Package ‘simplifyEnrichment’

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Description A new clustering algorithm, "binary cut", for clustering similarity matrices of functional terms is implemented in this package. It also provides functions for visualizing, summarizing and comparing the clusterings.

biocViews Software, Visualization, GO, Clustering, GeneSetEnrichment

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    https://simplifyEnrichment.github.io

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Description

All clustering methods

Usage

all_clustering_methods()

Details

The default clustering methods are:

- kmeans see \texttt{cluster\_by\_kmeans}.
- dynamicTreeCut see \texttt{cluster\_by\_dynamicTreeCut}.
- mclust see \texttt{cluster\_by\_mclust}.
- apcluster see \texttt{cluster\_by\_apcluster}.
- hdbscan see \texttt{cluster\_by\_hdbscan}.
- fast\_greedy see \texttt{cluster\_by\_igraph}.
- louvain see \texttt{cluster\_by\_igraph}.
- walktrap see \texttt{cluster\_by\_igraph}.
- MCL see \texttt{cluster\_by\_MCL}.
- binary\_cut see \texttt{binary\_cut}.

Value

A vector of method names.
See Also

New methods can be added by register_clustering_methods.

Examples

all_clustering_methods()

---

### Description

Word cloud annotations

### Usage

```r
anno_word_cloud(align_to, term, exclude_words = NULL, max_words = 10,
word_cloud_grob_param = list(), fontsize_range = c(4, 16), value_range = NULL,
bg_gp = gpar(fill = "#DDDDDD", col = "#AAAAAA"), side = c("right", "left"),
add_new_line = FALSE, count_words_param = list(), ..., return_gbl = FALSE)
```

### Arguments

- **align_to**: How to align the annotations to the heatmap. Similar as in `anno_link`, the value of align_to can be a list of row indices or a categorical vector where each vector in the list corresponds to a word cloud. If it is a categorical vector, rows with the same level correspond to a same word cloud. If align_to is a categorical vector and term is a list, names of term should have overlap to the levels in align_to. When align_to is set as a categorical vector, normally the same value is set to row_split in the main heatmap so that each row slice can correspond to a word cloud.

- **term**: The description text used for constructing the word clouds. The value should have the same format as align_to. If align_to is a list, term should also be a list. In this case, the length of vectors in term is not necessarily the same as in align_to. E.g. `length(term[[1]])` is not necessarily equal to `length(align_to[[1]])`. If align_to is a categorical vector, term should also be a character vector with the same length as align_to. To make it more general, when align_to is a list, term can also be a list of data frames where the first column contains keywords and the second column contains numeric values that will be mapped to font sizes in the word clouds.

- **exclude_words**: The words excluded for constructing word cloud.

- **max_words**: Maximal number of words visualized in the word cloud.

- **word_cloud_grob_param**: A list of graphics parameters passed to `word_cloud_grob`.

- **fontsize_range**: The range of the font size. The value should be a numeric vector with length two. The font size interpolation is linear.
**anno_word_cloud_from_GO**

value_range  The range of values to map to font sizes.
bg_gp  Graphics parameters for controlling the background.
side  Side of the annotation relative to the heatmap.
add_new_line  Whether to add new line after every word? If TRUE, each word will be in a separated line.
count_words_param  A list of parameters passed to count_words.
...  Other parameters.
return_gbl  Internally used.

**Details**

The word cloud annotation is constructed by anno_link.

If the annotation is failed to construct or no keyword is found, the function returns a anno_empty with 1px width.

English stop words, punctuation and numbers are removed by default when counting words. As specific stop words might coincide with gene or pathway names, and numbers in genes names might be meaningful it is recommended to adjust this behaviour by passing appropriate arguments to the count_words function using count_words_param.

**Examples**

```r
gm = readRDS(system.file("extdata", "random_GO_BP_sim_mat.rds", package = "simplifyEnrichment"))
go_id = rownames(gm)
go_term = AnnotationDbi::select(GO.db::GO.db, keys = go_id, columns = "TERM")$TERM

split = sample(letters[1:4], 100, replace = TRUE)
align_to = split(1:100, split)
term = lapply(letters[1:4], function(x) sample(go_term, sample(100:400, 1)))
names(term) = letters[1:4]

require(ComplexHeatmap)
mat = matrix(rnorm(100*10), nrow = 100)
Heatmap(mat, cluster_rows = FALSE, row_split = split, right_annotation = rowAnnotation(foo = anno_word_cloud(align_to, term)))
```

---

Word cloud annotations from GO

**Description**

Word cloud annotations from GO
Usage

anno_word_cloud_from_GO(align_to, go_id, stat = c("pvalue", "count"),
    min_stat = ifelse(stat == "count", 5, 0.05),
    term = NULL, exclude_words = NULL, ...)

Arguments

align_to The same format as in `anno_word_cloud`.
go_id The value should be in the same format as align_to. If go_id is a vector, it should have the same length as align_to, and if go_id is a list, note, e.g. length(go_id[[1]]) is not necessarily equal to length(align_to[[1]]). If align_to is a categorical vector and go_id is a list, names of go_id should have overlap to the levels in align_to.
min_stat Minimal value for stat for selecting keywords.
stat What type of value to map to font sizes of the keywords. There are two possible values, "pvalue": enrichment is applied to keywords and -log10(p-value) is used to map to font size; "count": simply word frequency of keywords.
term Alternatively the GO description can be set via the term argument. The same format as in `anno_word_cloud`.
extimate_words The words excluded for constructing word cloud. Some words are internally excluded: c("via", "protein", "factor", "side", "type", "specific").
... All other arguments passed to `anno_word_cloud`.

Examples

# There is no example
NULL

---

area_above_ecdf Area above the eCDF curve

Description

Area above the eCDF curve

Usage

area_above_ecdf(x)

Arguments

x A vector of similarity values.
Details

Denote F(x) as the eCDF (empirical Cumulative Distribution Function) of the similarity vector x, this function calculates the area above the eCDF curve, which is 1 - \int_0^1 F(x)dx.

Value

A numeric value.

Examples

# There is no example
NULL

---

binary_cut | Cluster functional terms by recursively binary cutting the similarity matrix

Description

Cluster functional terms by recursively binary cutting the similarity matrix

Usage

binary_cut(mat, value_fun = area_above_ecdf, partition_fun = partition_by_pam,
cutoff = 0.85, try_all_partition_fun = FALSE, partial = FALSE)

Arguments

mat | A similarity matrix.
value_fun | A function that calculates the scores for the four submatrices on a node.
partition_fun | A function to split each node into two groups. Pre-defined functions in this package are `partition_by_kmeanspp`, `partition_by_pam` and `partition_by_hclust`.
cutoff | The cutoff for splitting the dendrogram.
try_all_partition_fun | Different `partition_fun` gives different clusterings. If the vaule of `try_all_partition_fun` is set to TRUE, the similarity matrix is clustered by three partitioning method: `partition_by_pam`, `partition_by_kmeanspp` and `partition_by_hclust`. The clustering with the highest difference score is finally selected as the final clustering.
partial | Whether to generate the complete clustering or the clustering stops when submatrices cannot be split anymore.

