

Package ‘selectKSigs’

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Type Package

Title Selecting the number of mutational signatures using a perplexity-based measure and cross-validation

Depends R(>= 3.6)

Imports HiLDA, magrittr, gtools, methods, Rcpp

Suggests knitr, rmarkdown, testthat, BiocStyle, ggplot2, dplyr, tidyr

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Description A package to suggest the number of mutational signatures in a collection of somatic mutations using calculating the cross-validated perplexity score.

URL <https://github.com/USCbiostats/selectKSigs>

BugReports <https://github.com/USCbiostats/HiLDA/selectKSigs>

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biocViews Software, SomaticMutation, Sequencing, StatisticalMethod, Clustering

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LinkingTo Rcpp

VignetteBuilder knitr

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R topics documented:

| | |
|-------------------------------------|-----------|
| calcPMSLikelihood | 2 |
| Calculate_Likelihood_test | 3 |
| convertFromTurbo_F | 3 |
| convertFromTurbo_Q | 4 |
| convertToTurbo_F | 4 |
| convertToTurbo_Q | 5 |
| cv_PMSignature | 5 |
| getBG | 6 |
| getCounts | 6 |
| getExposures | 7 |
| getFeatures | 7 |
| getFeatureVec | 8 |
| getK | 8 |
| getLL | 9 |
| getLogLikelihoodC | 9 |
| getSamplelist | 10 |
| getSamplelistG | 11 |
| getSignatures | 11 |
| getTranscription | 12 |
| select_kth_fold | 12 |
| splitG | 13 |
| Index | 14 |

| | |
|-------------------|---|
| calcPMSLikelihood | <i>A function for calculating the log-likelihood from the data and parameters</i> |
|-------------------|---|

Description

A function for calculating the log-likelihood from the data and parameters

Usage

```
calcPMSLikelihood(p, y)
```

Arguments

| | |
|---|--|
| p | this variable includes the parameters for mutation signatures and membership parameters |
| y | this variable includes the information on the mutation features, the number of mutation signatures specified and so on |

Value

a value

Calculate_Likelihood_test

Output the maximum potential scale reduction statistic of all parameters estimated

Description

Output the maximum potential scale reduction statistic of all parameters estimated

Usage

```
Calculate_Likelihood_test(train, test, paramG)
```

Arguments

| | |
|--------|---|
| train | a MutationFeatureData S4 class output of training data. |
| test | a MutationFeatureData S4 class output of test data. |
| paramG | an estimatedParameters S4 class with estimated parameters |

Value

the likelihood of the test data

convertFromTurbo_F *Restore the converted parameter F for turboEM*

Description

Restore the converted parameter F for turboEM

Usage

```
convertFromTurbo_F(turboF, fdim, signatureNum, isBackground)
```

Arguments

| | |
|--------------|---|
| turboF | F (converted for turboEM) |
| fdim | a vector specifying the number of possible values for each mutation signature |
| signatureNum | the number of mutation signatures |
| isBackground | the logical value showing whether a background mutation features is included or not |

Value

a vector

convertFromTurbo_Q *Restore the converted parameter Q for turboEM*

Description

Restore the converted parameter Q for turboEM

Usage

```
convertFromTurbo_Q(turboQ, signatureNum, sampleNum)
```

Arguments

| | |
|--------------|-----------------------------------|
| turboQ | Q (converted for turboEM) |
| signatureNum | the number of mutation signatures |
| sampleNum | the number of cancer genomes |

Value

a vector

convertToTurbo_F *Convert the parameter F so that turboEM can treat*

Description

Convert the parameter F so that turboEM can treat

Usage

```
convertToTurbo_F(vF, fdim, signatureNum, isBackground)
```

Arguments

| | |
|--------------|---|
| vF | F (converted to a vector) |
| fdim | a vector specifying the number of possible values for each mutation signature |
| signatureNum | the number of mutation signatures |
| isBackground | the logical value showing whether a background mutation features is included or not |

Value

a vector

| | |
|------------------|--|
| convertToTurbo_Q | <i>Convert the parameter Q so that turboEM can treat</i> |
|------------------|--|

Description

Convert the parameter Q so that turboEM can treat

Usage

```
convertToTurbo_Q(vQ, signatureNum, sampleNum)
```

Arguments

| | |
|--------------|-----------------------------------|
| vQ | Q (converted to a vector) |
| signatureNum | the number of mutation signatures |
| sampleNum | the number of cancer genomes |

Value

a vector

| | |
|----------------|---|
| cv_PMSignature | <i>Output the maximum potential scale reduction statistic of all parameters estimated</i> |
|----------------|---|

Description

Output the maximum potential scale reduction statistic of all parameters estimated

Usage

```
cv_PMSignature(inputG, Kfold = 3, nRep = 3, Klimit = 8)
```

Arguments

| | |
|--------|--|
| inputG | a MutationFeatureData S4 class. |
| Kfold | an integer number of the number of cross-validation folds. |
| nRep | an integer number of replications. |
| Klimit | an integer of the maximum value of number of signatures. |

Value

a matrix of measures

Examples

```
load(system.file("extdata/sample.rdata", package = "selectKSigs"))
results <- cv_PMSignature(G, Kfold = 3)
```

getBG *Get the status of using the background signature*

Description

Get the status of using the background signature

Usage

```
getBG(object)
```

Arguments

object the EstimatedParameters class (the result of pmgetSignature)

