Package 'latentSNA'

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Type Package

Title LatentSNA

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Description Neuroimaging connectivity analysis needs network science for brain-behavior linking (Wang et al. (2023) < arXiv:2309.11349>).

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Encoding UTF-8

LazyData true

Depends R (>= 4.3.2), MASS

Imports dplyr, plyr

RoxygenNote 7.3.1

R topics documented:

`latentSNA` *Attribute informed brain connectivity*

Description

An MCMC algorithm for fitting the latentSNA model

Usage

```
latnetSNA(X, Y, W, H, seed = 1, nscan =
10000, burn = 500, odens = 25,
prior=list())
```

Arguments

`X`	a list of V x V brain connectivity data.
`Y`	a list of V x P attribute data.
`W`	a matrix of N x Q covariates for the connectivity data.
`H`	a matrix of N x Q1 covariates for the attribute data.
`seed`	random seed
`nscan`	number of iterations of the Markov chain (beyond burn-in)
`burn`	burn in for the Markov chain
`odens`	output density for the Markov chain
`prior`	list: A list of hyperparameters for the prior distribution

Value

`COV`	posterior mean of the covariance parameters between brain and behaviors
`BETAPM`	posterior mean of the regression coefficient parameters for the connectivity data
`GAMMAPM`	posterior mean of the regression coefficient parameters for the attribute data
`THETAPM`	posterior samples of the latent person variable
`APM`	posterior mean of connectivity intercepts
`BPM`	posterior mean of attribute intercepts
`U`	last iteration of latent connectivity for all regions
`UPM`	posterior mean of U
`UVPM.l`	list of posterior mean of connectivity
`Theta`	the last iteration of the Theta estimate
`X`	observed X
`Y`	observed Y
`EFlPM`	posterior mean estimates of X
`ETPM`	posterior mean estiamtes of Y
`TMPM`	posterior mean estimates of latent behavior component
`FLPM`	posterior mean estiamtes of latent connectivity component
`input`	input values

Author(s)

Selena Wang

rbeta_a — *Conditional simulation of intercept and regression coefficients*

Description

Simulates from the joint full conditional distribution of (beta) in a brain connectivity model

Usage

```
rbeta_a(Fl, W = NULL, s2 = 1, U = U, ivA = NULL, beta0 = NULL, S0 = NULL)
```

Arguments

Fl	a list of V X V normal connectivity matrix
W	N x Q covariate matrix
s2	variance
U	a V by V by N array
ivA	prior inverse variance for the intercept parameters
beta0	prior mean vector for regression parameters
S0	prior precision matrix for regression parameters

Value

beta	regression coefficients
a	subject-specific intercept

Author(s)

Selena Wang

rFl_nrm — *Simulate missing values in a normal connectivity model*

Description

Simulates missing values of a sociomatrix under a normal connectivity model

Usage

```
rFl_nrm(Z, EZ, s2, X)
```

Arguments

Z	a square matrix, the current value of Z
EZ	expected value of Z
s2	dyadic variance
X	square relational matrix

Value

a square matrix, equal to at non-missing values

Author(s)

Selena Wang

`rH_bin` *Simulate H*

Description

Simulates a random latent matrix H given its expectation and a behavior matrix Y

Usage

```
rH_bin(H, EH, Y)
```

Arguments

`H`	a n X m matrix, the current value of H
`EH`	expected value of H
`Y`	n X m binary item response matrix
`s1`	item response variance

Value

a n X m matrix, the new value of H

Author(s)

Selena Wang

`rH_nrm` *Simulate missing values in a normal behavior model*

Description

Simulates missing values under a behavior model

Usage

```
rH_nrm(H, EH,s1, Y)
```

Arguments

`H`	a matrix, the current value of H
`EH`	expected value of H
`s1`	behavior variance
`Y`	behavior matrix

Value

a behavior matrix, equal to at non-missing values

Author(s)

Selena Wang

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rs1_b *Gibbs update for behavior variance*

Description

Gibbs update for behavior variance

Usage

```
rs1(Tm, offset=0,nu1=NULL,s10=NULL)
```

Arguments

Tm	a list of V X P normal behavior matrix
nu1	prior degrees of freedom
s10	prior estimate of s1

