
}
```

`filterInput` *Filter Input*

Description

UI components for the filter module.

Usage

```
filterInput(id, filter_table)
```

Arguments

`id`	An ID string that corresponds with the ID used to call the module's UI function.
`filter_table`	table to filter

Value

A `shiny` UI

`filterServer` *Filter Server*

Description

Server components for the filter module.

Usage

```
filterServer(id, tidy_omic, filter_table)
```

Arguments

`id`	An ID string that corresponds with the ID used to call the module's UI function.
`tidy_omic`	an object of class tidy_omic produced by `create_tidy_omic`
`filter_table`	table to filter

Value

A `tidy_omic` with some features and/or samples filtered.

filter_tomic *Filter T* Omics*

Description

Filter a tidy or triple omic to entries of interest.

Usage

```
filter_tomic(
  tomic,
  filter_type,
  filter_table,
  filter_value,
  filter_variable = NULL
)
```

Arguments

`tomic`	Either a `tidy_omic` or `triple_omic` object
`filter_type`	**category** filter filter_variable to categories specified in filter_value **range** filter filter_variable to using the range (i.e., lower and upper limit) provided in filter_value **apply** a quosure as a `filter_value` to a table of interest
`filter_table`	table where the filter should be applied
`filter_value`	values to filter based on
`filter_variable`	variable to apply the filter to

Value

A `tomic` object where a subset of features, samples or measurmenets have been filtered.

Examples

```
filter_tomic(
  brauer_2008_triple,
  filter_type = "category",
  filter_table = "features",
  filter_variable = "BP",
  filter_value = c("biological process unknown", "vacuolar acidification")
)

filter_tomic(
  brauer_2008_triple,
  filter_type = "category",
  filter_table = "samples",
  filter_variable = "DR",
  filter_value = 0.05
)

filter_tomic(
  brauer_2008_tidy,
  filter_type = "range",
  filter_table = "samples",
  filter_variable = "DR",
  filter_value = c(0, 0.2)
)

filter_tomic(
  brauer_2008_triple,
  filter_type = "quo",
  filter_table = "features",
  filter_value = rlang::quo(BP == "biological process unknown")
)
```

format_names_for_plotting   *Format Names for Plotting*

Description

Wrap long names over multiple lines so that they will look better on plots.

Usage

```
format_names_for_plotting(chars, width = 40, truncate_at = 80)
```

Arguments

`chars`	a character vector (or a variable that can be converted to one)
`width`	Positive integer giving target line width (in number of characters). A width less than or equal to 1 will put each word on its own line.
`truncate_at`	max character length

Value

a reformatted character vector of the same length as the input.

Examples

```
chars <- "Lorem ipsum dolor sit amet, consectetur adipiscing elit. Integer
  ac arcu semper erat porttitor egestas. Etiam sagittis, sapien at mattis."

format_names_for_plotting(chars)
```

`get_design_tbl` *Get Design Table*

Description

Get a tabular summary of all variables.

Usage

```
get_design_tbl(tomic)
```

Arguments

`tomic`	Either a `tidy_omic` or `triple_omic` object

Value

a tibble reflecting the `tomic` object's design.

Examples

```
get_design_tbl(brauer_2008_triple)
```

`get_tomic_table` *Get Tomic Table*

Description

Extract one of the specific tables from a tomic object

Usage

```
get_tomic_table(tomic, table_type)
```

Arguments

`tomic`	Either a `tidy_omic` or `triple_omic` object
`table_type`	The type of table to extract from the `tomic` object. **tidy** one row per measurements with feature and sample attributes added. Equivalent to the $data field of a tidy omic object **measurements** one row per measurements defined a feature and sample foreign key. Equivalent to the $measurements field of a triple omic object **features** one row per feature defined by a feature primary key. Equivalent to the $features field of a triple omic object **samples** one row per sample defined by a sample primary key. Equivalent to the $samples field of a triple omic object

Value

a tibble matching the `table_type` of the `tomic` object

Examples

```
get_tomic_table(brauer_2008_triple, "samples")
get_tomic_table(brauer_2008_tidy, "features")
```

`ggBivOutput` *ggBivariate Output*

Description

UI components for the ggBivariate module.

Usage

