Package 'covEB'

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Type Package

Title Empirical Bayes estimate of block diagonal covariance matrices

Version 1.0.0

Date 2016-09-24

Author C. Pacini

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Description Using bayesian methods to estimate correlation matrices assuming that they can be written and estimated as block diagonal matrices. These block diagonal matrices are determined using shrinkage parameters that values below this parameter to zero.

License GPL-3

Depends R (>= 3.3), mvtnorm, igraph, gsl, Biobase, stats

Suggests curatedBladderData

biocViews Bayesian, Microarray, RNASeq, Preprocessing, Software, GeneExpression, StatisticalMethod

NeedsCompilation no

R topics documented:

`covEB-package` *Empirical Bayes estimate of block diagonal covariance matrices*

Description

Using bayesian methods to estimate correlation matrices assuming that they can be written and estimated as block diagonal matrices. These block diagonal matrices are determined using shrinkage parameters that values below this parameter to zero.

Details

The DESCRIPTION file:

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Index of help topics:

The function for this package is covEB that calculates an empirical Bayes estimate of a given covariance matrix assuming that is has a block diagonal structure.

Author(s)

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`covEB` *Empirical Bayes estimate of block diagonal correlation matrix*

Description

Assuming a block diagonal structure of the correlation matrix, the function calculates and empirical Bayes estimate of the original covariance matrix. The aim is to reduce false discovery rates by pooling information on the levels of correlations between elements in the same blocks. The blocks can have different levels of true correlation between them. The algorithm searches the space of possible correlation values and estimates the final correlation by and average of all non zero estimates.

Usage

```
covEB(Covmat, delta = 0.1, shift = 0.05, cutoff = NULL, startlambda = 0.5,n)
```

Arguments

Covmat	A sample covariance matrix. Must be positive semi-definite, is converted to a correlation matrix in the algorithm.
delta	This parameter gives the size of the range of correlation values that are considered in one iteration. The larger the value the more the values will be pooled to the overall correlation of the full matrix. Default 0.1
shift	The shift parameter determines how much the lower bound of the range of correlation values is moved by through each iteration. The larger the value the fewer iterations. Default 0.05.
cutoff	Optional - If the average correlations for a given block are below this value then the prior for this block is set to be the independence prior.
startlambda	This determines a lower noise level for the correlations, for example, it defaults to 0.5. This means that all correlation values below 0.5 will be set to zero (assumed to be noise).
n	The number of samples (replicates) used to calculate Covmat

Value

Returns the estimated correlation matrix.

Author(s)

C. Pacini

References

Champion, C. J. (2003). Empirical Bayesian estimation of normal variances and covariances. Journal of Multivariate Analysis, 87(1), 60-79

Examples

```
sigma <- matrix(c(4,2,2,3), ncol=2)
x <- rmvnorm(n=500, mean=c(1,2), sigma=sigma)

samplecov<-cov(x)

test<-covEB(samplecov,delta=0.05,shift=0.025,startlambda=0.4,n=500)
```

EBsingle *Empirical Bayes estimate of block diagonal correlation matrix*

Description

Assuming a block diagonal structure of the correlation matrix, the function calculates and empirical Bayes estimate of the original covariance matrix. The algorithm assumes a single block diagonal prior with one shrinkage threshold determining significance of correlations.

Usage

```
EBsingle(Covmat, startlambda = 0.5, n, happrox=FALSE)
```

Arguments

Covmat	A sample covariance matrix. Must be positive semi-definite, is converted to a correlation matrix in the algorithm.
startlambda	This determines a lower noise level for the correlations, for example, it defaults to 0.5. This means that all correlation values below 0.5 will be set to zero (assumed to be noise).
n	The number of samples (replicates) used to calculate Covmat
happrox	Logical indicating whether or not to use a hypergeometric distribution estimation of the correlations. The alternative is to take the sample average of the correlations. FALSE by default.

Value

Returns the estimated correlation matrix.

Author(s)

C. Pacini

References

Champion, C. J. (2003). Empirical Bayesian estimation of normal variances and covariances. Journal of Multivariate Analysis, 87(1), 60-79

Examples

```
sigma <- matrix(c(4,2,2,3), ncol=2)
x <- rmvnorm(n=500, mean=c(1,2), sigma=sigma)

samplecov<-cov(x)

test<-EBsingle(samplecov,startlambda=0.4,n=500)
```

Index