Package ‘affycomp’

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Title Graphics Toolbox for Assessment of Affymetrix Expression Measures

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Depends R (>= 2.13.0), methods, Biobase (>= 2.3.3)

Suggests splines, affycompData

Description The package contains functions that can be used to compare expression measures for Affymetrix Oligonucleotide Arrays.

License GPL (>= 2)

biocViews OneChannel, Microarray, Preprocessing

NeedsCompilation no

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Affycomp.compfigs.auxiliary

Auxiliary functions to create comparative Figures

Description
These functions are auxiliary function to affycompPlot. These Figures are used to compare expression measures. They take lists with components created by the assessDilution and assessSpikeIn functions.

Usage
affycomp.compfig2(l, method.names = as.character(1:length(l)),
                   add.legend = TRUE, main = "Figure 2")

affycomp.compfig3(l, method.names = as.character(1:length(l)),
                   main = "Figure 3")

affycomp.compfig4a(l, method.names = as.character(1:length(l)),
                    add.legend = TRUE, main = "Figure 4a")

affycomp.compfig4b(l, method.names = as.character(1:length(l)),
                    add.legend = TRUE, main = "Figure 4b")

affycomp.compfig4c(l, method.names = as.character(1:length(l)),
                    add.legend = TRUE, rotate=TRUE, main = "Figure 4c")

affycomp.compfig5a(l, method.names = as.character(1:length(l)),
                    add.legend = TRUE, main = "Figure 5a", maxfp=100)

affycomp.compfig5b(l, method.names = as.character(1:length(l)),
                    add.legend = TRUE, main = "Figure 5b", maxfp=100)

affycomp.compfig5cde(l, method.names = as.character(1:length(l)),
                     add.legend = TRUE, main = "Figure 5c", maxfp=100,
                     type=c("low","med","high"))

affycomp.compfig5c(l, method.names = as.character(1:length(l)),
                    add.legend = TRUE, main = "Figure 5c", maxfp=100)

affycomp.compfig5d(l, method.names = as.character(1:length(l)),
                    add.legend = TRUE, main = "Figure 5d", maxfp=100)

affycomp.compfig5e(l, method.names = as.character(1:length(l)),
                    add.legend = TRUE, main = "Figure 5e", maxfp=100)

Arguments

l a list of lists with the necessary components to create the Figure. See details.
method.names  a character vector with the names of the expression measures methodologies being compared.
add.legend    logical. If TRUE a legend is added.
main          title of the Figure.
rotate        in the case of compfig4c one can either show the actual local slopes or the bias (local slope minus 1).
maxfp         range of the false positives in ROC will be from 0 to maxfp.
type          compfig5cdef is the engine for 5c, 5d, and 5e. type tells which of these 4 to run.

Details

These are similar to the functions defined in affycomp.figures.auxiliary. Main difference is that here you send lists with the result of the assessment functions as components.

Value

Figures are produced.

Author(s)

Rafael A. Irizarry

Examples

library(affycompData)
data(rma.assessment)
data(mas5.assessment)
affycomp.compfig2(list(rma.assessment$Dilution,mas5.assessment$Dilution))
affycomp.compfig3(list(rma.assessment$Dilution,mas5.assessment$Dilution))
affycomp.compfig4a(list(rma.assessment$Signal,mas5.assessment$Signal))
affycomp.compfig4b(list(rma.assessment$Dilution,mas5.assessment$Dilution))
affycomp.compfig5a(list(rma.assessment$FC,mas5.assessment$FC))
affycomp.compfig5b(list(rma.assessment$FC2,mas5.assessment$FC2))
Usage

