Package ‘FactMixtAnalysis’

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Type Package

Title Factor Mixture Analysis with covariates

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Description The package estimates Factor Mixture Analysis via the EM algorithm

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Depends R (>= 2.0.1), MASS, mvtnorm

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fma

Fitting Factor Mixture Analysis model by the EM algorithm

Description

fma is used to perform Factor Mixture Analysis (with covariates) on a matrix of data by the Expectation Maximization algorithm.

Usage

fma(y, k, r, x.z = NULL, x.w = NULL, it = 15, eps = 1e-04, seed = 4, scaling = FALSE, init = NULL)

Arguments

y
A data matrix with n rows representing observations and p columns representing variables.

k
The number of the mixture components.

r
The number of factors.

x.z
A matrix of covariates with n rows representing observations and q columns representing the predictors. These covariates are assumed to linearly affect the factor means.

x.w
A matrix of covariates with n rows representing observations and m columns representing the predictors. These covariates are assumed to differently affect the a priori probability of group membership.

it
The maximum number of iterations of the EM algorithm. By default it is set to 15.

eps
The lower bound for relative variation of the likelihood. It is used as alternative stopping rule for the EM algorithm: if the relative increment of the likelihood is lower than eps the fitting is stopped. The default is 0.0001.

seed
Fix the seed of the running. Default is 4.

scaling
If TRUE (FALSE is default) the data are scaled before fitting the FMA model.

init
A list containing initial values for all (of some) model parameters. If NULL (default) the algorithm starts from random values.

Details

Factor Mixture Analysis is a particular factor model with non Gaussian factors modelled by a multivariate Gaussian mixture. The p observed variables y are modelled in terms of the smaller set of r factors, z, and an additive specific term u: y = Hz + u, where u is assumed to be normally distributed with diagonal variance matrix PSI. H is the factor loading matrix. The model is fitted by the EM algorithm. The code implements also factor mixture model with covariates. Covariates may affect the observed variables into two manners: they are assumed to linearly affect the factor means (x.z) and or they can differently affect the a priori probability of group membership (x.w). The default is NULL which means that covariates are not incorporated in the model.
Value

- **H**
  The estimated factor loading matrix.
- **lik**
  The log-likelihood computed at each iteration of the EM algorithm.
- **w**
  A matrix with the estimated weights of the mixture.
- **Beta**
  An array of dimension $k \times r \times (q + 1)$ containing the vectors of regression coefficients which are allowed to vary across the components. When no covariate is incorporated into the model, i.e. $x.z$ is NULL, Beta has dimension $k \times r$ and it corresponds to the estimated component means of the mixture.
- **phi**
  A matrix of dimension $k \times m$ which contains the coefficients of the covariates affecting the group membership.
- **sigma**
  An array of dimension $k \times r \times r$ which contains the estimated component covariance of the mixture.
- **psi**
  The noise diagonal variance matrix.
- **ph.y**
  The posterior distribution of each mixture components.
- **z**
  The reconstructed factor scores by Thompson method.
- **index**
  The allocation vector.
- **bic**
  The BIC value.
- **aic**
  The AIC value.
- **elapsed**
  Computational time in seconds.

Author(s)

Cinzia Viroli

References

A. Montanari and C. Viroli (2010), Heteroscedastic Factor Mixture Analysis, Statistical Modelling, 10(4), 441-460.


C. Viroli (2011), Using factor mixture analysis to model heterogeneity, cognitive structure and determinants of dementia: an application to the Aging, Demographics, and Memory Study, Statistics in Medicine, to appear.

Examples

data(crabs)
y=as.matrix(crabs[,4:8])
fit=fma(y,k=2,r=1,it=50,eps=0.0001,scaling=TRUE) # without covariates
misc(fit$index,crabs[,1]) # compute the misclassification error

sex=as.double(crabs[,2])-1
fit=fma(y,k=2,r=1,x.z=sex,x.w=sex,it=50,eps=0.0001,scaling=TRUE) # with covariates
fma.em.alg  
*Internal function to perform the EM algorithm*

**Description**

An internal function to perform the EM algorithm

mapClass  
*Internal function to perform the EM algorithm*

**Description**

An internal function to perform the EM algorithm

misc  
*Misclassification error*

**Description**

An internal function which computes the misclassification error between two partitions

**Usage**

misc(classification, truth)

**Arguments**

- **classification**  
  A numeric or character vector of class labels.

- **truth**  
  A numeric or character vector of truth class labels. The length of truth should be the same as that of classification.

**Value**

The misclassification error (a scalar).

**See Also**

fma
pi.greco.grad

**Description**
An internal function to perform the EM algorithm

pi.greco.hess

**Description**
An internal function to perform the EM algorithm
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