Package 'BatchQC'

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Type Package

Title Batch Effects Quality Control Software

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Description Sequencing and microarray samples often are collected or processed in multiple batches or at different times. This often produces technical biases that can lead to incorrect results in the downstream analysis. BatchQC is a software tool that streamlines batch preprocessing and evaluation by providing interactive diagnostics, visualizations, and statistical analyses to explore the extent to which batch variation impacts the data. BatchQC diagnostics help determine whether batch adjustment needs to be done, and how correction should be applied before proceeding with a downstream analysis. Moreover, BatchQC interactively applies multiple common batch effect approaches to the data, and the user can quickly see the benefits of each method. BatchQC is developed as a Shiny App. The output is organized into multiple tabs, and each tab features an important part of the batch effect analysis and visualization of the data. The BatchQC interface has the following analysis groups: Summary, Differential Expression, Median Correlations, Heatmaps, Circular Dendrogram, PCA Analysis, Shape, ComBat and SVA.

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URL https://github.com/mani2012/BatchQC

BugReports https://github.com/mani2012/BatchQC/issues

License GPL (>= 2)

Depends R (>= 3.5.0)

Collate 'simulate_data.R' 'heatmap.R' 'pca.R' 'batchtest.R' 'batchQC.R' 'correlation.R' 'utils.R' 'sva.R' 'Circos.R' 'shapeAnalysis.R' 'lmfitC.R'

Suggests testthat

Imports utils, rmarkdown, knitr, pander, gplots, MCMCpack, shiny, sva, corpcor, moments, matrixStats, ggvis, heatmaply, reshape2, limma, grDevices, graphics, stats, methods, Matrix

biocViews BatchEffect, GraphAndNetwork, Microarray, PrincipalComponent, Sequencing, Software, Visualization, QualityControl, RNASeq, Preprocessing, DifferentialExpression, ImmunoOncology

SystemRequirements pandoc (http://pandoc.org/installing.html) for generating reports from markdown files.

VignetteBuilder knitr

RoxygenNote 7.1.0

NeedsCompilation no

Encoding UTF-8

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R topics documented:

`batchQC` *Checks for presence of batch effect and creates a html report with information including whether the batch needs to be adjusted*

Description

Checks for presence of batch effect and creates a html report with information including whether the batch needs to be adjusted

Usage

```
batchQC(
  dat,
  batch,
  condition = NULL,
  report_file = "batchqc_report.html",
  report_dir = ".",
  report_option_binary = "111111111",
  view_report = FALSE,
```

```
  interactive = TRUE,
  batchqc_output = FALSE,
  log2cpm_transform = FALSE
)
```

Arguments

dat	Given data or simulated data from rnaseq_sim()
batch	Batch covariate
condition	Covariates or conditions of interest besides batch
report_file	Output report file name
report_dir	Output report directory path
report_option_binary	9 bits Binary String representing the plots to display and hide in the report
view_report	when TRUE, opens the report in a browser
interactive	when TRUE, opens the interactive shinyApp
batchqc_output	when TRUE, creates BatchQCout object in batchqc_output.rda R object file
log2cpm_transform	when TRUE, transforms the data using log2CPM - log2 Counts Per Million transformation function

Value

outputfile Report file generated by batchQC

Examples

```
nbatch <- 3
ncond <- 2
npercond <- 10
data.matrix <- rnaseq_sim(ngenes=50, nbatch=nbatch, ncond=ncond, npercond=
    npercond, basemean=10000, ggstep=50, bbstep=2000, ccstep=800,
    basedisp=100, bdispstep=-10, swvar=1000, seed=1234)
batch <- rep(1:nbatch, each=ncond*npercond)
condition <- rep(rep(1:ncond, each=npercond), nbatch)
batchQC(data.matrix, batch=batch, condition=condition, view_report=FALSE,
    interactive=FALSE)
```

BatchQCout-class *The BatchQC output class to output BatchQC results*

Description

Contains all currently-supported BatchQC output data classes:

Details

slots:

batchqc_ev a single object of class list

pca a single object of S3 class prcomp

`batchQC_analyze` *Checks for presence of batch effect and reports whether the batch needs to be adjusted*

Description

Checks for presence of batch effect and reports whether the batch needs to be adjusted

Usage

```
batchQC_analyze(data.matrix, batch, mod = NULL)
```

Arguments

`data.matrix`	Given data or simulated data from rnaseq_sim()
`batch`	Batch covariate
`mod`	Model matrix for outcome of interest and other covariates besides batch

