Package ‘fanc’
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Type Package
Title Penalized Likelihood Factor Analysis via Nonconvex Penalty
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Author Kei Hirose, Michio Yamamoto
Maintainer Kei Hirose <mail@keihirose.com>
Depends Matrix
Suggests RGtk2, tcltk, matlab
Description An R package “fanc” computes the penalized maximum
likelihood estimates of factor loadings and unique variances
for various tuning parameters. The pathwise coordinate descent
along with EM algorithm is used. This package also includes a
new graphical tool which outputs path diagram, goodness-of-fit
indices and model selection criteria for each regularization
parameter. The user can change the regularization parameter by
manipulating scrollbars, which is helpful to find a suitable
value of regularization parameter.
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fanc (penalized maximum likelihood factor analysis via nonconvex penalties)

Description
This package computes the solution path of penalized maximum likelihood estimates via MC+ penalties.

Usage
fanc(x, factors, n.obs, cor.factor=FALSE, normalize = TRUE, rho.max, covmat, control=list())

Arguments
- x: A data matrix.
- factors: The number of factors.
- cor.factor: An indicator of the factor correlation. If "TRUE", the factor correlation is considered. Default is "FALSE".
- normalize: If "TRUE", each variable is normalized, otherwise it is left alone.
- rho.max: Maximum value of rho.
- covmat: A covariance matrix, which is needed if the data matrix "x" is not available.
- n.obs: The number of observations, which is needed to calculate the model selection criteria and goodness-of-fit indices when the data matrix "x" is not available.
- control: A list of control parameters. See 'Details'.

Details
The control argument is a list that can supply any of the following components:

- length.rho: Candidates of tuning parameters which is used for grid search of reparametrization of MC+.
- length.gamma: A length of tuning parameter which controls sparsenesses. For each rho, gamma=Inf yields soft threshold operator (i.e., lasso penalty) and gamma=+1 produces hard threshold operator.
- max.gamma: A maximum value of gamma (excludes Inf.).
- min.gamma: A minimum value of gamma.
- eta: A tuning parameter used for preventing the occurrence of improper solutions. eta must be non-negative.
- ncand.initial: The number of candidates of initial values of factor loadings.
- maxit.em: A maximum number of iterations for EM algorithm.
fanc

maxit.cd A maximum number of iterations for coordinate descent algorithm.
maxit.bfgs A maximum number of iterations for BFGS algorithm used in the update of factor
correlation.
maxit.initial A maximum number of iterations for choosing the initial values.
start Type of start. If "cold", the initial value of factor loadings is randomly chosen for each
tuning parameter, which can be slow.
Delta A proportion of maximum value of rho to minimum value of rho, i.e., rho.min=Delta*rho.max.
min.uniquevar A minimum value of unique variances.
tol.em A positive scalar giving the tolerance at which the parameter in EM is considered close
enough to zero to terminate the algorithm.
tol.cd A positive scalar giving the tolerance at which the factor loadings in coordinate descent is
considered close enough to zero to terminate the algorithm.
tol.bfgs A positive scalar giving the tolerance at which the factor correlation in BFGS algorithm
is considered close enough to zero to terminate the algorithm.
min.rhzero If "TRUE", the minimum value of "rho" is zero.
zita A value of hyper-parameter of factor correlation.
progress If "TRUE", the progress for each tuning parameter is displayed.
openmp If "TRUE", the parallel computation via OpenMP is executed.
num.threads The number of threads of the openmp. Only used when openmp is "TRUE",
gamma.ebic The value of gamma used in the extended BIC

Value
loadings factor loadings
uniquenesses unique variances
Phi factor correlation
rho rho
AIC AIC
BIC BIC
CAIC CAIC
df degrees of freedom (number of non-zero parameters for the lasso estimation)
criteria values of AIC, BIC and CAIC
goodness.of.fit values of GFI and AGFI
gamma a value of gamma
Npflag If the number of observation is larger than the number of variables, 1, otherwise
0.
factors the number of factors
cor.factor An indicator of the factor correlation
x data matrix
convergence indicator of convergence of EM algorithm, coordinate descent and BFGS. If all
of these variables are 0, the algorithm has been converged
Description

This function gives us the loadings from a "fanc" object for fixed value of gamma.

Usage

out(x, rho, gamma, scores=FALSE, df.method="reparametrization")
Arguments

- x: Fitted "fanc" model object.
- gamma: The value of gamma.
- rho: The value of rho.
- scores: Logical flag for outputting the factor scores. Default is FALSE.
- df.method: Two types of degrees of freedom are supported. If "reparametrization", the degrees of freedom of the MC+ are reparametrized based on the degrees of freedom of the lasso. If "active", the degrees of freedom of are the number of nonzero parameters.

Value

- loadings: factor loadings
- uniquenesses: unique variances
- Phi: factor correlation
- scores: factor scores
- df: degrees of freedom (number of non-zero parameters for the lasso estimation)
- criteria: values of AIC, BIC and CAIC
- goodness.of.fit: values of GFI and AGFI
- rho: a value of rho
- gamma: a value of gamma

Author(s)

Kei Hirose
<mail@keihirose.com>

References


See Also

fanc and plot.fanc objects.
plot.fanc  

plot the solution path from a "fanc" object.

Description

This function plots the solution paths from a "fanc" object for fixed value of gamma.

Usage

```r
## S3 method for class 'fanc'
plot(x, Window.Height=500, type=NULL, df.method="reparametrization", ...)
```

Arguments

- `x`: Fitted "fanc" model object.
- `Window.Height`: A window height. The default is 500.
- `type`: Two plot types are supported. If "path", the path diagram is depicted. If "heatmap", the heatmap is depicted.
- `df.method`: Two types of degrees of freedom are supported. If "reparametrization", the degrees of freedom of the MC+ are reparametrized based on the degrees of freedom of the lasso. If "active", the degrees of freedom of are the number of nonzero parameters.
- `...`: Other graphical parameters to plot

Value

NULL

Author(s)

Kei Hirose  
<mail@keihirose.com>

References


See Also

fanc and out objects.
select

select from a "fanc" object for fixed value of gamma.

Description

This functions give us the loadings from a "fanc" object for fixed value of gamma.

Usage

select(x, criterion=c("BIC","AIC","CAIC","EBIC"),
gamma, scores=FALSE, df.method="active")

Arguments

- **x**: Fitted "fanc" model object.
- **criterion**: The criterion by which to select the tuning parameter rho. One of "AIC", "BIC", "CAIC", or "EBIC". Default is "BIC".
- **gamma**: The value of gamma.
- **scores**: Logical flag for outputting the factor scores. Default is FALSE.
- **df.method**: Two types of degrees of freedom are supported. If "active", the degrees of freedom are the number of nonzero parameters. If "reparametrization", the degrees of freedom of the MC+ are reparametrized based on the degrees of freedom of the lasso.

Value

- **loadings**: factor loadings
- **uniquenesses**: unique variances
- **Phi**: factor correlation
- **scores**: factor scores
- **df**: degrees of freedom (number of non-zero parameters for the lasso estimation)
- **criteria**: values of AIC, BIC and CAIC
- **goodness.of.fit**: values of GFI and AGFI
- **rho**: a value of rho
- **gamma**: a value of gamma

Author(s)

Kei Hirose
<mail@keihirose.com>
References


See Also

fanc and plot.fanc objects.
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