

Package ‘sbgcop’

February 20, 2015

Title Semiparametric Bayesian Gaussian copula estimation and imputation

Version 0.975

Date 2010-03-08

Author Peter Hoff

Maintainer Peter Hoff <hoff@stat.washington.edu>

Description This package estimates parameters of a Gaussian copula, treating the univariate marginal distributions as nuisance parameters as described in Hoff(2007). It also provides a semiparametric imputation procedure for missing multivariate data.

License GPL (>= 2)

URL <http://www.stat.washington.edu/hoff>

Repository CRAN

Date/Publication 2012-10-29 08:59:38

NeedsCompilation no

R topics documented:

sbgcop-package	2
ldmvnorm	2
plotci.sA	3
qM.sM	4
rwish	4
sbgcop.mcmc	5
sR.sC	6
Index	8

sbgcop-package

Semiparametric Bayesian Gaussian copula estimation and imputation

Description

This package estimates parameters of a Gaussian copula, treating the univariate marginal distributions as nuisance parameters as described in Hoff(2007). It also provides a semiparametric imputation procedure for missing multivariate data.

Details

Package: sbgcop
Type: Package
Version: 0.975
Date: 2010-03-08
License: GPL Version 2 or later

This function produces MCMC samples from the posterior distribution of a correlation matrix, using a scaled inverse-Wishart prior distribution and an extended rank likelihood. It also provides imputation for missing values in a multivariate dataset.

Author(s)

Peter Hoff <hoff@stat.washington.edu>

References

Hoff (2007) "Extending the rank likelihood for semiparametric copula estimation"

Examples

```
fit<-sbgcop.mcmc(swiss)
summary(fit)
plot(fit)
```

ldmvnorm

Log Multivariate Normal Density

Description

Computes the log of the multivariate normal density

Usage

```
ldmvnorm(Y, S)
```

Arguments

Y an n x p matrix
S a p x p positive definite matrix

Details

This function computes the log density of the data matrix Y under the model that the rows are independent samples from a mean-zero multivariate normal distribution with covariance matrix S.

Value

A real number.

Author(s)

Peter Hoff

Examples

```
Y<-matrix(rnorm(9*7),9,7)  
ldmvnorm(Y,diag(7))
```

plotci.sA

Plot Confidence Bands for Association Parameters

Description

Plots 95 parameters

Usage

```
plotci.sA(sA, ylabs = colnames(sA[, , 1]), mgp = c(1.75, 0.75, 0))
```

Arguments

sA a p x p x nsamp array
ylabs a p x 1 vector of names for plotting labels
mgp margin parameters

Author(s)

Peter Hoff

 qM.sM

Matrix Quantiles

Description

Computes quantiles along the third dimension of a 3-d array.

Usage

```
qM.sM(sM, quantiles = c(0.025, 0.5, 0.975))
```

Arguments

sM	an m x n x s array
quantiles	quantiles to be computed

Value

an array of dimension m x n x l, where l is the length of quantiles

Author(s)

Peter Hoff

rwish

Sample from the Wishart Distribution

Description

Generate a random sample from the Wishart distribution.

Usage

```
rwish(S0, nu)
```

Arguments

S0	a positive definite matrix
nu	a positive integer

Details

Return the sum of nu i.i.d. rank-one matrices generated as $z\%*\%t(z)$, where z is a sample from a multivariate normal distribution with covariance S0. The resulting random variable has mean $nu*S0$.

Value

a positive definite matrix.

Author(s)

Peter Hoff

sbgcop.mcmc

Semiparametric Bayesian Gaussian copula estimation and imputation

Description

sbgcop.mcmc is used to semiparametrically estimate the parameters of a Gaussian copula. It can be used for posterior inference on the copula parameters, and for imputation of missing values in a matrix of ordinal and/or continuous values.

Usage

```
sbgcop.mcmc(Y, S0 = diag(dim(Y)[2]), n0 = dim(Y)[2] + 2, nsamp = 100,
  odens = max(1, round(nsamp/1000)),
  impute=any(is.na(Y)),
  plugin.threshold=100,
  plugin.marginal=(apply(Y,2,function(x){ length(unique(x))})>plugin.threshold),
  seed = 1, verb = TRUE)
```

Arguments

Y	an n x p matrix. Missing values are allowed.
S0	a p x p positive definite matrix
n0	a positive integer
nsamp	number of iterations of the Markov chain.
odens	output density: number of iterations between saved samples.
impute	save posterior predictive values of missing data(TRUE/FALSE)?
plugin.threshold	if the number of unique values of a variable exceeds this integer, then plug-in the empirical distribution as the marginal.
plugin.marginal	a logical of length p. Gives finer control over which margins to use the empirical distribution for.
seed	an integer for the random seed
verb	print progress of MCMC(TRUE/FALSE)?

Details

This function produces MCMC samples from the posterior distribution of a correlation matrix, using a scaled inverse-Wishart prior distribution and an extended rank likelihood. It also provides imputation for missing values in a multivariate dataset.

Value

An object of class `psgc` containing the following components:

<code>C.psamp</code>	an array of size $p \times p \times \text{nsamp}/\text{odens}$, consisting of posterior samples of the correlation matrix.
<code>Y.pmean</code>	the original datamatrix with imputed values replacing missing data
<code>Y.impute</code>	an array of size $n \times p \times \text{nsamp}/\text{odens}$, consisting of copies of the original data matrix, with posterior samples of missing values included.
<code>LPC</code>	the log-probability of the latent variables at each saved sample. Used for diagnostic purposes.

Author(s)

Peter Hoff

References

<http://www.stat.washington.edu/hoff/>

Examples

```
fit<-sbgcop.mcmc(swiss)
summary(fit)
plot(fit)
```

sR.sC

Compute Regression Parameters

Description

Compute an array of regression parameters from an array of correlation parameters.

Usage

```
sR.sC(sC)
```

Arguments

`sC` a $p \times p \times \text{nsamp}$ array of, made up of `nsamp` correlation matrices.

Details

For each of the nsamp correlation matrices C, a matrix of regression parameters is computed via
 $R[j, -j] \leftarrow C[j, -j] \%*\% \text{solve}(C[-j, -j])$

Value

a $p \times p \times \text{nsamp}$ array of regression parameters.

Author(s)

Peter Hoff

Index

*Topic **array**

plotci.sA, 3

qM.sM, 4

sR.sC, 6

*Topic **datagen**

rwish, 4

*Topic **distribution**

ldmvnorm, 2

rwish, 4

*Topic **models**

sbgcop.mcmc, 5

*Topic **multivariate**

ldmvnorm, 2

qM.sM, 4

rwish, 4

sbgcop-package, 2

sbgcop.mcmc, 5

sR.sC, 6

*Topic **regression**

sR.sC, 6

ldmvnorm, 2

plot.psgc (sbgcop.mcmc), 5

plotci.sA, 3

print.sum.psgc (sbgcop.mcmc), 5

qM.sM, 4

rwish, 4

sbgcop (sbgcop-package), 2

sbgcop-package, 2

sbgcop.mcmc, 5

sR.sC, 6

summary.psgc (sbgcop.mcmc), 5