Package ‘mirIntegrator’

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Type Package
Title Integrating microRNA expression into signaling pathways for pathway analysis
Author Diana Diaz <dmd@wayne.edu>
Maintainer Diana Diaz <dmd@wayne.edu>
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Description Tools for augmenting signaling pathways to perform pathway analysis of microRNA and mRNA expression levels.
License GPL (>=3)
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biocViews Network, Microarray, GraphAndNetwork, Pathways, KEGG
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augmented_pathways  

**Description**

Human signaling KEGG pathways augmented with validated miRNA-target interactions from mirTarBase using the mirIntegrator package. These interactions represent the biological miRNA repression over its target genes and are included in the model as negative links.

**Usage**

data("augmented_pathways")

**Value**

A list of graphNEL objects where each graph is a pathway that were augmented with miRNA-target interactions. The name of each pathway is its KEGG pathway identifier.

**Source**

Generated using the mirIntegrator package. A script that constructs the augmented_pathways object may be found in 'inst/scripts/get_augmented_pathways.R', see the example.

**References**


**See Also**

mirTarBase and kegg_pathways

**Examples**

data(augmented_pathways)
head(augmented_pathways)

script <- system.file("scripts", "get_augmented_pathways.R",
   package = "mirIntegrator")
script
readLines(script)
GSE43592_miRNA

**Top table of preprocessed miRNA of GSE43592 dataset.**

**Description**
A data.frame with the Log fold change and p-value of preprocessed miRNA expression of GSE43592 dataset.

**Usage**
data(GSE43592_miRNA)

**Value**
A data frame with 881 miRNAs with the following 8 variables: entre, ID, logFC, AveExpr, t, P.Value, adj.P.Val, B.

**Source**

**References**


**Examples**
data(GSE43592_miRNA)
head(GSE43592_miRNA)

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GSE43592_mRNA

**Top table of preprocessed mRNA of GSE43592 dataset.**

**Description**
A data.frame with the Log fold change and p-value of preprocessed mRNA expression of GSE43592 dataset.

**Usage**
data(GSE43592_mRNA)
A data frame with 19611 mRNAs with the following 8 variables: entre, ID, logFC, AveExpr, t, P.Value, adj.P.Val, B.

**Source**


**References**


**Examples**

data(GSE43592_mRNA)
head(GSE43592_mRNA)

**integrate_mir**

*Produce augmented pathways*

**Description**

This function takes each pathway of the input list of signaling pathways and adds the miRNAs that are related to it.

**Usage**

integrate_mir(original_pathways, targets_db)

**Arguments**

- `original_pathways`: A list of graph::graphNEL objects where each of the nodes is named with '<gene_ID>'. Gene IDs used to identify the nodes must be the same gene IDs used to identify the genes on the miRNA-target interactions data.frame, targets_db, i.e. If the genes are identified by Entrez ID on the original_pathways graph::graphNEL list, then the targets_db data.frame must identify the genes by Entrez ID as well. Nodes of each graph::graphNEL represent the genes involved in the pathway and edges represent the biological interactions (activation or repression) among those genes (activation or repression).

- `targets_db`: A data.frame with columns: 'miRNA' which names the miRNAs and 'Target.ID' which gives the gene ID of the target gene. The Gene IDs used to identify the 'Target.ID' column must be the same gene IDs used on the nodes of the original_pathways, i.e. If the genes are identified by Entrez ID on the original_pathways graph::graphNEL list, then the targets_db data.frame must identify the genes by Entrez ID as well.
**kegg_pathways**

**Value**

Gene signaling pathways augmented with miRNA interactions. This is a list of graph::graphNEL objects where each of the nodes is named with '<gene_ID>'. Nodes of each graph::graphNEL represent genes and miRNAs involved in the pathway and edges represent the biological interactions (activation or repression) among them.

**Author(s)**

Diana Diaz <dmd at wayne dot edu>

**Examples**

```r
data(kegg_pathways)
data(mirTarBase)
kegg_pathways <- kegg_pathways[1:5]  # delete this for augmenting all pathways.
augmented_pathways <- integrate_mir(kegg_pathways, mirTarBase)
```

**Description**

This dataset contains 149 KEGG signaling pathways of human. The original pathways were parsed to a list of graphNEL objects using the ROntoTools package. The original KEGG pathways were published by Kanehisa Laboratories, release 73.0+/01-03, Jan 2015.

**Usage**

```r
data("kegg_pathways")
```

**Value**

A list of graphNEL objects where each graph represents one KEGG signaling pathway. The name of each pathway is its KEGG pathway identifier.

**Source**

Obtained using the ROntoTools package Version 1.2.0 with KEGG database release 73.0+/01-03, Jan 2015. A script that constructs the kegg_pathways object may be found in ‘inst/scripts/get_kegg_pathways.R’, see the example.

**References**


Examples

```r
data(kegg_pathways)
head(kegg_pathways)

script <- system.file("scripts", "get_kegg_pathways.R",
                      package = "mirIntegrator")
script
readLines(script)
```

**mirTarBase**  
*MicroRNA-target interactions in human.*

**Description**

Dataset of miRNA-target interactions in human obtained from mirTarBase release 4.5: Nov. 1, 2013.

**Usage**

```r
data(mirTarBase)
```

**Format**

A data.frame with 39083 interactions and 9 variables. The columns needed for this package are:

- **miRNA**: which contains the miRNA ID,
- **Target.ID**: contains the entrez ID of the gene targeted by the miRNA

**Details**

This dataset is licensed by its authors (Hsu et al.), see [http://mirtarbase.mbc.nctu.edu.tw/cache/download/LICENSE](http://mirtarbase.mbc.nctu.edu.tw/cache/download/LICENSE).