Value

pca Principal Components Analysis object of the data

Examples

```
nbatch <- 3
ncond <- 2
npercond <- 10
data.matrix <- rnaseq_sim(ngenes=50, nbatch=nbatch, ncond=ncond, npercond=
    npercond, basemean=10000, ggstep=50, bbstep=2000, ccstep=800,
    basedisp=100, bdispstep=-10, swvar=1000, seed=1234)
batch <- rep(1:nbatch, each=ncond*npercond)
condition <- rep(rep(1:ncond, each=npercond), nbatch)
pdata <- data.frame(batch, condition)
modmatrix = model.matrix(~as.factor(condition), data=pdata)
batchQC_analyze(data.matrix, batch, mod=modmatrix)
```

batchqc_circosplot *Produce Circos plot*

Description

Produce Circos plot

Usage

```
batchqc_circosplot(dat, batch, AggMethod)
```

Arguments

dat	Given data or simulated data from rnaseq_sim()
batch	Batch covariate
AggMethod	Aggregation Method

Value

Generates Circular Dendrogram plot for the given data

Examples

```
nbatch <- 3
ncond <- 2
npercond <- 10
data.matrix <- rnaseq_sim(ngenes=50, nbatch=nbatch, ncond=ncond, npercond=
    npercond, basemean=10000, ggstep=50, bbstep=2000, ccstep=800,
    basedisp=100, bdispstep=-10, swvar=1000, seed=1234)
batch <- rep(1:nbatch, each=ncond*npercond)
batchqc_circosplot(data.matrix, batch=batch, AggMethod='complete')
```

batchQC_condition_adjusted *Returns adjusted data after remove the variation across conditions*

Description

Returns adjusted data after remove the variation across conditions

Usage

```
batchQC_condition_adjusted(data.matrix, batch, condition)
```

Arguments

data.matrix	Given data or simulated data from rnaseq_sim()
batch	Batch covariate
condition	Condition covariate of interest

Value

Adjusted data after remove the variation across conditions

Examples

```
nbatch <- 3
ncond <- 2
npercond <- 10
data.matrix <- rnaseq_sim(ngenes=50, nbatch=nbatch, ncond=ncond, npercond=
    npercond, basemean=10000, ggstep=50, bbstep=2000, ccstep=800,
    basedisp=100, bdispstep=-10, swvar=1000, seed=1234)
batch <- rep(1:nbatch, each=ncond*npercond)
condition <- rep(rep(1:ncond, each=npercond), nbatch)
batchQC_condition_adjusted(data.matrix, batch, condition)
```

---

batchqc_correlation *Produce correlation heatmap plot*

Description

Produce correlation heatmap plot

Usage

```
batchqc_correlation(data.matrix, batch, mod = NULL)
```

Arguments

data.matrix	Given data or simulated data from rnaseq_sim()
batch	Batch covariate
mod	Model matrix for outcome of interest and other covariates besides batch

Value

Correlation heatmap plot

Examples

```
nbatch <- 3
ncond <- 2
npercond <- 10
data.matrix <- rnaseq_sim(ngenes=50, nbatch=nbatch, ncond=ncond, npercond=
    npercond, basemean=10000, ggstep=50, bbstep=2000, ccstep=800,
    basedisp=100, bdispstep=-10, swvar=1000, seed=1234)
batch <- rep(1:nbatch, each=ncond*npercond)
condition <- rep(rep(1:ncond, each=npercond), nbatch)
pdata <- data.frame(batch, condition)
modmatrix = model.matrix(~as.factor(condition), data=pdata)
batchqc_correlation(data.matrix, batch, mod=modmatrix)
```

---

batchqc_corscatter *Produce Median Correlation plot*

Description

Produce Median Correlation plot

Usage

```
batchqc_corscatter(data.matrix, batch, mod = NULL)
```

Arguments

data.matrix	Given data or simulated data from rnaseq_sim()
batch	Batch covariate
mod	Model matrix for outcome of interest and other covariates besides batch

Value

Median Correlation plot

Examples

```
nbatch <- 3
ncond <- 2
npercond <- 10
data.matrix <- rnaseq_sim(ngenes=50, nbatch=nbatch, ncond=ncond, npercond=
    npercond, basemean=10000, ggstep=50, bbstep=2000, ccstep=800,
    basedisp=100, bdispstep=-10, swvar=1000, seed=1234)
batch <- rep(1:nbatch, each=ncond*npercond)
condition <- rep(rep(1:ncond, each=npercond), nbatch)
pdata <- data.frame(batch, condition)
modmatrix = model.matrix(~as.factor(condition), data=pdata)
batchqc_corscatter(data.matrix, batch, mod=modmatrix)
```

batchqc_explained_variation

Returns a list of explained variation by batch and condition combinations

Description

Returns a list of explained variation by batch and condition combinations

Usage

```
batchqc_explained_variation(data.matrix, condition, batch)
```

Arguments

data.matrix	Given data or simulated data from rnaseq_sim()
condition	Condition covariate of interest
batch	Batch covariate