Value

A vector of cluster labels (in numeric).
Examples

mat = readRDS(system.file("extdata", "random_GO_BP_sim_mat.rds", 
    package = "simplifyEnrichment"))
binary_cut(mat)

cluster_by_apcluster  
Cluster similarity matrix by apcluster

Description

Cluster similarity matrix by apcluster

Usage

ccluster_by_apcluster(mat, s = apcluster::negDistMat(r = 2), ...)

Arguments

mat  
The similarity matrix.

s  
Passed to the s argument in apcluster.

...  
Other arguments passed to apcluster.

Value

A vector of cluster labels (in numeric).

Examples

# There is no example
NULL

cluster_by_dynamicTreeCut  
Cluster similarity matrix by dynamicTreeCut

Description

Cluster similarity matrix by dynamicTreeCut

Usage

ccluster_by_dynamicTreeCut(mat, minClusterSize = 5, ...)

### cluster_by_hdbscan

**Description**

Cluster similarity matrix by hdbscan

**Usage**

```r
cluster_by_hdbscan(mat, minPts = 5, ...)
```

**Arguments**

- `mat`: The similarity matrix.
- `minPts`: Passed to the `minPts` argument in `hdbscan`.
- `...`: Other arguments passed to `hdbscan`.

**Value**

A vector of cluster labels (in numeric).

**Examples**

```r
# There is no example
NULL
```
cluster_by_igraph

Cluster similarity matrix by graph community detection methods

Description

Cluster similarity matrix by graph community detection methods

Usage

```r
cluster_by_igraph(mat, 
                   method = c("fast_greedy", 
                               "leading_eigen", 
                               "louvain", 
                               "walktrap"), 
                   ...)```

Arguments

- `mat` The similarity matrix.
- `method` The community detection method.
- `...` Other arguments passed to the corresponding community detection function, see Details.

Details

The symmetric similarity matrix can be treated as an adjacency matrix and constructed as a graph/network with the similarity values as the weight of the edges. Thus, clustering the similarity matrix can be treated as detecting clusters/modules/communities from the graph.

Four methods implemented in igraph package can be used here:

- `fast_greedy` uses `cluster_fast_greedy`.
- `leading_eigen` uses `cluster_leading_eigen`.
- `louvain` uses `cluster_louvain`.
- `walktrap` uses `cluster_walktrap`.

Value

A vector of cluster labels (in numeric).

Examples

```r
# There is no example
NULL
```
cluster_by_kmeans

Description
Cluster similarity matrix by k-means clustering

Usage
cluster_by_kmeans(mat, max_k = max(2, min(round(nrow(mat)/5), 100)), ...)

Arguments
- mat: The similarity matrix.
- max_k: maximal k for k-means clustering.
- ...: Other arguments passed to `kmeans`.

Details
The best number of k for k-means clustering is identified according to the "elbow" or "knee" method on the distribution of within-cluster sum of squares (WSS) at each k.

Value
A vector of cluster labels (in numeric).

Examples
# There is no example
NULL

cluster_by_MCL

Description
Cluster similarity matrix by MCL

Usage
cluster_by_MCL(mat, addLoops = TRUE, ...)

cluster_similarity_matrix

Description
Cluster similarity matrix by clustering

Usage
cluster_similarity_matrix(mat, max_k = max(2, min(round(nrow(mat)/5), 100)), ...)

Arguments
- mat: The similarity matrix.
- max_k: maximal k for k-means clustering.
- ...: Other arguments passed to `kmeans`.

Details
The best number of k for k-means clustering is identified according to the "elbow" or "knee" method on the distribution of within-cluster sum of squares (WSS) at each k.

Value
A vector of cluster labels (in numeric).

Examples
# There is no example
NULL

cluster_similarity_matrix_by_kmeans

Description
Cluster similarity matrix by k-means clustering

Usage
cluster_similarity_matrix_by_kmeans(mat, max_k = max(2, min(round(nrow(mat)/5), 100)), ...)

Arguments
- mat: The similarity matrix.
- max_k: maximal k for k-means clustering.
- ...: Other arguments passed to `kmeans`.

Details
The best number of k for k-means clustering is identified according to the "elbow" or "knee" method on the distribution of within-cluster sum of squares (WSS) at each k.

Value
A vector of cluster labels (in numeric).

Examples
# There is no example
NULL
Arguments

mat The similarity matrix.
addLoops Passed to the addLoops argument in mcl.
... Other arguments passed to mcl.

Value

A vector of cluster labels (in numeric).

Examples

# There is no example
NULL
cluster_by_pam

Cluster similarity matrix by pam clustering

Usage

cluster_by_pam(mat, max_k = max(2, min(round(nrow(mat)/10), 100)), ...)

Arguments

mat The similarity matrix.
max_k maximal k for pam clustering.
... Other arguments passed to pamk.

Details

PAM is applied by pamk which can automatically select the best k.

Value

A vector of cluster labels (in numeric).

Examples

# There is no example
NULL

cluster_terms

Cluster functional terms

Description

Cluster functional terms

Usage

cluster_terms(mat, method = "binary_cut", control = list(), catch_error = FALSE, verbose = TRUE)
cluster_terms

Arguments

- **mat**: A similarity matrix.
- **method**: Method for clustering the matrix.
- **control**: A list of parameters passed to the corresponding clustering function.
- **catch_error**: Internally used.
- **verbose**: Whether to print messages.

Details

The following methods are the default:

- **kmeans** see `cluster_by_kmeans`.
- **pam** see `cluster_by_pam`.
- **dynamicTreeCut** see `cluster_by_dynamicTreeCut`.
- **mclust** see `cluster_by_mclust`.
- **apcluster** see `cluster_by_apcluster`.
- **hdbscan** see `cluster_by_hdbscan`.
- **leading_eigen** see `cluster_by_igraph`.
- **louvain** see `cluster_by_igraph`.
- **walktrap** see `cluster_by_igraph`.
- **MCL** see `cluster_by_MCL`.
- **binary_cut** see `binary_cut`.

Also the user-defined methods in `all_clustering_methods` can be used here.

New clustering methods can be registered by `register_clustering_methods`.

Please note it is better to directly call `cluster_terms` for clustering while not the individual `cluster_by_*` functions because `cluster_terms` does additional cluster label adjustment.

Value

A numeric vector of cluster labels (in numeric).

If `catch_error` is set to `TRUE` and if the clustering produces an error, the function returns a `try-error` object.

Examples

