Package ‘arrayQualityMetrics’

March 22, 2017

Title Quality metrics report for microarray data sets

Version 3.30.0

Author Audrey Kauffmann, Wolfgang Huber

Maintainer Audrey Kauffmann <akauffmann.bioinfo@gmail.com>

VignetteBuilder knitr

Depends

Suggests ALLMLL, CCl4, BiocStyle, knitr

Imports affy, affyPLM (>= 1.27.3), beadarray, Biobase, Cairo (>= 1.4-6), genefilter, graphics, grDevices, grid, gridSVVG (>= 1.4-3), Hmisc, hwriter, lattice, latticeExtra, limma, methods, RColorBrewer, setRNG, stats, SVGAnnotation (>= 0.9-0), utils, vsn (>= 3.23.3), XML

Description This package generates microarray quality metrics reports for data in Bioconductor microarray data containers (ExpressionSet, NChannelSet, AffyBatch). One and two color array platforms are supported.

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biocViews Microarray, QualityControl, OneChannel, TwoChannel, ReportWriting

Collate classes.R affyspecific.r annotateSvg.R arrayQualityMetrics.r boxplot.r density.r globalParameters.R heatmap.r makeColors.R maplot.r meansd.r outlier.R pca.r prepdata.r probesmap.r spatial.r writereport.r XYfromGAL.r

NeedsCompilation no

R topics documented:

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### addXYfromGAL

*Computing the coordinates of the spots on a slide*

**Description**

From the coordinates of the blocks of a microarray slide and the Row and Column locations of the spots within the blocks, `addXYfromGAL` computes the X and Y coordinates of the spots of a slide.

**Usage**

```r
addXYfromGAL(x, gal.file, nBlocks, skip, ...)
```

**Arguments**

- `x`: is an `AnnotatedDataFrame` representing the featureData of an object.
- `gal.file`: name of the file .gal that contains the coordinates of the blocks.
- `nBlocks`: number of blocks on the slide.
- `skip`: number of header lines to skip when reading the `gal.file`.
- `...`: Arguments that get passed on to `read.table`.

**Value**

The object `x` of class `AnnotatedDataFrame` will be returned with two added columns: X and Y corresponding to the absolute position of the probes on the array.

**Author(s)**

Audrey Kauffmann, Wolfgang Huber. Maintainer: <kauffmann@bergonie.org>

### aqm.writereport

*Write a quality report*

**Description**

`aqm.writereport` produces a quality report (HTML document with figures) from a list of `aqmReportModule` objects.

**Usage**

```r
aqm.writereport(modules, arrayTable, reporttitle, outdir)
```

**Arguments**

- `modules`: A list of `aqmReportModule` objects.
- `arrayTable`: A data.frame with array (meta)data to be displayed in the report.
Value

A side effect of this function is the creation of the HTML report.

Author(s)

Audrey Kauffmann, Wolfgang Huber

Description

Please see the vignette Advanced topics: Customizing arrayQualityMetrics reports and programmatic processing of the output.

Creating Objects

Please see the manual page of the module generations functions, e.g. aqm.boxplot.

Author(s)

Audrey Kauffmann, Wolfgang Huber

arrayQualityMetrics

Quality metrics for microarray experiments

Description

Produce an array quality metrics report. This is the main function of the package.

Usage

arrayQualityMetrics(expressionset, 
outdir = reporttitle, 
force = FALSE, 
do.logtransform = FALSE, 
intgroup = character(0), 
grouprep, 
spatial = TRUE, 
reporttitle = paste("arrayQualityMetrics report for", deparse(substitute(expressionset))), 
...)

aqmReportModule

Class to contain all the information to render a quality report module.

Description

A side effect of this function is the creation of the HTML report.

Author(s)

Audrey Kauffmann, Wolfgang Huber
Arguments

expressionset a Bioconductor microarray dataset container. This can be an object of class `ExpressionSet`, `AffyBatch`, `NChannelSet`, `ExpressionSetIllumina`, `RGList`, `MAList`.

outdir the name of the directory in which the report is created; a character of length 1.

force if the directory named by outdir already exists, then, if force is TRUE, the directory is overwritten, otherwise an error is thrown; if the directory does not exist, the value of force is irrelevant; a logical of length 1.

do.logtransform indicates whether the data should be logarithm transformed before the analysis; a logical of length 1.

intgroup the name of the sample covariate(s) used to draw a colour side bar next to the heatmap. The first element of intgroup is also used define sample groups in other plots (boxplots, densities). intgroup should be a character vector, and its elements need to match the columns names of `phenoData(expressionset)`. If its length is 0, then the plots are not decorated with sample covariate information.

grouprep deprecated. Use argument intgroup instead.

spatial indicates whether spatial plots should be made; a logical of length 1. This can be useful for large arrays (like Affymetrix hgu133Plus2) when CPU time and RAM resources of the machine would be limiting.

reporttitle title for the report (character of length 1).

... further arguments that will be passed on to the different module functions.