affycomp.figure1(l, main="Figure 1", xlim=NULL, ylim=NULL)
affycomp.figure1b(l, main="Figure 1b", xlim=NULL, ylim=NULL, cex=0.85, all=FALSE)
affycomp.figure2(l, main="Figure 2")
affycomp.figure2b(l, main="Figure 2b")
affycomp.figure3(l, main = "Figure 3")
affycomp.figure4a(l, main = "Figure 4a", equal.lims=FALSE)
affycomp.figure4b(l, main = "Figure 4b")
affycomp.figure4c(l, rotate=TRUE, main = "Figure 4c")
affycomp.figure5a(l, main = "Figure 5a", maxfp=100)
affycomp.figure5b(l, main = "Figure 5b", maxfp=100)
affycomp.figure5c(l, main = "Figure 5c", maxfp=100)
affycomp.figure5d(l, main = "Figure 5d", maxfp=100)
affycomp.figure5e(l, main = "Figure 5e", maxfp=100)
affycomp.figure6a(l, main = "Figure 6a", xlim = NULL, ylim = NULL)
affycomp.figure6b(l, main = "Figure 6b", xlim = NULL, ylim = NULL)

Arguments

l
A list with the necessary components to create the Figure. See details.

main
Title for the Figure.

maxfp
range of the false positives in ROC will be from 0 to maxfp

xlim
x-axis limits.

ylim
y-axis limits.

cex
size of numbers in figure 1b.

all
logical. If TRUE all spikeins are shown. Otherwise, only those resulting in smaller, realistic, fold changes are shown.

equal.lims
logical. If TRUE the limits of x-axis and y-axis will have same range.

rotate
in the case of compfig4c one can either show the actual local slopes or the bias (local slope minus 1).

Details

Read the vignette for more details on what each Figure is. You can read assessSpikeIn and assessDilution to see which assessments are needed.

Value

Figures are produced.

Author(s)

Rafael A. Irizarry

Examples

library(affycompData)
data(rma.assessment)
affycomp.figure1(rma.assessment$MA)
affycompPlot

affycomp.figure2(rma.assessment$Dilution)
affycomp.figure3(rma.assessment$Dilution)
affycomp.figure4a(rma.assessment$Signal)
affycomp.figure4b(rma.assessment$Dilution)
affycomp.figure5a(rma.assessment$FC)
affycomp.figure5b(rma.assessment$FC2)
affycomp.figure6a(rma.assessment$FC)
affycomp.figure6b(rma.assessment$FC)

 affycompPlot Assessment Plots

**Description**

Function that makes assessment plot

**Usage**

```
affycompPlot(..., assessment.list=NULL, method.names=NULL,
figure1.xlim=c(-4,15), figure1 ylim=c(-10,12),
figure1b.xlim=c(-2,14), figure1b.ylim=c(-6,5),
figure6a.xlim=c(-12,12), figure6a.ylim=c(-12,12),
figure6b.xlim=c(-3,3), figure6b.ylim=c(-6,6))
```

```
affycomp.compfimgs(l, method.names = NULL, figure1.xlim = c(-4, 15),
figure1 ylim = c(-10, 12), figure1b.xlim = c(-4, 15),
figure1b.ylim = c(-4, 4), figure6a.xlim = c(-12, 12),
figure6a.ylim = c(-12, 12), figure6b.xlim = c(-3, 3),
figure6b.ylim = c(-6, 6))
```

```
affycomp.figures(l)
affycomp.compfimgs.calls(what)
affycomp.compfimgs.calls(what)
```

**Arguments**

```
... lists produced by the assessment functions (one for each method) separated by
assessment.list Alternatively, one can also send a list of lists produced by one of the assessment
method.names A character vector with the names of the expression measure methodology.
figure1.xlim x-axis lim used for the plots in Figure 1.
figure1.ylim y-axis lim used for the plots in Figure 1.
figure1b.xlim x-axis lim used for the plots in Figure 1b.
figure1b.ylim y-axis lim used for the plots in Figure 1b.
figure6a.xlim x-axis lim used for the plots in Figure 6a.
figure6a.ylim y-axis lim used for the plots in Figure 6a.
figure6b.xlim x-axis lim used for the plots in Figure 6b.
figure6b.ylim y-axis lim used for the plots in Figure 6b.
l list with assessment lists as components.
what a dummy variable to know what function call to create.
```
Details

Read the vignette for more details on what each Figure is. Once an assessment is used this function knows what to do. You can call any of the assessment functions described in `assessSpikeIn`, `assessDilution` and `assessSD`.

`affycomp.figures`, `affycomp.figure.calls`, `affycomp.compfigs.calls` are auxiliary functions.

