

Package ‘OxyBS’

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Type Package

Title Processing of Oxy-Bisulfite Microarray Data

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Author E. Andres Houseman, Sc.D. and Kevin C. Johnson

Maintainer E. Andres Houseman <eahouseman@gmail.com>

Depends R (>= 3.2.2)

Description Provides utilities for processing of Oxy-Bisulfite microarray data (e.g. via the Illumina Infinium platform, <<http://www.illumina.com>>) with tandem arrays, one using conventional bisulfite conversion, the other using oxy-bisulfite conversion.

License GPL (>= 2)

NeedsCompilation no

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diffBeta1	<i>First derivative of beta minus-log-pdf with respect to first parameter</i>
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Description

First derivative of $-\log(\text{beta pdf})$ wrt a (first) parameter

Usage

`diffBeta1(x,a,b)`

Arguments

<code>x</code>	beta value
<code>a</code>	a parameter (first)
<code>b</code>	b parameter (second)

Details

First derivative of beta minus-log-pdf with respect to first parameter; used for maximum likelihood estimation, not typically called by user.

Value

first derivative with respect to a (first) parameter

Author(s)

E. Andres Houseman

See Also

[diffBeta2,score0xBS](#)

diffBeta2	<i>First derivative of beta minus-log-pdf with respect to second parameter</i>
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Description

First derivative of $-\log(\text{beta pdf})$ wrt b (second) parameter

Usage

`diffBeta2(x,a,b)`

Arguments

x	beta value
a	a parameter (first)
b	b parameter (second)

Details

First derivative of beta minus-log-pdf with respect to second parameter; used for maximum likelihood estimation, not typically called by user.

Value

first derivative with respect to b (second) parameter

Author(s)

E. Andres Houseman

See Also

[diffBeta1,score0xBS](#)

exampleMethBS

Sample Data: Methylation (red) signals from conventional bisulfite conversion.

Description

Matrix of signal intensities corresponding to 30 specimens and 30 CpGs.

Usage

```
exampleMethBS
```

Format

30 x 30 matrix (CpGs x Specimens)

`exampleMethOxBS`*Sample Data: Methylation (red) signals from oxy-bisulfite conversion.*

Description

Matrix of signal intensities corresponding to 30 specimens and 30 CpGs.

Usage`exampleMethOxBS`**Format**

30 x 30 matrix (CpGs x Specimens)

`exampleUnmethBS`*Sample Data: Unmethylated (green) signals from conventional bisulfite conversion.*

Description

Matrix of signal intensities corresponding to 30 specimens and 30 CpGs.

Usage`exampleUnmethBS`**Format**

30 x 30 matrix (CpGs x Specimens)

`exampleUnmethOxBS`*Sample Data: Unmethylated (green) signals from oxy-bisulfite conversion.*

Description

Matrix of signal intensities corresponding to 30 specimens and 30 CpGs.

Usage`exampleUnmethOxBS`**Format**

30 x 30 matrix (CpGs x Specimens)

fitOneOxBS	<i>Fit one OxyBS result</i>
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Description

Uses maximum likelihood to estimate (C,5mC,5hmC) for one CpG and one specimen

Usage

```
fitOneOxBS(betaBS, betaOxBS, signalBS, signalOxBS, eps=1E-5)
```

Arguments

betaBS	beta value from conventional bisulfite conversion
betaOxBS	beta value from oxy-bisulfite conversion
signalBS	total signal from conventional bisulfite conversion
signalOxBS	total signal from oxy-bisulfite conversion
eps	small positive value representing numerical zero

Details

Uses maximum likelihood to estimate (C,5mC,5hmC) for one CpG and one specimen; not typically called by user.

Value

(C,5mC,5hmC) for one CpG and one specimen.

Author(s)

E. Andres Houseman

See Also

[fit0xBS](#)

fitOxBS	<i>Fit OxyBS for one specimen</i>
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Description

Uses maximum likelihood to estimate (C,5mC,5hmC) vectors for one specimen

Usage

```
fitOxBS(betaBS, betaOxBS, signalBS, signalOxBS, eps=1E-5)
```

Arguments

betaBS	beta value from conventional bisulfite conversion
betaOxBS	beta value from oxy-bisulfite conversion
signalBS	total signal from conventional bisulfite conversion
signalOxBS	total signal from oxy-bisulfite conversion
eps	small positive value representing numerical zero

Details

Uses maximum likelihood to estimate (C,5mC,5hmC) one specimen (many CpGs).

Value

matrix of (C,5mC,5hmC) values (each row corresponds to a separate CpG).

Author(s)

E. Andres Houseman

Examples

```
## Not run:
data(OxyBSSampleData)

nSpecimens <- 30
nCpGs <- 30

# Calculate Total Signals
signalBS <- exampleMethBS+exampleUnmethBS
signalOxBS <- exampleMethOxBS+exampleUnmethOxBS

# Calculate Beta Values
betaBS <- exampleMethBS/signalBS
betaOxBS <- exampleMethOxBS/signalOxBS

# Create container for results
```

```

MethOxy <- array(NA,dim=c(nCpGs,nSpecimens,3))
dimnames(MethOxy) <- list(
  rownames(exampleMethBS)[1:nCpGs],
  colnames(exampleMethBS)[1:nSpecimens],
  c("C", "5mC", "5hmC"))

# Process results (one array at a time)
for(i in 1:nSpecimens){
  MethOxy[,i,] <- fitOxBS(betaBS[,i],betaOxBS[,i],signalBS[,i],signalOxBS[,i])
}

# Check that results sum to one
table(apply(MethOxy,1:2,sum))

# First specimen
MethOxy[,1,]

# Ranges
range(MethOxy[, ,1])
range(MethOxy[, ,2])
range(MethOxy[, ,3])

## End(Not run)

```

likeOxBS

Likelihood function for C/5mC/5hmC likelihood estimator

Description

Likelihood function for C/5mC/5hmC likelihood estimator

Usage

```
likeOxBS(theta, betaBS, betaOxBS, signalBS, signalOxBS)
```

Arguments

theta	2-element parameter vector
betaBS	beta value from conventional bisulfite conversion
betaOxBS	beta value from oxy-bisulfite conversion
signalBS	total signal from conventional bisulfite conversion
signalOxBS	total signal from oxy-bisulfite conversion

Details

Likelihood function for C/5mC/5hmC likelihood estimator; used for maximum likelihood estimation, not typically called by user.

Value

likelihood for C/5mC/5hmC likelihood

Author(s)

E. Andres Houseman

See Also

[fitOneOxBS](#)

scoreOxBS	<i>Score function for C/5mC/5hmC likelihood estimator</i>
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Description

Score function for C/5mC/5hmC likelihood estimator

Usage

scoreOxBS(theta, betaBS, betaOxBS, signalBS, signalOxBS)

Arguments

theta	2-element parameter vector
betaBS	beta value from conventional bisulfite conversion
betaOxBS	beta value from oxy-bisulfite conversion
signalBS	total signal from conventional bisulfite conversion
signalOxBS	total signal from oxy-bisulfite conversion

Details

Score function for C/5mC/5hmC likelihood estimator; used for maximum likelihood estimation, not typically called by user.

Value

score vector for C/5mC/5hmC likelihood

Author(s)

E. Andres Houseman

See Also

[fitOneOxBS](#)

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