

Package ‘ontologyPlot’

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Type Package

Title Visualising Sets of Ontological Terms

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Description Create R plots visualising ontological terms and the relationships between them with various graphical options - Greene et al. 2017 <[doi:10.1093/bioinformatics/btw763](https://doi.org/10.1093/bioinformatics/btw763)>.

License GPL (>= 2)

Depends R (>= 3.0.0)

Imports methods, ontologyIndex, paintmap, Rgraphviz

Suggests knitr, rmarkdown

VignetteBuilder knitr

RoxygenNote 7.1.1

NeedsCompilation no

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| | |
|-----------------|---|
| annotation_grid | <i>Get logical matrix of term annotation for group of cases</i> |
|-----------------|---|

Description

Get logical matrix of term annotation for group of cases

Usage

```
annotation_grid(ontology, term_sets, all_terms = grid_terms(ontology,
  term_sets), remove_unanimous = FALSE, cluster_rows = TRUE,
  cluster_cols = TRUE)
```

Arguments

| | |
|------------------|---|
| ontology | ontology_index object |
| term_sets | List of character vectors of ontological term IDs |
| all_terms | Character vector giving terms to use in annotation. |
| remove_unanimous | Logical value determining whether to remove terms present in all term_sets. |
| cluster_rows | Logical value rows determining whether to use hclust to cluster term_sets. |
| cluster_cols | Logical value rows determining whether to use hclust to cluster terms (based on correlation of inclusion in term_sets). |

Value

Logical matrix.

calibrate_sizes *Function to scale values between two given limits*

Description

Could be useful to modify a vector of sizes to between, say 1 and 3, before passing to 'onto_plot'.

Usage

```
calibrate_sizes(x, high, low)
```

Arguments

| | |
|------|--------------------------------|
| x | Numeric vector |
| high | Numeric value of largest size |
| low | Numeric value of smallest size |

Value

Numeric vector

Examples

```
calibrate_sizes(c("HP:0000001"=10, "HP:0000006"=5), high=3, low=1)
```

colour_by_frequency *Function to assign colours to terms based on frequency with which terms appear in term_sets*

Description

Function to assign colours to terms based on frequency with which terms appear in term_sets

Usage

```
colour_by_frequency(ontology, terms, term_sets,  
  colour_func = colorRampPalette(c("Yellow", "Green", "#0099FF")))
```

Arguments

| | |
|-------------|--|
| ontology | ontology_index object |
| terms | Character vector of ontological terms |
| term_sets | List of character vectors of ontological term IDs |
| colour_func | Function capable of returning a set of colours, given the number of colours it needs to return |

Value

Character vector of colours, named by term

See Also

[colour_by_term_set](#), [colour_by_population_frequency](#)

colour_by_population_frequency

Function to assign colours to terms based on population frequency of terms

Description

Function to assign colours to terms based on population frequency of terms

Usage

```
colour_by_population_frequency(ontology, terms, frequencies,
  colour_palette = colorRampPalette(c("Yellow", "Green", "#0099FF"))(10),
  max_colour_freq = max(terms_freq), min_colour_freq = min(terms_freq))
```

Arguments

| | |
|-----------------|--|
| ontology | ontology_index object |
| terms | Character vector of ontological terms |
| frequencies | Numeric vector of term frequencies named by term IDs |
| colour_palette | Character vector of colours for the different information contents of the terms to be plotted, going from rare to common |
| max_colour_freq | Numeric value in [0, 1] giving the maximum frequency (to which the duldest color will be assigned) |
| min_colour_freq | Numeric value in [0, 1] giving the minimum frequency (to which the brightest color will be assigned) |

Value

Character vector of colours, named by term

See Also

[colour_by_term_set](#), [colour_by_frequency](#)

colour_by_term_set *Function to set colours of nodes in plot to distinguish terms belonging to different term sets*

Description

Function to set colours of nodes in plot to distinguish terms belonging to different term sets

Usage

```
colour_by_term_set(ontology, terms, term_sets, colour_generator = rainbow,  
alpha = 0.5)
```

Arguments

| | |
|------------------|--|
| ontology | ontology_index object |
| terms | Character vector of ontological terms |
| term_sets | List of character vectors of ontological term IDs |
| colour_generator | Function which returns a vector of colours, e.g. rainbow or heat.colors. |
| alpha | alpha parameter to pass to colour_generator. |

Value

Character vector of colours, named by term.

