Package 'OxyBS'

October 12, 2022

Type Package

Title Processing of Oxy-Bisulfite Microarray Data

Version 1.5

Date 2017-02-20

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

Repository CRAN

Date/Publication 2017-02-20 23:58:16

R topics documented:

diffBeta1 *First derivative of beta minus-log-pdf with respect to first parameter*

Description

First derivative of -log(beta pdf) wrt a (first) parameter

Usage

```
diffBeta1(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 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,scoreOxBS

diffBeta2 *First derivative of beta minus-log-pdf with respect to second parameter*

Description

First derivative of -log(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,scoreOxBS

---

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

Description

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

Usage

```
exampleUnmethOxBS
```

Format

30 x 30 matrix (CpGs x Specimens)

`fitOneOxBS` *Fit one OxyBS result*

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

`fitOxBS`

`fitOxBS` *Fit OxyBS for one specimen*

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

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

Index