Package ‘psygenet2r’

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Title psygenet2r - An R package for querying PsyGeNET and to perform
comorbidity studies in psychiatric disorders

Version 1.6.2

Description Package to retrieve data from PsyGeNET database (www.psygenet.org) and to per-
form comorbidity studies with PsyGeNET's and user's data.

Depends R (>= 3.3)

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DataGeNET.Psy-class  

Class DataGeNET.Psy is the basic object used in psygenet2r package. It is the main data container to using the different functions to query PsyGeNET database and generate their output. The constructors of this class are the functions psygenetGene and psygenetDisease.

Slots

- **type** Character containing 'gene' of 'disease'. It is used to perform the correct query to PsyGeNET.
- **search** Character containing 'single' of 'list'. It is used to perform the correct query to PsyGeNET.
- **database** Character containing the name of the database that will be queried. It can take the values 'MODELS' to use Comparative Toxigenomics Database, data from mouse and rat; 'GAD' to use Genetic Association Database; 'CTD' to use Comparative Toxigenomics Database, data from human; 'PsyCUR' to use Psychiatric disorders Gene association manually curated; 'CURATED' to use Human, manually curated databases (PsyCUR and CTD); or 'ALL' to use all these databases.
- **term** Character with the term(s) to search into the database(s).
- **qresult** data.frame with the obtained result

See Also

psygenetGene, psygenetDisease, DataGeNET.Psy-methods

---

enrichedPD  

Enrichment of a user's input (genes) in PsyGeNET's diseases.

Description

Test the enrichment of a given gene list on Psychiatric Disorders from PsyGeNET.

Usage

enrichedPD(gene, database = "ALL", verbose = FALSE, warnings = FALSE)
Arguments

- **gene**: Name or vector of names (that can be both code or uml) to specific genes from PsyGeNET.
- **database**: Name of the database that will be queried. It can take the values 'psycur15' to use data validated by experts for first release of PsyGeNET; 'psycur16' to use data validated by experts for second release of PsyGeNET; or 'ALL' to use both databases. Default 'ALL'.
- **verbose**: By default FALSE. Change it to TRUE to get a on-time log from the function.
- **warnings**: By default TRUE. Change it to FALSE to not see the warnings.

Value

A data.frame with the enrichment at each Psychiatric Disorder

Examples

enrichedPD(c("ADCY2", "AKAP13", "ANK3"), "ALL")

extract

Raw data from DataGeNET.Psy and JaccardIndexPsy.

Description

Obtain the raw data from a PsyGeNET's query stored in a DataGeNET.Psy object or the raw data with all the Jaccard Index for the disease of interest of an JaccardIndexPsy object.

Usage

extract(object, ...)

## S4 method for signature 'DataGeNET.Psy'
extract(object)

## S4 method for signature 'JaccardIndexPsy'
extract(object, order.cl = "pval", ...)

Arguments

- **object**: Object of class DataGeNET.Psy or JaccardIndexPsy
- **...**: NO USED
- **order.cl**: Order resulting data.frame by the name of this column.

Value

A data.frame containing the raw result from PsyGeNET or a data.frame with the result Jaccard Index for each disease.

A data.frame containing the raw result from PsyGeNET

A data.frame with the result Jaccard Index for each disease.
extractSentences

Method to obtain the evidences from a DataGeNET.Psy object.

Description

Internally, PsyGeNET uses a series of collected evidences from public literature. The internal table of a DataGeNET.Psy object can contain this information. The method extractSentences allows to extract this information.

Usage

extractSentences(object, disorder, verbose)

## S4 method for signature 'DataGeNET.Psy'
extractSentences(object, disorder, verbose = FALSE)

Arguments

- **object**: Object of class DataGeNET.Psy.
- **disorder**: A disorder to check if any evidence exists.
- **verbose**: If set to TRUE informative messages are shown.

Value

A data frame showing the evidence.

Methods (by class)

- DataGeNET.Psy: Get sentences or evidences

Examples

data(qr)
extraestSentences(qr, "Depression")
geneAttrPlot

Ploting the relation between genes and disease-categories

Description

Given a set of genes or a result of psygenetGene creates four types of plots showing the relation of the genes with the disease's category in psyGeNET.

Usage

geneAttrPlot(x, type = "pie", verbose = FALSE)

Arguments

x Vector of genes of interest of DataGeNET.Psy resulting of psyegnetDisease.
type (default "pie") It can takes "pie".
verbose By default FALSE. Change it to TRUE to get a on-time log from the function.

Value

A plot for a DataGeNET.Psy in terms of the panther-class.

getUMLs

Query PsyGeNET for given gene(s) and generates an DataGeNET.Psy

Description

Given the name of one or multiple gene and retrieves their information from PsyGeNET and creates an object of type DataGeNET.Psy.