See Also

[colour_by_frequency](#), [colour_by_population_frequency](#)

| | |
|------------|---|
| dot_string | ontology_plot <i>object to dot string</i> |
|------------|---|

Description

ontology_plot object to dot string

Usage

```
dot_string(ontology_plot)
```

Arguments

ontology_plot Object of class 'ontology_plot' to export.

Value

String

See Also

[onto_plot](#)

| | |
|----------------------|---|
| get_adjacency_matrix | <i>Get an adjacency matrix for a set of ontological terms</i> |
|----------------------|---|

Description

Get an adjacency matrix for a set of ontological terms

Usage

```
get_adjacency_matrix(ontology, terms)
```

Arguments

| | |
|----------|---------------------------------------|
| ontology | ontology_index object |
| terms | Character vector of ontological terms |

Value

A logical matrix representing the adjacency matrix of terms based on the directed acyclic graph of ontology. A TRUE entry means the term corresponding to the column is a parent of the row term in ontology.

See Also

[get_pseudo_adjacency_matrix](#)

Examples

```
library(ontologyIndex)
data(hpo)
get_adjacency_matrix(hpo, c("HP:0000118", "HP:0001873", "HP:0011877"))
```

get_node_friendly_long_names

Split up node labels across lines so they fit in nodes better

Description

Split up node labels across lines so they fit in nodes better

Usage

```
get_node_friendly_long_names(ontology, terms, official_names = FALSE)
```

Arguments

| | |
|----------------|--|
| ontology | ontology_index object |
| terms | Character vector of ontological terms |
| official_names | Logical value indicating whether to use the exact names from the ontology. Otherwise, shortened, capitalised names are used. |

Value

Character vector.

Examples

```
library(ontologyIndex)
data(hpo)
get_node_friendly_long_names(hpo, c("HP:0001873", "HP:0011877"))
```

get_ontology_plot *Get ontology_plot object*

Description

Function to create ontology_plot objects where all graphical parameters to be used must be specified.

Usage

```
get_ontology_plot(ontology, terms, edge_attributes = list(color = "#000000",
  lty = "solid"), ...)
```

Arguments

| | |
|-----------------|---|
| ontology | ontology_index object |
| terms | Character vector of ontological terms |
| edge_attributes | List of properties to set for arrows (note, these properties will be used for all arrow). |
| ... | Named graphical parameters. These must either be vectors of values the same length as terms, or of length 1 if they should be used for all terms. |

Value

ontology_plot object.

get_pseudo_adjacency_matrix
Get an adjacency matrix for a set of ontological terms

Description

Get an adjacency matrix for a set of ontological terms

Usage

```
get_pseudo_adjacency_matrix(ontology, terms)
```

Arguments

| | |
|----------|---------------------------------------|
| ontology | ontology_index object |
| terms | Character vector of ontological terms |

Value

A logical matrix representing the adjacency matrix of terms based on the directed acyclic graph of ontology. A TRUE entry means the term corresponding to the column is a parent of the row term within terms.

See Also

[get_adjacency_matrix](#)

Examples

```
library(ontologyIndex)
data(hpo)
get_pseudo_adjacency_matrix(hpo, c("HP:0000118", "HP:0001873", "HP:0011877"))
```

| | |
|---------------------|--|
| get_shortened_names | <i>Get human readable, shortened (where possible) ontological term names</i> |
|---------------------|--|

Description

Get human readable, shortened (where possible) ontological term names

Usage

```
get_shortened_names(ontology, terms)
```

Arguments

| | |
|----------|---------------------------------------|
| ontology | ontology_index object |
| terms | Character vector of ontological terms |

Value

Character vector

Examples

```
library(ontologyIndex)
data(hpo)
get_shortened_names(hpo, c("HP:0001873", "HP:0011877"))
```

| | |
|------------|---|
| grid_terms | <i>Get set of HPO terms appropriate for showing in a grid</i> |
|------------|---|

Description

Get set of HPO terms appropriate for showing in a grid

Usage

```
grid_terms(ontology, term_sets)
```

Arguments

| | |
|-----------|---|
| ontology | ontology_index object |
| term_sets | List of character vectors of ontological term IDs |

Value

Character vector of terme IDs.

| | |
|--------------------|--|
| label_by_frequency | <i>Function to get plot labels for terms based on frequency in term_sets</i> |
|--------------------|--|

Description

Function to get plot labels for terms based on frequency in term_sets

Usage

```
label_by_frequency(ontology, terms, term_sets)
```

Arguments

| | |
|-----------|---|
| ontology | ontology_index object |
| terms | Character vector of ontological terms |
| term_sets | List of character vectors of ontological term IDs |

Value

Character vector of labels, named by term.