Value

a new value of s1

Author(s)

Selena Wang

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rs2 *Gibbs update for connectivity variance*

Description

Gibbs update for connectivity variance

Usage

```
rs2(Fl, offset=0,nu2=NULL,s20=NULL)
```

Arguments

Fl	a list of V X V normal connectivity matrix
nu2	prior degrees of freedom
s20	prior estimate of s2

Value

a new value of s2

Author(s)

Selena Wang

`rSu` *Gibbs update for latent effects covariance*

Description

Gibbs update for latent effects covariance

Usage

```
rSu(U,Su0=NULL,etau=NULL)
```

Arguments

`U`	latent connectivity and behavior
`Su0`	prior (inverse) scale matrix for the prior distribution
`etau`	prior degrees of freedom for the prior distribution

Author(s)

Selena Wang

`rTheta_b` *Gibbs sampling of Theta*

Description

A Gibbs sampler for updating the Person latent effect Theta.

Usage

```
rTheta(H, beta, Alpha, Theta ,U, Stheta, Sutheta, Su, s1)
```

Arguments

`H`	N X P normal behavior matrix
`beta`	P X 1 behavior intercept vector
`Alpha`	1 X 1 intercept vector
`Theta`	current value of Theta
`U`	matrix containing current value of U
`Stheta`	covariance of Theta
`Sutheta`	covariance between U and Theta
`Su`	matrix containing covariance of U
`s1`	behavior variance

Value

Theta	a new value of Theta

Author(s)

Selena Wang

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rU *Gibbs sampling of U*

Description

A Gibbs sampler for updating U.

Usage

```
rU(Fl,U,Theta, Stheta, Sutheta, Su, s2=1, offset=offset)
```

Arguments

Fl	a list of V X V normal relational matrix
EFl	a list of the same dimension as Fl. It is assumed that Fl-offset follows a SRRM, so the offset should contain any multiplicative effects (such as U%*% t(U))
U	V X K matrix containing current value of U
Theta	D X V current value of Theta
Stheta	D X D covariance of Theta
Sutheta	D X K covariance between U and Theta
Su	K X K matrix containing covariance of U
s2	dyadic variance

Value

U	a new value of U

Author(s)

Selena Wang

rXi *Gibbs sampling of behaivor parameters Xi*

Description

A Gibbs sampler for updating the behavior parameters.

Usage

```
rXi(H, beta, Alpha, Theta, mxi, Sigmaxi, s1 = 1)
```

Arguments

H	normal behavior matrix
beta	behavior intercept vector
Alpha	behavior intercept vector
Theta	current value of Theta
mxi	vector of prior for the mean of Xi
Sigmaxi	matrix of prior for the variance of Xi
s1	behavior variance

Value

beta	a new value of beta
Alpha	a new value of Alpha

Author(s)

Selena Wang

simH *Simulate H given its expectation and covariance*

Description

Simulate H given its expectation and covariance

Usage

```
simH(EH, s1 = 1)
```

Arguments

EH	expected value of H
s1	attribute variance

Value

a simulated value of H

Author(s)

Selena Wang

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simX_nrm *Simulate a normal connectivity matrix*

Description

Simulates a normal connectivity matrix

Usage

```
simX_nrm(EX, s2)
```

Arguments

EX	square matrix giving the expected value of the connectivity matrix
s2	dyadic variance

Value

a square matrix

Author(s)

Selena Wang

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simY_nrm *Simulate a normal behavior matrix*

Description

Simulates a normal behavior matrix

Usage

```
simY_nrm(EY, s1)
```

Arguments

EY	matrix giving the expected value of the behavior matrix
s1	variance

Value

a N by P matrix

Author(s)

Selena Wang

`simZ` *Simulate Z given its expectation and covariance*

Description

Simulate Z given its expectation and covariance

Usage

```
simZ(EZ, rho, s2 = 1)
```

Arguments

`EZ`	expected value of Z
`s2`	dyadic variance

Value

a simulated value of Z

Author(s)

Selena Wang

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