Value

List of explained variation by batch and condition

Examples

```
nbatch <- 3
ncond <- 2
npercond <- 10
data.matrix <- rnaseq_sim(ngenes=50, nbatch=nbatch, ncond=ncond, npercond=
    npercond, basemean=10000, ggstep=50, bbstep=2000, ccstep=800,
    basedisp=100, bdispstep=-10, swvar=1000, seed=1234)
batch <- rep(1:nbatch, each=ncond*npercond)
condition <- rep(rep(1:ncond, each=npercond), nbatch)
batchqc_explained_variation(data.matrix, condition, batch)
```

batchQC_filter_genes

Returns a datset after filtering genes of zero variance across batch and condition combinations

Description

Returns a datset after filtering genes of zero variance across batch and condition combinations

Usage

```
batchQC_filter_genes(data.matrix, batch, condition)
```

Arguments

data.matrix	Given data or simulated data from rnaseq_sim()
batch	Batch covariate
condition	Condition covariate of interest

Value

Filtered dataset after filtering genes of zero variance across batch and condition combinations

Examples

```
nbatch <- 3
ncond <- 2
npercond <- 10
data.matrix <- rnaseq_sim(ngenes=50, nbatch=nbatch, ncond=ncond, npercond=
    npercond, basemean=10000, ggstep=50, bbstep=2000, ccstep=800,
    basedisp=100, bdispstep=-10, swvar=1000, seed=1234)
batch <- rep(1:nbatch, each=ncond*npercond)
condition <- rep(rep(1:ncond, each=npercond), nbatch)
filtered.data <- batchQC_filter_genes(data.matrix, batch, condition)
```

---

batchQC_fsva_adjusted *Use frozen surrogate variable analysis to remove the surrogate variables inferred from sva*

Description

Use frozen surrogate variable analysis to remove the surrogate variables inferred from sva

Usage

```
batchQC_fsva_adjusted(data.matrix, modmatrix, sva.object)
```

Arguments

data.matrix	Given data or simulated data from rnaseq_sim()
modmatrix	Model matrix for outcome of interest and other covariates besides batch
sva.object	SVA object

Value

Frozen Surrogate variables adjusted data

Examples

```
nbatch <- 3
ncond <- 2
npercond <- 10
data.matrix <- rnaseq_sim(ngenes=50, nbatch=nbatch, ncond=ncond, npercond=
    npercond, basemean=10000, ggstep=50, bbstep=2000, ccstep=800,
    basedisp=100, bdispstep=-10, swvar=1000, seed=1234)
batch <- rep(1:nbatch, each=ncond*npercond)
condition <- rep(rep(1:ncond, each=npercond), nbatch)
pdata <- data.frame(batch, condition)
modmatrix = model.matrix(~as.factor(condition), data=pdata)
sva.object <- batchQC_sva(data.matrix, mod=modmatrix)
batchQC_fsva_adjusted(data.matrix, modmatrix, sva.object)
```

---

batchqc_heatmap *Produce heatmap plots for the given data*

Description

Produce heatmap plots for the given data

Usage

```
batchqc_heatmap(data.matrix, batch, mod = NULL, max_display = 50)
```

Arguments

data.matrix	Given data or simulated data from rnaseq_sim()
batch	Batch covariate
mod	Model matrix for outcome of interest and other covariates besides batch
max_display	Maximum number of rows to display in heat map

Value

Heatmap plots for the given data

Examples

```
nbatch <- 3
ncond <- 2
npercond <- 10
data.matrix <- rnaseq_sim(ngenes=50, nbatch=nbatch, ncond=ncond, npercond=
    npercond, basemean=10000, ggstep=50, bbstep=2000, ccstep=800,
    basedisp=100, bdispstep=-10, swvar=1000, seed=1234)
batch <- rep(1:nbatch, each=ncond*npercond)
condition <- rep(rep(1:ncond, each=npercond), nbatch)
pdata <- data.frame(batch, condition)
modmatrix = model.matrix(~as.factor(condition), data=pdata)
batchqc_heatmap(data.matrix, batch, mod=modmatrix)
```

batchQC_num.sv — *Returns the number of surrogate variables to estimate in the model using a permutation based procedure*

Description

Returns the number of surrogate variables to estimate in the model using a permutation based procedure

