

# Package ‘meshr’

November 21, 2024

**Title** Tools for conducting enrichment analysis of MeSH

**Description** A set of annotation maps describing the entire MeSH assembled using data from MeSH.

**Version** 2.12.0

**Author** Koki Tsuyuzaki, Itoshi Nikaido, Gota Morota

**Maintainer** Koki Tsuyuzaki <k.t.the-answer@hotmail.co.jp>

**Depends** R (>= 4.1.0)

**Imports** markdown, rmarkdown, BiocStyle, knitr, methods, stats, utils,  
fdrtool, MeSHDbi, Category, S4Vectors, BiocGenerics, RSQLite

**License** Artistic-2.0

**biocViews** AnnotationData, FunctionalAnnotation, Bioinformatics,  
Statistics, Annotation, MultipleComparisons, MeSHDb

**VignetteBuilder** knitr

**BugReports** <https://github.com/rikenbit/meshr/issues>

**git\_url** <https://git.bioconductor.org/packages/meshr>

**git\_branch** RELEASE\_3\_20

**git\_last\_commit** 0ea543c

**git\_last\_commit\_date** 2024-10-29

**Repository** Bioconductor 3.20

**Date/Publication** 2024-11-20

## Contents

meshr-package . . . . .	2
category . . . . .	3
database . . . . .	3
MeSHHyperGParams-class . . . . .	4
MeSHHyperGResult-class . . . . .	5
meshHyperGTest . . . . .	6
<b>Index</b>	<b>7</b>

meshr-package

*Enrichment analysis for MeSH terms.*

---

**Description**

meshr package conducts a MeSH enrichment analysis employing gene-MeSH annotation data. A hypergeometric test accounting for a multiple testing correction is used to find significantly enriched MeSH terms.

**Details**

Package: meshr  
Version: 1.2.6  
Date: 3-20-2015  
biocViews: AnnotationData, FunctionalAnnotation, Bioinformatics, Statistics, Annotation, MultipleComparisons  
Depends: R (>= 3.0.1), cummeRbund, org.Hs.eg.db, fdrtool, Category, BiocGenerics, methods, MeSH.db, MeSH.AOI  
Imports:  
Suggests:  
License: Artistic-2.0

**Index:**

meshHyperGTest performs a hypergeometric statistical test.

Further information is available in the vignettes.

**Author(s)**

Gota Morota, Koki Tsuyuzaki, Takeru Nakazato, Itoshi Nikaido

Maintainer: Koki Tsuyuzaki <k.t.the-answer@hotmail.co.jp>

**See Also**

[MeSHHyperGParams-class](#), [MeSHHyperGResult-class](#), [meshHyperGTest](#)

**Examples**

```
ls("package:meshr")
```

---

category

*A function to return the name of MeSH category*

---

### Description

This function returns the name of MeSH category.

### Usage

```
category(r)
category(r) <- value
```

### Arguments

r                    An object containing annotation information.  
value                The annotation information to set on object.

### Author(s)

Koki Tsuyuzaki

### Examples

```
showMethods("category")
```

---

database

*A function to return the name of MeSH database*

---

### Description

This function returns the name of MeSH database.

### Usage

```
database(r)
database(r) <- value
```

### Arguments

r                    An object containing annotation information.  
value                The annotation information to set on object.

### Author(s)

Koki Tsuyuzaki

### Examples

```
showMethods("database")
```

---

 MeSHHyperGParams-class

*Class "MeSHHyperGParams"*


---

### Description

A parameter class for representing all parameters needed for running the 'meshHyperGTest' method with one of the MeSH categories ("Anatomy", "Organisms", "Diseases", "Chemicals and Drugs", "Analytical, Diagnostic and Therapeutic Techniques and Equipment", "Psychiatry and Psychology", "Phenomena and Processes", "Disciplines and Occupations", "Anthropology, Education, Sociology and Social Phenomena", "Technology and Food and Beverages", "Humanities", "Information Science", "Persons", "Health Care", "Publication Type", "Geographical Locations").

### Objects from the Class

Objects can be created by calls of the form `new("MeSHHyperGParams", ...)`.

### Slots

`geneIds`: Object of class "ANY": A vector of gene identifiers. Numeric and character vectors are probably the only things that make sense. These are the gene ids for the selected gene set.

`universeGeneIds`: Object of class "ANY": A vector of gene ids in the same format as `geneIds` defining a subset of the gene ids on the chip that will be used as the universe for the hypergeometric calculation.