**Value**

A data.frame with human miRNA-targets interactions

**Source**

Downloaded from [http://mirtarbase.mbc.nctu.edu.tw/](http://mirtarbase.mbc.nctu.edu.tw/) on 4/1/2015. A script which downloads the file and constructs the mirTarBase object may be found in ‘inst/scripts/get_mirTarBase.R’, see the example.

**References**

names_pathways

Examples

data(mirTarBase)
head(mirTarBase)

script <- system.file("scripts", "get_mirTarBase.R",
                     package = "mirIntegrator")
script
readLines(script)

names_pathways List of KEGG signaling pathways’ names.

Description

Names of the KEGG signaling pathways in human obtained with the ROntoTools package. The original KEGG pathways were published by Kanehisa Laboratories, release 73.0+/01-03, Jan 2015.

Usage

data("names_pathways")

Value

A list of KEGG signaling pathways’ names.

Source

Obtained using the ROntoTools package Version 1.2.0 with KEGG database release 73.0+/01-03, Jan 2015. A script that constructs the names_pathways object may be found in ‘inst/scripts/get_names_pathways.R’, see the example.

References


Examples

data(names_pathways)
head(names_pathways)

script <- system.file("scripts", "get_names_pathways.R",
                     package = "mirIntegrator")
script
readLines(script)
Description

This function creates a pdf file with plotings of a list of augmented pathways.

Usage

pathways2pdf(original_pathways, augmented_pathways, pathway_names, file)

Arguments

original_pathways  A list of graph::graphNEL objects where each of the nodes is named with '<gene_ID>'.
Nodes of each graph::graphNEL represent the genes involved in the pathway and edges represent the biological interactions (activation or repression) among those genes (activation or repression).

augmented_pathways  A list of graph::graphNEL objects where each of the nodes is named with '<gene_ID>'.
Nodes of each graph::graphNEL represent genes and miRNAs involved in the pathway and edges represent the biological interactions (activation or repression) among them.

pathway_names  A list of names of the pathways named by '<pathway_ID>'.

file  The name of the file where the plots will be saved.

Value

A pdf file with the plotings of the augmented pathways.

Author(s)

Diana Diaz <dmd at wayne dot edu>

Examples

data(augmented_pathways)
data(kegg_pathways)
data(names_pathways)
#The following instruction writes a pdf with three pathways
pathways2pdf(kegg_pathways[18:20], augmented_pathways[18:20],
            names_pathways[18:20], "three_pathways.pdf")
#The following instruction writes a pdf with all the pathways:
#NOTE: It may take time.
#pathways2pdf(kegg_pathways, augmented_pathways,
#            names_pathways, "all_pathways.pdf")
plot_augmented_pathway

Plotting of augmented pathway

Description

Functions for plotting a particular augmented pathway. In the plot, miRNAs that were added to the original pathway are differentiated from proteins that were originally in the pathway. Blue boxes represent the proteins that were part of the original pathway, and black boxes represent the miRNAs that were added during augmentation.

Usage

plot_augmented_pathway(original_pathway, augmented_pathway, pathway_name = " ", ...)

Arguments

original_pathway
  A graph::graphNEL object where each of the nodes is named with `<gene_ID>`.
  Nodes of each graph::graphNEL represent the genes involved in the pathway and edges represent the biological interactions (activation or repression) among those genes.

augmented_pathway
  A graph::graphNEL object where each of the nodes is named with `<gene_ID>`.
  Nodes of each graph::graphNEL represent genes and miRNAs involved in the pathway and edges represent the biological interactions (activation or repression) among them.

pathway_name
  The name of the pathway.

...
  Other arguments for the `<plotPathway2Colors>` function.

Value

A plot of one augmented pathway with the new nodes highlighted in black.

Author(s)

Diana Diaz <dmd at wayne dot edu>

Examples

data(augmented_pathways)
data(kegg_pathways)
data(names_pathways)

plot_augmented_pathway(kegg_pathways[[18]], augmented_pathways[[18]], pathway_name = names_pathways[[18]])
plot_change  

Plotting the change in pathways order

Description

Function for plotting a lines plot of the difference in pathways’ order. The resultant plot shows the comparison between the order of the original pathways and the order of the augmented pathways. It also contains a line with the order difference (order of the augmented pathways minus order of the original pathways). The order of a biological pathway is the number of genes that are involved in it.

Usage

plot_change(original_pathways, augmented_pathways, pathway_names, ...)

Arguments

original_pathways
A list of graph::graphNEL objects where each of the nodes is named with '<gene_ID>'. Nodes of each graph::graphNEL represent the genes involved in the pathway and edges represent the biological interactions (activation or repression) among those genes (activation or repression).

augmented_pathways
A list of graph::graphNEL objects where each of the nodes is named with '<gene_ID>'. Nodes of each graph::graphNEL represent genes and miRNAs involved in the pathway and edges represent the biological interactions (activation or repression) among them.

pathway_names
A list of names of the pathways named by '<pathway_ID>'.

...
Other arguments for the '<plotLines>' function.

Value

A lines plot of the comparison of pathways order.

Author(s)

Diana Diaz <dmd at wayne dot edu>

Examples

data(augmented_pathways)
data(kegg_pathways)
data(names_pathways)
plot_change(kegg_pathways, augmented_pathways, names_pathways)
smallest_pathway  Get the smallest pathway

Description
Find the pathway with the fewer number of nodes among a list of pathways. This simple function is an example of how to navigate the genes on a list of pathways.

Usage
smallest_pathway(pathways)

Arguments
pathways A list of graph::graphNEL objects.

Value
The index of the pathway with fewer number of nodes.

Author(s)
Diana Diaz <dmd at wayne dot edu>

Examples
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smallest_pathway(augmented_pathways)
smallest_pathway
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