

bioDist

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KLD.matrix

Continuous version of Kullback-Leibler Distance (KLD)

Description

Calculate KLD by estimating by smoothing $\log(f(x)/g(x)) * f(x)$ and then integrating.

Usage

```
KLD.matrix(x, ...)
```

Arguments

x	n by p matrix or ExpressionSet; if x is an ExpressionSet, then the function works against its 'exprs' slot.
...	arguments passed to KLD.matrix:
method	use locfit or density to estimate integrand; default is c("locfit", "density")(i.e. both methods).
supp	upper and lower limits of the integral; default is c(-3, 3).
subdivisions	subdivisions for the integration; default is 1000.
diag	if TRUE, then the diagonal of the distance matrix will be displayed; default is FALSE.
upper	if TRUE, then the upper triangle of the distance matrix will be displayed; default is FALSE.
sample	for ExpressionSet methods: if TRUE, then distances are computed between samples, otherwise, they are computed between genes.

Details

The pairwise distances between the rows of x are computed.

The list method is meant for use when samples sizes are unequal.

Value

An object of class `dist` with the pairwise, between rows, Kullback-Leibler distances.

Author(s)

Beiyong Ding, Vincent Carey

See Also

[cor.dist](#), [spearman.dist](#), [tau.dist](#), [dist](#), [KLdist.matrix](#), [mutualInfo](#)

Examples

```
x <- matrix(rnorm(100), nrow = 5)
KLdist.matrix(x, method = "locfit", supp = range(x))
```

KLdist.matrix

Discrete version of Kullback-Leibler Distance (KLD)

Description

Calculate the KLD by binning continuous data.

Usage

```
KLdist.matrix(x, ...)
```

Arguments

x	n by p matrix or ExpressionSet; if x is an ExpressionSet, then the values returned by the <code>exprs</code> function are used.
...	arguments passed to <code>KLdist.matrix</code> :
nbin	number of bins to calculate discrete probabilities; default is 10.
symmetrize	if TRUE, then symmetrize; default is FALSE.
diag	if TRUE, then the diagonal of the distance matrix will be displayed; default is FALSE.
upper	if TRUE, then the upper triangle of the distance matrix will be displayed; default is FALSE.
sample	for ExpressionSet methods: if TRUE, then the distances are computed between samples, otherwise, between genes.

Details

The data are binned, and then the KL distance between the two discrete distributions is computed and used.

The list method is meant for use when samples sizes are unequal.

Value

Pairwise KLD object

Author(s)

Beiyong Ding

See Also

[cor.dist](#), [spearman.dist](#), [tau.dist](#), [euc](#), [man](#), [KLD.matrix](#), [mutualInfo](#)

Examples

```
x <- matrix(rnorm(100), nrow = 5)
KLdist.matrix(x, symmetrize = TRUE, nbin = 3)
```

closest.top *Find the closest genes.*

Description

Find the closest genes to the supplied target gene based on the supplied distances.

Usage

```
closest.top(x, dist.mat, top)
```

Arguments

x	the name of the gene (feature) to use.
dist.mat	either a dist object or a matrix of distances.
top	the number of closest genes desired.

Details

The feature named x must be in the supplied distances. If so, then the top closest other features are returned.

Value

A vector of names of the top closest features.

Author(s)

Beiyong Ding

See Also

[cor.dist](#), [spearman.dist](#), [tau.dist](#), [euc](#), [man](#), [KLdist.matrix](#), [KLD.matrix](#), [mutualInfo](#)

Examples

```
data(sample.ExpressionSet)
sE <- sample.ExpressionSet[1:100,]
d1 <- KLdist.matrix(sE, sample = FALSE)
closest.top(featureNames(sE)[1], d1, 5)
```

`cor.dist`*Pearson correlational distance*

Description

Calculate pairwise Pearson correlational distances, i.e. $1-\text{COR}$ or $1-|\text{COR}|$, for all columns of a matrix and save as a 'dist' object

Usage

```
cor.dist(x, ...)
```

Arguments

<code>x</code>	n by p matrix or ExpressionSet; if x is an ExpressionSet, then the function uses its 'exprs' slot.
<code>...</code>	arguments passed to <code>cor.dist</code> :
<code>abs</code>	if TRUE, then $1- \text{COR} $ else $1-\text{COR}$, default is TRUE.
<code>diag</code>	if TRUE, then the diagonal of the distance matrix will be displayed, default is FALSE.
<code>upper</code>	if TRUE, then the upper triangle of the distance matrix will be displayed, default is FALSE.
<code>sample</code>	for ExpressionSet methods: if TRUE, then distances are computed between samples, otherwise, they are computed between genes.

Details

The `cor` function is used to compute the pairwise distances.

Value

Pairwise Pearson correlational distance object

Author(s)

Beiyong Ding

See Also

[spearman.dist](#), [tau.dist](#), [euc](#), [man](#), [KLdist.matrix](#), [KLD.matrix](#), [mutualInfo](#)

Examples

```
x <- matrix(rnorm(200), nrow = 5)
cor.dist(x)
```

euc *Euclidean distance*

Description

Calculate pairwise Euclidean distances for all columns of a matrix and save as a 'dist' object

Usage

```
euc(x, ...)
```

Arguments

x	n by p matrix or ExpressionSet; if x is an ExpressionSet, then the function uses its 'exprs' slot.
...	arguments passed to euc:
diag	if TRUE, then the diagonal of the distance matrix will be displayed; default is FALSE.
upper	if TRUE, then the upper triangle of the distance matrix will be displayed; default is FALSE.