```r
# There is no example
NULL
```
cmp_make_clusters

Apply various clustering methods

Usage

```r
cmp_make_clusters(mat, method = setdiff(all_clustering_methods(), "mclust"),
  verbose = TRUE)
```

Arguments

- `mat` The similarity matrix.
- `method` Which methods to compare. All available methods are in `all_clustering_methods`. A value of `all` takes all available methods. By default `mclust` is excluded because its long runtime.
- `verbose` Whether to print messages.

Details

The function compares following default clustering methods by default:

- `kmeans` see `cluster_by_kmeans`.
- `pam` see `cluster_by_pam`.
- `dynamicTreeCut` see `cluster_by_dynamicTreeCut`.
- `mclust` see `cluster_by_mclust`. By default it is not included.
- `apcluster` see `cluster_by_apcluster`.
- `hdbscan` see `cluster_by_hdbscan`.
- `fast greedy` see `cluster_by_igraph`.
- `louvain` see `cluster_by_igraph`.
- `walktrap` see `cluster_by_igraph`.
- `MCL` see `cluster_by_MCL`.
- `binary cut` see `binary_cut`.

Also the user-defined methods in `all_clustering_methods` are also compared.

Value

A list of cluster label vectors for different clustering methods.
Examples

```r
## Not run:
mat = readRDS(system.file("extdata", "random_GO_BP_sim_mat.rds", 
    package = "simplifyEnrichment"))
clt = cmp_make_clusters(mat)

## End(Not run)
```

---

**cmp_make_plot**

*Make plots for comparing clustering methods*

**Description**

Make plots for comparing clustering methods

**Usage**

```r
cmp_make_plot(mat, clt, plot_type = c("mixed", "heatmap"), nrow = 3)
```

**Arguments**

- **mat** A similarity matrix.
- **clt** A list of clusterings from `cmp_make_clusters`.
- **plot_type** What type of plots to make. See Details.
- **nrow** Number of rows of the layout when `plot_type` is set to `heatmap`.

**Details**

If `plot_type` is the default value `mixed`, a figure with three panels generated:

- A heatmap of the similarity matrix with different classifications as row annotations.
- A heatmap of the pair-wise concordance of the classifications of every two clustering methods.
- Barplots of the difference scores for each method (calculated by `difference_score`), the number of clusters (total clusters and the clusters with size \( \geq 5 \)) and the mean similarity of the terms that are in the same clusters.

If `plot_type` is `heatmap`. There are heatmaps for the similarity matrix under clusterings from different methods. The last panel is a table with the number of clusters under different clusterings.

**Value**

No value is returned.
Examples

```r
## Not run:
mat = readRDS(system.file("extdata", "random_GO_BP_sim_mat.rds", 
package = "simplifyEnrichment"))
clt = cmp_make_clusters(mat)
cmp_make_plot(mat, clt)
cmp_make_plot(mat, clt, plot_type = "heatmap")

## End(Not run)
```

### Description

Compare clustering methods

### Usage

```r
compare_clustering_methods(mat, method = setdiff(all_clustering_methods(), "mclust"), 
plot_type = c("mixed", "heatmap"), nrow = 3, verbose = TRUE)
```

### Arguments

- `mat`  
  The similarity matrix.

- `method`  
  Which methods to compare. All available methods are in `all_clustering_methods`.  
  A value of all takes all available methods. By default `mclust` is excluded because its long runtime.

- `plot_type`  
  See explanation in `cmp_make_plot`.

- `nrow`  
  Number of rows of the layout when `plot_type` is set to `heatmap`.

- `verbose`  
  Whether to print messages.

### Details

The function compares following clustering methods by default:

- `kmeans`  
  see `cluster_by_kmeans`.

- `pam`  
  see `cluster_by_pam`.

- `dynamicTreeCut`  
  see `cluster_by_dynamicTreeCut`.

- `mclust`  
  see `cluster_by_mclust`. By default it is not included.

- `apcluster`  
  see `cluster_by_apcluster`.

- `hdbscan`  
  see `cluster_by_hdbscan`.

- `fast_greedy`  
  see `cluster_by_igraph`.
louvain see `cluster_by_igraph`
walktrap see `cluster_by_igraph`
MCL see `cluster_by_MCL`
binary_cut see `binary_cut`.

This function is basically a wrapper function. It calls the following two functions:

- `cmp_make_clusters`: applies clustering with different methods.
- `cmp_make_plot`: makes the plots.

**Value**

No value is returned.

**Examples**

```r
## Not run:
mat = readRDS(system.file("extdata", "random_GO_BP_sim_mat.rds", 
package = "simplifyEnrichment"))
compare_clustering_methods(mat)
compare_clustering_methods(mat, plot_type = "heatmap")
## End(Not run)
```

---

## count_words

**Calculate word frequency**

**Description**

Calculate word frequency

**Usage**

```r
count_words(term, 
   exclude_words = NULL, stop_words = stopwords(),
   min_word_length = 1, tokenizer = 'words', transform_case = tolower,
   remove_numbers = TRUE, remove_punctuation = TRUE, custom_transformer = NULL,
   stemming = FALSE, dictionary = NULL)
```

**Arguments**

- **term** A vector of description texts.
- **exclude_words** The words that should be excluded.
- **stop_words** The stop words that should be removed.
- **min_word_length** Minimum length of the word to be counted.
dend_node_apply

tokenizer
transform_case
remove_numbers
remove_punctuation
custom_transformer
stemming
dictionary

Details
The tokenizer function, one of the values accepted by \texttt{tm::termFreq}.
The function normalizing lettercase of the words.
Whether to remove numbers.
Whether to remove punctuation.
Custom function that transforms words.
Whether to only keep the roots of inflected words.
A vector of words to be counted (if given all other words will be excluded).

Details
The text preprocessing followings the instructions from \url{http://www.sthda.com/english/wiki/word-cloud-generator-in-r-one-killer-function-to-do-everything-you-need}.

Value
A data frame with words and frequencies.

Examples
```
gm = readRDS(system.file("extdata", "random_GO_BP_sim_mat.rds", package = "simplifyEnrichment"))
go_id = rownames(gm)
go_term = AnnotationDbi::select(GO.db::GO.db, keys = go_id, columns = "TERM")$TERM
count_words(go_term)
```

---

dend_node_apply

Apply functions on every node in a dendrogram

Description
Apply functions on every node in a dendrogram

Usage
dend_node_apply(dend, fun)

Arguments

dend A dendrogram.
fun A self-defined function.
Details

The function returns a vector or a list as the same length as the number of nodes in the dendrogram. The self-defined function can have one single argument which is the sub-dendrogram at a certain node. E.g. to get the number of members at every node:

```r
dend_node_apply(dend, function(d) attr(d, "members"))
```

The self-defined function can have a second argument, which is the index of current sub-dendrogram in the complete dendrogram. E.g. `dend[[1]]` is the first child node of the complete dendrogram and `dend[[c(1, 2)]]` is the second child node of `dend[[1]]`, et al. This makes that at a certain node, it is possible to get information of its child nodes and parent nodes.