```
ggBivOutput(id, return_brushed_points = FALSE)
```

Arguments

`id`	An ID string that corresponds with the ID used to call the module's UI function.
`return_brushed_points`	Return values selected on the plot

Value

A `shiny` UI

`ggBivServer` *ggBivariate Server*

Description

Server components for the ggBivariate module.

Usage

```
ggBivServer(id, tomic, plot_table, return_brushed_points = FALSE)
```

Arguments

`id`	An ID string that corresponds with the ID used to call the module's UI function.
`tomic`	Either a `tidy_omic` or `triple_omic` object
`plot_table`	table containing the data to be plotted
`return_brushed_points`	Return values selected on the plot

Value

a tomic_table if return_brushed_points is TRUE, and 0 otherwise

---

`ggplotOutput` *ggplot Output*

Description

UI components for the ggplot module.

Usage

```
ggplotOutput(
  id,
  default_data_type = "samples",
  default_plot_type = "univariate"
)
```

Arguments

`id`	An ID string that corresponds with the ID used to call the module's UI function.
`default_data_type`	Default data type selection
`default_plot_type`	Default plot type selection

Value

A `shiny` UI

`ggplotServer` *ggplot Server*

Description

Server components for the ggplot module.

Usage

```
ggplotServer(id, tomic, return_brushed_points = FALSE)
```

Arguments

`id`	An ID string that corresponds with the ID used to call the module's UI function.
`tomic`	Either a `tidy_omic` or `triple_omic` object
`return_brushed_points`	Return values selected on the plot

Value

a `tibble` of selected observations if `return_brushed_points` is TRUE. Otherwise, returns NULL.

`ggUnivOutput` *ggUnivariate Output*

Description

UI components for the ggUnivariate module.

Usage

```
ggUnivOutput(id, return_brushed_points = FALSE)
```

Arguments

`id`	An ID string that corresponds with the ID used to call the module's UI function.
`return_brushed_points`	Return values selected on the plot

Value

A `shiny` UI

`ggUnivServer` *ggUnivariate Server*

Description

Server components for the ggUnivariate module

Usage

```
ggUnivServer(id, tomic, plot_table, return_brushed_points = FALSE)
```

Arguments

`id`	An ID string that corresponds with the ID used to call the module's UI function.
`tomic`	Either a `tidy_omic` or `triple_omic` object
`plot_table`	table containing the data to be plotted
`return_brushed_points`	Return values selected on the plot

Value

a tomic_table if return_brushed_points is TRUE, and 0 otherwise.

`hclust_order` *Hierarchical clustering order*

Description

Format and hierarchically cluster a data.frame. If hclust could not normally be produced (usually because no samples are in common for a feature) pad the matrix with zeros and still calculate the distance

Usage

```
hclust_order(
  df,
  feature_pk,
  sample_pk,
  value_var,
  cluster_dim,
  distance_measure = "dist",
  hclust_method = "ward.D2"
)
```

Arguments

`df`	data.frame to cluster
`feature_pk`	variable uniquely defining a row
`sample_pk`	variable uniquely defining a sample
`value_var`	An abundance value to use with `hclust`
`cluster_dim`	rows, columns, or both
`distance_measure`	variable to use for computing dis-similarity **corr** pearson correlation **dist** euclidean distance
`hclust_method`	method from stats::hclust to use for clustering

Value

a list containing a hierarchically clustered set of rows and/or columns

Examples

```
library(dplyr)

df <- tidyr::crossing(letters = LETTERS, numbers = 1:10) %>%
  mutate(noise = rnorm(n()))
hclust_order(df, "letters", "numbers", "noise", "rows")
```

`impute_missing_values` *Impute Missing Values*

Description

Impute missing values using K-nearest neighbors imputation

Usage

```
impute_missing_values(
  tomic,
  impute_var_name = "imputed",
  value_var = NULL,
  ...
)
```

Arguments

`tomic`	Either a `tidy_omic` or `triple_omic` object
`impute_var_name`	variable to create for imputed measurements
`value_var`	An abundance value to use with `hclust`
`...`	additional arguments to pass to impute.knn

Value

A `tomic` object with imputed measurements.

Examples

```
impute_missing_values(brauer_2008_triple)
```

`infer_tomic_table_type` *Infer Tomic Table Type*

Description

From a tomic_table, choose whether it reflects features, samples or measurements

Usage

