Package 'DOSE'

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Type Package

Title Disease Ontology Semantic and Enrichment analysis

Version 4.5.1

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Description This package implements five methods proposed by Resnik, Schlicker, Jiang, Lin and Wang respectively for measuring semantic similarities among DO terms and gene products. Enrichment analyses including hypergeometric model and gene set enrichment analysis are also implemented for discovering disease associations of high-throughput biological data.

Depends R (>= 3.5.0)

Imports AnnotationDbi, enrichit (>= 0.0.4), ggplot2, GOSemSim (>= 2.37.1), methods, reshape2, utils, yulab.utils (> 0.2.2)

Suggests prettydoc, clusterProfiler, gson (>= 0.0.5), knitr, memoise, org.Hs.eg.db, rmarkdown, testthat

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ByteCompile true

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URL https://yulab-smu.top/contribution-knowledge-mining/

BugReports https://github.com/GuangchuangYu/DOSE/issues

biocViews Annotation, Visualization, MultipleComparison, GeneSetEnrichment, Pathways, Software

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Contents

`DOSE-package` *DOSE: Disease Ontology Semantic and Enrichment analysis*

Description

This package implements five methods proposed by Resnik, Schlicker, Jiang, Lin and Wang respectively for measuring semantic similarities among DO terms and gene products. Enrichment analyses including hypergeometric model and gene set enrichment analysis are also implemented for discovering disease associations of high-throughput biological data.

Author(s)

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See Also

Useful links:

- https://yulab-smu.top/contribution-knowledge-mining/
- Report bugs at https://github.com/GuangchuangYu/DOSE/issues

---

`clusterSim` *clusterSim*

Description

semantic similarity between two gene clusters

Usage

```
clusterSim(
  cluster1,
  cluster2,
  ont = "HDO",
  organism = "hsa",
  measure = "Wang",
  combine = "BMA"
)
```

Arguments

`cluster1`	a vector of gene IDs
`cluster2`	another vector of gene IDs
`ont`	one of "HDO", "HPO" and "MPO"
`organism`	one of "hsa" and "mmu"
`measure`	One of "Resnik", "Lin", "Rel", "Jiang" and "Wang" methods.
`combine`	One of "max", "avg", "rcmax", "BMA" methods, for combining

Details

given two gene clusters, this function calculates semantic similarity between them.

Value

similarity

Author(s)

Yu Guangchuang

Examples

```
## Not run:
cluster1 <- c("835", "5261","241", "994")
cluster2 <- c("307", "308", "317", "321", "506", "540", "378", "388", "396")
clusterSim(cluster1, cluster2)

## End(Not run)
```

`computeIC` *compute information content*

Description

compute information content

Usage

```
computeIC(ont = "HDO")
```

Arguments

`ont`	one of "DO", "HPO" and "MPO"

Author(s)

Guangchuang Yu https://yulab-smu.top

`DataSet` *Datasets*

Description

Information content and DO term to entrez gene IDs mapping

doseSim *doseSim*

Description

measuring similarities between two DO term vectors.

Usage

```
doseSim(DOID1, DOID2, measure = "Wang", ont = "HDO")

doSim(DOID1, DOID2, measure = "Wang", ont = "HDO")
```

Arguments

DOID1	DO term, MPO term or HPO term vector
DOID2	DO term, MPO term or HPO term vector
measure	one of "Wang", "Resnik", "Rel", "Jiang", "Lin", and "TCSS".
ont	one of "HDO", "HPO" and "MPO"

Details

provide two term vectors, this function will calculate their similarities.

