BicARE

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BicARE-package   *BicARE*

Description

Biclustering Analysis and Results Exploration

Details

Package:	BicARE
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```

Further information is available in the following vignettes:

```
BicARE    BicARE (source, pdf)
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Author(s)

Pierre Gestraud

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FLOC *Performs the FLOC algorithm*

Description

Find a given number of biclusters using the a modified version of the FLOC algorithm.

Usage

```
FLOC(Data, k = 20, pGene = 0.5, pSample=pGene, r = NULL, N = 8, M = 6, t = 500,
```

Arguments

Data	an `ExpressionSet-class` or a matrix (with genes on rows and conditions on columns)
k	the number of biclusters searched
pGene	genes initial probability of membership to the biclusters
pSample	samples initial probability of membership to the biclusters
r	the residue threshold
N	minimal number of gene per bicluster
M	minimal number of conditions per bicluster
t	number of iterations
blocGene	a matrix indicating the directed initialisation for the genes (see details)
blocSample	a matrix indicating the directed initialisation for the conditions (see details)

Details

This biclustering algorithm is based on the FLOC algorithm (FLexible Overlapped biClustering) defined by Yang et al. (see references). It can discover a set of k, possibly overlapping, biclusters. If r is set to NULL, the residue threshold used in the analysis is the residue of Data divided by 10.

blocGene and blocSample are matrix of 0 and 1 with the rows representing the features (gene or samples) and the columns the biclusters. A 1 on line i and column j indicates that the feature i (gene or sample) will be include in the bicluster j during the initialisation step and will not be removed from it during the analysis. If the number of columns in these matrices is different from the number of bicluster searched, k is set to the maximal value of these two.

See `bicluster` to extract a bicluster from the biclustering result.

Value

Returns an object of class 'biclustering', a list containing at least :

`Call`	the matched call.
`ExpressionSet`	
	the data used
`param`	a data.frame with the algorithm parameters
`bicRow`	a matrix of boolean indicating the belonging of the genes to the biclusters
`bicCol`	the same as for bicRow but for the conditions
`mat.resvol.bic`	
	a matrix describing the biclusters

Author(s)

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References

J. Yang, H. Wang, W. Wang, and P.S. Yu. An improved biclustering method for analyzing gene expression. International Journal on Artificial Intelligence Tools, 14(5):771-789, 2005

Examples

```
data(sample.bicData)     ## subset of sample.ExpressionSet from Biobase
residue(sample.bicData)  ##  0.3401921
resBic <- FLOC(sample.bicData, k=10, pGene=0.5,r=0.05,N=8,M=10,t=500)
resBic

## initialising samples of 2 biclusters
iniSample <- matrix(0, ncol=2, nrow=26)
## first bicluster initialised around Female cases
iniSample[pData(sample.bicData)$sex=="Female",1] <- 1
## second bicluster initialised around control cases
iniSample[pData(sample.bicData)$type=="Control",2] <- 1
resBic <- FLOC(sample.bicData, k=10, pGene=0.5, r=0.05, N=8, M=10, t=500, blocSample=iniS
resBic
```

---

bicluster	*Extract a bicluster*

Description

Extract a bicluster from an object of class biclustering

Usage

```
bicluster(biclustering, k, graph=TRUE)
```

Arguments

`biclustering`	an object of class "biclustering" created by function [FLOC]
`k`	the number of the bicluster considered in the "biclustering" object
`graph`	boolean, indicating whether the graph should be plotted or not

Value

Returns the bicluster as a matrix with the genes on rows and the samples on columns. Result matrix is of class "bicluster". The "graph" option allows to plot the expression profiles of the genes across the conditions in the bicluster.

Author(s)

Pierre Gestraud

Examples

```
### extract the first bicluster
data(sample.biclustering)
sample.biclustering
bic <- bicluster(sample.biclustering, 1, graph=TRUE)
plot(bic)
```

---

makeReport	*Export the results as html files*

Description

Creates a directory with html files containing the biclustering results.

Usage

```
makeReport(dirPath, dirName, resBic, browse=TRUE)
```

Arguments

`dirPath`	path to the directory
`dirName`	the name of the directory where the report will be created
`resBic`	a biclustering result
`browse`	logical. If TRUE the web browser will be opened

Details

`makeReport` produces a html report of biclustering results in a new directory named `dirName`. If the `browse` argument is set to TRUE the web browser will be opened on the "home.html" file.

Make sure to have rights to create the result directory.

Author(s)

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Examples