Usage

```
batchQC_num.sv(data.matrix, modmatrix)
```

Arguments

data.matrix	Given data or simulated data from rnaseq_sim()
modmatrix	Model matrix for outcome of interest and other covariates besides batch

Value

Number of Surrogate variables found

Examples

```
nbatch <- 3
ncond <- 2
npercond <- 10
data.matrix <- rnaseq_sim(ngenes=50, nbatch=nbatch, ncond=ncond, npercond=
    npercond, basemean=10000, ggstep=50, bbstep=2000, ccstep=800,
    basedisp=100, bdispstep=-10, swvar=1000, seed=1234)
batch <- rep(1:nbatch, each=ncond*npercond)
condition <- rep(rep(1:ncond, each=npercond), nbatch)
pdata <- data.frame(batch, condition)
modmatrix = model.matrix(~as.factor(condition), data=pdata)
batchQC_num.sv(data.matrix, modmatrix)
```

batchqc_pca — *Performs principal component analysis and produces plot of the first two principal components*

Description

Performs principal component analysis and produces plot of the first two principal components

Usage

```
batchqc_pca(data.matrix, batch, mod = NULL)
```

Arguments

data.matrix	Given data or simulated data from rnaseq_sim()
batch	Batch covariate
mod	Model matrix for outcome of interest and other covariates besides batch

Value

PCA object from principal component analysis

Examples

```
nbatch <- 3
ncond <- 2
npercond <- 10
data.matrix <- rnaseq_sim(ngenes=50, nbatch=nbatch, ncond=ncond, npercond=
    npercond, basemean=10000, ggstep=50, bbstep=2000, ccstep=800,
    basedisp=100, bdispstep=-10, swvar=1000, seed=1234)
batch <- rep(1:nbatch, each=ncond*npercond)
condition <- rep(rep(1:ncond, each=npercond), nbatch)
pdata <- data.frame(batch, condition)
modmatrix = model.matrix(~as.factor(condition), data=pdata)
batchqc_pca(data.matrix, batch, mod=modmatrix)
```

---

batchqc_pca_svd *Performs PCA svd variance decomposition and produces plot of the first two principal components*

Description

Performs PCA svd variance decomposition and produces plot of the first two principal components

Usage

```
batchqc_pca_svd(data.matrix, batch, mod = NULL)
```

Arguments

data.matrix	Given data or simulated data from rnaseq_sim()
batch	Batch covariate
mod	Model matrix for outcome of interest and other covariates besides batch

Value

res PCA list with two components v and d.

Examples

```
nbatch <- 3
ncond <- 2
npercond <- 10
data.matrix <- rnaseq_sim(ngenes=50, nbatch=nbatch, ncond=ncond, npercond=
    npercond, basemean=10000, ggstep=50, bbstep=2000, ccstep=800,
    basedisp=100, bdispstep=-10, swvar=1000, seed=1234)
batch <- rep(1:nbatch, each=ncond*npercond)
condition <- rep(rep(1:ncond, each=npercond), nbatch)
pdata <- data.frame(batch, condition)
modmatrix = model.matrix(~as.factor(condition), data=pdata)
batchqc_pca_svd(data.matrix, batch, mod=modmatrix)
```

---

batchqc_pc_explained_variation

Returns explained variation for each principal components

Description

Returns explained variation for each principal components

Usage

```
batchqc_pc_explained_variation(pcs, vars, condition, batch)
```

Arguments

pcs	Principal components in the given data
vars	Variance of the Principal components in the given data
condition	Condition covariate of interest
batch	Batch covariate

Value

Explained variation table for each principal components

Examples

```
nbatch <- 3
ncond <- 2
npercond <- 10
data.matrix <- rnaseq_sim(ngenes=50, nbatch=nbatch, ncond=ncond, npercond=
    npercond, basemean=10000, ggstep=50, bbstep=2000, ccstep=800,
    basedisp=100, bdispstep=-10, swvar=1000, seed=1234)
batch <- rep(1:nbatch, each=ncond*npercond)
condition <- rep(rep(1:ncond, each=npercond), nbatch)
pdata <- data.frame(batch, condition)
modmatrix = model.matrix(~as.factor(condition), data=pdata)
```

```
pca <- batchqc_pca(data.matrix, batch, mod=modmatrix)
pcs <- t(data.frame(pca$x))
batchqc_pc_explained_variation(pcs, pca$sdev^2, condition, batch)
```

`batchQC_shapeVariation` *Perform Mean and Variance batch variation analysis*

Description

Perform Mean and Variance batch variation analysis

Usage

```
batchQC_shapeVariation(
  data,
  groups,
  plot = FALSE,
  groupCol = NULL,
  robustSample = FALSE,
  robustGene = FALSE
)
```