Value

score matrix

Author(s)

Guangchuang Yu https://yulab-smu.top

dose_params *Shared parameters for DOSE functions*

Description

Shared parameters for DOSE functions

Arguments

gene	a vector of entrez gene id
organism	one of "hsa" and "mmu"
ont	one of "HDO", "HPO" or "MPO"
pvalueCutoff	pvalue cutoff
pAdjustMethod	one of "holm", "hochberg", "hommel", "bonferroni", "BH", "BY", "fdr", "none"
universe	background genes
minGSSize	minimal size of genes annotated by ontology term for testing
maxGSSize	maximal size of each geneSet for analyzing
qvalueCutoff	qvalue cutoff
readable	whether mapping gene ID to gene Name
geneList	order ranked geneList
exponent	weight of each step
nPerm	permutation numbers
verbose	print message or not
adaptive	logical, use adaptive permutation or not (default: FALSE)
minPerm	minimum number of permutations for adaptive mode (default: 1000)
maxPerm	maximum number of permutations for adaptive mode (default: 10000)
method	method of GSEA, one of "multilevel", "permute", "sample"

---

enrichDGN *Enrichment analysis based on the DisGeNET (http://www.disgenet.org/)*

Description

given a vector of genes, this function will return the enrichment NCG categories with FDR control

Usage

```
enrichDGN(
  gene,
  pvalueCutoff = 0.05,
  pAdjustMethod = "BH",
  universe,
  minGSSize = 10,
  maxGSSize = 500,
  qvalueCutoff = 0.2,
  readable = FALSE
)
```

Arguments

gene	a vector of entrez gene id
pvalueCutoff	pvalue cutoff
pAdjustMethod	one of "holm", "hochberg", "hommel", "bonferroni", "BH", "BY", "fdr", "none"
universe	background genes
minGSSize	minimal size of genes annotated by ontology term for testing
maxGSSize	maximal size of each geneSet for analyzing
qvalueCutoff	qvalue cutoff
readable	whether mapping gene ID to gene Name

Value

A enrichResult instance

Author(s)

Guangchuang Yu

References

Janet et al. (2015) DisGeNET: a discovery platform for the dynamical exploration of human diseases and their genes. *Database* bav028 http://database.oxfordjournals.org/content/2015/bav028.long

---

enrichDGNv *enrichDGN*

Description

Enrichment analysis based on the DisGeNET (http://www.disgenet.org/)

Usage

```
enrichDGNv(
  snp,
  pvalueCutoff = 0.05,
  pAdjustMethod = "BH",
  universe,
  minGSSize = 10,
  maxGSSize = 500,
  qvalueCutoff = 0.2,
  readable = FALSE
)
```

Arguments

snp	a vector of SNP
pvalueCutoff	pvalue cutoff
pAdjustMethod	one of "holm", "hochberg", "hommel", "bonferroni", "BH", "BY", "fdr", "none"
universe	background genes
minGSSize	minimal size of genes annotated by ontology term for testing
maxGSSize	maximal size of each geneSet for analyzing
qvalueCutoff	qvalue cutoff
readable	whether mapping gene ID to gene Name

Details

given a vector of genes, this function will return the enrichment NCG categories with FDR control

Value

A enrichResult instance

Author(s)

Guangchuang Yu

References

Janet et al. (2015) DisGeNET: a discovery platform for the dynamical exploration of human diseases and their genes. *Database* bav028 http://database.oxfordjournals.org/content/2015/bav028.long

---

enrichDO *DO Enrichment Analysis*

Description

Given a vector of genes, this function will return the enrichment DO categories with FDR control.

Usage

```
enrichDO(
  gene,
  ont = "HDO",
  organism = "hsa",
  pvalueCutoff = 0.05,
  pAdjustMethod = "BH",
  universe,
  minGSSize = 10,
```

```
  maxGSSize = 500,
  qvalueCutoff = 0.2,
  readable = FALSE
)
```

Arguments

gene	a vector of entrez gene id
ont	one of "HDO", "HPO" or "MPO"
organism	one of "hsa" and "mmu"
pvalueCutoff	pvalue cutoff
pAdjustMethod	one of "holm", "hochberg", "hommel", "bonferroni", "BH", "BY", "fdr", "none"
universe	background genes
minGSSize	minimal size of genes annotated by ontology term for testing
maxGSSize	maximal size of each geneSet for analyzing
qvalueCutoff	qvalue cutoff
readable	whether mapping gene ID to gene Name

Value

A enrichResult instance.