```r
dend_node_apply(dend, function(d, index) {
    dend[[c(index, 1)]] # is the first child node of d, or simply d[[1]]
    dend[[index[-length(index)]]] # is the parent node of d
    ...
})
```

Note for the top node, the value of `index` is `NULL`.

Value

A vector or a list, depends on whether `fun` returns a scalar or more complex values.

Examples

```r
mat = matrix(rnorm(100), 10)
dend = as.dendrogram(hclust(dist(mat)))
# number of members on every node
dend_node_apply(dend, function(d) attr(d, "members"))
# the depth on every node
dend_node_apply(dend, function(d, index) length(index))
```

---

**difference_score**

**Difference score**

**Description**

Difference score

**Usage**

`difference_score(mat, cl)`

**Arguments**

- `mat` The similarity matrix.
- `cl` Cluster labels.
**DO_similarity**

Details

This function measures the difference between the similarity values for the terms that belong to the same clusters and in different clusters. The difference score is the Kolmogorov-Smirnov statistic between the two distributions.

Value

A numeric scalar.

Examples

```r
mat = readRDS(system.file("extdata", "random_GO_BP_sim_mat.rds", package = "simplifyEnrichment"))
cl = binary_cut(mat)
difference_score(mat, cl)
```

---

**DO_similarity**

Calculate Disease Ontology (DO) semantic similarity matrix

Description

Calculate Disease Ontology (DO) semantic similarity matrix

Usage

```r
DO_similarity(do_id, measure = "Rel", remove_orphan_terms = FALSE)
```

Arguments

- `do_id` A vector of DO IDs.
- `measure` Semantic measure for the DO similarity, pass to `doSim`.
- `remove_orphan_terms` Whether to remove terms that have zero similarity to all other terms?

Details

This function is basically a wrapper on `doSim`.

Value

A symmetric matrix.

Examples

```r
require(DOSE)
do_id = random_DO(10)
DO_similarity(do_id)
```
### edit_node

**Modify nodes in a dendrogram**

**Description**

Modify nodes in a dendrogram

**Usage**

```r
edit_node(dend, fun = function(d, index) d)
```

**Arguments**

- `dend`: A dendrogram.
- `fun`: A self-defined function.

**Details**

If `fun` only has one argument, it is basically the same as `dendrapply`, but it can have a second argument which is the index of the node in the dendrogram, which makes it possible to get information of child nodes and parent nodes for a specific node.

As an example, we first assign random values to every node in the dendrogram:

```r
mat = matrix(rnorm(100), 10)
dend = as.dendrogram(hclust(dist(mat)))
dend = edit_node(dend, function(d) {attr(d, 'score') = runif(1); d})
```

Then for every node, we take the maximal absolute difference to all its child nodes and parent node as the attribute `abs_diff`

```r
dend = edit_node(dend, function(d, index) {
  n = length(index)
  s = attr(d, "score")
  if(is.null(index)) { # d is the top node
    s_children = sapply(d, function(x) attr(x, "score"))
    s_parent = NULL
  } else if(is.leaf(d)) { # d is the leaf
    s_children = NULL
    s_parent = attr(dend[[index[-n]]], "score")
  } else {
    s_children = sapply(d, function(x) attr(x, "score"))
    s_parent = attr(dend[[index[-n]]], "score")
  }
  abs_diff = max(abs(s - c(s_children, s_parent)))
  attr(d, "abs_diff") = abs_diff
  return(d)
})
```
**export_to_shiny_app**

Value

A dendrogram object.

Examples

```r
# There is no example
NULL
```

---

**export_to_shiny_app**  *Interactively visualize the similarity heatmap*

Description

Interactively visualize the similarity heatmap

Usage

```r
export_to_shiny_app(mat, cl = binary_cut(mat))
```

Arguments

- **mat**
  - A similarity matrix.
- **cl**
  - Cluster labels inferred from the similarity matrix, e.g. from `cluster_terms` or `binary_cut`.

Examples

```r
if(interactive()) {
  mat = readRDS(system.file("extdata", "random.GO_BP_sim_mat.rds", package = "simplifyEnrichment"))
  cl = binary_cut(mat)
  export_to_shiny_app(mat, cl)
}
```

---

**GO_similarity**  *Calculate Gene Ontology (GO) semantic similarity matrix*

Description

Calculate Gene Ontology (GO) semantic similarity matrix

Usage

```r
GO_similarity(go_id, ont = NULL, db = 'org.Hs.eg.db', measure = "Rel", remove_orphan_terms = FALSE)
```
Arguments

- **go_id**: A vector of GO IDs.
- **ont**: GO ontology. Value should be one of "BP", "CC" or "MF". If it is not specified, the function automatically identifies it by random sampling 10 IDs from go_id (see `guess_ont`).
- **db**: Annotation database. It should be from https://bioconductor.org/packages/3.10/BiocViews.html#___OrgDb. The value can also directly be a `OrgDb` object.
- **measure**: Semantic measure for the GO similarity, pass to `termSim`.
- **remove_orphan_terms**: Whether to remove terms that have zero similarity to all other terms?

Details

This function is basically a wrapper on `termSim`.

Value

A symmetric matrix.

Examples

```r
# go_id = random_GO(100)
mat = GO_similarity(go_id)
```

---

**guess_ont**

Guess the ontology of the input GO IDs

Description

Guess the ontology of the input GO IDs

Usage