Value

the status of using the background signature

getCounts *Get the count data in a matrix*

Description

Get the count data in a matrix

Usage

```
getCounts(object)
```

Arguments

object the MutationFeatureData class

Value

the count data in a matrix

| | |
|--------------|---|
| getExposures | <i>Get a matrix of mutational exposures of signatures</i> |
|--------------|---|

Description

Get a matrix of mutational exposures of signatures

Usage

getExposures(object)

Arguments

object the EstimatedParameters class (the result of pmgetSignature)

Value

a matrix of mutational exposures of signatures

| | |
|-------------|--|
| getFeatures | <i>Get a vector of possible features</i> |
|-------------|--|

Description

Get a vector of possible features

Usage

getFeatures(object)

Arguments

object the EstimatedParameters class (the result of pmgetSignature)

Value

a vector of possible features

getFeatureVec *Get a matrix of feature vector list*

Description

Get a matrix of feature vector list

Usage

getFeatureVec(object)

Arguments

object the MutationFeatureData class

Value

a matrix of feature vector list

getK *Get the number of signatures*

Description

Get the number of signatures

Usage

getK(object)

Arguments

object the EstimatedParameters class (the result of pmgetSignature)

Value

the number of signatures in pmgetSignature in HiLDA

| | |
|-------|--|
| getLL | <i>Get the values of loglikelihood</i> |
|-------|--|

Description

Get the values of loglikelihood

Usage

```
getLL(object)
```

Arguments

object the EstimatedParameters class (the result of pmgetSignature)

Value

likelihood values estimated by pmgetSignature in HiLDA

| | |
|-------------------|---|
| getLogLikelihoodC | <i>Calculate the value of the log-likelihood for given parameters</i> |
|-------------------|---|

Description

Calculate the value of the log-likelihood for given parameters

Usage

```
getLogLikelihoodC(  
  vPatternList,  
  vSparseCount,  
  vF,  
  vQ,  
  fdim,  
  signatureNum,  
  sampleNum,  
  patternNum,  
  samplePatternNum,  
  isBackground,  
  vF0  
)
```

Arguments

| | |
|------------------|--|
| vPatternList | The list of possible mutation features (converted to a vector) |
| vSparseCount | The table showing (mutation feature, sample, the number of mutation) (converted to a vector) |
| vF | F (converted to a vector) |
| vQ | Q (converted to a vector) |
| fdim | a vector specifying the number of possible values for each mutation signature |
| signatureNum | the number of mutation signatures |
| sampleNum | the number of cancer genomes |
| patternNum | the number of possible combinations of all the mutation features |
| samplePatternNum | the number of possible combination of samples and mutation patterns |
| isBackground | the logical value showing whether a background mutation features is included or not |
| vF0 | a background mutation features |

Value

a value

| | |
|---------------|----------------------------|
| getSamplelist | <i>Get the sample list</i> |
|---------------|----------------------------|

Description

Get the sample list

Usage

```
getSamplelist(object)
```

Arguments

| | |
|--------|--|
| object | the EstimatedParameters class (the result of pmgetSignature) |
|--------|--|

Value

the sample list of named elements.

`getSamplelistG` *Get the sample list*

Description

Get the sample list

Usage

`getSamplelistG(object)`

Arguments

`object` the `MutationFeatureData` class

Value

the sample list of named elements.

`getSignatures` *Get an array of signature feature distributions*

Description

Get an array of signature feature distributions

Usage

`getSignatures(object)`

Arguments

`object` the `EstimatedParameters` class (the result of `pmgetSignature`)

Value

an array of signature feature distributions

| | |
|------------------|--|
| getTranscription | <i>Get the status of specifying the transcription bias</i> |
|------------------|--|

Description

Get the status of specifying the transcription bias

Usage

```
getTranscription(object)
```

Arguments

object the MutationFeatureData class

Value

the status of specifying the transcription bias

| | |
|-----------------|--|
| select_kth_fold | <i>Output the training data or test data</i> |
|-----------------|--|

Description

Output the training data or test data

Usage

```
select_kth_fold(inputG, k, f_s, folds, include)
```

Arguments

| | |
|---------|---|
| inputG | a MutationFeatureData S4 class output by the pmsignature. |
| k | an integer number of the number of cross-validation folds. |
| f_s | a primary key of combining the feature pattern and sample ID. |
| folds | the assignment to each fold. |
| include | a boolean indicator of whether to include kth fold or not. |

Value

a MutationFeatureData S4 class of either include or exclude kth fold.

| | |
|--------|---|
| splitG | <i>Output the maximum potential scale reduction statistic of all parameters estimated</i> |
|--------|---|

Description

Output the maximum potential scale reduction statistic of all parameters estimated

Usage

```
splitG(inputG, Kfold = 3)
```

Arguments

| | |
|--------|--|
| inputG | a MutationFeatureData S4 class output by the pmsignature. |
| Kfold | an integer number of the number of cross-validation folds. |

Value

a matrix made of perplexity from the results of cross-validation.

Examples

```
load(system.file("extdata/sample.rdata", package = "selectKSigs"))  
G_split <- splitG(G, Kfold = 3)
```

Index

calcPMSLikelihood, 2
Calculate_Likelihood_test, 3
convertFromTurbo_F, 3
convertFromTurbo_Q, 4
convertToTurbo_F, 4
convertToTurbo_Q, 5
cv_PMSignature, 5

getBG, 6
getCounts, 6
getExposures, 7
getFeatures, 7
getFeatureVec, 8
getK, 8
getLL, 9
getLogLikelihoodC, 9
getSamplelist, 10
getSamplelistG, 11
getSignatures, 11
getTranscription, 12

select_kth_fold, 12
splitG, 13