Author(s)

Guangchuang Yu https://yulab-smu.top

Examples

```
data(geneList)
 gene = names(geneList)[geneList > 1]
 yy = enrichDO(gene, pvalueCutoff=0.05)
 summary(yy)
```

---

enrichNCG *enrichNCG*

Description

Enrichment analysis based on the Network of Cancer Genes database (http://ncg.kcl.ac.uk/)

Usage

```
enrichNCG(
  gene,
  pvalueCutoff = 0.05,
  pAdjustMethod = "BH",
  universe,
  minGSSize = 10,
  maxGSSize = 500,
  qvalueCutoff = 0.2,
  readable = FALSE
)
```

Arguments

gene	a vector of entrez gene id
pvalueCutoff	pvalue cutoff
pAdjustMethod	one of "holm", "hochberg", "hommel", "bonferroni", "BH", "BY", "fdr", "none"
universe	background genes
minGSSize	minimal size of genes annotated by ontology term for testing
maxGSSize	maximal size of each geneSet for analyzing
qvalueCutoff	qvalue cutoff
readable	whether mapping gene ID to gene Name

Details

given a vector of genes, this function will return the enrichment NCG categories with FDR control

Value

A `enrichResult` instance

Author(s)

Guangchuang Yu

---

gene2DO *convert Gene ID to DO Terms*

Description

provide gene ID, this function will convert to the corresponding DO Terms

Usage

```
gene2DO(gene, organism = "hsa", ont = "HDO")
```

Arguments

gene	entrez gene ID
organism	organism
ont	ont

Value

DO Terms

Author(s)

Guangchuang Yu https://yulab-smu.top

---

geneSim *geneSim*

Description

measuring similarities bewteen two gene vectors.

Usage

```
geneSim(
  geneID1,
  geneID2 = NULL,
  ont = "HDO",
  organism = "hsa",
  measure = "Wang",
  combine = "BMA"
)
```

Arguments

geneID1	entrez gene vector
geneID2	entrez gene vector
ont	one of "HDO" and "MPO"
organism	one of "hsa" and "mmu"
measure	one of "Wang", "Resnik", "Rel", "Jiang", and "Lin".
combine	One of "max", "avg", "rcmax", "BMA" methods, for combining semantic similarity scores of multiple DO terms associated with gene/protein.

Details

provide two entrez gene vectors, this function will calculate their similarity.

Value

score matrix

Author(s)

Guangchuang Yu https://yulab-smu.top

Examples

```
g <- c("835", "5261","241", "994")
geneSim(g)
```

---

gseDGN *DisGeNET Gene Set Enrichment Analysis*

Description

perform gsea analysis

Usage

```
gseDGN(
  geneList,
  exponent = 1,
  nPerm = 1000,
  minGSSize = 10,
  maxGSSize = 500,
  pvalueCutoff = 0.05,
  pAdjustMethod = "BH",
  verbose = TRUE,
  method = "multilevel",
  adaptive = FALSE,
  minPerm = 1000,
  maxPerm = 10000,
  ...
)
```

Arguments

geneList	order ranked geneList
exponent	weight of each step
nPerm	permutation numbers
minGSSize	minimal size of genes annotated by ontology term for testing
maxGSSize	maximal size of each geneSet for analyzing
pvalueCutoff	pvalue cutoff

pAdjustMethod	one of "holm", "hochberg", "hommel", "bonferroni", "BH", "BY", "fdr", "none"
verbose	print message or not
method	method of GSEA, one of "multilevel", "permute", "sample"
adaptive	logical, use adaptive permutation or not (default: FALSE)
minPerm	minimum number of permutations for adaptive mode (default: 1000)
maxPerm	maximum number of permutations for adaptive mode (default: 10000)
...	other parameter

Value

gseaResult object

Author(s)

Guangchuang Yu

---

gseDO *DO Gene Set Enrichment Analysis*

Description

perform gsea analysis

Usage

```
gseDO(
  geneList,
  ont = "HDO",
  organism = "hsa",
  exponent = 1,
  nPerm = 1000,
  minGSSize = 10,
  maxGSSize = 500,
  pvalueCutoff = 0.05,
  pAdjustMethod = "BH",
  verbose = TRUE,
  method = "multilevel",
  adaptive = FALSE,
  minPerm = 1000,
  maxPerm = 10000,
  ...
)
```