`annotation`: A string giving the name of the gene-MeSH annotation package like MeSH.XXX.eg.db.

`meshdb`: A string giving the name of the MeSH database like MeSH.db.

`category`: A string giving the name of the MeSH category like A, B, C, D, ...and so on.

`database`: A string giving the name of the MeSH database like gendoo, gene2pubmed, ...and so on.

`pvalueCutoff`: A numeric values between zero and one used as a p-value or FDR cutoff for hypergeometric test depending on `pAdjust`. The default is set to 0.05.

`pAdjust`: A string which can be one of the Benjamini-Hochberg procedure (a.k.a. q-value) ("BH"), Q-value ("QV"), empirical Bayes method ("IFDR"), and unadjusted p-value ("none") for multiple testing correction.

### Methods

`geneIds(p)`, `geneIds(p) <- value` Accessor methods for the `geneIds`.

`universeGeneIds(p)`, `universeGeneIds(p) <- value` Accessor methods for the `geneIds`.

`annotation(p)`, `annotation(p) <- value` Accessor methods for the gene-MeSH annotation data.

`pAdjust(p)` An accessor method for the choice of a method for multiple testing correction.

`pvalueCutoff(p)` An accessor method for the choice of a threshold when conducting enrichment analysis.

### Author(s)

Gota Morota, Koki Tsuyuzaki, Takeru Nakazato, Itoshi Nikaido

Maintainer: Koki Tsuyuzaki <k.t.the-answer@hotmail.co.jp>

**See Also**

[meshr-package](#), [MeSHHyperGResult-class](#), [meshHyperGTest](#), [category](#), [database](#)

---

MeSHHyperGResult-class

*Class "MeSHHyperGResult"*

---

**Description**

This class represents the results of a test for overrepresentation of MeSH terms among genes in a selected gene set based upon the Hypergeometric distribution.

For details on extracting information from this object, please read the documentation in the [MeSHHyperGParams-class](#).

**Objects from the Class**

Objects can be created by calls of the form `new("MeSHHyperGResult", ...)`.

**Slots**

**meshCategory:** Object of class "character" representing the category of MeSH terms tested.

**meshAnnotation:** Object of class "character". The name of the annotation data used in the analysis.

**meshDatabase:** Object of class "character". The name of the database used in the analysis.

**ORA:** Object of class "data.frame". MeSH IDs, MeSH Terms, P-value, and other statistics is returned.

**Methods**

**meshCategory** signature(`r = "MeSHHyperGResult"`): Returns the MeSH category used in the analysis.

**meshAnnotation** signature(`r = "MeSHHyperGResult"`): Returns the name of the annotation data used in the analysis.

**meshDatabase** signature(`r = "MeSHHyperGResult"`): Returns the name of the database used in the analysis.

**meshIds** signature(`r = "MeSHHyperGResult"`): Returns the character vector of the MeSH IDs identified as significant in the analysis.

**meshTerms** signature(`r = "MeSHHyperGResult"`): Returns the character vector of the MeSH terms identified as significant in the analysis.

**pvalues** signature(`r = "MeSHHyperGResult"`): Returns the associated p-values of significantly enriched MeSH terms.

**summary** signature(`r = "MeSHHyperGResult"`): Returns a `data.frame` summarizing the test result. Optional arguments `pvalue` and `categorySize` allow specification of maximum p-value and minimum `categorySize`, respectively. Optional argument `htmlLinks` is a logical value indicating whether to add HTML links (useful in conjunction with `xtables` print method with type set to "html").

**show** signature(`object = "MeSHHyperGResult"`): Return a short description of the result.

**Author(s)**

Gota Morota, Koki Tsuyuzaki, Takeru Nakazato, Itoshi Nikaido  
Maintainer: Koki Tsuyuzaki <k.t.the-answer@hotmail.co.jp>

**See Also**

[meshr-package](#), [MeSHHyperGParams-class](#), [meshHyperGTest](#)

---

meshHyperGTest

*Hypergeometric Tests for MeSH term association*

---

**Description**

Given a MeSHHyperGParams object containing a set of selected and background gene IDs, and gene-MeSH annotation data of interest, meshHyperGTest performs Hypergeometric test for over-representation of each MeSH term accounting for the multiple testing correction.

**Arguments**

p                      A MeSHHyperGParams object

**Details**

For details on creating MeSHHyperGParams object, please read the documentation in the [MeSHHyperGParams-class](#).

