Package ‘skewr’

December 22, 2016

Title  Visualize Intensities Produced by Illumina’s Human Methylation 450k BeadChip

Version  1.6.0

Description  The skewr package is a tool for visualizing the output of the Illumina Human Methylation 450k BeadChip to aid in quality control. It creates a panel of nine plots. Six of the plots represent the density of either the methylated intensity or the unmethylated intensity given by one of three subsets of the 485,577 total probes. These subsets include Type I-red, Type I-green, and Type II. The remaining three distributions give the density of the Beta-values for these same three subsets. Each of the nine plots optionally displays the distributions of the "rs" SNP probes and the probes associated with imprinted genes as series of ‘tick’ marks located above the x-axis.

Depends  R (>= 3.1.1), methylumi, wateRmelon, mixsmsn, IlluminaHumanMethylation450kmanifest

Imports  minfi, IRanges, RColorBrewer

Suggests  GEOquery, knitr, minfiData

VignetteBuilder  knitr

License  GPL-2

LazyData  true

biocViews  DNAMethylation, TwoChannel, Preprocessing, QualityControl

Author  Ryan Putney [cre, aut], Steven Eschrich [aut], Anders Berglund [aut]

Maintainer  Ryan Putney <ryanputney@gmail.com>

NeedsCompilation  no

R topics documented:

getBarcodes  .............................................................. 2
getMethylLumiSet  ...................................................... 3
getSNparams  ............................................................ 4
panelPlots  .............................................................. 5
preprocess  .............................................................. 7
subsetProbes  ........................................................... 8

Index  10
getBarcodes

Get barcodes from idat file names

Description

A convenience function for retrieving simple barcodes from idat file names.

Usage

getBarcodes(path = getwd(), recurse = FALSE)

Arguments

path
  The path or a character vector to the directory or directories in which to find the idat files.
recurse
  logical; should the function check subdirectories to derive barcodes from any found idat files. The default is FALSE.

Details

Barcodes will be generated by all found idats in path(s). The default path is the current working directory.

Value

A character vector of barcodes.

Author(s)

Ryan Putney <ryanputney@gmail.com>

See Also

getMethyLumiSet

Examples

if(require(minfiData)){
  path <- system.file("extdata/5723646052", package="minfiData")
  barcodes <- getBarcodes(path = path)
}

getMethyLumiSet

Read idat files and create a MethyLumiSet object

Description

This a wrapper function for methylumIDAT that does not require a vector of barcodes to be provided.

Usage

getMethyLumiSet(path = getwd(), barcodes = NULL,
    norm = c("none", "illumina", "SWAN", "dasen"),
    bg.corr = TRUE)

Arguments

  path              The path to the directory containing the idat files.
  barcodes          A vector of barcodes specifying which idat’s to read.
  norm              Should normalization be done on the resulting MethyLumiSet. The default is
                    "none"
  bg.corr           logical; if TRUE, an Illumina style background subtraction will be performed
                    only if norm is set to 'illumina'. Otherwise, it is ignored. If background
                    subtraction without any normalization is desired, the preprocess method must
                    be used.

Details

If only path is provided, all idat’s found in the given folder will be pulled. If only barcodes
is given, corresponding idat’s will be pulled from the current working directory. Both path and
barcodes may be passed for finer control. The default is to pull all idat’s found in the current
working directory.

Value

A MethyLumiSet object

Note

One would probably not normally want to use the preprocess option at this stage. It is more likely
that a MethyLumiSet of the raw data will be desired. Then the preprocess method may be used
to normalize the raw data or use background subtraction only on the raw data. See the vignette for
example workflow.

Author(s)

Ryan Putney <ryanputney@gmail.com>

References

Davis S, Du P, Bilke S, Triche T, Jr. and Bootwalla M (2014). methylumi: Handle Illumina methyla-
tion data. R package version 2.12.0.
getSNparams

Estimate parameters for finite mixture of Skew-Normal distributions

Description

Utilizes ssmn.mix from the mixsmsn package to find the parameters for a finite mixture of skew normal distributions to model the overall distribution of signal intensities for a subset of probes on the Illumina Infinium HumanMethylation450. The probes may be subset by type and methylated or unmethylated. It can also be specified whether the SNP(rs), imprinted(idmr), or ch probes should be included or filtered out prior to parameter estimation.

Usage

getSNparams(MethyLumiSet, allele = c('M', 'U'),
            type = c('I-red', 'I-green', 'II'),
            snps = TRUE, idmr = TRUE, ch = FALSE)

Arguments

MethyLumiSet A MethyLumiSet object
allele Should parameter estimation be done on the methylated or unmethylated signal intensities
type Use the signal intensities for which probe type
snps logical; should the rs probes be included in the dataset. The default is TRUE
idmr logical; should the probes of imprinted gene loci be included in the dataset. The default is TRUE
ch logical; should the ch probes be included in the dataset. The default is FALSE

Value

A Skew.normal object as returned by ssmn.mix from the mixsmsn package with the means and modes of the components added.

Author(s)

Ryan Putney <ryanputney@gmail.com>
References


See Also

subsetProbes

Examples

if(require('watermelon')) {
  data(melon)
  mixes.raw.meth.II <- getSNparams(melon[,1], 'M', 'II')
}

panelPlots

Plot the distributions of the probe intensities and the components of the skew-normal mixture model

Description

Creates a panel of nine plots. Six of the plots represent the density of either the methylated intensity or the unmethylated intensity given by one of three subsets of the 485,577 total probes. These subsets include Type I-red, Type I-green, and Type II. The remaining three distributions give the density of the beta-values for these same three subsets. Each of the nine plots optionally displays the distributions of the "rs" SNP probes and the probes associated with imprinted genes (Pidsley, 2013) as a series of 'tick' marks located above the x-axis.