Usage

getUMLs(word, database = "ALL")

Arguments

word Disease to convert to UMLS using PsyGeNET database.
database Name of the database that will be queried. It can take the values 'psycur15' to use data validated by experts for first release of PsyGeNET; 'psycur16' to use data validated by experts for second release of PsyGeNET; or 'ALL' to use both databases. Default 'ALL'.

Value

The corresponding UMLs for the input disease/s

Examples

uums <- getUMLs( word = "depressive", database = "ALL" )
Description

This function is able to calculate the Jaccard Index between: 1. multiple diseases, 2. a set of genes and multiple diseases, 3. a set of genes and multiple main psychiatric disorders and 4. multiple diseases and multiple main psychiatric disorders.

Usage

\[
\text{jaccardEstimation}(\text{pDisease}, \text{sDisease}, \text{database} = \text{"ALL"}, \text{nboot} = 100, \text{ncores} = 1, \text{verbose} = \text{FALSE})
\]

Arguments

- \text{pDisease}: vector of diseases, vector of genes, vector of main psychiatric disorder.
- \text{sDisease}: vector of diseases, vector of genes, vector of main psychiatric disorder. Only necessary when comparing genes vs. diseases, genes vs. main psychiatric disorders or diseases vs. main psychiatric disorders. To compare multiple diseases only use \text{pDisease}.
- \text{database}: Name of the database that will be queried. It can take the values ‘psycur15’ to use data validated by experts for first release of PsyGeNET; ‘psycur16’ to use data validated by experts for second release of PsyGeNET; or ‘ALL’ to use both databases.
- \text{nboot}: Number of iterations sued to compute the pvalue associated to the calculated Jaccard Index (default 100).
- \text{ncores}: Number of cores used to calculate the pvalue associated to the computed Jaccard Index (default 1).
- \text{verbose}: By default FALSE. Change it to TRUE to get a on-time log from the function.

Details

Warning: The main psychiatric disorders are understood as a single set of genes composed by the genes of all the diseases that the main psychiatric disorder contains.

Value

An object of class JaccardIndexPsy with the computed calculation of the JaccardIndex.

Examples

\[
\text{ji} \leftarrow \text{jaccardEstimation}(\text{c(\text{"COMT"}, \text{"CLOCK"}, \text{"DRD3"}), \text{\textquote{umls:C0005586"}, \text{"ALL"})}}
\]
Class **JaccardIndexPsy** is the result of the process to look for a Jaccard Index between multiple diseases in psygenet2r package.

**Slots**
- **nit** Number of iterations to calculate the estimated Jaccard index
- **type** Slot to save type of query (disease-disease, gene-disease)
- **table** data.frame containing the result table of Jaccard indexes
- **i1** [internal use] vector with names of first component
- **i2** [internal use] vector with names of second component

**See Also**
- psygenetGene, psygenetDisease, JaccardIndexPsy-methods

**Examples**
```r
ji <- jaccardEstimation( c("COMT", "CLOCK", "DRD3"), "umls:C0005586", "ALL" )
```

---

**ndisease**

*Getter from DataGeNET.Psy.*

**Description**

Obtain the number of unique diseases in a DataGeNET.Psy.

**Usage**

```r
ndisease(object)
```

```r
## S4 method for signature 'DataGeNET.Psy'
ndisease(object)
```

**Arguments**

- **object** Object of class DataGeNET.Psy.

**Value**

The number of unique diseases

**Methods (by class)**

- DataGeNET.Psy: Get number of diseases
 Examples

```r
data(qr)
disease(qr)
```

---

**ngene**  
*Getter from DataGeNET.Psy.*

---

**Description**

Obtain the number of unique genes in a `DataGeNET.Psy`

**Usage**

```r
ngene(object)
```

```r
## S4 method for signature 'DataGeNET.Psy'
ngene(object)
```

**Arguments**

- `object`  
  Object of class `DataGeNET.Psy`.

**Value**

The number of unique genes

**Methods (by class)**

- `DataGeNET.Psy`: Get number of genes

**Examples**

```r
data(qr)
ngene(qr)
```

---

**pantherGraphic**  
*Query PsyGeNET for given genes and creates a representation in base of their panther-class*

---

**Description**

Given a vector of genes of interest (or using a `DataGeNET.Psy` object), this function creates a representation of the panther-class these genes belong to.

