

# Package ‘FACTMLE’

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**Type** Package

**Title** Maximum Likelihood Factor Analysis

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**Description** Perform Maximum Likelihood Factor analysis on a covariance matrix or data matrix.

**License** GPL-3

**Imports** rARPACK, stats

**Suggests** MASS

**RoxygenNote** 5.0.0

**NeedsCompilation** no

**Repository** CRAN

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|---------|--------------------------------------------------------------------------|
| Factmle | <i>Calculates the Maximum likelihood Factor analysis with a dataset.</i> |
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## Description

Calculates the Maximum likelihood Factor analysis with a dataset.

**Usage**

```
Factmle(data, rnk, Psi_init = c(), lb = 0.01, index = c(), lb2 = 0.01,
        tol = 10^-7, Max_iter = 1000)
```

**Arguments**

|          |                                                                                                                                                                                                                             |
|----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| data     | The dataset. It is a $n \times p$ numeric matrix, where $n$ is the number of observations and $p$ is the number of variables.                                                                                               |
| rnk      | Rank constraint for the Factor analysis problem. It must a positive integer less than the number of variables $p$                                                                                                           |
| Psi_init | The initial value of Psi. It is a $p \times 1$ numeric vetor, where $p$ is the number of variables. Default value is a vector of uniform random numbers.                                                                    |
| lb       | The lower bound on the Psi values. The default value is set to 0.05                                                                                                                                                         |
| index    | This option is for modified version of factmle. The default value is a null vector. If assigned a zero vector, it will perform MLFA keeping some of the Psi values specified by the index at a specified level <i>*lb2*</i> |
| lb2      | This option of modified version of factmle algorithm. The default value is 0.001. The Psi values specified by the <i>*index*</i> is kept constant at <i>*lb2*</i> while doing MLFA.                                         |
| tol      | Precision parameter. Default is $10^{-7}$                                                                                                                                                                                   |
| Max_iter | Maximum number of iterations. Default is 1000.                                                                                                                                                                              |

**Value**

A list with the following components

|        |                                                                               |
|--------|-------------------------------------------------------------------------------|
| Psi    | A vector containing the unique variances.                                     |
| Lambda | A $p \times \text{rnk}$ matrix containing the factor loadings in the columns. |
| Nll    | A vector containing the negative Log-likelihood values at every iteration.    |
| Nllopt | The value of the negative log-likelihood upon convergence.                    |

**See Also**

svds

**Examples**

```
library(MASS)
library(stats)
Psi=runif(15,min=0.2,max=1.3)
Lambda=mvnrm(n=15,mu=rep(0,3),Sigma = diag(rep(1,3)))
data=mvnrm(n=5000,mu=rep(0,15),Sigma = diag(Psi)+Lambda%*%t(Lambda))
x=Factmle(data,3)
```

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|             |                                                                                    |
|-------------|------------------------------------------------------------------------------------|
| Factmle_cov | <i>Calculates the Maximum likelihood Factor analysis with a covariance Matrix.</i> |
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### Description

Calculates the Maximum likelihood Factor analysis with a covariance Matrix.

### Usage

```
Factmle_cov(S, rnk, Psi_init = c(), lb = 0.01, index = c(), lb2 = 0.01,
  tol = 10^-7, Max_iter = 1000)
```

### Arguments

|          |                                                                                                                                                                                                                    |
|----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| S        | The Covariance Matrix. It is a p*p numeric matrix, where p is the number of variables.                                                                                                                             |
| rnk      | Rank constraint for the Factor analysis problem. It must a positive integer less than the number of variables p                                                                                                    |
| Psi_init | The initial value of Psi. It is a p*1 numeric vetor, where p is the number of variables.Default value is a vector of uniform random numbers.                                                                       |
| lb       | The lower bound on the Psi values. The default value is set to 0.05                                                                                                                                                |
| index    | This option is for modified version of factmle.The default value is a null vector. If assigned a zero vector, it will perform MLFA keeping some of the Psi values specified by the index at a specifed level *lb2* |
| lb2      | This option of modified version of factmle algorithm. The default value is 0.001. The Psi values specified by the *index* is kept constant at *lb2* while doing MLFA.                                              |
| tol      | Precision parameter. Default is 10^-7                                                                                                                                                                              |
| Max_iter | Maximum number of iterations. Default is 1000.                                                                                                                                                                     |

### Value

A list with the following components

**Psi** A vector containing the unique variances.

**Lambda** A p\*rnk matrix containing the factor loadings in the columns.

**Nll** A vector containing the negative Log-likelihood values at every iteration.

**Nllopt** The value of the negative log-likelihood upon convergence.

### See Also

eigs\_sym

**Examples**

```
library(MASS)
library(stats)
Psi=runif(15,min=0.2,max=1.3)
Lambda=mvnrm(n=15,mu=rep(0,3),Sigma = diag(rep(1,3)))
data=mvnrm(n=5000,mu=rep(0,15),Sigma = diag(Psi)+Lambda%*%t(Lambda))
S=cov(data)
x=Factmle_cov(S,3)
```

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