Package ‘ontologyPlot’

February 10, 2021

Type Package
Title Visualising Sets of Ontological Terms
Version 1.6
Date 2021-02-10
Author Daniel Greene <dg333@cam.ac.uk>
Maintainer Daniel Greene <dg333@cam.ac.uk>
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)
Imports methods, ontologyIndex, paintmap, Rgraphviz
Suggests knitr, rmarkdown
VignetteBuilder knitr
RoxygenNote 7.1.1
NeedsCompilation no
Repository CRAN
Date/Publication 2021-02-10 13:30:05 UTC

R topics documented:

  annotation_grid ........................................... 2
  calibrate_sizes ............................................ 3
  colour_by_frequency ...................................... 3
  colour_by_population_frequency ........................... 4
  colour_by_term_set ....................................... 5
  dot_string ................................................. 6
  get_adjacency_matrix .................................... 6
  get_node_friendly_long_names ............................ 7
  get_ontology_plot ........................................ 8
  get_pseudo_adjacency_matrix ............................. 8
  get_shortened_names ..................................... 9
annotation_grid

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).
calibrate_sizes

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

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)
**colour_by_term_set**

**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**

```r
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 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 corresponding to the column is a parent of the row term in ontology.
get_node_friendly_long_names

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**

```r
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**

```r
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**

```r
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**

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

**Arguments**

- `ontology`: ontology_index object
- `terms`: Character vector of ontological terms

**Value**

Character vector

**Examples**

```r
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
ontlogy ontology_index object
term_sets List of character vectors of ontological term IDs

Value
Character vector of term 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
```r
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
```r
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
n_most_frequent_terms

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  

*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.

**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)
Daniel Greene <dg333@cam.ac.uk>
Maintainer: Daniel Greene <dg333@cam.ac.uk>

References


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
ontolog_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
dge_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).
plot.ontology_plot

Arguments

- `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:0001596","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, ...)
print.ontology_plot

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

```r
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

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

Arguments

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

```r
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**

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

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

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

Description

Remove terms with less than certain number of occurrences

Usage

```r
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
remove_uninformative_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:000118"))))
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.
write_dot

Value

Nothing, side effect - writes to file.

See Also

dot_string
Index

* GO
  ontologyPlot, 13
* HPO
  ontologyPlot, 13
* MPO
  ontologyPlot, 13
* ontology
  ontologyPlot, 13

annotation_grid, 2, 16

calibrate_sizes, 3
colour_by_frequency, 3, 5
colour_by_population_frequency, 4, 4, 5
colour_by_term_set, 4, 5, 5
dot_string, 6, 23
get_adjacency_matrix, 6, 9
get_node_friendly_long_names, 7
get_ontology_plot, 8, 14, 15, 21
get_pseudo_adjacency_matrix, 7, 8
get_shortened_names, 9
grid_terms, 10

label_by_frequency, 10, 11, 12
label_by_term_set, 11, 12
long_labels, 10, 11, 11

n_most_frequent_terms, 12, 18

official_labels, 13, 20
onto_plot, 6, 13, 14, 21
ontologyPlot, 13

p_values_for_occurrence_of_term_in_group, 17
plot.ontology_plot, 15
plot_annotation_grid, 16
print.ontology_plot, 16

remove_links, 17

remove_terms_with_less_than_n_occurrences, 12, 18
remove_uninformative_terms, 18, 19

simple_cap, 20
simple_labels, 10–13, 20
to_svg_string, 21

width_by_frequency, 21, 22
width_by_significance, 17, 21, 22
write_dot, 15, 22