Package 'MIRT4FC'

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Type Package
Title Fit FC-Model by *i*StEM Alogrithm
Version 0.1.0
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Description Fit Two-Parameter Logistic Item Response Theory(2PL-IRT) models in R by *i*StEM alogrithm. Functionality for extracting results, making predictions, and simulating data is provided as well.
License GPL-3
Encoding UTF-8
LazyData true
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Imports armspp, doParallel, foreach, coda, mvnfast, stats, utils, Matrix
Depends parallel

R topics documented:

StEM *Stochastic EM algorithm for solving generalized partial credit model*

Description

Stochastic EM algorithm for solving generalized partial credit model

Usage

StEM (Y, BID, positive = rep (TRUE, nrow(BID)), blocksize = 3, res = "rank", M = 10,B = 20, a = NULL ,d = NULL, item.par = NULL, sigma = NULL, theta = NULL, fix.sigma = FALSE, burnin. maxitr = 40, maxitr = 500, eps1 = 1.5, eps2 = 0.4, frac1 = 0.2, frac2 = 0.5, cores = 1)

Arguments

Y	A # of subjects x # of blocks matrix; item responses.
BID	A # of statements x 3 matrix; item information, columns are "Block", "Item" and "Dimensions".
positive	A logical vector; indicating whether each statement is positive directional or not.
blocksize	A number; block size of FC (2/3/4).
res	A string; response format('pick'/'rank'/'mole'), pick-2/rank-2/mole-2 are equivalent, rank-3/mole-3 are equivalent.
M	A number; # of batch.
B	A number; # of iterations in each batch.
a	A vector; length = # of statements, initial alpha parameters.
d	A vector; length = # of statements, initial beta parameters.
item.par	A data frame; initial parameters for a and d.
sigma	A # of dimensions x # of dimensions matrix; initial sigma parameters.
theta	A # of subjects x # of dimensions matrix; initial theta parameters.
fix.sigma	Logical; TRUE if sigma is estimated.
burnin.maxitr	A number; max burn-in allowed.
maxitr	A number; max iterations allowed.
eps1	A number; stability criteria.
eps2	A number; convergence criterion.
frac1	A number; cutoffs for calculating Geweke z.
frac2	A number; cutoffs for calculating Geweke z.

cores	A number; number of cores.

Value

The function returns a list with the following components:

a	A vector; length = # of statements, alpha parameters
d	A vector; length = # of statements, beta parameters.
sigm	A # of dimensions x # of dimensions matrix; sigma parameters.
total batch number	A number; total batch number.
final chain size	A number; final chain size.
burn-in size	A number; burn-in size.
time	A number; time.

Examples

```
# run a toy example based on the M2PL model
# demension
D <- 6

# items number per demension
nitem.per.dim <- 10

# blocks number
nblock <- D * nitem.per.dim / 3

# set random seed
set.seed(123456)

# simulate block-item-demension correspondence table
BID <- data.frame(Block=rep(1:nblock,each=3),
                  Item=rep(1:3,nblock),
                  Dim=c(combn(D,3)[,sample(choose(D,3),nblock,replace = TRUE)]))

# simulate item parameter truth value
item.par <- data.frame(a=seq_len(D*nitem.per.dim))
item.par <- within (item.par,{
   a <- runif(D*nitem.per.dim,0.7,3)
   b <- rnorm(D*nitem.per.dim)
   d <- a*b
})

item.par$d <- c(t(aggregate(item.par$d,by=list(BID$Block),function(x)x-mean(x))[,-1]))

# sample number
N <- 1000
```

```
# intertrait correlation
v <- matrix(0.5,D,D)
diag(v) <- 1

# latent trait parameter
theta <- mvnfast::rmvn(N,seq(-1,1,length.out = D),sigma = v)

# generate a simulated dataset
Y <- data.sim(item.par,theta,BID,blocksize=3,res='rank')

# fit MUPP-2PL
fit <- StEM(Y,BID,maxitr = 100,blocksize=3,res='rank',fix.sigma = TRUE,cores=1)
```

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data.sim *Simulated dataset for multivariate FC item response theory model.*

Description

Simulated dataset for multivariate FC item response theory model.

Usage

```
data.sim (item.par, theta, BID, blocksize=3, res='rank')
```

Arguments

BID	A # of statements x 3 matrix; item information, columns are "Block", "Item" and "Dimensions".
blocksize	A number; block size of FC (2/3/4).
res	A string; response format('pick'/'rank'/'mole'), pick-2(blocksize=2)/rank-2/mole-2 are equivalent, rank-3/mole-3 are equivalent.
item.par	A data frame; parameters for a and d.
theta	A # of subjects x # of dimensions matrix; theta parameters.

Value

A # of subjects x # of block number matrix.

Examples

```
# run a toy example based on the M2PL model
# demension
D <- 6

# items number per demension
nitem.per.dim <- 10

# blocks number
```

```
nblock <- D * nitem.per.dim / 3

# set random seed
set.seed(123456)

# simulate block-item-demension correspondence table
BID <- data.frame(Block=rep(1:nblock,each=3),
                  Item=rep(1:3,nblock),
                  Dim=c(combn(D,3)[,sample(choose(D,3),nblock,replace = TRUE)]))

# simulate item parameter truth value
item.par <- data.frame(a=seq_len(D*nitem.per.dim))
item.par <- within (item.par,{
   a <- runif(D*nitem.per.dim,0.7,3)
   b <- rnorm(D*nitem.per.dim)
   d <- a*b
})

item.par$d <- c(t(aggregate(item.par$d,by=list(BID$Block),function(x)x-mean(x))[,-1]))

# sample number
N <- 1000

# intertrait correlation
v <- matrix(0.5,D,D)
diag(v) <- 1

# latent trait parameter
theta <- mvnfast::rmvn(N,seq(-1,1,length.out = D),sigma = v)

# generate a simulated dataset
Y <- data.sim(item.par,theta,BID,blocksize=3,res='rank')
```