```r
guess_ont(go_id, db = 'org.Hs.eg.db')
```

Arguments

- **go_id**: A vector of GO IDs.
- **db**: Annotation database. It should be from https://bioconductor.org/packages/3.10/BiocViews.html#___OrgDb. The value can also directly be a `OrgDb` object.

Details

10 GO IDs are randomly sampled and checked.
Value

A single character scalar of "BP", "CC" or "MF".

If there are more than one ontologies detected. It returns NULL.

Examples

go_id = random_GO(100)
guess_ont(go_id)

Description

Height for word_cloud grob

Usage

## S3 method for class 'word_cloud'
heightDetails(x)

Arguments

x The word_cloud grob returned by word_cloud_grob.

Value

A unit object.

Examples

# There is no example
NULL
ht_clusters

Visualize the similarity matrix and the clustering

Description

Visualize the similarity matrix and the clustering

Usage

ht_clusters(
  mat,
  cl,
  dend = NULL,
  col = c("white", "red"),

  # arguments that control the word cloud annotation
  draw_word_cloud = TRUE,
  min_term = round(nrow(mat)*0.01),
  order_by_size = FALSE,
  stat = "pvalue",
  min_stat = ifelse(stat == "count", 5, 0.05),
  exclude_words = character(0),
  max_words = 10,
  word_cloud_grob_param = list(),
  fontsize_range = c(4, 16),
  bg_gp = gpar(fill = "#DDDDDD", col = "#AAAAAA"),

  # arguments that control the heatmaps
  column_title = NULL,
  ht_list = NULL,
  use_raster = TRUE,
  run_draw = TRUE,
  ...
)

Arguments

mat          A similarity matrix.
cl           Cluster labels inferred from the similarity matrix, e.g. from cluster_terms or binary_cut.
dend         Used internally.
col          A vector of colors that map from 0 to the 97.5\textsuperscript{th} percentile of the similarity values. The value can also be a color mapping function generated by colorRamp2.
draw_word_cloud Whether to draw the word clouds.
min_term      Minimal number of functional terms in a cluster. All the clusters with size less than min_term are all merged into one separated cluster in the heatmap.
**order_by_size**
Whether to reorder clusters by their sizes. The cluster that is merged from small clusters (size < min_term) is always put to the bottom of the heatmap.

**stat**
Type of value for mapping to the font size of keywords in the word clouds. There are two options: "count": simply number of keywords; "pvalue": enrichment on keywords is performed (by fisher's exact test) and -log10(pvalue) is used to map to font sizes.

**min_stat**
Minimal value for stat for selecting keywords.

**exclude_words**
Words that are excluded in the word cloud.

**max_words**
Maximal number of words visualized in the word cloud.

**word_cloud_grob_param**
A list of graphic parameters passed to `word_cloud_grob`.

**fontsize_range**
The range of the font size. The value should be a numeric vector with length two. The font size interpolation is linear.

**bg_gp**
Graphics parameters for controlling word cloud annotation background.

**column_title**
Column title for the heatmap.

**ht_list**
A list of additional heatmaps added to the left of the similarity heatmap.

**use_raster**
Whether to write the heatmap as a raster image.

**run_draw**
Internally used.

**...**
Other arguments passed to `draw,HeatmapList-method`.

### Value
A `HeatmapList-class` object.

### Examples
```r
## Not run:
mat = readRDS(system.file("extdata", "random_GO_BP_sim_mat.rds", package = "simplifyEnrichment"))
c1 = binary_cut(mat)
ht_clusters(mat, c1, word_cloud_grob_param = list(max_width = 80))
htClusters(mat, c1, word_cloud_grob_param = list(max_width = 80), order_by_size = TRUE)

## End(Not run)
```

---

**keyword_enrichment_from_GO**

**Keyword enrichment for GO terms**

### Description
Keyword enrichment for GO terms
Usage

keyword_enrichment_from_GO(go_id, min_bg = 5, min_term = 2)

Arguments

- go_id: A vector of GO IDs.
- min_bg: Minimal number of GO terms (in the background, i.e. all GO terms in the GO database) that contain a specific keyword.
- min_term: Minimal number of GO terms (GO terms in go_id) that contain a specific keyword.

Details

The enrichment is applied by Fisher’s exact test. For a keyword, there is the following 2x2 contingency table:

<table>
<thead>
<tr>
<th>contains the keyword</th>
<th>does not contain the keyword</th>
</tr>
</thead>
<tbody>
<tr>
<td>In the GO set</td>
<td>s11</td>
</tr>
<tr>
<td>Not in the GO set</td>
<td>s21</td>
</tr>
</tbody>
</table>

where s11, s12, s21 and s22 are number of GO terms in each category.

Value

A data frame with keyword enrichment results.

Examples

```r
## Not run:
go_id = random_GO(100)
keyword_enrichment_from.GO(go_id)
## End(Not run)
```

---

**partition_by_hclust**  
*Partition by hclust*

Description

Partition by hclust

Usage

partition_by_hclust(mat)

Arguments

- mat: The similarity matrix.
**Details**

The "ward.D2" clustering method was used.

This function is used to set to the `partition_fun` argument in `binary_cut`.

**Examples**

```r
# There is no example
NULL
```

---

**Description**

Partition by kmeans

**Usage**

```r
partition_by_kmeans(mat, n_repeats = 10)
```

**Arguments**

- `mat` The similarity matrix.
- `n_repeats` Number of repeated runs of k-means.

**Details**

Since k-means clustering brings randomness, this function performs k-means clustering several times (controlled by `n_repeats`) and uses the final consensus partitioning.

This function is used to set to the `partition_fun` argument in `binary_cut`.

**Examples**

```r
# There is no example
NULL
```
**partition_by_pam**

**Description**
Partition by PAM

**Usage**
```
partition_by_pam(mat)
```

**Arguments**
```
mat       The similarity matrix.
```

**Details**
The clustering is performed by `pam` with setting `pamonce` argument to 5.

This function is used to set to the `partition_fun` argument in `binary_cut`.

---

**partition_by_kmeanspp**  
*Partition by kmeans++*

**Description**
Partition by kmeans++

**Usage**
```
partition_by_kmeanspp(mat)
```

**Arguments**
```
mat       The similarity matrix.
```

**Details**
This function is used to set to the `partition_fun` argument in `binary_cut`.

---

**Examples**
```r
# There is no example
NULL
```
Examples

# There is no example
NULL

plot_binary_cut

Visualize the process of binary cut

Description

Visualize the process of binary cut

Usage

plot_binary_cut(mat, value_fun = area_above_ecdf, cutoff = 0.85,
partition_fun = partition_by_pam, dend = NULL, dend_width = unit(3, "cm"),
depth = NULL, show_heatmap_legend = TRUE, ...)

Arguments

mat The similarity matrix.
value_fun A function that calculates the scores for the four submatrices on a node.
cutoff The cutoff for splitting the dendrogram.
partition_fun A function to split each node into two groups. Pre-defined functions in this pack-
age are partition_by_kmeanspp, partition_by_pam and partition_by_hclust.
dend A dendrogram object, used internally.
depth Depth of the recursive binary cut process.
dend_width Width of the dendrogram on the plot.
show_heatmap_legend Whether to show the heatmap legend.
...
Other arguments.

Details

After the functions which perform clustering are executed, such as simplifyGO or binary_cut, the
dendrogram is temporarily saved and plot_binary_cut directly uses this dendrogram.

Examples

mat = readRDS(system.file("extdata", "random_GO_BP_sim_mat.rds",
package = "simplifyEnrichment"))
plot_binary_cut(mat, depth = 1)
plot_binary_cut(mat, depth = 2)
plot_binary_cut(mat)
random_D0  
Generate random Disease Ontology (DO) IDs

Description
Generate random Disease Ontology (DO) IDs

Usage
random_D0(n)

Arguments
n  Number of DO IDs.

Details
DO.db package should be installed.

Value
A vector of DO IDs.

Examples
random_D0(100)

random_GO  
Generate random GO IDs

Description
Generate random GO IDs

Usage
random_GO(n, ont = "BP", db = 'org.Hs.eg.db')

Arguments
n  Number of GO IDs.
ont  GO ontology. Value should be one of "BP", "CC" or "MF".
db  Annotation database. It should be from https://bioconductor.org/packages/3.10/BiocViews.html##OrgDb
Register new clustering methods

Description
Register new clustering methods

Usage
register_clustering_methods(...)

Arguments
... A named list of clustering functions, see Details.

Details
The user-defined functions should accept at least one argument which is the input matrix. The second optional argument should always be ... so that parameters for the clustering function can be passed by control argument from cluster_terms, simplifyGO or simplifyEnrichment. If users forget to add ..., it is added internally.

Please note, the user-defined function should automatically identify the optimized number of clusters.

The function should return a vector of cluster labels. Internally it is converted to numeric labels.

Value
No value is returned.

Examples
register_clustering_methods(
# assume there are 5 groups
random = function(mat, ...) sample(5, nrow(mat), replace = TRUE)
)
all_clustering_methods()
remove_clustering_methods("random")
remove_clustering_methods

Remove clustering methods

Description
Remove clustering methods

Usage
remove_clustering_methods(method)

Arguments
method A vector of method names.

Value
No value is returned.

Examples
# There is no example
NULL

reset_clustering_methods

Reset to default clustering methods

Description
Reset to default clustering methods

Usage
reset_clustering_methods()

Details
The default methods are:
kmeans see cluster_by_kmeans.
pam see cluster_by_pam.
dynamicTreeCut see cluster_by_dynamicTreeCut.
scale_fontsize

mclust see `cluster_by_mclust`.
apcluster see `cluster_by_apcluster`.
hdbscan see `cluster_by_hdbscan`.
fast_greedy see `cluster_by_igraph`.
louvain see `cluster_by_igraph`.
walktrap see `cluster_by_igraph`.
MCL see `cluster_by_MCL`.
binary_cut see `binary_cut`.

Value

No value is returned.

Examples

