Package ‘bgx’

June 30, 2019

Title Bayesian Gene eXpression
Version 1.50.0
Author Ernest Turro, Graeme Ambler, Anne-Mette K Hein
Maintainer Ernest Turro <et341@cam.ac.uk>
Description Bayesian integrated analysis of Affymetrix GeneChips
License GPL-2
Depends R (>= 2.0.1), Biobase, affy (>= 1.5.0), gcrma (>= 2.4.1)
Suggests affydata, hgu95av2cdf
biocViews Microarray, DifferentialExpression
Imports Rcpp (>= 0.11.0)
LinkingTo Rcpp
get_url https://git.bioconductor.org/packages/bgx
get_branch RELEASE_3_9
get_last_commit 999a4e1
get_last_commit_date 2019-05-02
Date/Publication 2019-06-29

R topics documented:

analysis.bgx .................................................. 1
bgx ............................................................. 3
readOutput.bgx .............................................. 5

Index

Analysis BGX output.

Description

Functions for plotting expression densities, differential expression densities, histogram of proportion of differentially expressed genes, etc.
Usage

plotExpressionDensity(bgxOutput, gene=NULL, normalize=c("none","mean","loess"),...)
plotDEDensity(bgxOutput, gene=NULL, conditions=c(1,2), normalize=c("none","mean","loess"), normgenes=c(1:length(bgxOutput["geneNames"])),...)
plotDEHistogram(bgxOutput, conditions=c(1,2), normalize=c("none","mean","loess"), normgenes=c(1:length(bgxOutput["geneNames"])), df=floor(1.8 * log10(length(bgxOutput["geneNames"]))))
rankByDE(bgxOutput, conditions=c(1,2),normalize=c("none","mean","loess"), normgenes=c(1:length(bgxOutput["geneNames"])), absolute=TRUE)
plotDiffRank(bgxOutput, conditions=c(1,2),normalize=c("none","mean","loess"), normgenes=c(1:length(bgxOutput["geneNames"])), ymax=NULL)

Arguments

bgxOutput A list obtained from running readOutput.bgx on a BGX output directory.
gene Which gene to analyse. This can either be an index or a name.
conditions Indices of conditions to compare.
normalize "none": do not normalise posterior distributions of mu. "mean": normalise by scaling posterior distributions of mu for conditions > 1 to have the same mean as the posterior distribution of mu for condition 1. "loess": same as "mean" but use loess normalisation.
normgenes Which genes to use for loess normalisation. By default, use all genes.
df Residual degrees of freedom. Decrease to 6 if the histogram fit goes haywire.
absolute Rank genes by absolute differential expression.
ymax Specify upper limit of y axis.
... Parameters to pass to density function (where applicable).

Details

plotExpressionDensity plots gene expression distributions under various conditions for the specified gene.
plotDEDensity plots the differential expression distribution between two conditions for a given gene.
plotDEHistogram plots a histogram of differential expression between two conditions and estimates the number of up and down regulated differentially expressed genes.
rankByDE ranks genes by differential expression and returns ordering and corresponding DE values in a matrix.
plotDiffRank plots 2.5-97.5% confidence intervals for ranked differential expression estimates.

Value

None, except plotDERank, which returns a matrix of genes ranked by differential expression.

Author(s)

Ernest Turro

See Also

bgx, standalone.bgx, readOutput.bgx, plotExpressionDensity, plotDEDensity, plotDEHistogram
Fully Bayesian integrated approach to the analysis of Affymetrix GeneChip data

Description
'bgx' estimates Bayesian Gene eXpression (BGX) measures from an AffyBatch object.
'standalone.bgx' creates various files needed by the bgx standalone binary and places them in a directory. One of these files is 'infile.txt'. In order to run standalone BGX, compile it and run 'bgx <path_to_infile.txt>' from the command line.