See Also

[simple_labels](#), [long_labels](#)

| | |
|-------------------|--|
| label_by_term_set | <i>Function to label nodes by term_set</i> |
|-------------------|--|

Description

Function to label nodes by term_set

Usage

```
label_by_term_set(ontology, terms, term_sets)
```

Arguments

| | |
|-----------|---|
| ontology | ontology_index object |
| terms | Character vector of ontological terms |
| term_sets | List of character vectors of ontological term IDs |

Value

Character vector of colours, named by term.

See Also

[simple_labels](#), [label_by_frequency](#), [long_labels](#)

| | |
|-------------|---|
| long_labels | <i>Function to assign detailed node labels to terms</i> |
|-------------|---|

Description

Label includes term ID, term name, number of instances of term amongst term_sets and percentage frequency in population.

Usage

```
long_labels(ontology, terms, term_sets, frequencies)
```

Arguments

| | |
|-------------|--|
| ontology | ontology_index object |
| terms | Character vector of ontological terms |
| term_sets | List of character vectors of ontological term IDs |
| frequencies | Numeric vector of term frequencies named by term IDs |

Value

Character vector of labels, named by term.

See Also

[simple_labels](#), [label_by_frequency](#), [label_by_term_set](#)

n_most_frequent_terms *Select n most prevalent terms in term_sets*

Description

Selects n most prevalent terms in set of term sets/annotations including implicit terms. If more than one term are tied at the nth position, all terms are included in the result.

Usage

```
n_most_frequent_terms(ontology, term_sets, n,  
  terms = unique(unlist(term_sets)))
```

Arguments

| | |
|-----------|---|
| ontology | ontology_index object |
| term_sets | List of character vectors of ontological term IDs |
| n | Integer |
| terms | Character vector of ontological terms |

Value

Character vector of length at most n

See Also

[remove_terms_with_less_than_n_occurrences](#)

Examples

```
library(ontologyIndex)  
data(hpo)  
n_most_frequent_terms(hpo, c("HP:0001873"),  
  list(term_sets=list("HP:0001873", "HP:0001902")), n=2)
```

| | |
|-----------------|-------------------------------------|
| official_labels | <i>Get official names for terms</i> |
|-----------------|-------------------------------------|

Description

Get official names for terms

Usage

```
official_labels(ontology, terms)
```

Arguments

| | |
|----------|---------------------------------------|
| ontology | ontology_index object |
| terms | Character vector of ontological terms |

Value

Character vector of labels, named by term.

See Also

[simple_labels](#)

| | |
|--------------|--|
| ontologyPlot | <i>Functions for Visualising Sets of Ontological Terms</i> |
|--------------|--|

Description

Functions for visualising sets of ontological terms using the ‘graphviz’ layout system.

Details

| | |
|----------|--------------|
| Package: | ontologyPlot |
| Type: | Package |
| Version: | 1.0 |
| Date: | 2016-01-11 |
| License: | GPL (>= 2) |

This package succeeds the package hpoPlot with an improved interface and focusing on general ontologies. The key function is [onto_plot](#), which creates an object of class ontology_plot which can be displayed as a graph or exported to dot format.

Author(s)

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References

Greene D, Richardson S, Turro E (2017). ‘ontologyX: a suite of R packages for working with ontological data. *_Bioinformatics_*, 33(7), 1104–1106.

‘The Human Phenotype Ontology project: linking molecular biology and disease through phenotype data’, *Nucl. Acids Res.* (1 January 2014) 42 (D1): D966-D974 doi:10.1093/nar/gkt1026 Westbury, S. K. et al. (2015). Human Phenotype Ontology annotation and cluster analysis to unravel genetic defects in 707 cases with unexplained bleeding and platelet disorders. *Genome Medicine*. 7 (2015)

onto_plot

Get ontology_plot object

Description

A convenience wrapper for the [get_ontology_plot](#) function, enabling functions to be passed to generate graphical parameters for terms automatically.