```r
all_clustering_methods()
remove_clustering_methods(c("kmeans", "mclust"))
all_clustering_methods()
reset_clustering_methods()
all_clustering_methods()
```

---

<table>
<thead>
<tr>
<th>scale_fontsize</th>
<th>Scale font size</th>
</tr>
</thead>
</table>

Description

Scale font size

Usage

`scale_fontsize(x, rg = c(1, 30), fs = c(4, 16))`

Arguments

- `x` A numeric vector.
- `rg` The range.
- `fs` Range of the font size.

Value

A numeric vector.

Details

It is a linear interpolation.
Description
Select the cutoff for binary cut

Usage
select_cutoff(mat, cutoff = seq(0.6, 0.98, by = 0.01), verbose = TRUE, ...)

Arguments
mat     A similarity matrix.
cutoff  A list of cutoffs to test. Note the range of the cutoff values should be inside [0.5, 1].
verbose Whether to print messages.
...     Pass to binary_cut.

Details
Binary cut is applied to each of the cutoff and the clustering results are evaluated by following metrics:

- difference score, calculated by difference_score.
- number of clusters.
- block mean, which is the mean similarity in the blocks in the diagonal of the heatmap.

Examples
mat = readRDS(system.file("extdata", "random_GO_BP_sim_mat.rds",
package = "simplifyEnrichment"))
select_cutoff(mat)
**se_opt**  
Global parameters

**Description**
Global parameters

**Usage**
```r
se_opt(..., RESET = FALSE, READ.ONLY = NULL, LOCAL = FALSE, ADD = FALSE)
```

**Arguments**
- `...` Arguments for the parameters, see "details" section.
- `RESET` Whether to reset to default values.
- `READ.ONLY` Please ignore.
- `LOCAL` Please ignore.
- `ADD` Please ignore.

**Details**
There are the following global options:

- `verobse` Whether to print messages.

**Examples**
```r
# There is no example
NULL
```

---

**simplifyEnrichment**  
Simplify functional enrichment results

**Description**
Simplify functional enrichment results

**Usage**
```r
simplifyEnrichment(mat, method = "binary_cut", control = list(),
plot = TRUE, verbose = TRUE,
column_title = qq("nrow(mat}) terms clustered by '@{method}'"),
ht_list = NULL, ...)
```
Arguments

- **mat**: A similarity matrix.
- **method**: Method for clustering the matrix. See `cluster_terms`.
- **control**: A list of parameters for controlling the clustering method, passed to `cluster_terms`.
- **plot**: Whether to make the heatmap.
- **column_title**: Column title for the heatmap.
- **verbose**: Whether to print messages.
- **ht_list**: A list of additional heatmaps added to the left of the similarity heatmap.
- **...**: Arguments passed to `ht_clusters`.

Details

The usage is the same as `simplifyGO`.

Examples

```r
# There is no example
NULL
```

`simplifyGO`  
Simplify Gene Ontology (GO) enrichment results

Description

Simplify Gene Ontology (GO) enrichment results

Usage

```r
simplifyGO(mat, method = "binary_cut", control = list(),
plot = TRUE, verbose = TRUE,
column_title = qq("@{nrow(mat)} GO terms clustered by '@{method}'"),
ht_list = NULL, ...)
```

Arguments

- **mat**: A GO similarity matrix.
- **method**: Method for clustering the matrix. See `cluster_terms`.
- **control**: A list of parameters for controlling the clustering method, passed to `cluster_terms`.
- **plot**: Whether to make the heatmap.
- **column_title**: Column title for the heatmap.
- **verbose**: Whether to print messages.
- **ht_list**: A list of additional heatmaps added to the left of the similarity heatmap.
- **...**: Arguments passed to `ht_clusters`.
Details

This is basically a wrapper function that it first runs `cluster_terms` to cluster GO terms and then runs `ht_clusters` to visualize the clustering.

The arguments in `simplifyGO` passed to `ht_clusters` are:

- **draw_word_cloud** Whether to draw the word clouds.
- **min_term** Minimal number of GO terms in a cluster. All the clusters with size less than `min_term` are all merged into one single cluster in the heatmap.
- **order_by_size** Whether to reorder GO clusters by their sizes. The cluster that is merged from small clusters (size < `min_term`) is always put to the bottom of the heatmap.
- **stat** What values of keywords are used to map to font sizes in the word clouds.
- **exclude_words** Words that are excluded in the word cloud.
- **max_words** Maximal number of words visualized in the word cloud.
- **word_cloud_grob_param** A list of graphic parameters passed to `word_cloud_grob`.
- **fontsize_range** The range of the font size. The value should be a numeric vector with length two. The minimal font size is mapped to word frequency value of 1 and the maximal font size is mapped to the maximal word frequency. The font size interlostation is linear.
- **bg_gp** Graphic parameters for controlling the background of word cloud annotations.

Value

A data frame with two columns: GO IDs and cluster labels.

See Also

- `simplifyGOFromMultipleLists` which performs simplifyGO analysis with multiple lists of GO IDs.

Examples