```
infer_tomic_table_type(tomic, tomic_table)
```

Arguments

`tomic`	Either a `tidy_omic` or `triple_omic` object
`tomic_table`	A table taken from a tidy (i.e., augmented measurements) or triple omic dataset

Value

features, samples or measurements

`lassoInput` *Lasso Input*

Description

UI components for the lasso module.

Usage

```
lassoInput(id)
```

Arguments

`id`	An ID string that corresponds with the ID used to call the module's UI function.

Value

A `shiny` UI

`lassoServer` *Lasso Server*

Description

Take a subset of entries from a tomic table (generally selected using the lasso function) and then either filter a tomic object to these entries or tag the entries of interest with a user-specified variable.

Usage

```
lassoServer(id, tomic, tomic_table)
```

Arguments

`id`	An ID string that corresponds with the ID used to call the module's UI function.
`tomic`	Either a `tidy_omic` or `triple_omic` object
`tomic_table`	A table taken from a tidy (i.e., augmented measurements) or triple omic dataset

Value

A `tomic` object amended based on the lasso selection.

`organizeInput` *Organize Input*

Description

UI components for the organize input module.

Usage

```
organizeInput(id)
```

Arguments

`id`	An ID string that corresponds with the ID used to call the module's UI function.

Value

A `shiny` UI

`organizeServer` *Organize Servers*

Description

Server components for the organize input module.

Usage

```
organizeServer(id, tidy_omic, feature_vars, sample_vars, value_var)
```

Arguments

`id`	An ID string that corresponds with the ID used to call the module's UI function.
`tidy_omic`	an object of class tidy_omic produced by `create_tidy_omic`
`feature_vars`	variables available for arranging features
`sample_vars`	variables available for arrange samples
`value_var`	An abundance value to use with `hclust`

Value

A `tomic` with sorted features and/or samples.

`plotsaverInput` *Plot Saver Input*

Description

UI components for the plot saver module.

Usage

```
plotsaverInput(id, ui_format = "tall")
```

Arguments

`id`	An ID string that corresponds with the ID used to call the module's UI function.
`ui_format`	Set UI appearance **tall** stack all UI elements **wide** UI elements are side-by-side

Value

a `shiny` UI

`plotsaverServer` *Plot Saver Server*

Description

Server components for the plot saver module.

Usage

```
plotsaverServer(id, grob, filename = "grob.png")
```

Arguments

`id`	An ID string that corresponds with the ID used to call the module's UI function.
`grob`	a ggplot2 plot
`filename`	filename for saving plot. The extension will be respected by ggsave.

Value

None

`plot_bivariate` *Bivariate Plot*

Description

Create a scatter or boxplot from a tomic dataset.

Usage

```
plot_bivariate(
  tomic_table,
  x_var,
  y_var,
  color_var = NULL,
  shape_var = NULL,
  alpha_var = NULL,
  size_var = NULL
)
```

Arguments

`tomic_table`	A table taken from a tidy (i.e., augmented measurements) or triple omic dataset
`x_var`	x-axis variable
`y_var`	y-axis variable
`color_var`	coloring variable (NULL to suppress coloring)
`shape_var`	shape variable (NULL to suppress shape)
`alpha_var`	alpha variable or numeric for constant alpha (NULL to suppress alpha)
`size_var`	size variable or integer/numeric for constant size (NULL to suppress size)

Value

a ggplot2 grob

Examples

```
library(dplyr)

brauer_augmented <- brauer_2008_tidy %>%
  add_pcs(npcs = 5) %>%
  tomic_to("triple_omic")

tomic_table <- brauer_augmented$samples
plot_bivariate(tomic_table, "PC1", "PC2", "nutrient", "nutrient", 0.5, 10)
plot_bivariate(tomic_table, "PC1", "PC2", NULL)
plot_bivariate(tomic_table, "nutrient", "PC2", "nutrient")
```

`plot_heatmap` *Plot Heatmap*

Description

Generate a heatmap visualization of a features x samples matrix of measurements.

Usage

