Package ‘BSSprep’
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Type Package
Title Whitening Data as Preparation for Blind Source Separation
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Maintainer Markus Matilainen <markus.matilainen@outlook.com>
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Description Whitening is the first step of almost all blind source separation (BSS) methods. A fast implementation of whitening for BSS is implemented to serve as a lightweight dependency for packages providing BSS methods.
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Description

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Details

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**License:** GPL (>= 2)

This package contains the single function `BSSprep` for whitening multivariate data as a preprocessing step for blind source separation (BSS). The package is meant as a fast and lightweight dependency for packages providing BSS methods as whitening is almost always the first step.

Author(s)

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**BSSprep**  
*Whitening of Multivariate Data*

Description

A function for data whitening.

Usage

`BSSprep(X)`

Arguments

- **X**  
  A numeric matrix. Missing values are not allowed.

Details

A $p$-variate $\mathbf{Y}$ with $T$ observations is whitened, i.e. $\mathbf{Y} = \mathbf{S}^{-1/2}(\mathbf{X} - \frac{1}{T} \sum_{t=1}^{T} \mathbf{X}_t)$, where $\mathbf{S}$ is the sample covariance matrix of $\mathbf{X}$.

This is often need as a preprocessing step like in almost all blind source separation (BSS) methods. The function is implemented using C++ and returns the whitened data matrix as well as the ingredients to back transform.

Value

A list containing the following components:

- **Y**  
  The whitened data matrix.
- **X.C**  
  The mean-centered data matrix.
- **COV.sqrt.i**  
  The inverse square root of the covariance matrix of $\mathbf{X}$.
- **MEAN**  
  Mean vector of $\mathbf{X}$. 
**BSSprep**

**Author(s)**
Markus Matilainen, Klaus Nordhausen

**Examples**

```r
n <- 100
X <- matrix(rnorm(10*n) - 1, nrow = n, ncol = 10)

res1 <- BSSprep(X)
res1$Y  # The whitened matrix
colMeans(res1$Y)  # should be close to zero
cov(res1$Y)  # should be close to the identity matrix
res1$MEAN  # Should hover around -1 for all 10 columns
```
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