Arguments

geneList	order ranked geneList
ont	one of "HDO", "HPO" or "MPO"
organism	one of "hsa" and "mmu"
exponent	weight of each step
nPerm	permutation numbers
minGSSize	minimal size of genes annotated by ontology term for testing
maxGSSize	maximal size of each geneSet for analyzing
pvalueCutoff	pvalue cutoff
pAdjustMethod	one of "holm", "hochberg", "hommel", "bonferroni", "BH", "BY", "fdr", "none"
verbose	print message or not
method	method of GSEA, one of "multilevel", "permute", "sample"
adaptive	logical, use adaptive permutation or not (default: FALSE)
minPerm	minimum number of permutations for adaptive mode (default: 1000)
maxPerm	maximum number of permutations for adaptive mode (default: 10000)
...	other parameter

Value

gseaResult object

Author(s)

Guangchuang Yu

---

gseNCG *NCG Gene Set Enrichment Analysis*

Description

perform gsea analysis

Usage

```
gseNCG(
  geneList,
  exponent = 1,
  nPerm = 1000,
  minGSSize = 10,
  maxGSSize = 500,
  pvalueCutoff = 0.05,
  pAdjustMethod = "BH",
```

```
  verbose = TRUE,
  method = "multilevel",
  adaptive = FALSE,
  minPerm = 1000,
  maxPerm = 10000,
  ...
)
```

Arguments

geneList	order ranked geneList
exponent	weight of each step
nPerm	permutation numbers
minGSSize	minimal size of genes annotated by ontology term for testing
maxGSSize	maximal size of each geneSet for analyzing
pvalueCutoff	pvalue cutoff
pAdjustMethod	one of "holm", "hochberg", "hommel", "bonferroni", "BH", "BY", "fdr", "none"
verbose	print message or not
method	method of GSEA, one of "multilevel", "permute", "sample"
adaptive	logical, use adaptive permutation or not (default: FALSE)
minPerm	minimum number of permutations for adaptive mode (default: 1000)
maxPerm	maximum number of permutations for adaptive mode (default: 10000)
...	other parameter

Value

gseaResult object

Author(s)

Guangchuang Yu

---

mclusterSim *mclusterSim*

Description

Pairwise semantic similarity for a list of gene clusters

Usage

```
mclusterSim(
  clusters,
  ont = "HDO",
  organism = "hsa",
  measure = "Wang",
  combine = "BMA"
)
```

Arguments

clusters	A list of gene clusters
ont	one of "HDO", "HPO" and "MPO"
organism	organism
measure	one of "Wang", "Resnik", "Rel", "Jiang", and "Lin".
combine	One of "max", "avg", "rcmax", "BMA" methods, for combining semantic similarity scores of multiple DO terms associated with gene/protein.

Value

similarity matrix

Author(s)

Guangchuang Yu

Examples

```
## Not run:
cluster1 <- c("835", "5261","241")
cluster2 <- c("578","582")
cluster3 <- c("307", "308", "317")
clusters <- list(a=cluster1, b=cluster2, c=cluster3)
mclusterSim(clusters, measure="Wang")

## End(Not run)
```

---

reexports *Objects exported from other packages*

Description

These objects are imported from other packages. Follow the links below to see their documentation.

ggplot2 facet_grid

GOSemSim get_organism

simplot *simplot*

Description

plotting similarity matrix

Usage

```
simplot(
  sim,
  xlab = "",
  ylab = "",
  color.low = "white",
  color.high = "red",
  labs = TRUE,
  digits = 2,
  labs.size = 3,
  font.size = 14
)
```

Arguments

sim	similarity matrix
xlab	xlab
ylab	ylab
color.low	color of low value
color.high	color of high value
labs	logical, add text label or not
digits	round digit numbers
labs.size	lable size
font.size	font size

Value

ggplot object

Author(s)

Yu Guangchuang

theme_dose *theme_dose*

Description

ggplot theme of DOSE

Usage

```
theme_dose(font.size = 14)
```

Arguments

font.size	font size

Value

ggplot theme

Examples

```
library(ggplot2)
qplot(1:10) + theme_dose()
```

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