Usage

panelPlots(MethyLumiSet, typeIRedModels, typeIGreenModels, typeIIModels, 
plot = c("panel", "frames"), samp.num = NULL, frame.nums = 1:9, 
norm = "", idmr = TRUE, snps = TRUE)

Arguments

MethyLumiSet The MethyLumiSet object from which the mixture models were derived

typeIRedModels A list of the Type I-red mixture models listed in the following order: methylated models followed by unmethylated models

typeIGreenModels A list of the Type I-green mixture models listed in the following order: methylated models followed by unmethylated models

typeIIModels A list of the Type II mixture models listed in the following order: methylated models followed by unmethylated models
Should the output consist of panel plots—one panel per sample or a single panel if samp.num is specified; or should the function output separate plots corresponding to the frames, given by frame.nums, for a single sample. The default is "panel". If set to "frames", samp.num must be specified.

If plotting for a single sample is desired, for which sample. The number given simply refers to the MethyLumiSet column that corresponds to the sample of interest.

If plot is set to "frame", then frame.nums is a vector that specifies which frames of the panel to plot. The default is to plot all nine frames. The frames are numbered from 1 to 9 in column-major order starting with the top left. For example, to plot the four corners, use frame.nums=c(1,3,7,9).

A character string which will be displayed as part of the main title for each plot. Useful in indicating which normalization method was used for the modeled and plotted data.

logical; should the intensities of the idmr probes be plotted as a series of tick-marks above the x-axis. The default is TRUE.

logical; should the intensities of the rs probes be plotted as a series of tick-marks above the x-axis. The default is TRUE.

No return value. Only plots are generated.

Please refer to the vignette for an example workflow.

Ryan Putney <ryanputney@gmail.com>


getSNparams

if(require('minfiData')) {
  path <- system.file("extdata/5723646052", package="minfiData")
methylumiset.raw <- getMethyLumiSet(path = path)
mixes.raw.meth.I.red <- getSNparams(methylumiset.raw, 'M', 'I-red')
mixes.raw.meth.I.green <- getSNparams(methylumiset.raw, 'M', 'I-green')
mixes.raw.meth.II <- getSNparams(methylumiset.raw, 'M', 'II')
mixes.raw.unmeth.I.red <- getSNparams(methylumiset.raw, 'U', 'I-red')
mixes.raw.unmeth.I.green <- getSNparams(methylumiset.raw, 'U', 'I-green')
mixes.raw.unmeth.II <- getSNparams(methylumiset.raw, 'U', 'II')
}
preprocess

mixes.I.red <- list(mixes.raw.meth.I.red, mixes.raw.unmeth.I.red)
mixes.I.green <- list(mixes.raw.meth.I.green, mixes.raw.unmeth.I.green)
mixes.II <- list(mixes.raw.meth.II, mixes.raw.unmeth.II)
panelPlots(methylumiset.raw, mixes.I.red, mixes.I.green, mixes.II)

---

preprocess Normalize a MethyLumiSet object using some popular choices

Description
This is a wrapper function that allows normalizing of a MethyLumiSet using either a BeadStudio approximation, SWAN, or dasen. If desired, background correction only may be performed on the raw data.

Usage
preprocess(MethyLumiSet, norm = c("none", "illumina", "SWAN", "dasen"),
           bg.corr = TRUE)

Arguments
- MethyLumiSet A MethyLumiSet object
- norm The normalization method to be used
- bg.corr If TRUE, background subtraction using negative controls is performed. Ignored unless norm equals 'illumina' or 'none'

Details
Both Illumina style normalization via controls and the background correct method are handled by methylumi. The SWAN and dasen normalization methods are both performed by wateRmelon

Value
A MethyLumiSet

Author(s)
Ryan Putney <ryanputney@gmail.com>

References
subsetProbes

Conveniently subset probes by type and retrieve the methylated or unmethylated intensities

Description

Thus function accepts a MethyLumiSet object generated by methylumi or a MethylSet object generated by minfi. It will subset the probes by type—"I-red", "I-green", or "II"—and return a matrix of the methylated, "M", or unmethylated, "U" signal intensities. It is also possible to include or filter out probes according to whether they are CpG sites(cg), SNPs(rs), imprinted(idmr) gene sites, or non-CpG loci(ch).

Usage

subsetProbes(object, allele = c("M", "U"),
              type = c("I-red", "I-green", "II"),
              cg = TRUE, snps = TRUE, idmr = TRUE, ch = FALSE)

Arguments

object A MethyLumiSet or MethylSet object
allele Should methylated or unmethylated data for the probes be returned.
type May be "I-red", "I-green", or "II".
cg Logical; Should the returned dataset contain the CpG probes. The default is TRUE
snps Logical; Should the returned dataset contain the rs probes. The default is TRUE
idmr Logical; should the returned dataset include probes that interrogate imprinted gene sites as given by Pidsley et al.(2013). The default is TRUE
ch Logical; should the returned dataset include the non-CpG (ch) probes. The default is FALSE

Value

A matrix

Author(s)

Ryan Putney <ryanputney@gmail.com>
subsetProbes

References


See Also

getSNparams

Examples

if(require('watermelon')) {
  data(melon)
  melon.meth.II <- subsetProbes(melon, 'M', 'II')
}
Index

*Topic IO
  getMethyLumiSet, 3

*Topic aplot
  panelPlots, 5

*Topic manip
  preprocess, 7
  subsetProbes, 8

*Topic models
  getSNparams, 4

*Topic utilities
  getBarcodes, 2
  getMethyLumiSet, 2, 3, 8
  getSNparams, 4, 6, 9
  panelPlots, 5
  preprocess, 4, 7
  subsetProbes, 5, 8