Package ‘dagLogo’

October 9, 2015

Type Package

Title dagLogo

Version 1.6.0

Date 2014-10-26

Author Jianhong Ou, Alexey Stukalov, Niraj Nirala, Usha Acharya, Lihua Julie Zhu

Maintainer Jianhong Ou <jianhong.ou@umassmed.edu>

Description

Visualize significant conserved amino acid sequence pattern in groups based on probability theory

License GPL (>=2)

Depends R (>= 3.0.1), methods, biomaRt, grImport, grid, motifStack

Imports pheatmap, Biostrings

Suggests XML, UniProt.ws, RUnit, BiocGenerics, BiocStyle

biocViews SequenceMatching, Visualization

NeedsCompilation no

R topics documented:

dagLogo-package 2
buildBackgroundModel 3
colorsets 4
dagBackground-class 5
dagHeatmap 5
dagLogo 6
dagPeptides-class 7
ecoli.proteome 7
fetchSequence 8
formatSequence 9
nameHash 10
prepareProteome 11
Proteome-class 12
proteome.example 12
seq.example 13

testDAU 14
testDAUresults-class 15

Index **16**

`dagLogo-package` *Visualize significant conserved amino acid sequence pattern in groups based on probability theory*

Description

We implement iceLogo by R to visualize significant conserved amino acid sequence pattern based on probability theory. Compare to iceLogo, dagLogo can also visualize significant sequence patterns by clustering the peptides by groups such as charge, chemistry, hydrophobicity and etc.

Details

Package:	dagLogo
Type:	Package
Version:	1.0
Date:	2013-09-31
License:	GPL (>= 2)

DAG: Differential Amino acid Group

There are several differences between dagLogo from iceLogo:

1. The sequence patterns can be grouped by charge, chemistry, hydrophobicity and etc.

2. dagLogo accepts different length of aligned amino acid sequences.

3. Except Random, regional (called restricted in dagLogo) and terminal (called anchored) background model, the background sequence could be set to other regions of the genes in inputs and complementary set of the proteome.

Author(s)

Jianhong Ou, Julie Lihua Zhu

Maintainer: Jianhong Ou <jianhong.ou@umassmed.edu>

Examples

```
 data("seq.example")
 data("proteome.example")
bg <- buildBackgroundModel(seq.example, proteome=proteome.example, permutationSize=10L)
 t <- testDAU(seq.example, bg)
 dagLogo(t)
```

buildBackgroundModel *build background model*

Description

build background model for dag test

Usage

```
buildBackgroundModel(dagPeptides,
                                 bg=c("wholeGenome", "inputSet", "nonInputSet"),
                                  model=c("any", "anchored"),
                              targetPosition=c("any", "Nterminus", "Cterminus"),
                                  uniqueSeq=TRUE,
                                  permutationSize=30L,
                                  rand.seed=1,
                                  replacement=FALSE,
                                  proteome)
```

Arguments

dagPeptides	an object of dagPeptides, output of fetchSequence or formatSequence
bg	could be "wholeGenome", "inputSet" or "nonInputSet"
model	could be "any" or "anchored"
targetPosition	could be "any", "Nterminus" or "Cterminus"
uniqueSeq	should the background sequence be unique?
permutationSize	how many times should it samples
rand.seed	random seed
replacement	Should sampling be with replacement?
proteome	an object of Proteome, output of prepareProteome

Details

The background could be generated from wholeGenome, inputSet or nonInputSet. whole genome: randomly select subsequences from the whole genome with each subsequence containing amino acids with same width of input sequences. anchored whole genome: randomly select subsequences from the whole genome with each subsequence containing amino acids with same width of input sequences where the middle amino acids must contain anchor amino acid, e.g., K, which is specified by user. input set: same to whole genome, but only use protein sequence from input id and not including the site specified in input sequences anchored input set: same to anchored whole genome, but only use protein sequences from input id, and not including the site specified in input sequences. non-input set: whole genome - input set. anchored non-input set: whole genome - input set and the middle amino acids must contain anchor amino acid.

Value

an object of dagBackground which contains background and permutationSize.