Usage

```
onto_plot(ontology, term_sets = NULL, frequencies = NULL,
  terms = remove_uninformative_terms(ontology, term_sets),
  edge_attributes = list(color = "#000000", lty = "solid"),
  fillcolor = "powderblue", label = simple_labels, color = "transparent",
  width = 0.75, fontsize = 30, style = "filled", fixedsize = "true",
  shape = "circle", ...)
```

Arguments

| | |
|-----------------|--|
| ontology | ontology_index object |
| term_sets | List of character vectors of ontological term IDs |
| frequencies | Numeric vector of term frequencies named by term IDs |
| terms | Character vector of ontological terms |
| edge_attributes | List of properties to set for arrows (note, these properties will be used for all arrow). |
| fillcolor | Character vector of colours to fill nodes corresponding to terms with. Alternatively a function to set the colours of the nodes in the graph based on term_sets. |
| label | Character vector of labels (or function to set them). |

| | |
|-----------|---|
| color | Character vector of colours for borders of nodes representing terms (or function to set them). |
| width | Numeric vector of widths for nodes (of function to set them). |
| fontsize | Numeric vector of font sizes for the text to be placed in the nodes (or function to set them). |
| style | Display style for nodes, defaults to "filled". |
| fixedsize | Character indicating whether nodes should be fixed size, "true", or adjusted to fit around the contained text, "false". |
| shape | Character vector of shape names for nodes (or function to set them). Defaults to "circle". |
| ... | Other node attributes for dot format. |

Value

ontology_plot object.

See Also

[get_ontology_plot](#), [write_dot](#)

Examples

```
library(ontologyIndex)
data(hpo)
hpo_phenotypes <- c(
  A=c("HP:0001382", "HP:0004272", "HP:0007917", "HP:0004912", "HP:0001596"),
  B=c("HP:0001382", "HP:0004272", "HP:0002165", "HP:0004800", "HP:0004912"),
  C=c("HP:0004800", "HP:0001382", "HP:0004912", "HP:0007917", "HP:0008743"),
  D=c("HP:0001257", "HP:0001382", "HP:0007917", "HP:0012623", "HP:0002165"),
  E=c("HP:0007917", "HP:0004800", "HP:0004272", "HP:0001596", "HP:0002165")
)

onto_plot(
  ontology=hpo,
  term_sets=hpo_phenotypes
)
```

plot.ontology_plot *Plotting function for ontology_plot object*

Description

Plotting function for ontology_plot object

Usage

```
## S3 method for class 'ontology_plot'
plot(x, ...)
```

Arguments

x Object of class ontologicalPlot.
 ... Other options passed to plot().

Value

Nothing, side-effect: plots a graph.

plot_annotation_grid *Plot a logical matrix of term annotation*

Description

Plot a logical matrix of term annotation

Usage

```
plot_annotation_grid(..., on_colour = "#FF0000FF", off_colour = "#FFFFBFFF")
```

Arguments

... Arguments to be passed to [annotation_grid](#).
 on_colour Colour to use to show presence of term.
 off_colour Colour to use to show absence of term.

Value

Plots heatmap.

print.ontology_plot *Print function for ontology_plot object*

Description

Print function for ontology_plot object

Usage

```
## S3 method for class 'ontology_plot'  
print(x, ...)
```

Arguments

x Object of class ontologicalPlot.
 ... Other options passed to be passed to plot().

Value

Nothing. Side-effect: plots graphs.

p_values_for_occurrence_of_term_in_group

Get p-values for observing at least as many of each term as occur in term_sets given the population frequencies of the terms

Description

Get p-values for observing at least as many of each term as occur in term_sets given the population frequencies of the terms

Usage

`p_values_for_occurrence_of_term_in_group(ontology, term_sets, terms_freq)`

Arguments

- `ontology` `ontology_index` object
- `term_sets` List of character vectors of ontological term IDs
- `terms_freq` Numeric vector of population frequencies of terms.

Value

Numeric vector of log p-values named by corresponding term.

See Also

[width_by_significance](#)

`remove_links`

Remove terms which just link two other terms together in a subontology

Description

Remove terms which just link two other terms together in a subontology

Usage

`remove_links(ontology, terms, hard = FALSE)`

Arguments

| | |
|----------|--|
| ontology | ontology_index object |
| terms | Character vector of ontological terms |
| hard | Logical value determining whether to multiple edges to leaf terms are kept - <code>`hard=FALSE`</code> , or removed - <code>`hard=TRUE`</code> . |

Value

Character vector.

