Package ‘BADER’

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**Type** Package

**Title** Bayesian Analysis of Differential Expression in RNA Sequencing Data

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**Description** For RNA sequencing count data, BADER fits a Bayesian hierarchical model. The algorithm returns the posterior probability of differential expression for each gene between two groups A and B. The joint posterior distribution of the variables in the model can be returned in the form of posterior samples, which can be used for further down-stream analyses such as gene set enrichment.

**License** GPL-2

**Suggests** pasilla (>= 0.2.10)

**biocViews** Sequencing, RNASeq, DifferentialExpression, Software, SAGE

**NeedsCompilation** yes

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**R topics documented:**

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**Description**

This function estimates the posterior distribution of various parameters regarding RNA Sequencing data. The most interesting parameter is the probability of differential expression (DE) between two groups A and B. But also estimates for the log mean and the log dispersion parameter of the underlying poisson-log-normal model can be returned.
Usage

BADER(x, design, sizeFactors = TRUE, start = NULL, burn = 1000, reps = 10000, printEvery = 100, saveEvery = 1, t0 = 10, mode = "minimal")

Arguments

x  
m x n matrix: Every column should contain count data for a subject with m genes or tags.

design  
Factor specifying the samples’ treatment groups. The first level of "design" corresponds to the treatment group A, the second level to treatment group B

sizeFactors  
boolean: Whether size factors should be estimated (TRUE) or all set to 1 (FALSE)

start  
list containing start values for MCMC sampler

burn  
Number of burning in steps

reps  
Number of repetitions

printEvery  
After every printEvery iteration the current step is being printed

saveEvery  
Every saveEvery-th step is saved for inference

t0  
Warming up time for Metropolis-Hastings

mode  
How much data should be returned? Returning all posterior distributions requires large memory.

- mode = 0: Only posterior means are returned for every parameter
- mode = 1: Full posterior distribution for log fold change parameter is returned
- mode = 2: Posterior distributions for the following parameters are returned: log fold change log mean and log dispersion

Value

A list with posterior distributions / posterior means

Author(s)

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Examples

set.seed(21)

## log mean expression
muA <- rnorm(100,4,1)
gam <- c(rnorm(10,0,2),rep(0,90))
muB <- muA + gam

## log dispersion
alphaA <- alphaB <- rnorm(100,-2,1)

## count tables for treatment group a and b
kA <- t(matrix(rnbinom(300,mu=exp(muA),size=exp(-alphaA)),nrow=3,byrow=TRUE))
kB <- t(matrix(rnbinom(300,mu=exp(muB),size=exp(-alphaB)),nrow=3,byrow=TRUE))

x <- cbind(kA,kB)
design <- factor(c("A","A","A","B","B","B"))
results <- BADER(x,design,burn=1000,reps=2000)

## Not run:
plot(results$diffProb,xlab="Index",ylab="posterior DE prob.")

## End(Not run)
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