Package ‘rTRM’

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Maintainer Diego Diez <diego10ruiz@gmail.com>
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| rTRM-package | Identification transcription regulatory modules (TRMs) |

Description

This package identifies transcriptional regulatory modules (TRMs) from PPI networks.

Details
annotateFreq

Package: rTRM
Type: Package
Version: 1.0
Date: 2013-02-01
License: GPL-3

Author(s)
Diego Diez
Maintainer: Diego Diez <diego10ruiz@gmail.com>

Examples
getAnnotations()

annotateFreq                Annotate a graph with frequency of nodes/edges in other graphs.

Description
Returns an annotated graph with node size and edge width proportional at the number of occurrences of nodes/edges in a supplied list of graphs.

Usage
annotateFreq(g, graph_list)

Arguments
g        target graph to annotate.
graph_list    list of graph to extract information from.

Details
Commonly graph_list refers to a list of predicted TRMs (with findTRM) and g is the combined TRM. This function annotates the nodes/edges in g to known their frequency in the original list of graphs.

Author(s)
Diego Diez
### annotateModule

**Annotate a network module with information**

**Description**

Uses information about expression, enrichment and parent PPI network to annotate a subgraph.

**Usage**

`annotateModule(g, enrich, trm, targets, ppi, exprs, tfs)`

**Arguments**

- `g`: graph to annotate in igraph format.
- `enrich`: list of enriched transcription factors (or motifs).
- `trm`: TRM to compare with (to identify bridges).
- `targets`: list of target transcription factors (typically those with ChIP-seq data).
- `ppi`: parent PPI network (to check membership of nodes).
- `exprs`: list of entrezgene ids representing expressed genes.
- `tfs`: list of transcription factors.

**Author(s)**

Diego Diez

### annotateTRM

**Annotate a network object with information about clusters.**

**Description**

This function takes a network object and includes cluster information as piecolor attribute, suitable to be plotted with `plotTRM()`

**Usage**

`annotateTRM(g, target)`

**Arguments**

- `g`: a network object.
- `target`: target node (from `findTRM()`)

**Author(s)**

Diego Diez
**biogrid_hs**

---

| biogrid_hs | Network dataset of class 'igraph' |

**Description**

Human protein-protein interaction (PPI) dataset from the BioGRID database release.

**Usage**

```r
data(biogrid_hs)
```

**Format**

An igraph object.

**Author(s)**

Diego Diez

---

**biogrid_mm**

---

| biogrid_mm | Network dataset of class 'igraph' |

**Description**

Mouse protein-protein interaction (PPI) dataset from the BioGRID database.

**Usage**

```r
data(biogrid_mm)
```

**Format**

An igraph object.

**Author(s)**

Diego Diez
findTRM

Identifies a TRM associated with a target node and one or more query nodes.

Description

This the main function used to identify TRMs. It takes a graph object and use it to search in the neighborhood of a target node for query nodes that are separated a maximum distance (controlled by max.bridge parameter).

Usage

```r
findTRM(g, target, query, method = "nsa", max.bridge = 1, extended = FALSE, strict = FALSE, type = "igraph")
```

Arguments

- `g`: the network used to identify TRMs (typically a PPI network)
- `target`: character variable with the name of a target node.
- `query`: character vector with the list of query nodes.
- `method`: method to use.
- `max.bridge`: maximum number of nodes allowed between the target and query nodes.
- `extended`: whether to allow distance restrictions to include both target and query nodes.
- `strict`: whether to return a single component (using decompose.graph())
- `type`: type of graph object to return, either an "igraph" (the default) or a "graphNEL"

Details

Currently only "first" and "nsa" methods are available. First is used for tests and returns the first neighborhood of the target node. Method "nsa" implements the TRM finding algorithm.

Value

A network in igraph format or NULL.

Author(s)

Diego Diez

Examples

```r
# load example network.
load(system.file(package = "rTRM", "extra/example.rda"))

# define target and query nodes.
target = "N6"
query = c("N7", "N12", "N28")
```
# find TRM:
s = findTRM(g, target = target, query = query, method = "nsa", max.bridge = 1)

---

getAnnotations  

Obtain the 'pwm' table from the database, containing PWM's annotations.

