

# Package ‘MLP’

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**Title** MLP

**Type** Package

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**Description** Mean Log P Analysis

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**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, anno-  
tate, 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'

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`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)*

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### 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 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. 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, providing a concise description of the gene set

### See Also

[MLP](#)

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`getGeneSets` *Prepare Pathway Data for the MLP Function*

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### 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	<i>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.</i>
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**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**

<code>geneSet</code>	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 <code>getGeneSets</code> function can be used to construct the <code>geneSet</code> argument for different pathway sources.
<code>geneStatistic</code>	is either a named numeric vector (if <code>rowPermutations</code> is TRUE) or a numeric matrix of pvalues (if <code>rowPermutations</code> is FALSE). The names of the numeric vector or row names of the matrix should represent the gene IDs.
<code>minGenes</code>	minimum number of genes in a gene set for it to be considered (lower threshold for gene set size)
<code>maxGenes</code>	maximum number of genes in a gene set for it to be considered (upper threshold for gene set size)
<code>rowPermutations</code>	logical indicating whether to use row permutations (TRUE; default) or column permutations (FALSE)
<code>nPermutations</code>	is the number of simulations. By default 100 permutations are conducted.
<code>smoothPValues</code>	logical indicating whether one wants to calculate smoothed cut-off thresholds (TRUE; default) or not (FALSE).
<code>probabilityVector</code>	vector of quantiles at which p values for each gene set are desired
<code>df</code>	degrees of freedom for the <code>smooth.spline</code> function used in <code>getSmoothedPValues</code>
<code>addGeneSetDescription</code>	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)
}
```

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`mlpBarplot`*Draw a Barplot for MLP Results*

---

**Description**

Draw a Barplot for MLP Results

**Usage**

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

**Arguments**

<code>object</code>	object of class MLP
<code>nRow</code>	number of rows of the MLP data frame to depict in the barplot; defaults to 20.
<code>barColors</code>	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.
<code>main</code>	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**

<code>object</code>	object of class MLP (as produced by the MLP function)
<code>nRow</code>	number of GO IDs for which to produce the plot
<code>main</code>	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")  
}
```

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