Arguments

`data`	Given data
`groups`	a character vector indicating sample group membership
`plot`	Indicate whether to generate plot
`groupCol`	group color
`robustSample`	Indicate whether to use robust sample-wise test
`robustGene`	Indicate whether to use robust gene-wise test

Value

Mean and Variance batch variation Overall and Pairwise p-values

Examples

```
nbatch <- 3
ncond <- 2
npercond <- 10
data.matrix <- rnaseq_sim(ngenes=50, nbatch=nbatch, ncond=ncond, npercond=
    npercond, basemean=10000, ggstep=50, bbstep=2000, ccstep=800,
    basedisp=100, bdispstep=-10, swvar=1000, seed=1234)
batch <- rep(1:nbatch, each=ncond*npercond)
batchQC_shapeVariation(data.matrix, groups=batch)
```

batchQC_sva *Estimate the surrogate variables using the 2 step approach proposed by Leek and Storey 2007*

Description

Estimate the surrogate variables using the 2 step approach proposed by Leek and Storey 2007

Usage

```
batchQC_sva(data.matrix, modmatrix)
```

Arguments

data.matrix	Given data or simulated data from rnaseq_sim()
modmatrix	Model matrix for outcome of interest and other covariates besides batch

Value

Surrogate variables analysis object

Examples

```
nbatch <- 3
ncond <- 2
npercond <- 10
data.matrix <- rnaseq_sim(ngenes=50, nbatch=nbatch, ncond=ncond, npercond=
    npercond, basemean=10000, ggstep=50, bbstep=2000, ccstep=800,
    basedisp=100, bdispstep=-10, swvar=1000, seed=1234)
batch <- rep(1:nbatch, each=ncond*npercond)
condition <- rep(rep(1:ncond, each=npercond), nbatch)
pdata <- data.frame(batch, condition)
modmatrix = model.matrix(~as.factor(condition), data=pdata)
batchQC_sva(data.matrix, modmatrix)
```

batchQC_svregress_adjusted *Regress the surrogate variables out of the expression data*

Description

Regress the surrogate variables out of the expression data

Usage

```
batchQC_svregress_adjusted(data.matrix, modmatrix, sva.object)
```

Arguments

data.matrix	Given data or simulated data from rnaseq_sim()
modmatrix	Model matrix for outcome of interest and other covariates besides batch
sva.object	SVA object

Value

Surrogate variables regress adjusted data

Examples

```
nbatch <- 3
ncond <- 2
npercond <- 10
data.matrix <- rnaseq_sim(ngenes=50, nbatch=nbatch, ncond=ncond, npercond=
    npercond, basemean=10000, ggstep=50, bbstep=2000, ccstep=800,
    basedisp=100, bdispstep=-10, swvar=1000, seed=1234)
batch <- rep(1:nbatch, each=ncond*npercond)
condition <- rep(rep(1:ncond, each=npercond), nbatch)
pdata <- data.frame(batch, condition)
modmatrix = model.matrix(~as.factor(condition), data=pdata)
sva.object <- batchQC_sva(data.matrix, mod=modmatrix)
batchQC_svregress_adjusted(data.matrix, modmatrix, sva.object)
```

---

batchtest *Performs test to check whether batch needs to be adjusted*

Description

Performs test to check whether batch needs to be adjusted

Usage

```
batchtest(pca, batch, mod = NULL)
```

Arguments

pca	PCA object from principal component analysis
batch	Batch covariate
mod	Model matrix for outcome of interest and other covariates besides batch

Value

Summary of linear regression of first five principal components

Examples

```
nbatch <- 3
ncond <- 2
npercond <- 10
data.matrix <- rnaseq_sim(ngenes=50, nbatch=nbatch, ncond=ncond, npercond=
    npercond, basemean=10000, ggstep=50, bbstep=2000, ccstep=800,
    basedisp=100, bdispstep=-10, swvar=1000, seed=1234)
batch <- rep(1:nbatch, each=ncond*npercond)
condition <- rep(rep(1:ncond, each=npercond), nbatch)
pdata <- data.frame(batch, condition)
modmatrix = model.matrix(~as.factor(condition), data=pdata)
pca <- batchqc_pca(data.matrix, batch, mod=modmatrix)
batchtest(pca, batch, mod=modmatrix)
```

`combatPlot` *Adjust for batch effects using an empirical Bayes framework ComBat allows users to adjust for batch effects in datasets where the batch covariate is known, using methodology described in Johnson et al. 2007. It uses either parametric or non-parametric empirical Bayes frameworks for adjusting data for batch effects. Users are returned an expression matrix that has been corrected for batch effects. The input data are assumed to be cleaned and normalized before batch effect removal.*

Description

Adjust for batch effects using an empirical Bayes framework ComBat allows users to adjust for batch effects in datasets where the batch covariate is known, using methodology described in Johnson et al. 2007. It uses either parametric or non-parametric empirical Bayes frameworks for adjusting data for batch effects. Users are returned an expression matrix that has been corrected for batch effects. The input data are assumed to be cleaned and normalized before batch effect removal.