Author(s)

Jianhong Ou, Alexey Stukalov, Julie Zhu

See Also

prepareProteome

Examples

```
data("seq.example")
data("proteome.example")
bg <- buildBackgroundModel(seq.example, proteome=proteome.example)
```

---

colorsets *retrieve color setting for logo*

Description

retrieve prepared color setting for logo

Usage

```
colorsets(colorScheme=c("null", "classic", "charge", "chemistry", "hydrophobicity"))
```

Arguments

colorScheme	could be 'null', 'charge', 'chemistry', 'classic' or 'hydrophobicity'

Value

A character vector of color scheme

Author(s)

Jianhong Ou

Examples

```
col <- colorsets("hydrophobicity")
```

dagBackground-class *Class* "dagBackground"

Description

An object of class "dagBackground" represents background model.

Objects from the Class

Objects can be created by calls of the form new("dagBackground", background, permutationSize).

Slots

background Object of class "list" records the background model

permutationSize code"integer" permutation size of background

dagHeatmap *plot heatmap for test results*

Description

plot heatmap for test results

Usage

```
dagHeatmap(testDAUresults, type=c("diff", "zscore"), ...)
```

Arguments

testDAUresults	output of testDAU, should be an object of testDAUresults
type	"diff" or "zscore"
...	parameter could be passed to pheatmap

Value

none

Author(s)

Jianhong Ou

Examples

```
 data("seq.example")
 data("proteome.example")
bg <- buildBackgroundModel(seq.example, proteome=proteome.example, permutationSize=10)
 t <- testDAU(seq.example, bg)
 dagHeatmap(t)
```

dagLogo *plot sequence logo for test results*

Description

plot sequence logo for test results

Usage

```
dagLogo(testDAUresults, type=c("diff", "zscore"), pvalueCutoff=0.05, namehash=NULL,
                    font="Helvetica-Bold", textgp=gpar(), legend=FALSE,
                    labelRelativeToAnchor=FALSE)
```

Arguments

testDAUresults	output of testDAU, should be an object of testDAUresults
type	"diff" or "zscore"
pvalueCutoff	pvalue cutoff for logo plot
namehash	the hash table to convert rownames of test results to a single letter to be plotted in the logo
font	font for logo symbol
textgp	text parameter
legend	plot legend or not, default false.
labelRelativeToAnchor	plot label relative to anchor or not, default false.

Value

none

Author(s)

Jianhong Ou

See Also

nameHash

Examples

```
 data("seq.example")
 data("proteome.example")
bg <- buildBackgroundModel(seq.example, proteome=proteome.example, permutationSize=10)
 t <- testDAU(seq.example, bg)
 dagLogo(t)
```

dagPeptides-class *Class* "dagPeptides"

Description

An object of class "dagPeptides" represents the information of peptides.

Objects from the Class

Objects can be created by calls of the form new("dagPeptides", data, peptides, upstreamOffset, downstreamOffse

Slots

data Object of class "data.frame" The details of the input sequences. It includes the columns: IDs, anchorAA (anchor Amino Acid), anchorPos (anchor Position), peptide (protein peptide), anchor, upstream, downstream (peptides in given upstream and downstream offset from anchor)

peptides code"matrix" The input peptides. Each column contains one peptide in that position

upstreamOffset "numeric" The upstream offset from anchor

downstreamOffset "numeric" The downstream offset from anchor

type "charactger" ID type of inputs

ecoli.proteome *the subset proteome of Escherichia coli*

Description

the subset proteome of Escherichia coli

Usage

```
data(ecoli.proteome)
```

Format

An object of Proteome for Escherichia coli proteome. The format is: A list with one data frame and an character.

proteome 'data.frame': obs. of 4 variables

type 'character': "UniProt"

The format of proteome is

ENTREZ_GENE a character vector, records entrez gene id

SEQUENCE a character vector, peptide sequences

ID a character vector, Uniprot ID

LEN a character vector, length of peptides

Details

used in the examples Annotation data obtained by: library(UniProt.ws) taxId(UniProt.ws) <- 562 proteome <- prepareProteome(UniProt.ws, species="Escherichia coli")

Examples

```
data(ecoli.proteome)
head(ecoli.proteome@proteome)
ecoli.proteome@type
```

---

fetchSequence *fetch sequence by id*

Description

fetch amino acid sequence by given identifiers via biomaRt or proteome prepared by prepareProteome

Usage

```
fetchSequence(IDs, type="entrezgene", anchorAA=NULL, anchorPos,
                              mart, proteome, upstreamOffset, downstreamOffset)
```