**Value**

A MeSHHyperGResult object.

**Author(s)**

Gota Morota, Koki Tsuyuzaki, Takeru Nakazato, Itoshi Nikaido  
Maintainer: Koki Tsuyuzaki <k.t.the-answer@hotmail.co.jp>

**See Also**

[meshr-package](#), [MeSHHyperGParams-class](#), [MeSHHyperGResult-class](#)

**Examples**

```
showMethods("meshHyperGTest")
```

# Index

- \* **classes**
  - MeSHHyperGParams-class, 4
  - MeSHHyperGResult-class, 5
- \* **methods**
  - category, 3
  - database, 3
- \* **models**
  - meshHyperGTest, 6
- \* **package**
  - meshr-package, 2
- annotation, MeSHHyperGParams-method (MeSHHyperGParams-class), 4
- annotation<-, MeSHHyperGParams, character-method (MeSHHyperGParams-class), 4
- category, 3, 5
- category, MeSHHyperGParams-method (category), 3
- category<- (category), 3
- category<-, MeSHHyperGParams, character-method (category), 3
- database, 3, 5
- database, MeSHHyperGParams-method (database), 3
- database<- (database), 3
- database<-, MeSHHyperGParams, character-method (database), 3
- geneIds, MeSHHyperGParams-method (MeSHHyperGParams-class), 4
- geneIds<-, MeSHHyperGParams, ANY-method (MeSHHyperGParams-class), 4
- geneIds<-, MeSHHyperGParams, logical-method (MeSHHyperGParams-class), 4
- generic, category (category), 3
- generic, database (database), 3
- initialize, MeSHHyperGParams-method (MeSHHyperGParams-class), 4
- makeValidParams, MeSHHyperGParams-method (MeSHHyperGParams-class), 4
- meshAnnotation (MeSHHyperGResult-class), 5
- meshAnnotation, MeSHHyperGResult-method (MeSHHyperGResult-class), 5
- meshCategory (MeSHHyperGResult-class), 5
- meshCategory, MeSHHyperGResult-method (MeSHHyperGResult-class), 5
- meshDatabase (MeSHHyperGResult-class), 5
- meshDatabase, MeSHHyperGResult-method (MeSHHyperGResult-class), 5
- MeSHHyperGParams-class, 4, 5, 6
- MeSHHyperGResult-class, 5
- meshHyperGTest, 2, 5, 6, 6
- meshHyperGTest, MeSHHyperGParams-method (meshHyperGTest), 6
- meshIds (MeSHHyperGResult-class), 5
- meshIds, MeSHHyperGResult-method (MeSHHyperGResult-class), 5
- meshr (meshr-package), 2
- meshr-package, 2
- meshTerms (MeSHHyperGResult-class), 5
- meshTerms, MeSHHyperGResult-method (MeSHHyperGResult-class), 5
- pAdjust (MeSHHyperGParams-class), 4
- pAdjust, MeSHHyperGParams-method (MeSHHyperGParams-class), 4
- pAdjust<- (MeSHHyperGParams-class), 4
- pAdjust<-, MeSHHyperGParams, character-method (MeSHHyperGParams-class), 4
- pvalueCutoff, MeSHHyperGParams-method (MeSHHyperGParams-class), 4
- pvalueCutoff<-, MeSHHyperGParams-method (MeSHHyperGParams-class), 4
- pvalues (MeSHHyperGResult-class), 5
- pvalues, MeSHHyperGResult-method (MeSHHyperGResult-class), 5
- show (MeSHHyperGResult-class), 5
- show, MeSHHyperGResult-method (MeSHHyperGResult-class), 5
- summary (MeSHHyperGResult-class), 5
- summary, MeSHHyperGResult-method (MeSHHyperGResult-class), 5

universeGeneIds  
    (MeSHHyperGParams-class), 4  
universeGeneIds, MeSHHyperGParams-method  
    (MeSHHyperGParams-class), 4  
universeGeneIds<-  
    (MeSHHyperGParams-class), 4  
universeGeneIds<- , MeSHHyperGParams, ANY-method  
    (MeSHHyperGParams-class), 4  
universeGeneIds<- , MeSHHyperGParams, logical-method  
    (MeSHHyperGParams-class), 4  
universeGeneIds<- , MeSHHyperGParams-method  
    (MeSHHyperGParams-class), 4