See Also

[remove_uninformative_terms](#)

Examples

```
library(ontologyIndex)
data(hpo)
remove_links(hpo, c("HP:0001873", "HP:0001872", "HP:0011873", "HP:0011877"))
```

remove_terms_with_less_than_n_occurrences

Remove terms with less than certain number of occurrences

Description

Remove terms with less than certain number of occurrences

Usage

```
remove_terms_with_less_than_n_occurrences(ontology, term_sets, n,
  terms = unique(unlist(term_sets)))
```

Arguments

| | |
|-----------|---|
| ontology | ontology_index object |
| term_sets | List of character vectors of ontological term IDs |
| n | Integer |
| terms | Character vector of ontological terms |

Value

Character vector

See Also

[n_most_frequent_terms](#)

Examples

```
library(ontologyIndex)
data(hpo)
remove_terms_with_less_than_n_occurrences(hpo,
term_sets=list("HP:0001873", "HP:0001902"), n=2)
```

remove_uninformative_terms

Remove uninformative terms from union of all terms in set of annotations

Description

For a set of ontological annotation sets, remove terms annotated to the same objects as all their children. Useful for selecting terms for summarising a set of annotation sets, as it can lead to a significant reduction in the number of terms.

Usage

```
remove_uninformative_terms(ontology, term_sets)
```

Arguments

| | |
|-----------|---|
| ontology | ontology_index object |
| term_sets | List of character vectors of ontological term IDs |

Value

Character vector of terms

Examples

```
library(ontologyIndex)
data(hpo)
remove_uninformative_terms(hpo, list(Patient1=c("HP:0001873", "HP:0000118")))
```

simple_cap *Capitalise words in character vector*

Description

Capitalise words in character vector

Usage

```
simple_cap(x)
```

Arguments

x Character vector

Value

Character vector

Examples

```
simple_cap(c("a simple test", "Another-test"))
```

simple_labels *Get simplified labels for terms*

Description

Get simplified labels for terms

Usage

```
simple_labels(ontology, terms)
```

Arguments

ontology ontology_index object
terms Character vector of ontological terms

Value

Character vector of labels, named by term.

See Also

[official_labels](#)

| | |
|---------------|--|
| to_svg_string | <i>Convert ontology_plot to SVG string</i> |
|---------------|--|

Description

Note that by setting "id" and "class" attributes it enables nodes to be selected for manipulation using Javascript if interactivity is desired.

Usage

```
to_svg_string(op)
```

Arguments

| | |
|----|--------------------------------|
| op | Object of class ontology_plot. |
|----|--------------------------------|

Value

Character vector of length 1 containing SVG representation of node.

See Also

[onto_plot](#), [get_ontology_plot](#)

| | |
|--------------------|---|
| width_by_frequency | <i>Function to get node sizes for terms based on frequency in term_sets</i> |
|--------------------|---|

Description

Function to get node sizes for terms based on frequency in term_sets

Usage

```
width_by_frequency(ontology, terms, term_sets)
```

Arguments

| | |
|-----------|---|
| ontology | ontology_index object |
| terms | Character vector of ontological terms |
| term_sets | List of character vectors of ontological term IDs |

Value

Character vector of sizes, named by term

See Also

[width_by_significance](#)

`width_by_significance` *Function to get node sizes for terms based on statistical significance of seeing at least this number of each term in term_sets*

Description

Function to get node sizes for terms based on statistical significance of seeing at least this number of each term in term_sets

Usage

```
width_by_significance(ontology, terms, term_sets, frequencies)
```

Arguments

| | |
|--------------------------|--|
| <code>ontology</code> | ontology_index object |
| <code>terms</code> | Character vector of ontological terms |
| <code>term_sets</code> | List of character vectors of ontological term IDs |
| <code>frequencies</code> | Numeric vector of term frequencies named by term IDs |

Value

Character vector of sizes, named by term

See Also

[width_by_frequency](#)

`write_dot` *Export ontology_plot object as dot file*

Description

Export ontology_plot object as dot file

Usage

```
write_dot(ontology_plot, file)
```

Arguments

| | |
|----------------------------|--|
| <code>ontology_plot</code> | Object of class 'ontology_plot' to export. |
| <code>file</code> | Character value of target file path. |

Value

Nothing, side effect - writes to file.

See Also

[dot_string](#)

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