Usage

```
combatPlot(dat, batch, mod = NULL, par.prior = TRUE, prior.plots = TRUE)
```

Arguments

`dat`	Genomic measure matrix (dimensions probe x sample) - for example, expression matrix
`batch`	Batch covariate (only one batch allowed)
`mod`	Model matrix for outcome of interest and other covariates besides batch
`par.prior`	(Optional) TRUE indicates parametric adjustments will be used, FALSE indicates non-parametric adjustments will be used
`prior.plots`	(Optional)TRUE give prior plots with black as a kernel estimate of the empirical batch effect density and red as the parametric

Value

data A probe x sample genomic measure matrix, adjusted for batch effects.

Examples

```
nbatch <- 3
ncond <- 2
npercond <- 10
data.matrix <- rnaseq_sim(ngenes=50, nbatch=nbatch, ncond=ncond, npercond=
    npercond, basemean=10000, ggstep=50, bbstep=2000, ccstep=800,
    basedisp=100, bdispstep=-10, swvar=1000, seed=1234)
batch <- rep(1:nbatch, each=ncond*npercond)
condition <- rep(rep(1:ncond, each=npercond), nbatch)
pdata <- data.frame(batch, condition)
mod = model.matrix(~as.factor(condition), data = pdata)
combatPlot(data.matrix, batch, mod=mod)
```

---

example_batchqc_data *Batch and Condition indicator for signature data captured when activating different growth pathway genes in human mammary epithelial cells.*

Description

This data consists of three batches and ten different conditions corresponding to control and nine different pathways

This data consists of three batches and ten different conditions corresponding to control and nine different pathways

Usage

```
batch_indicator

signature_data
```

Format

A data frame with 89 rows and 2 variables:

V1 Batch Indicator

V2 Condition (Pathway) Indicator

A data frame with 18052 rows and 89 variables:

Columns1-89 Control and Pathway activated samples

rows1-18052 Genes 1-18052

Value

Batch indicator object

Signature data

Source

GEO accession: GSE73628

GEO accession: GSE73628

---

getShinyInput *Getter function to get the shinyInput option*

Description

Getter function to get the shinyInput option

Usage

```
getShinyInput()
```

Value

shinyInput option

Examples

```
getShinyInput()
```

---

getShinyInputCombat *Getter function to get the shinyInputCombat option*

Description

Getter function to get the shinyInputCombat option

Usage

```
getShinyInputCombat()
```

Value

shinyInputCombat option

Examples

```
getShinyInputCombat()
```

getShinyInputOrig *Getter function to get the shinyInputOrig option*

Description

Getter function to get the shinyInputOrig option

Usage

```
getShinyInputOrig()
```

Value

shinyInputOrig option

Examples

```
getShinyInputOrig()
```

getShinyInputSVA *Getter function to get the shinyInputSVA option*

Description

Getter function to get the shinyInputSVA option

Usage

```
getShinyInputSVA()
```

Value

shinyInputSVA option

Examples

```
getShinyInputSVA()
```

getShinyInputSVAf *Getter function to get the shinyInputSVAf option*

Description

Getter function to get the shinyInputSVAf option

Usage

```
getShinyInputSVAf()
```

Value

shinyInputSVAf option

Examples

```
getShinyInputSVAf()
```

getShinyInputSVAr *Getter function to get the shinyInputSVAr option*

Description

Getter function to get the shinyInputSVAr option

Usage

```
getShinyInputSVAr()
```

Value

shinyInputSVAr option

Examples

```
getShinyInputSVAr()
```

`gnormalize` *Perform Genewise Normalization of the given data matrix*

Description

Perform Genewise Normalization of the given data matrix

Usage

```
gnormalize(dat)
```

Arguments

`dat`	Given data matrix

Value

gnormdata Genewise Normalized data matrix

Examples

```
dat <- matrix(1:10, 2)
gnormdata <- gnormalize(dat)
```

`lmFitC` *Fit linear model for each gene given a series of arrays. This is the standard lmFit function from limma package with the modification to accept an additional correlation matrix parameter option*

