Package 'BALLI'

October 12, 2022

Type Package

Title Expression RNA-Seq Data Analysis Based on Linear Mixed Model

Version 0.2.0

Author Kyungtaek Park <qkrrudxor147@snu.ac.kr>

Maintainer Kyungtaek Park <qkrrudxor147@snu.ac.kr>

Description Analysis of gene expression RNA-seq data using Bartlett-Adjusted Likelihood-based LInear model (BALLI). Based on likelihood ratio test, it provides comparisons for effect of one or more variables. See Kyungtaek Park (2018) <doi:10.1101/344929> for more information.

Depends R (>= 2.15.0), edgeR, limma, MASS, parallel, stats, methods

License GPL

Encoding UTF-8

LazyData true

RoxygenNote 6.1.1

Suggests knitr, rmarkdown

VignetteBuilder knitr

NeedsCompilation no

Repository CRAN

Date/Publication 2019-04-25 10:40:07 UTC

R topics documented:

balli *BALLI*

Description

DEG analysis using BALLI algorithm

Usage

```
balli(object, intV = 2, logcpm = NULL, tecVar = NULL,
  design = NULL, numCores = NULL, threshold = 1e-06, maxiter = 200)
```

Arguments

object	a TecVarList object
intV	numeric vector designating interest variable(s) which is(are) column number(s) of design matrix
logcpm	logcpm values for each gene and each sample
tecVar	estimated technical variance values for each gene and each sample
design	design matrix with samples in row and covariable(s) to be estimated in column
numCores	number of cores to be used for multithreding. If NULL, a single core is used
threshold	threshold for convergence
maxiter	maximum number of iteration to converge of estimated biological variance. If not, biological variance is estimated by using Brent method

Value

an Balli object including Result and topGenes list. Following components are shown by Result (same order of genes with input data) and topGenes (ordered by pBALLI in Result) :

log2FC	log2 fold changes of interest variable(s)
lLLI	log-likelihoods estimated by LLI
lBALLI	log-likelihoods estimated by BALLI
pLLI	p-values estimated by LLI
pBALLI	p-values estimated by BALLI
BCF	Bartlett's correction factor

expr <- data.frame(t(sapply(1:1000,function(x)rnbinom(20,mu=500,size=50)))) group <- c(rep("A",10),rep("B",10)) design <- model.matrix(~group, data = expr) dge <- DGEList(counts=expr, group=group) dge <- calcNormFactors(dge) tV <- tecVarEstim(dge,design) balli(tV,intV=2)

Balli-class *Class Balli Class* Balli *holds results from BALLI*

Description

Class Balli Class Balli holds results from BALLI

balliFit *balliFit*

Description

Estimates likelihood and Bartlett correction factor using BALLI algorithm of each gene

Usage

```
balliFit(y_mat, x_mat, tecVar, intVar = 2, full = T, cfault = 0,
  miter = 200, conv = 1e-06)
```

Arguments

y_mat	numeric vector containing log-cpm values of each gene and each sample
x_mat	design matrix with samples in row and covariable(s) to be estimated in column
tecVar	numeric vector containing estimated technical variance of a gene of each sample
intVar	numeric vector designating interest variable(s) which is(are) column number(s) of x_mat
full	logical value designating full model (TRUE) or reduced model (FALSE).
cfault	initial value of index showing whether converged (0) or not (1).
miter	maximum number of iteration to converge.
conv	threshold for convergence

Value

following components are estimated

ll	log-likelihoods
beta	coefficients of interested variable(s)
alpha	coefficients of nuisance variable(s)
BCF	Bartlett's correction factor
cfault	index whether converged or not

Examples

```
expr <- data.frame(t(sapply(1:1000,function(x)rnbinom(20,mu=500,size=50))))
group <- c(rep("A",10),rep("B",10))
design <- model.matrix(~group, data = expr)
dge <- DGEList(counts=expr, group=group)
dge <- calcNormFactors(dge)
tV <- tecVarEstim(dge,design)
gtv <- tV$tecVar[1,]
gdat <- data.frame(logcpm=tV$logcpm[1,],design,tecVar=gtv)
gy <- matrix(unlist(gdat[,1]),ncol=1)
gx <- matrix(unlist(gdat[,2:(ncol(gdat)-1)]),ncol=ncol(gdat)-2)
balliFit(y_mat=gy,x_mat=gx,tecVar=gtv,intVar=2,full=TRUE,cfault=0,miter=200,conv=1e-6)
```

LargeDataObject-class *Class LargeDataObject Class* LargeDataObject *holds large data such as technical variance and results from BALLI fit*

Description

Class LargeDataObject Class `LargeDataObject` holds large data such as technical variance and results from BALLI fit

---

tecVarEstim *Technical Variance Estimation*

Description

Estimate technical variance by using voom-trend. The code is derived from voom function in limma package

Usage

```
tecVarEstim(counts, design = NULL, lib.size = NULL, span = 0.5, ...)
```

Arguments

`counts`	a DGEList object
`design`	design matrix with samples in row and coefficient(s) to be estimated in column
`lib.size`	numeric vector containing total library sizes for each sample
`span`	width of the lowess smoothing window as a proportion
`...`	other arguments are passed to lmFit.

Value

an TecVarList object with the following components:

targets	matrix containing covariables, library sizes and normalization foctors of each sample
design	design matrix with samples in row and covariable(s) to be estimated in column
logcpm	logcpm values of each gene and each sample
tecVar	estimated techical variance of each gene and each sample

Examples

```
expr <- data.frame(t(sapply(1:1000,function(x)rnbinom(20,mu=500,size=50))))
group <- c(rep("A",10),rep("B",10))
design <- model.matrix(~group, data = expr)
dge <- DGEList(counts=expr, group=group)
dge <- calcNormFactors(dge)
tecVarEstim(dge,design)
```

TecVarList-class *Class TecVarList Class* TecVarList *holds technical variance*

Description

Class TecVarList Class TecVarList holds technical variance

Index