Usage

bgx(aData, samplesets = NULL, genes = NULL, genesToWatch = NULL, burnin = 8192, iter = 16384, output = c("minimal","trace","all"), probeAff = TRUE, probecat_threshold = 100, adaptive = TRUE, rundir = ".")

standalone.bgx(aData, samplesets = NULL, genes = NULL, genesToWatch = NULL, burnin = 8192, iter = 16384, output = c("minimal","trace","all"), probeAff = TRUE, probecat_threshold = 100, adaptive = TRUE, batch_size = 50, optimalAR = 0.44, inputdir = "input")

Arguments

aData
An AffyBatch object.
samplesets
A numeric vector specifying which condition each array belongs to. E.g. if samplesets=c(2,2), then the first two replicates belong to one condition and the last two replicates belong to another condition. If NULL, each array is assumed to belong to a different condition. If the aData object contains information about the experiment design in its phenoData slot, this argument is not required.
genes
A numeric vector specifying which genes to analyse. If NULL, all genes are analysed.
genesToWatch
A numeric vector specifying which genes to monitor closely amongst those chosen to be analysed (see below for details).
burnin
Number of burn-in iterations.
iter
Number of post burn-in iterations.
output
One of "minimal", "trace" or "all". See below for details.
probeAff
Stratify the mean (lambda) of the cross-hybridisation parameter (H) by categories according to probe-level sequence information.
probecat_threshold
Minimum amount of probes per probe affinity category.
adaptive
Adapt the variance of the proposals for Metropolis Hastings objects (that is: S, H, Lambda, Eta, Sigma and Mu).
batch_size
Size of batches for calculating acceptance ratios and updating jumps.
optimalAR
Optimal acceptance ratio.
rundir
The directory in which to save the output runs.
inputdir
The name of the directory in which to place the input files for the standalone binary.
Details

- **genesToWatch**: Specify the subset of genes for which thinned samples from the full posterior distributions of log(S+1) \((x)\) and log(H+1) \((y)\) are collected.
- **output**: Output the following to disk:
  - "minimal": The gene expression measure (muave), thinned samples from the full posterior distributions of mu \((mu.[1..c])\), where ‘c’ is the number of conditions, the integrated autocorrelation time (IACT) and the Markov chain Monte Carlo Standard Error (MCSE) for each gene under each condition. Note that the IACT and MCSE are calculated from the thinned samples of mu.
  - "trace": The same as "minimal" plus thinned samples from the full posterior distributions of sigma2 \((sigma2.[1..c])\), lambda \((lambda.[1..s])\), eta2 \((eta2)\), phi \((phi)\) and tau2 \((tau2)\), where ‘s’ is the number of samples. If there are probes with unknown sequences, output a thinned trace of their categorisation.
  - "all": The same as "trace" plus acceptance ratios for S \((sacc)\), H \((hacc)\), mu \((muacc)\), sigma \((sigmaacc)\), eta \((etaacc)\) and lambda \((lambdasacc)\).

Value

'b gx' returns an ExpressionSet object containing gene expression information for each gene under each condition (not each replicate).
'standalone.bgx' returns the path to the BGX input files.

Note

The bgx() method and the bgx standalone binary create a directory in the working directory called 'run.x' \((x:1,2,3,...)\), wherein files are placed for further detailed analysis.

Author(s)

Ernest Turro

References


Examples

# This example requires the 'affydata' and 'hgu95av2cdf' packages
if(require(affydata) && require(hgu95av2cdf)) {
  data(Oilution)
  eset <- bgx(Oilution, samplesets=c(2,2), probeAff=FALSE, burnin=4096, iter=8192, genes=c(12500:12599), output="all", rundir=file.path(tempdir()))
}
Description

readOutput.bgx reads in output from BGX which can then be fed into BGX analysis functions.

Usage

readOutput.bgx(...)

Arguments

...  Paths of BGX output directories. If you specify more than one path, then the runs will be combined such that each condition from each run is treated as a different different from all the others.

Details

See bgx for more details.

Value

A list containing data from the BGX output.

Author(s)

Ernest Turro

See Also

bgx, standalone.bgx, plotExpressionDensity, plotDEDensity, plotDEHistogram
Index

*Topic **IO**
  analysis.bgx, 1
  readOutput.bgx, 5

*Topic **manip**
  bgx, 3

  analysis.bgx, 1
  bgx, 2, 3, 5
  plotDEDensity, 2, 5
  plotDEDensity(analysis.bgx), 1
  plotDEHistogram, 2, 5
  plotDEHistogram(analysis.bgx), 1
  plotDiffRank(analysis.bgx), 1
  plotExpressionDensity, 2, 5
  plotExpressionDensity(analysis.bgx), 1
  rankByDE(analysis.bgx), 1
  readOutput.bgx, 2, 5

  standalone.bgx, 2, 5
  standalone.bgx(bgx), 3