```
data(sample.biclustering)
dirPath <- getwd() ## report created in the current working directory
dirName <- "test"
makeReport(dirPath, dirName, sample.biclustering, browse=FALSE)
```

---

residue   *Residue of a matrix*

Description

Returns the residue of a matrix.

Usage

```
residue(Data)
```

Arguments

Data   an [ExpressionSet-class]() or a matrix

Details

This function computes the residue of a matrix as defined by Yang et al (see references).

Author(s)

Pierre Gestraud

References

J. Yang, H. Wang, W. Wang, and P.S. Yu. An improved biclustering method for analyzing gene expression. International Journal on Artificial Intelligence Tools, 14(5):771-789, 2005

See Also

[FLOC]()

Examples

```
data(sample.bicData)
residue(sample.bicData)
```

---

sample.bicData   *Example data set for BicARE*

Description

A subset of sample.ExpressionSet from package Biobase. The data for 26 cases, labeled A to Z and 350 genes. Each case has three covariates: sex (male/female), type (case/control) and score (testing score).

Usage

```
sample.bicData
```

Format

An ExpressionSet

---

sample.biclustering

Example biclustering object

Description

A biclustering object created by the [FLOC](#) function on the sample.bicData with the following options : k=10, pGene = 0.3, pSample = 0.5, r = 0.025, N = 8, M = 8, t = 1000.

Usage

```
sample.biclustering
```

Format

a biclustering object

---

testAnnot   *Find samples annotations over-represented covariates in biclusters*

Description

Characterisation of the biclusters in term of over-representation of sample covariates.

Usage

```
testAnnot(resBic, annot=NULL, covariates="all")
```

Arguments

`resBic`	a biclustering result from FLOC
`annot`	annotation matrix, default value is set to NULL, then phenoData of the ExpressionSet is used
`covariates`	the names of the covariates that should be tested, default value is set to "all"

Details

For each bicluster and each covariate a chi-squarred test is performed to test the adequation between the distribution of the levels of the covariates in the bicluster and in the original dataset.

Multiple testing correction is performed by the Benjamini-Yekutieli procedure. The residuals of the tests indicate if the level is over or down represented in the bicluster.

Due to the amount of results it is advised to use the `makeReport` function to get a html report.

Value

A `biclustering` object containing `resBic` and updated with the results of the tests in `resBic$covar`.

The results are presented as a list with :

`covar`	the samples covariates tested
`pvalues`	a matrix with the p-values of the tests
`adjpvalues`	a matrix with the p-values adjusted by the Benjamini Yekutieli procedure
`index`	a list of matrices with the numbers of each level in each bicluster
`residuals`	a list of matrices with the residuals of the tests for each modality in each bicluster

Author(s)

Pierre Gestraud

Examples

```
data(sample.biclustering)
resBic <- testAnnot(sample.biclustering, annot=NULL, covariates=c("sex", "type"))
```

---

testSet	*Find gene sets that are enriched in a bicluster*

Description

Test of the over-representation of gene sets in the biclusters

Usage

```
testSet(resBic, geneSetCol)
```

Arguments

`resBic`	a `biclustering` object created by FLOC
`geneSetCol`	a `GeneSetCollection-class`

Details

The over-representation of a gene set in a bicluster is evaluated by an hypergeometric test.

The genes identifiers of the gene sets will automatically be mapped to the same as those used in the data.

Due to the amount of results it is advised to use the [makeReport](#) function to get a html report.

Value

A `biclustering` object containing `resBic` and updated with the results of the tests in `resBic$geneSet`.

The results are presented as a list with :

`GeneSetCollection`
        the GeneSetCollection used

`pvalues`   a matrix containing the pvalues of the tests for each geneSet and each bicluster

`adjpvalue`   a matrix containing the p-values adjusted by the Benjamini Yekutieli procedure

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Examples

```
data(sample.biclustering)
gss <- GeneSetCollection(sample.biclustering$ExpressionSet[1:50,], setType=GOCollection()
resBic <- testSet(sample.biclustering, gss)
```

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