

Package ‘cauchyPCA’

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Type Package

Title Robust Principal Component Analysis Using the Cauchy Distribution

Version 1.1

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Depends R (>= 4.0)

Imports doParallel, foreach, parallel, Rfast, stats

Description A new robust principal component analysis algorithm is implemented that relies upon the Cauchy Distribution. The algorithm is suitable for high dimensional data even if the sample size is less than the number of variables. The methodology is described in this paper: Fayomi A., Pantazis Y., Tsagris M. and Wood A.T.A. (2022). “Cauchy robust principal component analysis with applications to high-dimensional data sets”. <[arXiv:2211.03181](https://arxiv.org/abs/2211.03181)>.

License GPL (>= 2)

NeedsCompilation no

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R topics documented:

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cauchypca-package

Robust Principal Component Analysis Using the Cauchy Distribution

Description

A new robust principal component analysis algorithm is implemented that relies upon the Cauchy Distribution. The algorithm is suitable for high dimensional data even if the sample size is less than the number of variables.

Details

Package: cauchypca
Type: Package
Version: 1.1
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Maintainers

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References

Fayomi A., Pantazis Y., Tsagris M. and Wood A.T.A. (2022). Cauchy robust principal component analysis with applications to high-dimensional data sets. <arXiv:2211.03181>.

Robust PCA using the Cauchy distribution

Robust PCA using the Cauchy distribution

Description

Robust PCA using the Cauchy distribution.

Usage

```
cauchy.pca(x, k = 1, center = "sm", scale = "mad", trials = 20, parallel = FALSE)
```

Arguments

| | |
|----------|--|
| x | A numerical matrix with the data. |
| k | The number of eigenvectors to extract. |
| center | The way to center the data. This can be either "sm" corresponding to the spatial median, "med" corresponding to the classical variable-wise median. Alternatively the user can specify their own vector. |
| scale | This is the method to scale the data. The default value is "mad" corresponding to the mean absolute deviation, computed column-wise. Alternatively the user can provide their own vector. |
| trials | The number of trials to attempt. How many times the algorithm will be performed with different starting values (different starting vectors). |
| parallel | If you want parallel computations set this equal to TRUE. |

Details

This is the main function used to extract the Cauchy robust eigenvectors.

Value

A list including:

| | |
|----------|--|
| runtime | The duration (in seconds) of the algorithm. |
| loglik | The minimum maximum Cauchy log-likelihood. |
| mu | The estimated location parameter of the Cauchy distribution. |
| su | The estimated scale parameter of the Cauchy distribution. |
| loadings | A matrix with the robust eigenvectors. |

Author(s)

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R implementation and documentation: Michail Tsagris <mtsagris@uoc.gr>.

References

Fayomi A., Pantazis Y., Tsagris M. and Wood A.T.A. (2022). Cauchy robust principal component analysis with applications to high-dimensional data sets. <arXiv:2211.03181>.

Examples

```
x <- as.matrix( iris[, 1:4] )
cauchy.pca(x, k = 1)
```

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