Value

Figures are produced.

Author(s)

Rafael A. Irizarry

Examples

```r
library(affycompData)
data(rma.assessment)
data(mas5.assessment)
affycompPlot(rma.assessment, mas5.assessment)
affycompPlot(rma.assessment$FC)
affycompPlot(rma.assessment$Dilution, mas5.assessment$Dilution)
affycompPlot(rma.assessment$Dilution, mas5.assessment$Dilution)
affycompPlot(rma.assessment$Signal, mas5.assessment$Signal)
affycompPlot(rma.assessment$Dilution, mas5.assessment$Dilution)
affycompPlot(rma.assessment$FC2, mas5.assessment$FC2)
```

---

affycompTable | Expression Assessment Table

Description

These functions take as an argument the output of the assessment functions.

Usage

```r
affycompTable(..., Table=NULL, assessment.list=NULL, method.names=NULL)
tableAll(..., assessment.list=NULL, method.names=NULL)
tableDilution(l, method.names=NULL)
tableFC(l, method.names=NULL)
tableFC2(l, method.names=NULL)
tableSignal(l, method.names=NULL)
tableLS(l, method.names=NULL)
```
**Arguments**

- `...`: lists produced by the assessment functions
- `Table`: If TableAll was used one can send it through this argument
- `assessment.list`: Alternatively, one can also send a list of lists produced by `tableAll`.
- `method.names`: A character vector with the names of the expression measure methodology.
- `l`: list of assessments.
- `rank`: if TRUE `tableRanks` will present ranks instead of local slopes.
- `ngenes`: when computing ranks, out of how many genes should we do it?

**Details**

Read the vignette for more details on what the entries of the table are. `affycompTable` has a few entries per graph. `tableAll` has more entries. Once an assessment is used this function knows what to do. You can call any of the assessment functions described in `assessSpikeIn`, `assessDilution`, `assessSD`, `assessLS`, `assessMA2`, and `assessSpikeInSD`.

Note `tableRanks` and `tableOverallSNR` work on the results from `assessSpikeIn2`.

**Value**

A matrix. One column per each method and one row for each comparison. `tableOverallSNR` is an exception. Where rows represent methods.

**Author(s)**

Rafael A. Irizarry

**Examples**

```r
library(affycompData)
data(rma.assessment) ##this was produced with affycomp.assess
data(mas5.assessment) ##this one too
tmp <- affycompTable(mas5.assessment,rma.assessment)
format(tmp,digit=2)
```
assessAll  Assessment functions

Description
Assessment functions. Takes a couple of ExpressionSet, one for spike in another for the dilution and returns a list with necessary information to create assessment plots.

Usage
assessAll(d,s,method.name=NULL,verbose=TRUE)
affycomp(d,s,method.name=NULL,verbose=TRUE,return.it=TRUE)

Arguments
d  An ExpressionSet containing the expression measures for the Gene Logic’s dilution experiment.
s  An ExpressionSet containing expression measures for the Affymetrix’s spike-in experiment.
method.name  Name of expression measure being assessed.
verbose  verbosity flag.
return.it  if TRUE returns assessment lists.

Details
assessAll performs assessments for Figures 1-6. It is a wrapper for assessDilution and assessSpikeIn.
affycomp is a wrapper that does it all... including the plotting and creation of table.

Value
Lists with the necessary information to make the Figures.

Author(s)
Rafael A. Irizarry

assessDilution  Assessment functions for Dilution Data

Description
Assessment function. Takes an ExpressionSet and returns a list with necessary information to create assessment plots.

Usage
assessDilution(exprset,method.name=NULL)
assessSD

Arguments

exprset    An ExpressionSet containing expression measures for GeneLogic’s dilution experiment.

method.name Name of expression measure being assessed.

Details

assessDilution performs the assessment for the plots related to Dilution (Figures 2, 3, 4b)

Value

Lists with the necessary information to make the Figures.

Author(s)

Rafael A. Irizarry

assessSD    SD Assessment functions

Description

Assessment function for standard deviation estimates. Takes a dilution data ExpressionSet and returns a list with necessary information to create assessment plot.