Details

See the arrayQualityMetrics vignette for examples of this function.

Value

A side effect of the function is the creation of directory named by outdir containing a HTML report `QMreport.html` and figures. The function also returns a list with R objects containing the report elements for subsequent programmatic processing.

Author(s)

Audrey Kauffmann and Wolfgang Huber.

modulefunctions Functions for computing quality report modules.

Description

These functions produce objects of class `aqmReportModule` representing the various modules of the quality report. Given a list of modules, the report is then rendered by the `aqm.writereport` function.

Most users will not call these functions directly, but will use the function `arrayQualityMetrics`, which in turns calls these functions. The function arguments can be provided through the `...` argument of `arrayQualityMetrics`. 
Usage

aqm.boxplot(x, subsample=20000, outlierMethod = "KS", ...)
aqm.density(x, ...)
aqm.heatmap(x, ...)
aqm.pca(x, ...)
aqm.maplot(x, subsample=20000, Dthresh=0.15, maxNumArrays=8, nrColumns=4, ...)
aqm.spatial(x, scale="rank", channels = c("M", "R", "G"), maxNumArrays=8, nrColumns=4, ...)
aqm.meansd(x, ...)
aqm.probesmap(x, ...)

# Affymetrix specific sections

aqm.pmmm(x, ...)
aqm.rnadeg(expressionset, x, ...)
aqm.rle(x, outlierMethod = "KS", ...)
aqm.nuse(x, outlierMethod = "upperquartile", ...)

Arguments

x
expressionset
subsample
outlierMethod
Dthresh
scale, channels
maxNumArrays, nrColumns

Details

For a simple example of the aqm.* functions, have a look at the source code of the aqm.pca function. Please see also the vignette *Advanced topics: Customizing arrayQualityMetrics reports and programmatic processing of the output*. 
outliers

Value

An object of class `aqmReportModule`.

Author(s)

Audrey Kauffmann, Wolfgang Huber

outlierDetection

Represents the results from applying an outlier detection criterion to the arrays.

Description

The class is described in the vignette *Advanced topics: Customizing arrayQualityMetrics reports and programmatic processing of the output*.

Author(s)

Audrey Kauffmann, Wolfgang Huber

See Also

`outliers`

outliers

Helper functions for outlier detection and reporting in arrayQualityMetrics

Description

For an overview of outlier detection, please see the corresponding section in the vignette *Advanced topics: Customizing arrayQualityMetrics reports and programmatic processing of the output*. These two functions are helper functions used by the different report generating functions, such as `aqm.boxplot`.

Usage

```r
outliers(exprs, method = c("KS", "sum", "upperquartile"))
boxplotOutliers(x, coef = 1.5)
```

Arguments

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>exprs</code></td>
<td>A matrix whose columns correspond to arrays, rows to the array features.</td>
</tr>
<tr>
<td><code>method</code></td>
<td>A character string specifying the summary statistic to be used for each column of <code>exprs</code>. See Details.</td>
</tr>
<tr>
<td><code>x</code></td>
<td>A vector of real numbers.</td>
</tr>
<tr>
<td><code>coef</code></td>
<td>A number is called an outlier if it is larger than the upper hinge plus <code>coef</code> times the interquartile range. Upper hinge and interquartile range are computed by <code>fivenum</code>.</td>
</tr>
</tbody>
</table>
Details

outliers: with argument method="KS", the function first computes for each column of exprs (i.e. for each array) the value of the ks.test test statistic between its distribution of intensities and the pooled distribution of intensities from all arrays. With "sum" and "upperquartile", it computes the sum or the 75 percent quantile. Subsequently, it calls boxplotOutliers on these values to identify the outlying arrays.

boxplotOutliers uses a criterion similar to that used in boxplot.stats to detect outliers in a set of real numbers. The main difference is that in boxplotOutliers, only the outliers to the right (i.e. extraordinarily large values) are detected.

Value

For outliers, an object of class outlierDetection. For boxplotOutliers, a list with two elements: thresh, the threshold against which x was compared, and outliers, an integer vector of indices.

Author(s)

Wolfgang Huber

prepdata 
Compute useful summary statistics from a data object.

Description

prepdata computes summary statistics that are useful for all platforms; prepaffy computes Affymetrix-specific ones. These are helper functions used by arrayQualityMetrics.

Usage

prepdata(expressionset, intgroup, do.logtransform)
prepaffy(expressionset, x)

Arguments

expressionset An object of class ExpressionSet for one colour non Affymetrix data, AffyBatch for Affymetrix data, NChannelSet for two colour arrays, or BeadLevelList for Illumina bead arrays.

intgroup, do.logtransform
as in arrayQualityMetrics.

x A list, typically the result from a prior call to prepdata.

Details

See the vignette Working with arrayQualityMetrics report sections.

Value

A list with various derived quantities. In the case of prepaffy, the returned list is x with the additional elements appended.
Author(s)

Audrey Kauffmann, Wolfgang Huber
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