### Description

Obtain the 'pwm' table from the database, containing PWM's annotations.

### Usage

```r
getAnnotations(filter, dbname = NULL)
```

### Arguments

- `filter`  
  one or more PWM ids.
- `dbname`  
  the location of the database (to load custom databases).

### Author(s)

Diego Diez

### Examples

```r
ann = getAnnotations()
```

---

getiBiogridData  

Downloads network data from BioGRID in TAB2 format.

### Description

This function is used to generate igraph network objects from BioGRID data. It downloads the database into a data.frame object that can be used later with processBiogrid().

### Usage

```r
getBiogridData(release)
```

### Arguments

- `release`  
  release of BioGRID to download.
getConcentricList

Details

The release to download must be specified as currently there is no way to download automatically the latests release.

Value

An data.frame object.

Author(s)

Diego Diez

getConcentricList  
Returns a list with nodes membership to be used in a graph with a concentric layout

Description

Specify target and enriched motifs and returns a list with circle membership. This information is used by layout.concentric to position the nodes in plots.

Usage

getConcentricList(g, t, e, max.size = 60, order.by = "label")

Arguments

g  graph to layout (extract the nodes).
t  list of target nodes (will go in the center).
e  list of enriched nodes (will go in the periphery).
max.size  maximum number of nodes per layer.
order.by  ordering attribute for list before split.

Author(s)

Diego Diez
getLargestComp

Gets the largest connected component

Description

Returns the largest connected component from a graph.

Usage

getLargestComp(g)

Arguments

- g: an igraph object.

Author(s)

Diego Diez

getMaps

Obtain the mapping between PWM and Entrez Gene identifiers.

Description

Obtain the mapping between PWM and Entrez Gene identifiers.

Usage

getMaps(filter, dbname = NULL)

Arguments

- filter: vector of PWMs to filter results.
- dbname

Author(s)

Diego Diez

Examples

getMaps()
getMatrices

Obtain a list of PWMs.

Description

Returns a list of PWMs, by default all the PWMs in the database. Alternativelly, filtered by the ids provided by filter.

Usage

getMatrices(filter, dbname = NULL)

Arguments

filter
  list of PWMs to filter results.
dbname

Author(s)

Diego Diez

Examples

pwms = getMatrices()

gemMotifsFromEntrezgene

Retrieve PWMs associated with genes provided as entrezgene identifiers.

Description

Retrieve PWMs associated with genes provided as entrezgene identifiers.

Usage

gemMotifsFromEntrezgene(e, organism)

Arguments

e
  vector of entrezgene identifiers to retrieve exitng PWMs.
organism
  target organism.

Author(s)

Diego Diez
getMotifsFromSymbol

Retrieve PWMs associated with genes provided as symbol.

Description
Retrieve PWMs associated with genes provided as symbol.

Usage
getMotifsFromSymbol(s, organism)

Arguments
s vector of gene symbols.
organism target organism.

Author(s)
Diego Diez

getOrthologFromMatrix
Obtain gene identifiers for a target organism associated with a list of PWMs.

Description
Obtain gene identifiers for a target organism associated with a list of PWMs.

Usage
getOrthologFromMatrix(filter, organism = "human", dbname = NULL)

Arguments
filter vector of matrices to filter results.
organism target organism.
dbname database- usually not need to specify.

Author(s)
Diego Diez
getOrthologs

Obtain the mapping to Entrez Gene identifiers in the given organism.

Description

Obtain the mapping to Entrez Gene identifiers in the given organism.

Usage

getOrthologs(filter, organism, dbname = NULL)

Arguments

filter entrezgene identifiers for the original mapping (PWM to gene). These can belong to diverse species and correspond to the "entrezgene" column obtained with getMaps() function.
organism target organisms, currently supported "human" and "mouse"
dbname

Details

If organism is not specified the entire table of orthologs (with all supported species) is returned.

Value

A data.frame object with ortholog information.

Author(s)

Diego Diez

Examples

getOrthologs(organism = "human")

getOrthologsFromBiomart

Returns ortholog genes for a target organism

Description

Returns ortholog genes for a target organism

Usage

getOrthologsFromBiomart(eg, target_org, mart)
getSequencesFromGenome

Arguments

eg list of entrezgene ids to obtain orthologs.
target_org target organism.
mart mart object.

