Package ‘SQDA’

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Type Package
Title Sparse Quadratic Discriminant Analysis
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Imports limma (>= 3.18.13), PDSCE (>= 1.2), mvtnorm (>= 0.9.99992)
Description Sparse Quadratic Discriminant Analysis (SQDA) can be performed. In SQDA, the covariance matrix are assumed to be block-diagonal. And, for each block, sparsity assumption is imposed on the covariance matrix. It is useful in high-dimensional setting.
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R topics documented:

SQDA-package .................................................. 2
cross .......................................................... 2
exampledata .................................................. 3
sGda .......................................................... 3
sGdaCV2 ....................................................... 4
simpleAGG3 .................................................. 4
sortgene ....................................................... 5
sQDA ........................................................ 5
test.data .................................................... 6
train.data .................................................... 6

Index 7
Sparse Quadratic Discriminant Analysis

Description
This package is used to perform Sparse Quadratic Discriminant Analysis (SQDA). In SQDA, the covariance matrix are assumed to be block-diagonal. And, for each block, sparsity assumption is imposed on the covariance matrix. It is useful in high-dimensional setting.

Details

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License: GPL-3

The package has one function, sQDA(), which basically takes in several parameters and output the predictions on the new dataset based on the sparse quadratic discriminant analysis. More details on the algorithms see the reference below.

Author(s)

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References
The application of sparse estimation of covariance matrix to quadratic discriminant analysis. Jiehuan Sun and Hongyu Zhao.

Examples

```r
data(exampledata)
res<-sQDA(train.data[1:100,],test.data[1:100,],lams=0.2, presel=FALSE)
sum(res$pred=colnames(test.data))/ncol(test.data) ## prediction error
res$p # number of blocks selected
res$pred # predicted class labels on test.data
```

cross

generate cross-validation ids

Description
generate cross-validation ids
Usage

```r
cross(data = NULL, cv = 5)
```

Arguments

- `data`: data matrix with column names being the class labels and row names being the genes.
- `cv`: the cross-validation folds

Value

cross-validation ids that can be used to split data into training data and testing data.

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**Example Data**

- `exampledata`

**Description**

Simulated example data

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**sGda**

**Prediction function**

Usage

```r
sGda(data = NULL, data.new = NULL, lam = 0)
```

Arguments

- `data`: data matrix with column names being the class labels and row names being the genes.
- `data.new`: the new data needs to be predicted.
- `lam`: optimal lambda from cross-validation.

Value

returns a list object with following items.

- `pred`: predictions for class labels on the new dataset
- `lik`: likelihood of each class on the new dataset
sgdaCV2

Cross-validation function

Description

Cross-validation function

Usage

sgdaCV2(data = NULL, cv = 5, lam = 0)

Arguments

data data matrix with column names being the class labels and row names being the genes.
cv cross-validation folds.
lam a sequence of lambda’s.

Value

returns a list object with following item.
cv.error cross-validation errors for each lambda

simpleAGG3

Blockwise classifiers

Description

Blockwise classifiers

Usage

simpleAGG3(data = NULL, data.new = NULL, len = 100, times = 100, lam = seq(0, 0.1, length = 10))

Arguments

data data matrix with column names being the class labels and row names being the genes.
data.new the new data needs to be predicted.
len block size
times number of blocks
lam a sequence of lambda’s from cross-validation.
sortgene

**Value**

returns a list object with following items.

- **cv.error** cross-validation errors for each block
- **pred** predictions for class labels on the new dataset
- **lik** likelihood of each class on the new dataset

**Description**

Gene sorter

**Usage**

```r
sortgene(data = NULL)
```

**Arguments**

- **data** data matrix with column names being the class labels and row names being the genes.

**Value**

topTable data structure from limma.

sQDA

**Spase Quadratic Discriminant Analysis**

**Description**

Spase Quadratic Discriminant Analysis

**Usage**

```r
sQDA(train.data = NULL, test.data = NULL, len = 100, lams = seq(0.02, 1, length = 10), presel = T, prelam = 0.2, margin = 0.05)
```
Arguments

- **train.data**: data matrix with column names being the class labels and row names being the genes.
- **test.data**: the new data needs to be predicted.
- **len**: block size
- **lams**: a sequence of lambda's from cross-validation.
- **presel**: pre-selection indicator.
- **prelam**: pre-selection sparsity parameter, only used when presel=T.
- **margin**: error margin for pre-selection, only used when presel=T.

Value

returns a list object with following items.

- **pred**: predictions for class labels on the test.data
- **p**: the number of blocks selected

References

The application of sparse estimation of covariance matrix to quadratic discriminant analysis. Jiehuan Sun and Hongyu Zhao.

Examples

```r
data(exampledata)
res<-sqDA(train.data[1:100,],test.data[1:100,],lams=0.2,presel=FALSE)
sum(res$pred!=colnames(test.data))/nrow(test.data)  ##prediction error
res$p  ## number of blocks selected
res$pred  ## predicted class labels on test.data
```

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**test.data**  *testing data*

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**train.data**  *training data*

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Description

simulated testing data

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Description

simulated training data
Index

*Topic **data**
  - exampledata, 3
  - test.data, 6
  - train.data, 6
*Topic **package**
  - SQDA-package, 2

cross, 2

exampledata, 3

sGda, 3
sGdaCV2, 4
simpleAGG3, 4
sortgene, 5
SQDA (SQDA-package), 2
SQDA, 5
SQDA-package, 2

test.data, 6
train.data, 6