**Usage**

```r
pantherGraphic(x, database = "ALL", score, verbose = FALSE)
```
plot,DataGeNET.Psy,ANY-method

Arguments

- **x**: Vector of genes of interest of DataGeNET.Psy resulting of psyegnetDisease.
- **database**: Name of the database that will be queried. It can take the values 'psycur15' to use data validated by experts for first release of PsyGeNET; 'psycur16' to use data validated by experts for second release of PsyGeNET; or 'ALL' to use both databases. Default 'ALL'.
- **score**: threshold to take into account a gene in the analysis
- **verbose**: By default FALSE. Change it to TRUE to get a on-time log from the function.

Value

A plot for a DataGeNET.Psy in terms of the panther-class.

Examples

```r
d.alch <- pantherGraphic( c( "COMT", "CLOCK", "DRD3" ), "ALL" )
```

Description

This functions llows to create a variety of plots for DataGeNET.Psy and JaccardIndexPsy objects.

Usage

```r
## S4 method for signature 'DataGeNET.Psy,ANY'
plot(x, y,
    layout = igraph::layout.fruchterman.reingold, type = "disease",
    verbose = FALSE, ...)
```

Arguments

- **x**: Object of class DataGeNET.Psy
- **y**: NOT USED
- **layout**: Function to design the location of the different nodes. By default layout.fruchterman.reingold from igraph is used.
- **type**: Type of the drawn chart. By default it is "disease" but it also can be "individual disease", "disease", "disease class", "barplot", "heatmapGenes" or "heatmap".
- **verbose**: By default FALSE. If set to TRUE information on the drawing process will be shown.
- **...**: Passed to inner functions for different plots.

Value

A plot for DataGeNET.Psy.
Examples

data(qr)
plot(qr) # for all-disease plot
plot(qr, type = 'disease class') # for MPI plot

---

**plot,JaccardIndexPsy,ANY-method**

*Plot the content of a JaccardIndexPsy object.*

Description

This function allows to create a variety of plots for DataGeNEt.Psy and JaccardIndexPsy objects.

Usage

```r
## S4 method for signature 'JaccardIndexPsy,ANY'
plot(x, y, cutOff, zero.remove = TRUE,
     noTitle = FALSE, verbose = FALSE, ...)
```

Arguments

- `x` Object of class JaccardIndexPsy.
- `y` NOT USED
- `cutOff` Number to filter the shown results.
- `zero.remove` By default TRUE. It removes those relations with a Jaccard Index of 0.
- `noTitle` By default FALSE. If set to true no title will be added to the plot.
- `verbose` By default FALSE. If set to TRUE information on the drawing process will be shown.
- `...` NOT USED

Value

A plot for JaccardIndexPsy.

Examples

```r
## Not run:
# Being x an JaccardIndexPsy
qr <- plot(x)
## End(Not run)
```
psygenet2r

Description

psygenet2r has two categories of functions: querying functions and analysis and plotting functions.

querying functions

The functions to retrieve data from PsyGeNET are psygenetDisease and psygenetGene. There are some other support functions like psygenetGeneSentences.

analysis and plotting functions

The functions extract and extractSentences allows to retrieve the row data obtained from on-line resources. The functions plot and pantherGraphic draws a variety of charts to illustrate the obtained results. The function enrichedPD was built to perform enrichment studies on PsyGeNET data. Finally the function jaccardEstimation computes a Jaccard Index from a given input on PsyGeNET data.

psygenetDisease

Description

Given the name of one or multiple diseases and retrieves their information from PsyGeNET and creates an object of type DataGeNET.Psy.

Usage

psygenetDisease(disease, database = "ALL", score = c(">", 0), verbose = FALSE, warnings = TRUE)

Arguments

disease Name or vector of names (that can be both code or uml) to specific diseases from PsyGeNET. The diseases non existing in PsyGeNET will be removed from the output.
database Name of the database that will be queried. It can take the values 'psycur15' to use data validated by experts for first release of PsyGeNET; 'psycur16' to use data validated by experts for second release of PsyGeNET; or 'ALL' to use both databases. Default 'ALL'.
score A vector with two elements: 1) character with greather '>' or with lower '<' meaning greather or equal and lower or equal; 2) the evidence index cut-off to be compared. By default: c(">", 0).
verbose By default FALSE. Change it to TRUE to get a on-time log from the function.
warnings By default TRUE. Change it to FALSE to don’t see the warnings.
psygenetDiseaseSentences

Value
An object of class DataGeNET.Psy

Examples
```r
d.sch <- psygenetDisease( "schizophrenia", "ALL" )
```

Description
Given a disease or a disease list, retrieves the pmids and sentences for each gene-disease association from PsyGeNET and creates an object of type DataGeNET.Psy.