Author(s)

Diego Diez

getSequencesFromGenome

Retrieves a set of sequences from a BSgenome object and optionally appends a label to each sequence id.

Description

This is just a wrapper to getSeq() in package Biostrings that facilitates adding a label to each sequence.

Usage

getSequencesFromGenome(BED, genome, append.id)

Arguments

BED file with peak locations in BED format.
genome a BSgenome object (e.g. Mmusculus)
append.id optional label to append to each sequence id.

Author(s)

Diego Diez
getSimilarityMatrix

Compute similarity matrix of list of graphs.

Description
This function computes pair-wise similarity based on common nodes (default) or edges between the graphs passed as a list.

Usage
getSimilarityMatrix(g_list, type = "edges")

Arguments
- g_list: list of graph objects.
- type: type of similarity, either node or edge (default).

Author(s)
Diego Diez

getTFclass

Return the ontology in the TFclass database associated with an entrezgene identifier

Description
Return the ontology in the TFclass database associated with an entrezgene identifier.

Usage
getTFclass(dbname = NULL)

Arguments
- dbname: SQLite file to use as database.

Author(s)
Diego Diez
getTFclassFromEntrezgene

Applies getTFclass sequentially to a vector of entrezgene identifiers.

Description

Applies getTFclass sequentially to a vector of entrezgene identifiers.

Usage

getTFclassFromEntrezgene(x, subset = "Class", tfclass, dbname = NULL)

Arguments

- **x**: vector of entrezgene identifiers.
- **subset**: level in the ontology (subset in TFclass terminology. By default "Class")
- **tfclass**: data.frame with tfclass data to pass to the recursive function.
- **dbname**: SQLite file to use as database.

Author(s)

Diego Diez

getTFterms

Get terms associated with a specified TFclass subset.

Description

Returns a vector of names (not ids) with the members of a particular subset in the TFclass database. By default it returns the Class subset.

Usage

getTFterms(subset = "Class", dbname = NULL)

Arguments

- **subset**: a subset in TFclass (default Class).
- **dbname**: SQLite file to use as database.

Author(s)

Diego Diez
initBiomart  
*Initializes mart objects to identify ortholog genes*

Description

Initializes mart objects to identify ortholog genes

Usage

```r
initBiomart(filter, biomart = "ensembl", host)
```

Arguments

- `filter`: list of supported organisms
- `biomart`: host
- `host`:

Author(s)

Diego Diez

layout.arc  
*Layouts a graph using arcs.*

Description

Generates a layout for graphs that places in the center the target transcription factors, in the sides the enriched transcription factors and in between of them the bridge proteins.

Usage

```r
layout.arc(g, target, query)
```

Arguments

- `g`: the graph object to layout.
- `target`: list of target nodes (typically target transcription factors.)
- `query`: list of query nodes (typically enriched transcription factors.)

Value

A matrix with the x and y locations of each node in the target graph.

Author(s)

Diego Diez
**layout.concentric**

Generates a concentric layout for graphs

---

**Description**

Generates a matrix with x,y coordinates for each node in a target graph, which layouts the nodes using concentric circles.

**Usage**

```r
layout.concentric(g, concentric = NULL, radius = NULL, order.by)
```

**Arguments**

- **g**: graph (igraph) to layout.
- **concentric**: list with the components of each layer.
- **radius**: radius of each layer.
- **order.by**: graph attributes to order nodes by.

**Author(s)**

Diego Diez

---

**plotDegree**

Plot degree distribution for network nodes

---

**Description**

Plots the degree distribution and fits a power law, returning in the legend the values of the fitted parameters.

**Usage**

```r
plotDegree(g)
```

**Arguments**

- **g**: igraph object

**Author(s)**

Diego Diez
plotGraph

Plot an graph in igraph format.

Description

This function plots graphs of the class igraph.

