Package 'MLP'

April 10, 2015

Maintainer Tobias Verbeke <tobias.verbeke@openanalytics.eu>

License GPL-3

Title MLP

Type Package

Author Nandini Raghavan, Tobias Verbeke, An De Bondt with
contributions by Javier Cabrera, Dhammika Amaratunga, Tine Casneuf
and Willem Ligtenberg

Description Mean Log P Analysis

Version 1.14.0

biocViews Genetics

Date 2013-02-27

Depends AnnotationDbi, affy, plotrix, gplots, gmodels, gdata, gtools

Suggests GO.db, org.Hs.eg.db, org.Mm.eg.db, org.Rn.eg.db,
org.Cf.eg.db, KEGG.db, annotate, Rgraphviz, GOstats, limma,
mouse4302.db, reactome.db

Collate 'addGeneSetDescription.R' 'getGeneSets.R' 'mlpBarplot.R'
'MLP.R' 'plotGeneSetSignificance.R' 'plotGOgraph.R'
'plot.MLP.R' 'plotQuantileCurves.R' 'utils.R'

R topics documented:

---

addGeneSetDescription   *Utility function which adds the biological description of the gene sets as a column to the return value of the MLP function (data frame)*

Description

Utility function which adds the biological description of the gene sets as a column to the return value of the MLP function (data frame)

Usage

```
addGeneSetDescription(object, geneSetSource = NULL)
```

Arguments

object   object of class 'MLP' as produced by the 'MLP' function

geneSetSource   source to be used to construct the list of pathway categories; for public data
                sources, the user can specify a string (one of 'GOBP', 'GOMF', 'GOCC', 'KEGG'
                or 'REACTOME') and BioC packages will be used to construct the list of path-
                way categories; for non-public data sources, the user can pass the pathway
                data as a dataframe with (at least) the following four columns: PATHWAYID,
                TAXID, PATHWAYNAME and GENEID. It is assumed all columns are of type
                character. The 'geneSetSource' argument should be the same as the argument
                provided to the getGeneSets function; defaults to NULL

Value

the data frame as returned by MLP enriched with an additional column geneSetDescription, provid-
ing a concise description of the gene set

See Also

[MLP](MLP)

---

getGeneSets   *Prepare Pathway Data for the MLP Function*

Description

The return value of the getGeneSets function has as primary use to serve as geneSet argument for
the MLP function

Usage

```
getGeneSets(species = "Mouse", geneSetSource = NULL,
  entrezIdentifiers)
```

Arguments

species	character vector of length one indicating the species, one of 'Mouse', 'Human' or 'Rat'; defaults to 'Mouse'.
geneSetSource	source to be used to construct the list of pathway categories; for public data sources, the user can specify a string (one of 'GOBP', 'GOMF', 'GOCC', 'KEGG' or 'REACTOME') and BioC packages will be used to construct the list of pathway categories; for non-public data sources, the user can pass the pathway data as a dataframe with (at least) the following four columns: PATHWAYID, TAXID, PATHWAYNAME and GENEID. It is assumed all columns are of type character.
entrezIdentifiers	
	Entrez Gene identifiers used to subset the relevant gene set

Value

object of class geneSetMLP which is essentially a named list of pathway categories. Each list component contains a vector of Entrez Gene identifiers related to that particular pathway

Examples

```
if (require(GO.db) && require(org.Mm.eg.db)){
 pathExampleData <- system.file("exampleFiles", "expressionSetGcrma.rda", package = "MLP")
 pathExamplePValues <- system.file("exampleFiles", "examplePValues.rda", package = "MLP")
  load(pathExampleData)
  load(pathExamplePValues)
 geneSet <- getGeneSets(species = "Mouse", geneSetSource = "GOBP", entrezIdentifiers = names(examplePValues)[1:20
  head(geneSet)
}
```

MLP	*This function calculates p-values for each gene set based on row permutations of the gene p values or column permutations of the expression matrix; the p values can be obtained either as individual gene set p values or p values based on smoothing across gene sets of similar size.*

Description

This function calculates p-values for each gene set based on row permutations of the gene p values or column permutations of the expression matrix; the p values can be obtained either as individual gene set p values or p values based on smoothing across gene sets of similar size.

