Package 'StarBioTrek'

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Type Package

Title StarBioTrek

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Depends R (>= 3.3)

Imports SpidermiR, graphite, AnnotationDbi, e1071, ROCR, MLmetrics, grDevices, igraph, reshape2, ggplot2

Description
This tool StarBioTrek presents some methodologies to measure pathway activity and cross-talk among pathways integrating also the information of network data.

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biocViews GeneRegulation, Network, Pathways, KEGG

Suggests BiocStyle, knitr, rmarkdown, testthat, devtools, roxygen2, qgraph, png, grid

VignetteBuilder knitr

LazyData true

URL https://github.com/claudiacava/StarBioTrek

BugReports https://github.com/claudiacava/StarBioTrek/issues

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R topics documented:

`average` *For TCGA data get human pathway data and creates a matrix with the average of genes for each pathway.*

Description

average creates a matrix with a summarized value for each pathway

Usage

```
average(pathwayexpsubset)
```

Arguments

`pathwayexpsubset`
list of pathway data

Value

a matrix value for each pathway

Examples

```
list_path_gene<-GE_matrix(DataMatrix=Data_CANCER_normUQ_fil,genes.by.pathway=pathway[1:50])
score_mean<-average(pathwayexpsubset=list_path_gene)
```

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circleplot *Preparation for circle plot*

Description

circleplot function takes as input data derived by the function plotcrosstalk and plOt a circle plot.

Usage

```
circleplot(preplot, scoregene)
```

Arguments

preplot	a list as obtained from the function plotcrosstalk
scoregene	a score for each gene with values included between -10 e +10

Value

a list with correlation matrix and gene set for each gene

Examples

```
formatplot<-plotcrosstalk(pathway_plot=pathway[1:6],gs_expre=tumo)
score<-runif(length(formatplot[[2]]), min=-10, max=+10)
circleplot(preplot=formatplot,scoregene=score)
```

ConvertedIDgenes *Get interacting genes inside pathways.*

Description

GetPathNet creates a list of genes inside the pathways.

Usage

```
ConvertedIDgenes(path_ALL)
```

Arguments

path_ALL	variable. The user can select the variable as obtained by GetData function

Value

a list of pathways

Examples

```
pathway<-ConvertedIDgenes(path_ALL=path[1:3])
```

`dsscorecrtlk` *For TCGA data get human pathway data and creates a measure of discriminating score among pathways*

Description

dsscorecrtlk creates a matrix with discriminating score for pathways

Usage

```
dsscorecrtlk(dataFilt, pathway_exp)
```

Arguments

`dataFilt`	TCGA matrix
`pathway_exp`	a list of pathway data

Value

a matrix value for each pathway

Examples

```
cross_talk_st_dv<-dsscorecrtlk(dataFilt=tumo[,1:2],pathway_exp=pathway[1:5])
```

`eucdistcrtlk` *For TCGA data get human pathway data and creates a measure of cross-talk among pathways*

Description

eucdistcrtlk creates a matrix with euclidean distance for pairwise pathways

Usage

```
eucdistcrtlk(dataFilt, pathway_exp)
```

Arguments

dataFilt	TCGA matrix
pathway_exp	list of pathway data

Value

a matrix value for each pathway

Examples

```
score_euc_dista_t<-eucdistcrtlk(dataFilt=tumo[,1:2],pathway_exp=pathway[1:5])
```

GetData *Get general information inside pathways.*

Description

GetData creates a list with genes inside the pathways.

Usage

```
GetData(species, pathwaydb)
```

Arguments

species	variable. The user can select the species of interest from SELECT_path_species(path_spec)
pathwaydb	variable. The user can select the pathway database of interest from SELECT_path_graphite(path_spec)

Value

a list of pathways

Examples

```
## Not run:
species="hsapiens"
pathwaydb="pharmgkb"
path<-GetData(species,pathwaydb)
## End(Not run)
```

getNETdata *Get network data from GeneMania.*

Description

getNETdata creates a data frame with network data. Network category can be filtered among: physical interactions, co-localization, genetic interactions and shared protein domain.