Arguments

IDs	A vector of Identifiers to retrieve peptides
type	type of identifiers
anchorAA	a vector of character, anchor Amino Acid
anchorPos	a vector of character or numeric, anchor position, for example, K121
mart	an object of Mart
proteome	an object of Proteome, output of prepareProteome
upstreamOffset	an integer, upstream offset position
downstreamOffset	an integer, downstream offset position

Value

return an object of dagPeptides

Author(s)

Jianhong Ou, Alexey Stukalov, Julie Zhu

See Also

formatSequence

Examples

```
mart <- useMart("ensembl", "dmelanogaster_gene_ensembl")
dat <- read.csv(system.file("extdata", "dagLogoTestData.csv", package="dagLogo"))
seq <- fetchSequence(as.character(dat$entrez_geneid[1:5]),
            anchorPos=as.character(dat$NCBI_site[1:5]),
            mart=mart,
            upstreamOffset=7,
            downstreamOffset=7)
```

`formatSequence` *prepare an object of dagPeptides from sequences*

Description

prepare an object of dagPeptides from sequences

Usage

```
formatSequence(seq, proteome, upstreamOffset, downstreamOffset)
```

Arguments

`seq`	a vector of character, amino acid sequences
`proteome`	an object of Proteome, output of `prepareProteome`
`upstreamOffset`	an integer, upstream offset position
`downstreamOffset`	an integer, downstream offset position

Value

return an object of dagPeptides, which is a list contains: data, peptides, upstreamOffset, downstreamOffset and type information

Author(s)

Jianhong Ou, Julie Zhu

See Also

`fetchSequence`

Examples

```
if(interactive()){
    dat <- unlist(read.delim(system.file("extdata",
                             "grB.txt", package="dagLogo"),
                             header=F, as.is=TRUE))
    proteome <- prepareProteome(fasta=system.file("extdata",
                                                  "HUMAN.fasta",
                                                  package="dagLogo"))
    seq <- formatSequence(dat, proteome)
}
```

---

nameHash *convert group name to a single character*

Description

convert group name to a single character to shown in a logo

Usage

```
nameHash(nameScheme=c("classic", "charge", "chemistry", "hydrophobicity"))
```

Arguments

nameScheme	could be "classic", "charge", "chemistry", "hydrophobicity"

Value

A character vector of name scheme

Author(s)

Jianhong Ou

Examples

```
nameHash("charge")
```

prepareProteome *prepare proteome for background building*

Description

prepare proteome from UniProt webserver or a fasta file

Usage

```
prepareProteome(UniProt.ws, fasta, species="unknown")
```

Arguments

UniProt.ws	an object of UniProt.ws
fasta	fasta file name or an object of AAStringSet
species	an character to assign the species of the proteome

Value

an object of Proteome which contain protein sequence information

Author(s)

Jianhong Ou

See Also

formatSequence, buildBackgroundModel

Examples

```
if(interactive()){
    library(UniProt.ws)
    taxId(UniProt.ws) <- 7227
    proteome <- prepareProteome(UniProt.ws, species="Drosophila melanogaster")
}
```

Proteome-class *Class* "Proteome"

Description

An object of class "Proteome" represents proteome of a given species.

Objects from the Class

Objects can be created by calls of the form new("Proteome", proteome, type, species).

Slots

proteome Object of class "data.frame" the proteome of a given species, should include ids and peptide sequences.

type code"character" indicates how the object is prepared, could be "fasta" or "UniProt"

species "character" the species

proteome.example *the subset proteome of fruit fly*

Description

the subset proteome of fruit fly

Usage

```
data(proteome.example)
```

Format

An object of Proteome for fly subset proteome. The format is: A list with one data frame and an character.

proteome 'data.frame': 1406 obs. of 4 variables

type 'character': "UniProt"

The format of proteome is

ENTREZ_GENE a character vector, records entrez gene id

SEQUENCE a character vector, peptide sequences

ID a character vector, Uniprot ID

LEN a character vector, length of peptides

Details

used in the examples Annotation data obtained by: library(UniProt.ws) taxId(UniProt.ws) <- 7227 proteome <- prepareProteome(UniProt.ws) proteome@proteome <- proteome@proteome[sample(1:19902, 1406),]

Examples

```
data(proteome.example)
head(proteome.example@proteome)
proteome.example@type
```

---

seq.example *example object of dagPeptides*

Description

example object of dagPeptides

Usage

```
data(seq.example)
```

Format

An object of dagPeptides. The format is: A list.