Description

Fit linear model for each gene given a series of arrays. This is the standard lmFit function from limma package with the modification to accept an additional correlation matrix parameter option

Usage

```
lmFitC(
  object,
  design = NULL,
  ndups = 1,
  spacing = 1,
  block = NULL,
  correlation,
  cormatrix = NULL,
  weights = NULL,
  method = "ls",
  ...
)
```

Arguments

object	A matrix-like data object containing log-ratios or log-expression values for a series of arrays, with rows corresponding to genes and columns to samples. Any type of data object that can be processed by getEAWP is acceptable.
design	the design matrix of the microarray experiment, with rows corresponding to arrays and columns to coefficients to be estimated. Defaults to the unit vector meaning that the arrays are treated as replicates
ndups	positive integer giving the number of times each distinct probe is printed on each array.
spacing	positive integer giving the spacing between duplicate occurrences of the same probe, spacing=1 for consecutive rows.
block	vector or factor specifying a blocking variable on the arrays. Has length equal to the number of arrays. Must be NULL if ndups>2.
correlation	the inter-duplicate or inter-technical replicate correlation
cormatrix	the complete correlation matrix of the samples
weights	non-negative observation weights. Can be a numeric matrix of individual weights, of same size as the object expression matrix, or a numeric vector of array weights with length equal to ncol of the expression matrix, or a numeric vector of gene weights with length equal to nrow of the expression matrix.
method	fitting method; "ls" for least squares or "robust" for robust regression
...	other optional arguments to be passed to lm.series, gls.series or mrlm

Value

list containing log2(quantile counts per mil reads) and library sizes

---

log2CPM *Compute log2(counts per mil reads) and library size for each sample*

Description

Compute log2(counts per mil reads) and library size for each sample

Usage

```
log2CPM(qcounts, lib.size = NULL)
```

Arguments

qcounts	quantile normalized counts
lib.size	default is colsums(qcounts)

Value

list containing log2(quantile counts per mil reads) and library sizes

Examples

```
nbatch <- 3
ncond <- 2
npercond <- 10
data.matrix <- rnaseq_sim(ngenes=50, nbatch=nbatch, ncond=ncond, npercond=
    npercond, basemean=10000, ggstep=50, bbstep=2000, ccstep=800,
    basedisp=100, bdispstep=-10, swvar=1000, seed=1234)
data.matrix <- as.matrix(data.matrix)
log2CPM(data.matrix)
```

`makeSVD` *Compute singular value decomposition*

Description

Compute singular value decomposition

Usage

```
makeSVD(x)
```

Arguments

`x`	matrix of genes by sample (ie. the usual data matrix)

Value

returns a list of svd components v and d

`pcRes` *Compute variance of each principal component and how they correlate with batch and cond*

Description

Compute variance of each principal component and how they correlate with batch and cond

Usage

```
pcRes(v, d, condition = NULL, batch = NULL)
```

Arguments

`v`	from makeSVD
`d`	from makeSVD
`condition`	factor describing experiment
`batch`	factor describing batch

Value

A dataframe containig variance, cum. variance, cond.R-sqrd, batch.R-sqrd

---

plotPC *Plot first 2 principal components*

Description

Plot first 2 principal components

Usage

```
plotPC(v, d, ...)
```

Arguments

v	from makeSVD
d	from makeSVD
...	pass options to internal plot fct.

Value

a plot

---

plot_genewise_moments *Visualize gene-wise moments*

Description

Visualize gene-wise moments

Usage

```
plot_genewise_moments(data, batch, robust)
```

Arguments

data	Given data or simulated data from rnaseq_sim()
batch	Batch covariate
robust	Boolean indicator of using robust (TRUE) or non-robust test (FALSE) in visualization

Value

Gene-wise moments

Examples

```
nbatch <- 3
ncond <- 2
npercond <- 10
data.matrix <- rnaseq_sim(ngenes=50, nbatch=nbatch, ncond=ncond, npercond=
    npercond, basemean=10000, ggstep=50, bbstep=2000, ccstep=800,
    basedisp=100, bdispstep=-10, swvar=1000, seed=1234)
batch <- rep(1:nbatch, each=ncond*npercond)
condition <- rep(rep(1:ncond, each=npercond), nbatch)
data_adjusted <- batchQC_condition_adjusted(data.matrix, batch, condition)
gene_moments <- plot_genewise_moments(data_adjusted, batch, robust=FALSE)
```

`plot_samplewise_moments` *Visualize sample-wise moments*

Description

Visualize sample-wise moments

Usage

```
plot_samplewise_moments(data, batch, robust)
```

Arguments

`data`	Given data or simulated data from rnaseq_sim()
`batch`	Batch covariate
`robust`	Boolean indicator of using robust (TRUE) or non-robust test (FALSE) in visualization