```
plot_heatmap(
  tomic,
  feature_var = NULL,
  sample_var = NULL,
  value_var = NULL,
  cluster_dim = "both",
  distance_measure = "dist",
  hclust_method = "ward.D2",
  change_threshold = Inf,
  plot_type = "grob",
  max_display_features = 800,
  x_label = NULL,
  y_label = NULL,
  colorbar_label = NULL
)
```

Arguments

`tomic`	Either a `tidy_omic` or `triple_omic` object
`feature_var`	variable from "features" to use as a unique feature label.
`sample_var`	variable from "samples" to use as a unique sample label.
`value_var`	which variable in "measurements" to use for quantification.
`cluster_dim`	rows, columns, or both
`distance_measure`	variable to use for computing dis-similarity **corr** pearson correlation **dist** euclidean distance
`hclust_method`	method from stats::hclust to use for clustering
`change_threshold`	values with a more extreme absolute change will be thresholded to this value.
`plot_type`	plotly (for interactivity) or grob (for a static ggplot)
`max_display_features`	aggregate and downsample distinct feature to this number to speed to up heatmap rendering.
`x_label`	label for x-axis (if NULL then use `feature_var`)
`y_label`	label for y-axis (if NULL then use `sample_var`)
`colorbar_label`	label for color-bar; default is log2 abundance

Value

a ggplot2 grob

Examples

```
library(dplyr)

tomic <- brauer_2008_triple %>%
  filter_tomic(
    filter_type = "category",
    filter_table = "features",
    filter_variable = "BP",
    filter_value = c(
      "protein biosynthesis",
      "rRNA processing", "response to stress"
    )
  )
```

```
plot_heatmap(
  tomic = tomic,
  value_var = "expression",
  change_threshold = 5,
  cluster_dim = "rows",
  plot_type = "grob",
  distance_measure = "corr"
)
```

---

plot_univariate *Univariate Plot*

Description

Create a histogram from a tomic dataset.

Usage

```
plot_univariate(tomic_table, x_var, color_var = NULL)
```

Arguments

`tomic_table`	A table taken from a tidy (i.e., augmented measurements) or triple omic dataset
`x_var`	x-axis variable
`color_var`	coloring variable (NULL to suppress coloring)

Value

A ggplot2 grob

Examples

```
library(dplyr)

brauer_augmented <- brauer_2008_tidy %>%
  add_pcs(npcs = 5) %>%
  tomic_to("triple_omic")

plot_univariate(brauer_augmented$samples, "PC1", "nutrient")
plot_univariate(brauer_augmented$measurements, "expression", NULL)
```

`prepare_example_datasets` *Prepare Example Datasets*

Description

Format example datasets and add them to the package.

Usage

```
prepare_example_datasets(seed = 1234)
```

Arguments

`seed`	a seed value used to reproducibly sample random genes.

Value

None; used for side-effects.

`reconcile_triple_omic` *Reconcile Triple Omic*

Description

If some samples, feature or measurements have been dropped; update other tables.

Usage

```
reconcile_triple_omic(triple_omic)
```

Arguments

`triple_omic`	an object of class triple_omic produced by `create_triple_omic`

Value

a triple_omic object

remove_missing_values *Remove Missing Values*

Description

Account for missing values by dropping features, samples or using imputation.

Usage

```
remove_missing_values(
  tomic,
  value_var = NULL,
  missing_val_method = "drop_samples",
  verbose = TRUE
)
```

Arguments

`tomic`	Either a `tidy_omic` or `triple_omic` object
`value_var`	An abundance value to use with `hclust`
`missing_val_method`	Approach to remove missing values: **drop_features** Drop features with missing values; **drop_samples** Drop samples which are missing all features, then drop features; **impute** Impute missing values
`verbose`	extra reporting messages

Value

A `tomic` object where missing values have been accounted for.

Examples

```
remove_missing_values(brauer_2008_triple)
```

`shiny_filter_test` *Shiny Filter Test*

Description

Tests the shiny filter module as a stand-alone application.

Usage

```
shiny_filter_test(tidy_omic, filter_table = "features")
```

Arguments

`tidy_omic`	an object of class tidy_omic produced by `create_tidy_omic`
`filter_table`	table to filter

Value

A `shiny` app

Examples

```
if (interactive()) {
  shiny_filter_test(brauer_2008_tidy)
}
```

`shiny_ggbiv_test` *Shiny ggBivariate Test*

Description

Test the shiny ggBivariate module as a stand-alone application.

Usage

