Package: ontologyPlot (via r-universe)

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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>.

License GPL (>= 2)

Depends R (>= 3.0.0)

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Contents

`annotation_grid` *Get logical matrix of term annotation for group of cases*

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 dullest 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 object to dot string*

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 *Get an adjacency matrix for a set of ontological terms*

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

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 *Get set of HPO terms appropriate for showing in a grid*

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

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 *Function to label nodes by* term_set

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` *Function to assign detailed node labels to terms*

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 `n`th 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 *Get official names for terms*

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 *Functions for Visualising Sets of Ontological Terms*

Description

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

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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 un- ravel 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 correspnding 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 - `hard=FALSE`, or removed - `hard=TRUE`.

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 *Convert* ontology_plot *to SVG string*

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

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

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 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

ontology_plot	Object of class 'ontology_plot' to export.
file	Character value of target file path.

Value

Nothing, side effect - writes to file.

See Also

dot_string

Index