rrum-package  

rrum: Bayesian Estimation of ‘RRUM’ Model with Gibbs Sampling

Description


Details

Implementation of a Bayesian estimation for the reduced Reparameterized Unified Model (rRUM).

Author(s)

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Gibbs sampler to estimate the rRUM

Description

Obtains samples from posterior distribution for the reduced Reparametrized Unified Model (rRUM).

Usage

rrum(Y, Q, chain_length = 1000L, as = 1, bs = 1, ag = 1, bg = 1, delta0 = rep(1, 2*ncol(Q)))
Arguments

Y
A matrix with N rows and J columns, where N represents the number of individuals and J the number of items. Y indicates the individuals’ responses to each of the items.

Q
A matrix with J rows and K columns indicating which attributes are required to answer each of the items. An entry of 1 indicates attribute k is required to answer item j. An entry of one indicates attribute k is not required.

chain_length
A numeric indicating the number of iterations of Gibbs sampler to be run. Default is set to 10000.

as
A numeric, parameter for the prior distribution of pistar. High values encourage higher values of pistar and lower values of rstar.

bs
A numeric, parameter for the prior distribution of pistar. High values encourage lower values of pistar and higher values of rstar.

ag
A numeric, parameter for the prior distribution of rstar. High values encourage higher values of rstar.

bg
A numeric, parameter for the prior distribution of pistar. High values encourage lower values of rstar.

delta0
A vector, parameters for the Dirichlet prior on pi.

Value

A list that contains

- PISTAR: A matrix where each column represents one draw from the posterior distribution of pistar.
- RSTAR: A JxKxchain_length array where J represents the number of items, and K represents the number of attributes. Each slice represents one draw from the posterior distribution of rstar.
- PI: A matrix where each column represents one draw from the posterior distribution of pi.
- ALPHA: An N x K x chain_length array where N represents the number of individuals, and K represents the number of attributes. Each slice represents one draw from the posterior distribution of alpha.

Author(s)

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References


See Also

`simcdm::sim_rrum_items()`

Examples

```r
# Set seed for reproducibility
set.seed(217)

## Define Simulation Parameters

N = 10000  # Number of Individuals
J = 6      # Number of Items
K = 2      # Number of Attributes

# Matrix where rows represent attribute classes
As = attribute_classes(K)

# Latent Class probabilities
pis = c(.1, .2, .3, .4)

# Q Matrix
Q = rbind(c(1, 0),
          c(0, 1),
          c(1, 0),
          c(0, 1),
          c(1, 1),
          c(1, 1))

# The probabilities of answering each item correctly for individuals
# who do not lack any required attribute
pistar = rep(.9, J)

# Penalties for failing to have each of the required attributes
rstar = .5 * Q

# Randomized alpha profiles
alpha = As[sample(1:(K^2), N, replace = TRUE, pis),]

# Simulate data
rrum_items = simcdm::sim_rrum_items(Q, rstar, pistar, alpha)

## Not run:
# Note: This portion of the code is computationally intensive.

# Recover simulation parameters with Gibbs Sampler
Gibbs.out = rrum(rrum_items, Q)

# Iterations to be discarded from chain as burnin
burnin = 1:5000

# Calculate summarizes of posterior distributions
```
rstar.mean = with(Gibbs.out, apply(RSTAR[,,-burnin], c(1, 2), mean))
pistar.mean = with(Gibbs.out, apply(PISTAR[,,-burnin], 1, mean))
pi.mean = with(Gibbs.out, apply(PI[,,-burnin], 1, mean))

## End(Not run)
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