```
shiny_ggbiv_test(tomic, plot_table = "samples")
```

Arguments

`tomic`	Either a `tidy_omic` or `triple_omic` object
`plot_table`	table containing the data to be plotted

Value

a `shiny` app

Examples

```
if (interactive()) {
  shiny_ggbiv_test(
    add_pcs(brauer_2008_triple, npcs = 5),
    plot_table = "samples"
  )
  shiny_ggbiv_test(
    brauer_2008_triple,
    plot_table = "measurements"
  )
}
```

---

shiny_ggplot_test *Shiny ggplot Test*

Description

Test the shiny ggplot module as a stand-alone application.

Usage

```
shiny_ggplot_test(tomic)
```

Arguments

tomic	Either a `tidy_omic` or `triple_omic` object

Value

A `shiny` app

Examples

```
if (interactive()) {
  shiny_ggplot_test(add_pcs(brauer_2008_triple, npcs = 5))
  shiny_ggplot_test(brauer_2008_triple)
}
```

`shiny_gguniv_test` *Shiny ggUnivariate Test*

Description

Test the shiny ggUnivariate module as a stand-alone application.

Usage

```
shiny_gguniv_test(tomic, plot_table = "samples")
```

Arguments

`tomic`	Either a `tidy_omic` or `triple_omic` object
`plot_table`	table containing the data to be plotted

Value

A `shiny` app

Examples

```
if (interactive()) {
  shiny_gguniv_test(
    add_pcs(brauer_2008_triple, npcs = 5),
    plot_table = "samples"
  )
  shiny_gguniv_test(brauer_2008_triple, plot_table = "measurements")
  shiny_gguniv_test(brauer_2008_triple, plot_table = "features")
}
```

`shiny_lasso_test` *Shiny Lasso Test*

Description

Tests the shiny lasso module as a stand-alone application.

Usage

```
shiny_lasso_test(tomic, tomic_table)
```

Arguments

`tomic`	Either a `tidy_omic` or `triple_omic` object
`tomic_table`	A table taken from a tidy (i.e., augmented measurements) or triple omic dataset

Value

A `shiny` app

Examples

```
if (interactive()) {
  tomic <- brauer_2008_triple
  tomic_table <- tomic[["samples"]] %>% dplyr::filter(nutrient == "G")
  shiny_lasso_test(tomic, tomic_table)
}
```

`shiny_lasso_test_reactval` *Shiny Lasso Test w/ Reactive Values*

Description

Tests the shiny lasso module as a stand-alone application when the `tomic` is a `reativeVal`.

Usage

```
shiny_lasso_test_reactval(tomic, tomic_table)
```

Arguments

`tomic`	Either a `tidy_omic` or `triple_omic` object
`tomic_table`	A table taken from a tidy (i.e., augmented measurements) or triple omic dataset

Value

A `shiny` app

Examples

```
if (interactive()) {
  tomic <- brauer_2008_triple
  tomic_table <- tomic[["samples"]] %>% dplyr::filter(nutrient == "G")
  shiny_lasso_test_reactval(tomic, tomic_table)

  tomic_table <- tomic[["measurements"]] %>% dplyr::filter(expression < -3)
  shiny_lasso_test_reactval(tomic, tomic_table)
}
```

`shiny_organize_test` *Shiny Organize Test*

Description

Tests the shiny organization module as stand-alone application.

Usage

```
shiny_organize_test(tidy_omic, feature_vars, sample_vars, value_var)
```

Arguments

`tidy_omic`	an object of class tidy_omic produced by `create_tidy_omic`
`feature_vars`	variables available for arranging features
`sample_vars`	variables available for arrange samples
`value_var`	An abundance value to use with `hclust`

Value

a `shiny` app

Examples

```
if (interactive()) {
  shiny_organize_test(
    brauer_2008_tidy,
    feature_vars = c("BP", "MF"),
    sample_vars = c("sample", "nutrient", "DR"),
    value_var = "expression"
  )
}
```

`shiny_plotsaver_test` *Shiny Plot Saver Test*

Description

Test the shiny plotsaver module as a stand-alone application.

Usage