Usage
```r
psygenetDiseaseSentences(diseaseList, database = "ALL", verbose = FALSE)
```

Arguments
diseaseList Name or vector of names (that can be both code or uml) to specific diseases from PsyGeNET. The diseases non existing in PsyGeNET will be removed from the output.
database Name of the database that will be queried. It can take the values ‘psycur15’ to use data validated by experts for first release of PsyGeNET, ‘psycur16’ to use data validated by experts for second release of PsyGeNET, or ‘ALL’ to use both databases. Default ‘ALL’.
verbose By default FALSE. Change it to TRUE to get a on-time log from the function.

Value
An object of class DataGeNET.Psy

Examples
```r
diseasesOfInterest <- c( "Bipolar Disorder","Depressive Disorder, Major" )
psyDisSen <- psygenetDiseaseSentences( diseaseList = diseasesOfInterest, database = "ALL" )
```
psygenetGene  

**Description**

Given the name of one or multiple gene and retrives their information from PsyGeNET and creates an object of type `DataGeNET.Psy`.

**Usage**

```r
psygenetGene(gene, database = "ALL", score = c(">", 0), verbose = FALSE, warnings = TRUE)
```

**Arguments**

- `gene` Name or vector of names (that can be both code or symbol) to specific genes from PsyGeNET. The genes non existing in PsyGeNET will be removed from the output.
- `database` Name of the database that will be queried. It can take the values 'psycur15' to use data validated by experts for first release of PsyGeNET; 'psycur16' to use data validated by experts for second release of PsyGeNET; or 'ALL' to use both databases. Default 'ALL'.
- `score` A vector with two elements: 1) character with greater '>' or with lower '<' meaning greater or equal and lower or equal; 2) the evidence index cut-off to be compared. By default: c('>', 0).
- `verbose` By default FALSE. Change it to TRUE to get a on-time log from the function.
- `warnings` By default TRUE. Change it to FALSE to not see the warnings.

**Value**

An object of class `DataGeNET.Psy`

**Examples**

```r
d.alch <- psygenetGene("ALDH2", "ALL")
```

---

**psygenetGeneSentences**  

**Query PsyGeNET for given gene(s) and extract the pmids sentences that report a gene-disease association.**

**Description**

Given a gene or a gene list, retrives the pmids and sentences for each gene-disease association from PsyGeNET and creates an object of type `DataGeNET.Psy`.

**Usage**

```r
psygenetGeneSentences(geneList, database = "ALL", verbose = FALSE)
```
Arguments

geneList Name or vector of names (that can be both code or symbol) to specific genes from PsyGeNET. The genes non existing in PsyGeNET will be removed from the output.
database Name of the database that will be queried. It can take the values 'psycur15' to use data validated by experts for first release of PsyGeNET; 'psycur16' to use data validated by experts for second release of PsyGeNET; or 'ALL' to use both databases. Default 'ALL'.
verbose By default FALSE. Change it to TRUE to get a on-time log from the function.

Value
An object of class DataGeNET.Psy

Examples

genesOfInterest <- c("PECR", "ADH1C", "CAST", "ERAP1", "PPP2R2B", "ESR1", "GATA4", "CDH13")
psyGeneSen <- psygenetGeneSentences( geneList = genesOfInterest, database = "ALL")

Description
A dataset obtained from PsyGeNET after being queried with psygenetGene using the term '4852' on "ALL" database.

Usage
data("qr")

Format
The format is: Formal class 'DataGeNET.Psy' [package "psygenet2r"] with 5 slots .. type : chr "gene" .. search : chr "" .. database: chr "ALL" .. term : chr "4852" .. qresult : 'data.frame'

Value
A DataGeNET.Psy object.

Source
http://psygenet.org

Examples
ngene(qr)
ndisease(qr)
topAnatEnrichment

Enrichment of a user's input (genes) in anatomical terms (TopAnat).

Description

Test the enrichment of a given gene list on Psychiatric Disorders from PsyGeNET.

Usage

topAnatEnrichment(gene, datatype = c("rna_seq", "affymetrix", "est", "in_situ"), statistic = "fisher", cutOff = 1, verbose = FALSE, warnings = FALSE)

Arguments

gene Name or vector of names (that can be both code or uml) to specific genes from PsyGeNET.
datatype It can take the values ‘rna_seq’, ‘affymetrix’, ‘est’ or ‘in situ’. Default c("rna_seq", "affymetrix", "est", "in_situ").
statistic Default ‘fisher’.
cutOff Default 1.
verbose By default FALSE. Change it to TRUE to get a on-time log from the function.
warnings By default TRUE. Change it to FALSE to not see the warnings.

Value

A data.frame with the enrichment results

Examples

## Not run:
topAnatEnrichment(gene=c("ADCY2", "AKAP13", "ANK3"))

## End(Not run)
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