Value

Pairwise Euclidean distance object

Author(s)

Beiyong Ding

See Also

[spearman.dist](#), [tau.dist](#), [man](#), [KLdist.matrix](#), [KLD.matrix](#), [mutualInfo](#)

Examples

```
x <- matrix(rnorm(200), nrow = 5)
euc(x)
```

man *Manhattan distance*

Description

Calculate pairwise Manhattan distances for all rows of a matrix and save as a dist object.

Usage

```
man(x, ...)
```

Arguments

<code>x</code>	a matrix or an ExpressionSet; if <code>x</code> is an ExpressionSet, then the function uses its 'exprs' slot.
<code>...</code>	arguments passed to <code>man</code> :
<code>diag</code>	if <code>TRUE</code> , then the diagonal of the distance matrix will be displayed; default is <code>FALSE</code> .
<code>upper</code>	if <code>TRUE</code> , then the upper triangle of the distance matrix will be displayed; default is <code>FALSE</code> .

Details

This is just an interface to `dist` with the right parameters set.

Value

An instance of the `dist` class with the pairwise Manhattan distances between the rows of `x`.

Author(s)

Beiyong Ding

See Also

[cor.dist](#), [spearman.dist](#), [tau.dist](#), [euc](#), [Kldist.matrix](#), [KLD.matrix](#), [mutualInfo](#)

Examples

```
x <- matrix(rnorm(200), nrow = 5)
man(x)
```

mutualInfo

Mutual Information

Description

Calculate mutual information via binning

Usage

```
mutualInfo(x, ...)
MIdist(x, ...)
```

Arguments

<code>x</code>	an <code>n</code> by <code>p</code> matrix or ExpressionSet; if <code>x</code> is an ExpressionSet, then the function uses its 'exprs' slot.
<code>...</code>	arguments passed to <code>mutualInfo</code> and <code>MIdist</code> :
<code>nbin</code>	number of bins to calculate discrete probabilities; default is 10.
<code>diag</code>	if <code>TRUE</code> , then the diagonal of the distance matrix will be displayed; default is <code>FALSE</code> .

upper	if TRUE, then the upper triangle of the distance matrix will be displayed; default is FALSE.
sample	for ExpressionSet methods, if TRUE, then distances are computed between samples, otherwise, between genes.

Details

For `mutualInfo` each row of `x` is divided into `nbin` groups and then the mutual information is computed, treating the data as if they were discrete.

For `MI`dist we use the transformation proposed by Joe (1989), $\delta^* = (1 - \exp(-2\delta))^{1/2}$ where δ is the mutual information. The `MI`dist is then $1 - \delta^*$. Joe argues that this measure is then similar to Kendall's tau, `tau.dist`.

Value

An object of class `dist` which contains the pairwise distances.

Author(s)

Robert Gentleman

References

H. Joe, Relative Entropy Measures of Multivariate Dependence, *JASA*, 1989, 157-164.

See Also

`dist`, `KLdist.matrix`, `cor.dist`, `KLD.matrix`

Examples

```
x <- matrix(rnorm(100), nrow = 5)
mutualInfo(x, nbin = 3)
```

`spearman.dist`

Spearman correlational distance

Description

Calculate pairwise Spearman correlational distances, i.e. 1-SPEAR or 1-|SPEAR|, for all rows of a matrix and return a `dist` object.

Usage

```
spearman.dist(x, ...)
```

Arguments

<code>x</code>	<code>n</code> by <code>p</code> matrix or ExpressionSet; if <code>x</code> is an ExpressionSet, then the function uses its 'exprs' slot.
<code>...</code>	arguments passed to <code>spearman.dist</code> :
<code>abs</code>	if <code>TRUE</code> , then <code>1- SPEAR </code> else <code>1-SPEAR</code> ; default is <code>TRUE</code> .
<code>diag</code>	if <code>TRUE</code> , then the diagonal of the distance matrix will be displayed; default is <code>FALSE</code> .
<code>upper</code>	if <code>TRUE</code> , then the upper triangle of the distance matrix will be displayed; default is <code>FALSE</code> .
<code>sample</code>	for the ExpressionSet method: if <code>TRUE</code> (the default), then distances are computed between samples.

Details

We call `cor` with the appropriate arguments to compute the row-wise correlations.

Value

One minus the Spearman correlation, between rows of `x`, are returned, as an instance of the `dist` class.

Author(s)

Beiyong Ding

See Also

`cor.dist`, `tau.dist`, `euc`, `man`, `KLdist.matrix`, `KLD.matrix`, `mutualInfo`, `dist`

Examples

```
x <- matrix(rnorm(200), nrow = 5)
spearman.dist(x)
```

`tau.dist`

Kendall's tau correlational distance

Description

Calculate pairwise Kendall's tau correlational distances, i.e. `1-TAU` or `1-|TAU|`, for all rows of the input matrix and return an instance of the `dist` class.

Usage

```
tau.dist(x)
```


Arguments

x	n by p matrix or ExpressionSet; if x is an ExpressionSet, then the function uses its 'exprs' slot.
...	arguments passed to tau.dist:
abs	if TRUE, then 1- TAU else 1-TAU; default is TRUE.
diag	if TRUE, then the diagonal of the distance matrix will be displayed; default is FALSE.
upper	if TRUE, then the upper triangle of the distance matrix will be displayed; default is FALSE.
sample	for the ExpressionSet method: if TRUE (the default), then distances are computed between samples.

Details

Row-wise correlations are computed by calling the `cor` function with the appropriate arguments.

Value

One minus the row-wise Kendall's tau correlations are returned as an instance of the `dist` class. Note that this can be extremely slow for large data sets.

Author(s)

Beiyong Ding

See Also

[cor.dist](#), [spearman.dist](#), [euc](#), [man](#), [KLdist.matrix](#), [KLD.matrix](#), [mutualInfo](#)

Examples

```
x <- matrix(rnorm(200), nrow = 5)
tau.dist(x)
```

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