```r
set.seed(123)
go_id = random_GO(500)
mat = GO_similarity(go_id)
df = simplifyGO(mat, word_cloud_grob_param = list(max_width = 80))
head(df)
```
simplifyGOFromMultipleLists

Perform simplifyGO analysis with multiple lists of GO IDs

Description

Perform simplifyGO analysis with multiple lists of GO IDs

Usage

simplifyGOFromMultipleLists(lt, go_id_column = NULL, padj_column = NULL, padj_cutoff = 1e-2, filter = function(x) any(x < padj_cutoff), default = 1, ont = NULL, db = 'org.Hs.eg.db', measure = "Rel", heatmap_param = list(NULL), show_barplot = TRUE, method = "binary_cut", control = list(), min_term = NULL, verbose = TRUE, column_title = NULL, ...)

Arguments

lt
A data frame, a list of numeric vectors (e.g. adjusted p-values) where each numeric vector has GO IDs as names, or a list of GO IDs.
go_id_column
Column index of GO ID if lt contains a list of data frames.
padj_column
Column index of adjusted p-values if lt contains a list of data frames.
padj_cutoff
Cut off for adjusted p-values
filter
A self-defined function for filtering GO IDs. By default it requires GO IDs should be significant in at least one list.
default
The default value for the adjusted p-values. See Details.
ont
GO ontology. Value should be one of "BP", "CC" or "MF". If it is not specified, the function automatically identifies it by random sampling 10 IDs from go_id (see guess_ont).
db
Annotation database. It should be from https://bioconductor.org/packages/3.10/BiocViews.html#_OrgDb
measure
Semantic measure for the GO similarity, pass to termSim.
heatmap_param
Parameters for controlling the heatmap, see Details.
show_barplot
Whether draw barplots which shows numbers of significant GO terms in clusters.
method
Pass to simplifyGO.
control
Pass to simplifyGO.
min_term
Pass to simplifyGO.
verbose
Pass to simplifyGO.
column_title
Pass to simplifyGO.
...
Details

The input data can have three types of formats:

- A list of numeric vectors of adjusted p-values where each vector has the GO IDs as names.
- A data frame. The column of the GO IDs can be specified with go_id_column argument and the column of the adjusted p-values can be specified with padj_column argument. If these columns are not specified, they are automatically identified. The GO ID column is found by checking whether a column contains all GO IDs. The adjusted p-value column is found by comparing the column names of the data frame to see whether it might be a column for adjusted p-values. These two columns are used to construct a numeric vector with GO IDs as names.
- A list of character vectors of GO IDs. In this case, each character vector is changed to a numeric vector where all values take 1 and the original GO IDs are used as names of the vector.

Now let's assume there are \( n \) GO lists, we first construct a global matrix where columns correspond to the \( n \) GO lists and rows correspond to the "union" of all GO IDs in the lists. The value for the \( i \)th GO ID and in the \( j \)th list are taken from the corresponding numeric vector in \( lt \). If the \( j \)th vector in \( lt \) does not contain the \( i \)th GO ID, the value defined by default argument is taken there (e.g. in most cases the numeric values are adjusted p-values, default is set to 1). Let's call this matrix as \( M_0 \).

Next step is to filter \( M_0 \) so that we only take a subset of GO IDs of interest. We define a proper function via argument filter to remove GO IDs that are not important for the analysis. Functions for filter is applied to every row in \( M_0 \) and filter function needs to return a logical value to decide whether to remove the current GO ID. For example, if the values in \( lt \) are adjusted p-values, the filter function can be set as \( \text{function}(x) \ any(x < \text{padj_cutoff}) \) so that the GO ID is kept as long as it is significant in at least one list. After the filter, let's call the filtered matrix \( M_1 \).

GO IDs in \( M_1 \) (row names of \( M_1 \)) are used for clustering. A heatmap of \( M_1 \) is attached to the left of the GO similarity heatmap so that the group-specific (or list-specific) patterns can be easily observed and corresponded to GO functions.

Argument heatmap_param controls several parameters for heatmap \( M_1 \):

- **transform**: A self-defined function to transform the data for heatmap visualization. The most typical case is to transform adjusted p-values by \( -\log_{10}(x) \).
- **breaks**: break values for color interpolation.
- **col**: The corresponding values for breaks.
- **labels**: The corresponding labels.
- **name**: Legend title.

Examples

```r
# perform functional enrichment on the signatures genes from cola analysis
require(cola)
require(hu6800.db)
data(golub_cola)
res = golub_cola["ATC:skmeans"]
require(hu6800.db)
```
```r
x = hu6800ENTREZID
mapped_probes = mappedkeys(x)
id_mapping = unlist(as.list(x[mapped_probes]))
lt = functional_enrichment(res, k = 3, id_mapping = id_mapping) # you can check the value of `lt`

# a list of data frames
simplifyGOFromMultipleLists(lt, padj_cutoff = 0.001)

# a list of numeric values
lt2 = lapply(lt, function(x) structure(x$p.adjust, names = x$ID))
simplifyGOFromMultipleLists(lt2, padj_cutoff = 0.001)

# a list of GO IDS
lt3 = lapply(lt, function(x) x$ID[x$p.adjust < 0.001])
simplifyGOFromMultipleLists(lt3)
```

---

subset_enrichResult  Subset method of the enrichResult class

**Description**

Subset method of the enrichResult class

**Usage**

```r
subset_enrichResult(x, i)
```

**Arguments**

- **x**: A enrichResult object from `clusterProfiler` or other related packages.
- **i**: Row indices.

**Value**

Still a enrichResult object but with the selected subset of rows.

**Examples**

```r
# There is no example
NULL
```
summarizeGO

**Description**

A simplified way to visualize enrichment in GO clusters

**Usage**