Usage

assessSD(exprset, method.name=NULL, logx=FALSE)

Arguments

exprset    An ExpressionSet containing expression measures for Affymetrix’s dilution experiment.

method.name Name of expression measure being assessed.

logx      Logical indicating whether the average expression being computed should be logged, default no. See details.

Details

assessSD does the assessment for Figure 7. This requires the ExpressionSet to have standard error estimates for the expression measure. Some expression measures (e.g. dChip) will have SEs in original scale, where others (e.g. RMA) will have them in log scale. For the former, use logx=TRUE.

Value

Lists with the necessary information to make the Figures.

Author(s)

Rafael A. Irizarry
assessSpikeIn  

Assessment functions for Spike In Data

Description

These functions are assessment functions. Each takes an ExpressionSet and returns a list with necessary information to create assessment plots.

Usage

assessSpikeIn(s, method.name=NULL, verbose=TRUE)
assessMA(exprset, method.name=NULL)
assessSignal(exprset, method.name=NULL)
assessFC(exprset, method.name=NULL)
assessFC2(exprset, method.name=NULL)

Arguments

s  An ExpressionSet containing expression measures for Affymetrix’s spike-in experiment.
exprset  An ExpressionSet containing expression measures for Affymetrix’s spike-in experiment.
method.name  Name of expression measure being assessed.
verbose  logical. If TRUE show messages.

Details

assessMA performs the assessment for the MA-plot (Figure 1), assessSignal performs the assessment for signal detection plot (Figure 4a), assessFC performs assessments used by fold-change related plots (Figures 5a, 6a, 6b). assessFC2 is for the ROC for genes with nominal fold changes of 2 (Figure 5b). assessSpikeIn is a wrapper for all these and returns a list of lists.

Value

Lists with the necessary information to make the Figures.

Author(s)

Rafael A. Irizarry
New Assessment functions for Spike In Data

Description

These functions are assessment functions. Each takes an ExpressionSet and returns a list with necessary information to create assessment plots.

Usage

assessSpikeIn2(s, method.name=NULL, verbose=TRUE)
assessSpikeInSD(exprset, method.name=NULL, span=1/3)
assessLS(exprset, method.name=NULL)
assessMA2(exprset, method.name=NULL)

Arguments

s An ExpressionSet containing expression measures for Affymetrix’s spike-in experiment.
exprset An ExpressionSet containing expression measures for Affymetrix’s spike-in experiment.
method.name Name of expression measure being assessed.
verbose logical. If TRUE show messages.
span span used in call to loess.

Details

assessMA2 performs the assessment for the second MA-plot (Figure 1b), and assessLS performs the assessment for signal detection plot (Figure 4c). assessMA2 also performs assessments used by fold-change related plots (Figures 5a,b) and the ROC plots (Figures 5c,d,e). assessSpikeInSD is for the standard deviation assessment in Figure 2b. assessSpikeIn2 is a wrapper for all these and returns a list of lists.

Value

Lists with the necessary information to make the Figures.

Author(s)

Rafael A. Irizarry
dilution.phenodata  Phenotypic Information for Dilution Study

Description
This object is of class phenoData with necessary information for the assessments.

Usage
data(dilution.phenodata)

Format
An object of class phenoData

Source
Two sources of cRNA A (human liver tissue) and B (Central Nervous System cell line) have been hybridized to human array (HGU95Av2) in a range of proportions and dilutions. This object described these.

exprset.log  Take log base 2 of Expression

Description
Take log base 2 of the expression matrix in an ExpressionSet

Usage
exprset.log(exprset)

Arguments
exprset  ExpressionSet

Details
This function takes log base 2 of the expression matrix in an ExpressionSet. Negatives are converted to the smallest non-negative entry.

Value
An ExpressionSet

Author(s)
Rafael A. Irizarry
**hgu133a.spikein.phenodata**

*phenotypic information for HGU133A spike in study*

**Description**

This object is of class `phenoData` with necessary information for the assessments.