Usage

```
    MLP(geneSet, geneStatistic, minGenes = 5, maxGenes = 100,
      rowPermutations = TRUE, nPermutations = 100,
      smoothPValues = TRUE,
      probabilityVector = c(0.5, 0.9, 0.95, 0.99, 0.999, 0.9999, 0.99999),
      df = 9, addGeneSetDescription = TRUE)
```

Arguments

geneSet	is the input list of gene sets (components) and gene IDs (character vectors). A gene set can, for example, be a GO category with for each category Entrez Gene identifiers; The [getGeneSets](#) function can be used to construct the geneSet argument for different pathway sources.
geneStatistic	is either a named numeric vector (if rowPermutations is TRUE) or a numeric matrix of pvalues (if rowPermutations is FALSE). The names of the numeric vector or row names of the matrix should represent the gene IDs.
minGenes	minimum number of genes in a gene set for it to be considered (lower threshold for gene set size)
maxGenes	maximum number of genes in a gene set for it to be considered (upper threshold for gene set size)
rowPermutations	
	logical indicating whether to use row permutations (TRUE; default) or column permutations (FALSE)
nPermutations	is the number of simulations. By default 100 permutations are conducted.
smoothPValues	logical indicating whether one wants to calculate smoothed cut-off thresholds (TRUE; default) or not (FALSE).
probabilityVector	
	vector of quantiles at which p values for each gene set are desired
df	degrees of freedom for the smooth.spline function used in getSmoothedPValues
addGeneSetDescription	
	logical indicating whether a column with the gene set description be added to the output data frame; defaults to TRUE.

Value

data frame with four (or five) columns: totalGeneSetSize, testedGeneSetSize, geneSetStatistic and geneSetPValue and (if addDescription is set to TRUE) geneSetDescription; the rows of the data frame are ordered by ascending geneSetPValue.

References

Raghavan, Nandini et al. (2007). The high-level similarity of some disparate gene expression measures, Bioinformatics, 23, 22, 3032-3038.

Examples

```
if (require(GO.db)){
 pathExampleGeneSet <- system.file("exampleFiles", "exampleGeneSet.rda", package = "MLP")
 pathExamplePValues <- system.file("exampleFiles", "examplePValues.rda", package = "MLP")
 load(pathExampleGeneSet)
 load(pathExamplePValues)
 head(examplePValues)
 head(exampleGeneSet)
 mlpResult <- MLP(geneSet = exampleGeneSet, geneStatistic = examplePValues)
 head(mlpResult)
}
```

---

mlpBarplot   *Draw a Barplot for MLP Results*

Description

Draw a Barplot for MLP Results

Usage

```
mlpBarplot(object, nRow = 20, barColors = NULL,
    main = NULL)
```

Arguments

object   object of class MLP

nRow   number of rows of the MLP data frame to depict in the barplot; defaults to 20.

barColors   vector of colors to use for the bars of the barplot; defaults to NULL; if NULL,
                three gray shades are used reflecting the proportion of tested genes of a gene set
                versus the total number of genes in a geneset. If the proportion exceeds 75%,
                the darkest shade is used; between 50 and 75% a moderately dark shade is used;
                below 50% a lighter gray shade is used.

main   main title; if NULL (default) "Effect of the treatment on <geneSetSource> gene
                sets" will be used

Value

the midpoints of all the bars are returned invisibly (using the conventions of barplot); an MLP-
specific barplot is drawn to the current device;

See Also

barplot

Examples

```
pathExampleMLPResult <- system.file("exampleFiles", "exampleMLPResult.rda", package = "MLP")
load(pathExampleMLPResult)
dev.new(width = 10, height = 10)
op <- par(mar = c(30, 10, 6, 2))
mlpBarplot(exampleMLPResult)
par(op)
```