```r
summarizeGO(go_id, value = NULL, aggregate = mean, method = "binary_cut", control = list(), verbose = TRUE, axis_label = "Value", title = "", legend_title = axis_label, min_term = round(nrow(mat)*0.01), stat = "pvalue", min_stat = ifelse(stat == "count", 5, 0.05), exclude_words = character(0), max_words = 6, word_cloud_grob_param = list(), fontsize_range = c(4, 16), bg_gp = gpar(fill = "#DDDDDD", col = "#AAAAAA")
)
```

**Arguments**

- **go_id**: A vector of GO IDs.
- **value**: A list of numeric value associate with `go_id`. We suggest to use `-log10(p.adjust)` or `-log2(fold enrichment)` as the values.
- **aggregate**: Function to aggregate values in each GO cluster.
- **method**: Method for clustering the matrix. See `cluster_terms`.
- **control**: A list of parameters for controlling the clustering method, passed to `cluster_terms`.
- **verbose**: Whether to print messages.
- **axis_label**: X-axis label.
- **title**: Title for the whole plot.
- **legend_title**: Title for the legend.
- **min_term**: Minimal number of functional terms in a cluster. All the clusters with size less than `min_term` are all merged into one separated cluster in the heatmap.
- **stat**: Type of value for mapping to the font size of keywords in the word clouds. There are two options: "count": simply number of keywords; "pvalue": enrichment on keywords is performed (by fisher’s exact test) and `-log10(pvalue)` is used to map to font sizes.
- **min_stat**: Minimal value for `stat` for selecting keywords.
- **exclude_words**: Words that are excluded in the word cloud.
**term_similarity**

- **max_words**: Maximal number of words visualized in the word cloud.
- **word_cloud_grob_param**: A list of graphic parameters passed to `word_cloud_grob`.
- **fontsize_range**: The range of the font size. The value should be a numeric vector with length two. The font size interpolation is linear.
- **bg_gp**: Graphics parameters for controlling word cloud annotation background.

**Details**

There are several other ways to specify GO IDs and the associated values.

1. specify `value` as a named vector where GO IDs are the names.
2. specify `value` as a list of numeric named vectors. In this case, `value` contains multiple enrichment results.

**Examples**

```r
# There is no example
NULL
```

---

**term_similarity**

*Similarity between terms based on the overlap of genes*

**Description**

Similarity between terms based on the overlap of genes

**Usage**

```r
term_similarity(gl, method = c("kappa", "jaccard", "dice", "overlap"), all = NULL, remove_negative = TRUE)
```

**Arguments**

- **gl**: A list of genes that are in the terms.
- **method**: The similarity measurement.
- **all**: The universe set.
- **remove_negative**: If the value is negative, reset to zero

**Details**

The definition of the four similarity measurements can be found at [https://jokergoo.github.io/simplifyEnrichment_supplementary/supplS01_coefficient_definition/supplS01_coefficient_definition.html](https://jokergoo.github.io/simplifyEnrichment_supplementary/supplS01_coefficient_definition/supplS01_coefficient_definition.html).

**Value**

A symmetric matrix.
term_similarity_from_enrichResult

Examples

# There is no example
NULL

term_similarity_from_enrichResult

Similarity between terms in the enrichResult class

Description

Similarity between terms in the enrichResult class

Usage

term_similarity_from_enrichResult(x, ...)

Arguments

x            A enrichResult object from 'clusterProfiler' or other related packages.
...          Pass to term_similarity.

Details

The object is normally from the 'clusterProfiler', 'DOSE', 'meshes' or 'ReactomePA' package.

Value

A symmetric matrix.

Examples

# There is no example
NULL
term_similarity_from_gmt

*Similarity between terms from a gmt file*

**Description**
Similarity between terms from a gmt file

**Usage**
term_similarity_from_gmt(term_id, gmt, extract_term_id = NULL, ...)

**Arguments**
- `term_id`: A vector of terms.
- `gmt`: The path of the gmt file.
- `extract_term_id`: If the term ID in the first column only as a substring, setting a function to extract this substring.
- `...`: Pass to `term_similarity`.

**Value**
A symmetric matrix.

**Examples**
```
# There is no example
NULL
```

------------------

term_similarity_from_KEGG

*Similarity between KEGG terms*

**Description**
Similarity between KEGG terms

**Usage**
term_similarity_from_KEGG(term_id, ...)

------------------
Arguments

term_id A vector of KEGG IDs, e.g., hsa001.
... Pass to `term_similarity`.

Value

A symmetric matrix.

Examples

# There is no example
NULL
term_similarity_from_Reactome

*Similarity between Reactome terms*

**Description**

Similarity between Reactome terms

**Usage**

```
term_similarity_from_Reactome(term_id, ...)
```

**Arguments**

- `term_id` A vector of Reactome IDs.
- `...` Pass to `term_similarity`.

**Value**

A symmetric matrix.

**Examples**

```r
# There is no example
NULL
```

---

widthDetails.word_cloud

*Width for word_cloud grob*

**Description**

Width for word_cloud grob

**Usage**

```
# S3 method for class 'word_cloud'
widthDetails(x)
```

**Arguments**

- `x` The word_cloud grob returned by `word_cloud_grob`.

**Value**

A `unit` object.
word_cloud_grob

Examples

# There is no example
NULL

---

word_cloud_grob A simple grob for the word cloud

Description

A simple grob for the word cloud

Usage

word_cloud_grob(text, fontsize,
line_space = unit(4, "pt"), word_space = unit(4, "pt"), max_width = unit(80, "mm"),
col = function(fs) circlize::rand_color(length(fs), luminosity = "dark"),
add_new_line = FALSE, test = FALSE)

Arguments

text A vector of words.
fontsize The corresponding font size. With the frequency of the words known, scale_fontsize can be used to linearly interpolate frequencies to font sizes.
line_space Space between lines. The value can be a unit object or a numeric scalar which is measured in mm.
word_space Space between words. The value can be a unit object or a numeric scalar which is measured in mm.
max_width The maximal width of the viewport to put the word cloud. The value can be a unit object or a numeric scalar which is measured in mm. Note this might be larger than the final width of the returned grob object.
col Colors for the words. The value can be a vector, in numeric or character, which should have the same length as text. Or it is a self-defined function that takes the font size vector as the only argument. The function should return a color vector. See Examples.
add_new_line Whether to add new line after every word? If TRUE, each word will be in a separated line.
test Internally used. It basically adds borders to the words and the viewport.

Value

A grob object. The width and height of the grob can be get by grobWidth and grobHeight.
Examples

# very old R versions do not have strrep() function
if(!exists("strrep")) {
  strrep = function(x, i) paste(rep(x, i), collapse = "")
}
words = sapply(1:30, function(x) strrep(sample(letters, 1), sample(3:10, 1)))
require(grid)
gb = word_cloud_grob(words, fontsize = runif(30, min = 5, max = 30),
                      max_width = 100)
grid.newpage(); grid.draw(gb)

# color as a single scalar
gb = word_cloud_grob(words, fontsize = runif(30, min = 5, max = 30),
                      max_width = 100, col = 1)
grid.newpage(); grid.draw(gb)

# color as a vector
gb = word_cloud_grob(words, fontsize = runif(30, min = 5, max = 30),
                      max_width = 100, col = 1:30)
grid.newpage(); grid.draw(gb)

# color as a function
require(circlize)
col_fun = colorRamp2(c(5, 17, 30), c("blue", "black", "red"))
gb = word_cloud_grob(words, fontsize = runif(30, min = 5, max = 30),
                      max_width = 100, col = function(fs) col_fun(fs))
grid.newpage(); grid.draw(gb)
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