Value

Sample-wise moments

Examples

```
nbatch <- 3
ncond <- 2
npercond <- 10
data.matrix <- rnaseq_sim(ngenes=50, nbatch=nbatch, ncond=ncond, npercond=
    npercond, basemean=10000, ggstep=50, bbstep=2000, ccstep=800,
    basedisp=100, bdispstep=-10, swvar=1000, seed=1234)
batch <- rep(1:nbatch, each=ncond*npercond)
condition <- rep(rep(1:ncond, each=npercond), nbatch)
data_adjusted <- batchQC_condition_adjusted(data.matrix, batch, condition)
sample_moments <- plot_samplewise_moments(data_adjusted, batch, robust=FALSE)
```

protein_example_data *Batch and Condition indicator for protein expression data*

Description

This data consists of two batches and two conditions corresponding to case and control for the protein expression data

This data consists of two batches and two conditions corresponding to case and control

Usage

```
protein_sample_info

protein_data
```

Format

A data frame with 24 rows and 4 variables:

Arrayname Array Name

samplename Sample Name

Batch Batch Indicator

category Condition (Case vs Control) Indicator

A data frame with 39 rows and 24 variables:

Columns1-24 Control and Case samples

rows1-39 Proteins 1-39

Value

Protein data sample info

Protein data

rnaseq_sim *Generate simulated count data with batch effects for ngenes*

Description

Generate simulated count data with batch effects for ngenes

Usage

```
rnaseq_sim(
  ngenes = 50,
  nbatch = 3,
  ncond = 2,
  npercond = 10,
  basemean = 10000,
  ggstep = 50,
  bbstep = 2000,
  ccstep = 800,
  basedisp = 100,
  bdispstep = 10,
  swvar = 1000,
  seed = 1000
)
```

Arguments

ngenes	Number of genes to simulate
nbatch	Number of batches to simulate
ncond	Number of conditions to simulate
npercond	Number of samples per condition per batch to simulate
basemean	Base mean
ggstep	Gene to Gene step variation
bbstep	Batch to Batch step variation
ccstep	Condition to Condition step variation
basedisp	Base Dispersion
bdispstep	Batch to Batch Dispersion step variation
swvar	Sample-wise extra variation
seed	Random seed for reproducibility

Value

RNA Seq count data matrix

Examples

```
rnaseq_sim()
rnaseq_sim(ngenes=100, nbatch=5, seed=1234)
rnaseq_sim(ngenes=100, nbatch=3, ncond=2, npercond=10, basemean=10000,
    ggstep=50, bbstep=20000, ccstep=8000, basedisp=100, bdispstep=10,
    swvar=1000, seed=1234)
```

setShinyInput *Setter function to set the shinyInput option*

Description

Setter function to set the shinyInput option

Usage

```
setShinyInput(x)
```

Arguments

x	shinyInput option

Value

shinyInput option

Examples

```
setShinyInput(NULL)
```

setShinyInputCombat *Setter function to set the shinyInputCombat option*

Description

Setter function to set the shinyInputCombat option

Usage

```
setShinyInputCombat(x)
```

Arguments

x	shinyInputCombat option

Value

shinyInputCombat option

Examples

```
setShinyInputCombat(NULL)
```

setShinyInputOrig *Setter function to set the shinyInputOrig option*

Description

Setter function to set the shinyInputOrig option

Usage

```
setShinyInputOrig(x)
```

Arguments

x	shinyInputOrig option

Value

shinyInputOrig option

Examples

```
setShinyInputOrig(NULL)
```

setShinyInputSVA *Setter function to set the shinyInputSVA option*

Description

Setter function to set the shinyInputSVA option

Usage

```
setShinyInputSVA(x)
```

Arguments

x	shinyInputSVA option

Value

shinyInputSVA option

Examples

```
setShinyInputSVA(NULL)
```

setShinyInputSVAf *Setter function to set the shinyInputSVAf option*

Description

Setter function to set the shinyInputSVAf option

Usage

```
setShinyInputSVAf(x)
```

Arguments

x	shinyInputSVAf option

Value

shinyInputSVAf option

Examples

```
setShinyInputSVAf(NULL)
```

setShinyInputSVAr *Setter function to set the shinyInputSVAr option*

Description

Setter function to set the shinyInputSVAr option

Usage

```
setShinyInputSVAr(x)
```

Arguments

x	shinyInputSVAr option

Value

shinyInputSVAr option

Examples

```
setShinyInputSVAr(NULL)
```

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