---

plot.MLP   *Plot the Results of an MLP Run*

Description

Plot the Results of an MLP Run

Usage

```
  ## S3 method for class MLP
plot(x, y = NULL,
    type = c("barplot", "GOgraph", "quantileCurves"), ...)
```

Arguments

x	object of class 'MLP'
y	argument added to comply with generic; not used, defaults to NULL
type	character of length one; one of 'barplot', 'GOgraph' or 'quantileCurves'
...	further arguments for the plot functions for each type

Value

for type = "barplot", the midpoints of the barplot

Examples

```
pathExampleMLPResult <- system.file("exampleFiles", "exampleMLPResult.rda", package = "MLP")
load(pathExampleMLPResult)
dev.new(width = 10, height = 10)
op <- par(mar = c(30, 10, 6, 2))
plot(exampleMLPResult, type = "barplot")
par(op)
plot(exampleMLPResult, type = "quantileCurves")
if (require(GO.db) && require(Rgraphviz)){
  plot(exampleMLPResult, type = "GOgraph")
}
```

---

plotGeneSetSignificance
                    Plot the Significance for the Genes of a Given Gene Set

---

Description

Plot the Significance for the Genes of a Given Gene Set

Usage

```
plotGeneSetSignificance(geneSet, geneSetIdentifier,
  geneStatistic, annotationPackage, barColors = NULL,
  descriptionInMainTitle = TRUE)
```

Arguments

geneSet   object of class 'geneSetMLP' as produced by function getGeneSets

geneSetIdentifier

identifier of the gene set for which a significance plot should be produced; character of length one

geneStatistic   named vector of gene statistics (e.g. p values); the names of the vector are Entrez Gene identifiers

annotationPackage

name of the annotation package to be used (without .db extension); character of length one

barColors   named vector of colors to use for the bars of the barplot; the names of the vector are Entrez Gene identifiers and the vector should be of length equal to the length of the geneStatistic vector defaults to NULL in which case 'grey50' is used

descriptionInMainTitle

Boolean whether or not to use the gene set description in the main title of the plot

Value

no return value

Examples

```
pathExamplePValues <- system.file("exampleFiles", "examplePValues.rda", package = "MLP")
pathExampleGeneSet <- system.file("exampleFiles", "exampleGeneSet.rda", package = "MLP")
pathExampleMLPResult <- system.file("exampleFiles", "exampleMLPResult.rda", package = "MLP")
load(pathExampleGeneSet)
load(pathExamplePValues)
load(pathExampleMLPResult)
# annotationPackage <- if (require(mouse4302mmentrezg.db)) "mouse4302mmentrezg" else "mouse4302"
annotationPackage <- "mouse4302"
geneSetID <- rownames(exampleMLPResult)[1]
dev.new(width = 10, height = 10)
op <- par(mar = c(25, 10, 6, 2))
plotGeneSetSignificance(
    geneSet = exampleGeneSet,
    geneSetIdentifier = geneSetID,
    geneStatistic = examplePValues,
    annotationPackage = annotationPackage
)
par(op)
```

---

plotGOgraph   *Graphical Representation of GO Based MLP Results*

Description

Graphical Representation of GO Based MLP Results

Usage

```
plotGOgraph(object, nRow = 5, main = NULL)
```

Arguments

object   object of class MLP (as produced by the MLP function)

nRow   number of GO IDs for which to produce the plot

main   main title of the graph; if NULL (default) the main title is set to 'GO graph'

Value

GO graph is plotted to the current device

Examples

```
if (require(GO.db) && require(Rgraphviz)){
 pathExampleMLPResult <- system.file("exampleFiles", "exampleMLPResult.rda", package = "MLP")
  load(pathExampleMLPResult)
  plotGOgraph(exampleMLPResult, main = "GO Graph")
}
```

Index