```
shiny_plotsaver_test()
```

Value

a shiny app

Examples

```
if (interactive()) {
  shiny_plotsaver_test()
}
```

`shiny_sort_test` *Shiny Sort Test*

Description

Test the shiny sorting module as a stand-alone app.

Usage

```
shiny_sort_test(triple_omic, valid_sort_vars, value_var)
```

Arguments

`triple_omic`	an object of class triple_omic produced by `create_triple_omic`
`valid_sort_vars`	variables available for categorical arranging
`value_var`	An abundance value to use with `hclust`

Value

a shiny app

Examples

```
if (interactive()) {
  shiny_sort_test(brauer_2008_triple,
    valid_sort_vars = c("sample", "nutrient", "DR"),
    value_var = "expression"
  )
}
```

`sortInput` *Sort Input*

Description

UI components for the sort module.

Usage

```
sortInput(id, sort_table)
```

Arguments

`id`	An ID string that corresponds with the ID used to call the module's UI function.
`sort_table`	table to sort

Value

A `shiny` UI

`sortServer` *Sort Server*

Description

Server components for the sort module.

Usage

```
sortServer(id, tomic, sort_table, valid_sort_vars = NULL, value_var = NULL)
```

Arguments

`id`	An ID string that corresponds with the ID used to call the module's UI function.
`tomic`	Either a `tidy_omic` or `triple_omic` object
`sort_table`	samples or features
`valid_sort_vars`	variables available for categorical arranging
`value_var`	An abundance value to use with `hclust`

Value

A sorted `tomic` object.

sort_tomic *Sort Triple Omic*

Description

Sort a dataset's features or samples

Usage

```
sort_tomic(
  tomic,
  sort_type,
  sort_table,
  sort_variables = NULL,
  value_var = NULL
)
```

Arguments

tomic	Either a `tidy_omic` or `triple_omic` object
sort_type	**hclust** Arrange samples by hierarchical clustering of a provided `value_var` **arrange** Arrange samples by the factor or alphanumeric ordering of a set of `sort_variables`
sort_table	samples or features
sort_variables	A set of attributes in sort_table to sort with in `arrange`.
value_var	An abundance value to use with `hclust`

Details

`sort_tomic` supports the reordering of features or samples using either hierarchical clustering or based on the levels of other variables. Sorting occurs by turning either the feature or sample primary key into a factor whose levels reflect the sort.

Value

A `tomic` object where feature or sample primary keys have been turned into a factor reflecting how they are sorted.

Examples

```
library(dplyr)

sort_tomic(brauer_2008_triple,
  sort_type = "arrange", sort_table = "samples",
  sort_variables = c("nutrient", "DR")
) %>%
  sort_tomic(
    sort_type = "hclust",
    sort_table = "features",
    value_var = "expression"
  )
```

`sort_triple_arrange` *Sort Triple Arrange*

Description

Sort a `triple_omic` object based on the values of one or more variables.

Usage

```
sort_triple_arrange(triple_omic, sort_table, sort_variables)
```

Arguments

`triple_omic`	an object of class triple_omic produced by `create_triple_omic`
`sort_table`	samples or features
`sort_variables`	A set of attributes in sort_table to sort with in `arrange`.

Value

A `triple_omic` with sorted features or samples.

`sort_triple_hclust` *Sort Triple Hclust*

Description

Sort a `triple_omic` object using hierarchical clustering

Usage

```
sort_triple_hclust(triple_omic, sort_table, value_var)
```

Arguments

`triple_omic`	an object of class triple_omic produced by `create_triple_omic`
`sort_table`	samples or features
`value_var`	An abundance value to use with `hclust`

Value

A `triple_omic` with clustered features or samples.

`tidy_to_triple` *Tidy omic to triple omic*

Description

Convert a `tidy_omic` object into a `triple_omic` object.

Usage

```
tidy_to_triple(tidy_omic)
```

Arguments

`tidy_omic`	an object of class tidy_omic produced by `create_tidy_omic`

Details

The `data` table will be converted into `features`, `samples`, and `measurements` tables using the `design` to determine which variables belong in each table. The `design` will be preserved as-is.

Value

A `triple_omic` object as created by `create_triple_omic`

Examples

