

# Package ‘BSSprep’

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**Type** Package

**Title** Whitening Data as Preparation for Blind Source Separation

**Version** 0.1

**Date** 2021-03-25

**Maintainer** Markus Matilainen <markus.matilainen@outlook.com>

**Imports** Rcpp (>= 0.11.0)

**LinkingTo** Rcpp, RcppArmadillo

**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.

**License** GPL (>= 2)

**NeedsCompilation** yes

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**Repository** CRAN

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## R topics documented:

BSSprep-package . . . . .	1
BSSprep . . . . .	2
<b>Index</b>	<b>4</b>

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BSSprep-package	<i>Whitening Data as Preparation for Blind Source Separation</i>
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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.

**Details**

Package: BSSprep  
 Type: Package  
 Version: 0.1  
 Date: 2021-03-25  
 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*

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**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.  $\mathbf{Y} = \mathbf{S}^{-1/2}(\mathbf{X}_t - \frac{1}{T} \sum_{t=1}^T \mathbf{X}_t)$ , 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:

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

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**Examples**

```
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
```

# Index

\* **multivariate**

BSSprep, [2](#)

BSSprep-package, [1](#)

\* **package**

BSSprep-package, [1](#)

\* **ts**

BSSprep, [2](#)

BSSprep, [2](#), [2](#)

BSSprep-package, [1](#)