Usage

```
getNETdata(network, organismID = NULL)
```

Arguments

network	variable. The user can use the following parameters based on the network types to be used. PHint for Physical_interactions, COloc for Co-localization, GENint for Genetic_interactions and SHpd for Shared_protein_domains
organismID	organism==NULL default value is homo sapiens.

Value

list with gene-gene (or protein-protein interactions)

Examples

```
## Not run:
organismID="Saccharomyces_cerevisiae"
netw<-getNETdata(network="SHpd",organismID)
## End(Not run)
```

GetPathData *Get genes inside pathways.*

Description

GetPathData creates a list of genes inside the pathways.

Usage

```
GetPathData(path_ALL)
```

Arguments

path_ALL	variable. The user can select the variable as obtained by GetData function

Value

a list of pathways

Examples

```
pathway_ALL_GENE<-GetPathData(path_ALL=path[1:3])
```

`GetPathNet` *Get interacting genes inside pathways.*

Description

GetPathNet creates a list of genes inside the pathways.

Usage

```
GetPathNet(path_ALL)
```

Arguments

`path_ALL`	variable. The user can select the variable as obtained by GetData function

Value

a list of pathways

Examples

```
pathway_net<-GetPathNet(path_ALL=path[1:3])
```

`GE_matrix` *Get human KEGG pathway data and a gene expression matrix in order to obtain a list with the gene expression for only pathways given in input .*

Description

GE_matrix creates a list of gene expression for pathways given by the user.

Usage

```
GE_matrix(DataMatrix, genes.by.pathway)
```

Arguments

DataMatrix	gene expression matrix (eg.TCGA data)
genes.by.pathway	a list of pathway data as provided by GetData and ConvertedID_genes

Value

a list for each pathway (gene expression level belong to that pathway)

Examples

```
list_path_gene<-GE_matrix(DataMatrix=tumo[,1:2],genes.by.pathway=pathway[1:5])
```

GE_matrix_mean *Get human KEGG pathway data and a gene expression matrix in order to obtain a matrix with the mean gene expression for only pathways given in input .*

Description

GE_matrix creates a matrix of mean gene expression levels for pathways given by the user.

Usage

```
GE_matrix_mean(DataMatrix, genes.by.pathway)
```

Arguments

DataMatrix	gene expression matrix (eg.TCGA data)
genes.by.pathway	list of pathway data as provided by getKEGGdata

Value

a matrix for each pathway (mean gene expression level belong to that pathway)

Examples

```
list_path_plot<-GE_matrix_mean(DataMatrix=tumo[,1:2],genes.by.pathway=pathway[1:5])
```

GOChord *Displays the relationship between genes and terms.*

Description

The GOChord function generates a circularly composited overview of selected/specific genes and their assigned processes or terms. More generally, it joins genes and processes via ribbons in an intersection-like graph.

Usage

```
GOChord(data, title, space, gene.order, gene.size, gene.space, nlfc = 1,
  lfc.col, lfc.min, lfc.max, ribbon.col, border.size, process.label, limit)
```

Arguments

data	The matrix represents the binary relation (1= is related to, 0= is not related to) between a set of genes (rows) and processes (columns); a column for the logFC of the genes is optional
title	The title (on top) of the plot
space	The space between the chord segments of the plot
gene.order	A character vector defining the order of the displayed gene labels
gene.size	The size of the gene labels
gene.space	The space between the gene labels and the segement of the logFC
nlfc	Defines the number of logFC columns (default=1)
lfc.col	The fill color for the logFC specified in the following form: c(color for low values, color for the mid point, color for the high values)
lfc.min	Specifies the minimium value of the logFC scale (default = -3)
lfc.max	Specifies the maximum value of the logFC scale (default = 3)
ribbon.col	The background color of the ribbons
border.size	Defines the size of the ribbon borders
process.label	The size of the legend entries
limit	A vector with two cutoff values (default= c(0,0)).