```
tidy_to_triple(brauer_2008_tidy)
```

`tomic_sort_status` *T* Omic Sort Status*

Description

Determine whether features &/or samples have been sorted and stored as ordered_featureId and ordered_sampleId.

Usage

```
tomic_sort_status(tomic)
```

Arguments

`tomic`	Either a `tidy_omic` or `triple_omic` object

Value

length 1 character string indicating whether the `tomic` is sorted.

Examples

```
tomic_sort_status(brauer_2008_tidy)
```

---

tomic_to *T* Omic To*

Description

Takes in any `romic` reprsentation of a dataset and returns a specific representation.

Usage

```
tomic_to(tomic, to_class)
```

Arguments

`tomic`	Either a `tidy_omic` or `triple_omic` object
`to_class`	The class to return, either `tidy_omic` or `triple_omic`

Value

tomic transformed to `to_class` class (or un-transformed if it started that way).

Examples

```
tomic_to(brauer_2008_tidy, "triple_omic")
```

---

triple_to_tidy *Triple Omic to Tidy Omic*

Description

Convert a `triple_omic` object into a `tidy_omic` oobject.

Usage

```
triple_to_tidy(triple_omic)
```

Arguments

`triple_omic`	an object of class triple_omic produced by `create_triple_omic`

Details

Features, samples and measurements will be merged into a single `data` table, and the `design` will be preserved as-is.

Value

A `tidy_omic` object as created by `create_tidy_omic`.

Examples

```
library(dplyr)

measurement_df <- tidyr::expand_grid(
  feature_id = 1:10,
  sample_id = LETTERS[1:5]
) %>%
  dplyr::mutate(value = rnorm(n()))

feature_df <- tibble(
  feature_id = 1:10,
  feature_group = rep(c("a", "b"), each = 5)
)
sample_df <- tibble(
  sample_id = LETTERS[1:5],
  sample_group = c("a", "a", "b", "b", "b")
)

triple_omic <- create_triple_omic(
  measurement_df, feature_df, sample_df,
  "feature_id", "sample_id"
)
triple_to_tidy(triple_omic)
```

`try_brushedPoints` *Try brushedPoints*

Description

This function wraps brushedPoints in a try statement to catch cases where the brushing is out-of-sync with the df that is selected.

Usage

```
try_brushedPoints(...)
```

Arguments

`...`	args to pass to brushedPoints

Value

a df of brushed points

`update_tidy_omic` *Update Tidy Omic*

Description

Update a Tidy 'Omics data and schema to reflect newly added fields.

Usage

```
update_tidy_omic(tidy_omic, updated_tidy_data, new_variable_tables = c())
```

Arguments

`tidy_omic`	an object of class tidy_omic produced by `create_tidy_omic`
`updated_tidy_data`	a tibble of data to use to update `tidy_omic`.
`new_variable_tables`	a named character vector of newly added variables in `updated_tidy_data` (names) and the table features, samples, measurements they apply to (values).

Value

a `tidy_omic` object with an updated schema and/or data.

Examples

```

library(dplyr)

tidy_omic <- brauer_2008_tidy
updated_tidy_data <- tidy_omic$data %>%
  mutate(new_sample_var = "foo") %>%
  select(-DR)
new_variable_tables <- c("new_sample_var" = "samples")
```

update_tomic *Update T* Omic*

Description

Provide an updated features, samples or measurements table to a `tomic`.

Usage

```
update_tomic(tomic, tomic_table)
```

Arguments

`tomic`	Either a `tidy_omic` or `triple_omic` object
`tomic_table`	A table taken from a tidy (i.e., augmented measurements) or triple omic dataset

Value

A `tomic` object with updated features, samples or measurements.

Examples

```
library(dplyr)
updated_features <- brauer_2008_triple$features %>%
  dplyr::filter(BP == "biological process unknown") %>%
  dplyr::mutate(chromosome = purrr::map_int(systematic_name, function(x) {
    which(LETTERS == stringr::str_match(x, "Y([A-Z])")[2])
  }))

update_tomic(brauer_2008_triple, updated_features)
```

var_partial_match *Var Partial Match*

Description

Partial string matching of a provided variable to the variables available in a table

Usage

```
var_partial_match(x, df)
```

Arguments

`x`	a variable name or regex match to a variable name
`df`	a data.frame or tibble

Value

a single variable from df

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