Usage

plotGraph(g, layout = layout.fruchterman.reingold, mar = .5, vertex.pch = 21, vertex.cex, vertex.col, vertex.bg, ... = TRUE, label.col, label.cex, label.pos = NULL, label.offset = 1.5, adjust.label.col = FALSE, normalize.layout = TRUE)

Arguments

g          a network object.
layout      graph layout, either a function or the output of a layout function.
mar         plot margin.
vertex.pch  node size.
vertex.cex  node size.
vertex.col  node line color.
vertex.bg   node background color.
vertex.lwd  node line width.
edge.col    edge color.
edge.lwd    edge line width.
edge.lty    edge line type.
label       logical; whether to plot labels.
label.col   label color.
label.cex   label expansion.
label.pos   label position.
label.offset label offset.
adjust.label.col whether to automatically adjust label color depending on the luminance of the node’s color/s.
normalize.layout whether to apply layout.norm (with limits xmin=-1, xmax=1, ymin=-1, ymax=1) to the layout.

Author(s)

Diego Diez
plotTRM

Plot an annotated TRM.

Description

This function plots the output findTRM() after it has been annotated with cluster information with annotateTRM() function. Cluster membership is plotted using a pie plot.

Usage

plotTRM(g, layout = layout.fruchterman.reingold, mar = .5, vertex.col, vertex.cex, vertex.lwd, edge.col, edge.lwd, edge.lty, label = TRUE, label.cex, label.col, label.pos = NULL, label.offset = 1.5, adjust.label.col = FALSE, normalize.layout = TRUE)

Arguments

- **g**: a network object with cluster information (attribute piecolor).
- **layout**: graph layout, either a function or the output of a layout function.
- **mar**: plot margin.
- **vertex.col**: node color.
- **vertex.cex**: node size.
- **vertex.lwd**: node border line width.
- **edge.col**: edge color.
- **edge.lwd**: edge line width.
- **edge.lty**: edge line type.
- **label**: logical; whether to plot labels.
- **label.cex**: label expansion.
- **label.col**: label color.
- **label.pos**: label position.
- **label.offset**: label offset.
- **adjust.label.col**: whether to automatically adjust label color depending on the luminance of the node’s color.
- **normalize.layout**: whether to apply layout.norm (with limits xmin=-1, xmax=1, ymin=-1, ymax=1) to the layout.

Author(s)

Diego Diez
**processBiogrid**

Process a data.frame with BioGRID data into a network for a target organism.

**Description**

Process a data.frame with BioGRID data into a network for a target organism.

**Usage**

`processBiogrid(dblist, org = "human", simplify = TRUE, type = "physical", mimic.old = FALSE)`

**Arguments**

- `dblist`: data.frame containing the BioGRID data.
- `org`: target organism (default: "human")
- `simplify`: whether to eliminate redundant edges (default TRUE)
- `type`: type of interaction (physical or genetic) to include (default: "physical")
- `mimic.old`: mimic old behavior of processBiogrid() when interactions for multiple species could be retrieved. Used only for testing.

---

**plotTRMlegend**

Plot the legend of a TRM with information about the cluster families.

**Description**

This function just plots a legend with the cluster membership of the provided list of genes. The legend includes the most prominent families of each cluster and there is some name polishing as well.

**Usage**

`plotTRMlegend(x, title = NULL, cex = 1)`

**Arguments**

- `x`: list of family names or igraph object.
- `title`: title for the legend.
- `cex`: numeric value controlling the size of the legend’s text.

**Author(s)**

Diego Diez
**removeVertices**

**Value**
An igraph object.

**Author(s)**
Diego Diez

---

**Description**
Remove nodes from a graph and returns the largest component

**Usage**

```r
removeVertices(g, filter, keep.hanging = FALSE)
```

**Arguments**

- `g`: graph to remove nodes.
- `filter`
- `keep.hanging` (logical) whether to return the largest component or not.

**Author(s)**
Diego Diez

---

**writeTRMreport**

Export a table with TRM nodes and associated information.

**Description**
This function generates a data.frame with the nodes in the provided graph and associated annotations.

**Usage**

```r
writeTRMreport(graph, file, organism, target, query, sort.by = "symbol")
```
Arguments

- **graph**: a graph object.
- **file**: file name.
- **organism**: organisms for the annotations.
- **target**: target transcription factor.
- **query**: query transcription factors.
- **sort.by**: order the columns of the data.frame by (default: "symbol").

Author(s)

Diego Diez
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