**Usage**

`data(hgu133a.spikein.phenodata)`

**Format**

An object of class `phenoData`

**Source**

This comes from an experiment where 16 different cRNA fragments have been added to the hybridization mixture of the GeneChip arrays at different pM concentrations. For more information see Irizarry, R.A., et al. (2001) [http://www.biostat.jhsph.edu/~ririzarr/papers/index.html](http://www.biostat.jhsph.edu/~ririzarr/papers/index.html)

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**hgu133a.spikein.xhyb**

*Cross hybridizers*

**Description**

Probe Sets likely to crosshybridize to spiked-in probesets in the Affymetrix HGU133A spike in. This object is list. Each component of the list contains probeset names of possible crosshybridizers. The sequences of each spiked-in clone were collected and blasted against all HG-U133A target sequences. Target sequences are the ~600bp regions from which probes were selected. Thresholds of 100, 150 and 200bp were used and define the three components of the list.

**Usage**

`data(hgu133a.spikein.xhyb)`

**Format**

A list

**Source**

Simon Cawley <simon_cawley@affymetrix.com>
mas5.assessment  

Example of the result of assessments

Description

The Dilution and both (HGU95 and HGU133) types of Spike-in data were processed with Affymetrix MAS 5.0 software, yielding three "MAS 5.0" ExpressionSet's. (These are available, in csv-format, at http://affycomp.jhsph.edu/AFFY2/rafa@jhu.edu/030424.1033/.) Then various assessment functions from the affycomp package (most recently, version 1.28.0) were applied. mas5.assessment resulted from assessAll on Dilution and HGU95. See mas5.assessment in affycompData for results of other assessments.

Usage

data(mas5.assessment)

Format

A list of list.

readin  

Read Expression Date Sets

Description

Reads a comma-delimited file containing the expression values of the dilution and spike-in data sets and creates a ExpressionSet

Usage

read.dilution(filename)
read.spikein(filename, cdfName=c("hgu95a","hgu133a"), remove.xhyb=TRUE)
read.newspikein(filename)

Arguments

filename  character containing the filename to be read.
cdfName  are we reading data from the hgu95a or hgu133a spike-in experiment?
remove.xhyb  logical. If TRUE possible cross hybridizers are removed from the HGU133A spikein. See remove.hgu133a.xhyb.

Details

The file to be read must be comma-delimited with the first row containing the cel filenames (case sensitive). The first column must be the Affymetrix gene identifiers. read.dilution will put things in the right place.
read.newspikein is a wrapper to read results from the hgu133a spikein experiment.
**Description**

This functions removes possible cross hybridizers from Affymetrix HGU133A spike-in experiment.

**Usage**

```r
remove.hgu133a.xhyb(s, bp = c("200", "150", "100"))
```

**Arguments**

- `s` : an ExpressionSet containing the HGU133A spike-in
- `bp` : number of base pair matches needed to define a possible cross hybridizer

**Details**

Some details are contained in the help file for `hgu133a.spikein.xhyb`

**Value**

An ExpressionSet with probeset removed

**See Also**

- `hgu133a.spikein.xhyb`
spikein.phenodata

Arguments

l a list of lists with the necessary components to create the Figure. See details.

method.names a character vector with the names of the expression measures methodologies being compared.

main title of the Figure.

Details

This uses the dilution data. The exprsets need to have standard error estimates in the assayDataElement(exprset, "se.exprs"). Read the vignette for more details. The functions work similarly to those assessing expression measures.

All these files need the result of assessSD

Value

Depends on the call.

Author(s)

Rafael A. Irizarry

Examples

library(affycompData)
data(rma.sd.assessment) ##this was produced with affycomp.assess
data(lw.sd.assessment) ##this one too
affycomp.comppfig7(list(rma.sd.assessment,lw.sd.assessment))
aftycomp.figure7(rma.sd.assessment)

spikein.phenodata phenotypic information for spike in study

Description

This object is of class phenoData with necessary information for the assessemnts.

Usage

data(spikein.phenodata)

Format

An object of class phenoData

Source

This comes from an experiments where 16 different cRNA fragments have been added to the hybridization mixture of the GeneChip arrays at different pM concentrations. For more information see Irizarry, R.A., et al. (2001) http://www.biostat.jhsph.edu/~ririzarr/papers/index.html
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tableLS (affycompTable), 6