IPPI *Multilayer analysis Cava et al. BMC Genomics 2017*

Description

IPPI function takes as input pathway and network data in order to select genes with central role in that pathway. Please see Cava et al. 2017 BMC Genomics

Usage

```
IPPI(pathax, netwa)
```

Arguments

pathax	pathway matrix Please see example path for format
netwa	a dataframe Please see example path for format netw

Value

a list with driver genes for each pathway

Examples

```
## Not run:
DRIVER_SP<-IPPI(pathax=pathway_matrix[,1:3],netwa=netw_IPPI[1:50000,])
## End(Not run)
```

listpathnet *Get human KEGG pathway data and the output of list_path_net define the common genes.*

Description

listpathnet creates a list of interacting genes for each human pathway.

Usage

```
listpathnet(lista_net, pathway_exp)
```

Arguments

lista_net	output of path_net
pathway_exp	pathway data as provided by getKEGGdata

Value

a list of genes for each pathway (interacting genes belong to that pathway)

Examples

```
lista_network<-pathnet(genes.by.pathway=pathway[1:5],data=netw)
list_path<-listpathnet(lista_net=lista_network,pathway=pathway[1:5])
```

---

pathnet *Get human KEGG pathway data and creates a network data.*

Description

pathnet creates a list of network data for each human pathway. The network data will be generated when interacting genes belong to that pathway.

Usage

```
pathnet(genes.by.pathway, data)
```

Arguments

genes.by.pathway	a list of pathway data as provided by ConvertedIDgenes
data	a list of network data as provided by getNETdata

Value

a list of network data for each pathway (interacting genes belong to that pathway)

Examples

```
lista_net<-pathnet(genes.by.pathway=pathway[1:5],data=netw)
```

---

plotcrosstalk *Preparation for plotting cross-talk*

Description

plot_cross_talk function takes as input pathway data and prepares the data to visualize (e.g. ggplot2, qqgraph, igraph)

Usage

```
plotcrosstalk(pathway_plot, gs_expre)
```

Arguments

pathway_plot	pathway
gs_expre	a gene expression matrix

Value

a list with correlation matrix and gene set for each gene

Examples

```
formatplot<-plotcrosstalk(pathway_plot=pathway[1:6],gs_expre=tumo)
```

SelectedSample *Select the class of TCGA data*

Description

select two labels from ID barcode

Usage

```
SelectedSample(Dataset, typesample)
```

Arguments

Dataset	gene expression matrix
typesample	the labels of the samples (e.g. tumor,normal)

Value

a gene expression matrix of the samples with specified label

Examples

```
tumo<-SelectedSample(Dataset=Data_CANCER_normUQ_fil,typesample="tumour")[,2]
```

select_class *Select the class of TCGA data*

Description

select best performance

Usage

```
select_class(performance_matrix, cutoff)
```

Arguments

performance_matrix	list of AUC value
cutoff	cut-off for AUC value

Value

a gene expression matrix with only pairwise pathway with a particular cut-off

StarBioTrek *Download data*

Description

StarBioTrek allows you to Download data of samples from StarBioTrek

Details

The functions you're likely to need from **StarBioTrek** is `path_star` Otherwise refer to the vignettes to see how to format the documentation.

stdv *For TCGA data get human pathway data and creates a measure of standard deviations among pathways*

Description

stdv creates a matrix with standard deviation for pathways

Usage

```
stdv(gslist)
```

Arguments

gslist	pathway data

Value

a matrix value for each pathway

Examples

```
list_path_gene<-GE_matrix(DataMatrix=tumo[,1:2],genes.by.pathway=pathway[1:5])
score_stdev<-stdv(gslist=list_path_gene)
```

svm_classification *SVM classification for each feature*

Description

svm class creates a list with AUC, Accuracy, Sensitivity, Specificity values

Usage

```
svm_classification(TCGA_matrix, tumour, normal, nfs)
```

Arguments

TCGA_matrix	gene expression matrix where the first two columns represent the interacting pathways.
tumour	barcode samples for a class
normal	barcode samples for another class
nfs	nfs split data into a training and test set
Target	label for the classes

Value

a list with AUC value for pairwise pathway

Examples

```
## Not run:
nf <- 60
res_class<-svm_classification(TCGA_matrix=score_euc_dista[1:30,],nfs=nf,
normal=colnames(norm[,1:10]),tumour=colnames(tumo[,1:10]))
## End(Not run)
```

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