`data` 'data.frame': 732 obs. of 7 variables

`peptides` 'matrix': amnio acid in each position

`upstreamOffset` an integer, upstream offset position

`downstreamOffset` an integer, downstream offset position

`type` "character", type of identifiers

The format of data is

`IDs` a character vector, input identifiers

`anchorAA` a character vector, anchor amino acid provided in inputs

`anchorPos` a numeric vector, anchor position in the protein

`peptide` a character vector, peptide sequences

`anchor` a character vector, anchor amino acid in the protein

`upstream` a character vector, upstream peptides

`downstream` a character vector, downstream peptides

Details

used in the examples seq obtained by: mart <- useMart("ensembl", "dmelanogaster_gene_ensembl") dat <- read.csv(system.file("extdata", "dagLogoTestData.csv", package="dagLogo")) seq <- fetchSequence(as.character(dat$entrez_geneid), anchorPos=as.character(dat$NCBI_site), mart=mart, upstreamOffset=7, downstreamOffset=7)

Examples

```
data(seq.example)
head(seq.example@peptides)
seq.example@upstreamOffset
seq.example@downstreamOffset
```

---

testDAU *DAU test*

Description

Performs DAU test

Usage

```
testDAU(dagPeptides, dagBackground,
                group=c("null", "classic", "charge", "chemistry", "hydrophobicity"),
                    bgNoise=NA)
```

Arguments

dagPeptides	an object of dagPeptides, output of fetchSequence or fformatSequence
dagBackground	an object of dagBackground, output of buildBackgroundModel
group	could be "null", "classic", "charge", "chemistry", "hydrophobicity"
bgNoise	if it is not NA, test will using a background by Dirichlet(1)-distributed random frequencies with weight bg.noise. The value of bgNoise should be a number in the range of 0 to 1, eg. 0.05

Value

an object of testDAUresults ready for plotting

Author(s)

Jianhong Ou, Alexey Stukalov, Julie Zhu

Examples

```
data("seq.example")
data("proteome.example")
bg <- buildBackgroundModel(seq.example, proteome=proteome.example)
t <- testDAU(seq.example, bg, bgNoise=0.05)
```

testDAUresults-class *Class* "testDAUresults"

Description

An object of class "testDAUresults" represents background model.

Objects from the Class

Objects can be created by calls of the form new("dagBackground", group="character", differen

Slots

group Object of class "character" could be "null", "classic", "charge", "chemistry", "hydrophobicity"

difference code"matrix" the difference of inputs from background for each amino acid in each position

zscore code"matrix" z score for each amino acid in each position

pvalue code"matrix" pvalue for each amino acid in each position

background code"matrix" background frequencies for each amino acid in each position

motif code"matrix" inputs frequencies for each amino acid in each position

upstream "numeric" The upstream offset from anchor

downstream "numeric" The downstream offset from anchor

Index

∗Topic **classes**
- dagBackground-class, 5
- dagPeptides-class, 7
- Proteome-class, 12
- testDAUresults-class, 15

∗Topic **datasets**
- ecoli.proteome, 7
- proteome.example, 12
- seq.example, 13

∗Topic **figure**
- colorsets, 4
- dagHeatmap, 5
- dagLogo, 6
- nameHash, 10

∗Topic **misc**
- buildBackgroundModel, 3
- fetchSequence, 8
- formatSequence, 9
- prepareProteome, 11
- testDAU, 14

∗Topic **package**
- dagLogo-package, 2

buildBackgroundModel, 3, *11*, *14*

colorsets, 4

dagBackground-class, 5
dagHeatmap, 5
dagLogo, 6
dagLogo-package, 2
dagPeptides, *8*
dagPeptides-class, 7

ecoli.proteome, 7

fetchSequence, *3*, 8, *9*, *14*
formatSequence, *3*, *8*, 9, *11*, *14*

nameHash, *6*, 10

prepareProteome, *3*, *4*, *8*, *9*, 11
Proteome-class, 12
proteome.example, 12

seq.example, 13

testDAU, *5*, *6*, 14
testDAUresults-class, 15