

Package ‘bayesGDS’

March 16, 2016

Type Package

Title Scalable Rejection Sampling for Bayesian Hierarchical Models

Version 0.6.2

Date 2016-03-16

URL coxprofs.cox.smu.edu/braunm

Maintainer Michael Braun <braunm@smu.edu>

Description Functions for implementing the Braun and Damien (2015) rejection sampling algorithm for Bayesian hierarchical models. The algorithm generates posterior samples in parallel, and is scalable when the individual units are conditionally independent.

License MPL (== 2.0)

Depends R (>= 3.2.4), Matrix (>= 1.2.4)

Suggests sparseHessianFD(>= 0.3.0), sparseMVN(>= 0.2.0), mvtnorm, trustOptim (>= 0.8.5), plyr (>= 1.8), dplyr, testthat, knitr, R.rsp, MCMCpack

VignetteBuilder R.rsp

RoxygenNote 5.0.1

NeedsCompilation no

Author Michael Braun [aut, cre, cph]

Repository CRAN

Date/Publication 2016-03-16 18:37:03

R topics documented:

bayesGDS-package	2
binary	2
binary-data	3
Deprecated	3
get.cutoffs	4
get.LML	4
sample.GDS	5

Index**7**

bayesGDS-package	<i>Braun and Damien Algorithm for Scalable Rejection Sampling</i>
------------------	---

Description

Functions for implementing the Braun and Damien (BD) Scalable Rejection Sampling algorithm

References

Braun, Michael and Paul Damien (2015). Scalable Rejection Sampling for Bayesian Hierarchical Models. Marketing Science. Articles in Advance. <http://doi.org/10.1287/mksc.2014.0901>

binary	<i>Binary choice example</i>
--------	------------------------------

Description

Functions for binary choice example in the vignette.

Usage

```
binary.f(P, data, priors)
```

```
binary.grad(P, data, priors)
```

```
binary.hess(P, data, priors)
```

Arguments

P	Numeric vector of length $(N+1)*k$. First $N*k$ elements are heterogeneous coefficients. The remaining k elements are population parameters.
data	List of data matrices Y and X, and choice count integer T
priors	List of named matrices inv.Omega and inv.Sigma

Details

Hessian is sparse, and returned as a dgcMatrix object

Value

Log posterior density, gradient and Hessian.

 binary-data

Sample simulated data for binary choice model in vignette

Description

Simulated data, with $N=20$ and $k=2$. See vignette. Generated from data-raw/binary.R

Simulated data, with $N=800$ and $k=3$. See vignette. Generated from data-raw/binary.R

Deprecated

Deprecated functions

Description

These functions were in earlier versions, but will no longer be maintained in this package. They will likely be moved to another package a some time.

Usage

vech(M)

inv.vech(y)

logit(p)

inv.logit(x)

log_inv.logit(x)

Arguments

M a matrix

y A vector of conforming length

p A scalar, vector or matrix, where each element is between 0 and 1.

x A scalar, vector or matrix

Value

A vector containing the lower triangle of M, ordered column-wise.

A $k \times k$ lower triangular matrix

result = $\log(p/(1-p))$

result = $\exp(x)/(1+\exp(x))$

result = $\log[\exp(x)/(1+\exp(x))]$

get.cutoffs	<i>Draw thresholds for the accept-reject stage of the BD sampling algorithm.</i>
-------------	--

Description

Returns a vector of $\log(u)$, where u is the threshold to determine if a proposal draw should be accepted as a draw from the target posterior distribution.

Usage

```
get.cutoffs(log.phi, n.draws)
```

Arguments

log.phi	Vector of log.phi from the proposal draws. All must be non-positive.
n.draws	an integer. number of draws to be taken from the target posterior.

Details

For use in conjunction with the Braun and Damien (2012) Generalized Direct Sampling algorithm. This is usually not called directly (and, thus, it is not exported), since it is called from the sample.GDS function.

Value

a numeric vector for $v = -\log.u$ (the thresholds for the accept-reject stage).

get.LML	<i>Log marginal likelihood of model</i>
---------	---

Description

Estimate log marginal likelihood of model

Usage

```
get.LML(counts, log.phi, post.mode, fn.dens.post, fn.dens.prop, prop.params,
...)
```

Arguments

counts	vector of counts of the number of proposals that were generated before accepting a draw. Length of vector is equal to the number of draws from the posterior. If the first proposal for a particular posterior draw is accepted, that count is a 1.
log.phi	Numeric vector of draws of log.phi from the proposal draws.
post.mode	The posterior mode.
fn.dens.post	Function that returns the log posterior density. Function should take the parameter vector as the first argument. Additional arguments are passed as ...
fn.dens.prop	Function that returns the log density of the proposal distribution. The first argument of the function should take either a vector or a matrix. If the argument is a matrix, each row is considered a sample. Additional parameters are passed as a list, prop.params.
prop.params	Object (list or vector) to be passed to both fn.dens.prop and fn.draw.prop. Contains parameters for the proposal distribution. See details.
...	Additional parameters to be passed to fn.dens.post

Value

The estimate log marginal likelihood of the model.

sample.GDS

Collect draws from the target posterior distribution

Description

Runs the accept-reject phase of the Braun and Damien (2015) algorithm for scalable rejection sampling.

Usage

```
sample.GDS(n.draws, log.phi, post.mode, fn.dens.post, fn.dens.prop,
  fn.draw.prop, prop.params, ..., max.tries = 1e+06, report.freq = 1,
  announce = FALSE, thread.id = 1, seed = .Random.seed)
```

Arguments

n.draws	number of draws to take from the target posterior density.
log.phi	Vector of log.phi, as computed from the proposal draws.
post.mode	Mode of the target posterior density (numeric vector).
fn.dens.post	Function that returns the log posterior density. Function should take the parameter vector as the first argument. Additional arguments are passed as ...
fn.dens.prop	Function that returns the log density of the proposal distribution. The first argument of the function should take either a vector or a matrix. If the argument is a matrix, each row is considered a sample. Additional parameters are passed as a list, prop.params.

fn.draw.prop	Function that returns random samples from the proposal density. This function should return a matrix, with each row being a sample. Additional parameters are passed as a list, prop.params.
prop.params	Object (list or vector) to be passed to both fn.dens.prop and fn.draw.prop. Contains parameters for the proposal distribution. See details.
...	Additional parameters to be passed to fn.dens.post.
max.tries	Maximum number of proposal draws to try, without a success. This prevents the routine from being stuck in an endless loop.
report.freq	The frequency that the function will report the current iteration. For example, if report.freq=5, the function will display a message after every fifth iteration.
announce	If TRUE, will print a message when a proposal is accepted as a sample from the target posterior distribution.
thread.id	An identifier used in the announce function. This is useful if running sample.GDS on multiple processors, to collect multiple batches of samples. Defaults to 1.
seed	Sets a random seed within the call to sample.GDS. Useful for assigning different seeds to calls to sample.GDS that are running on different threads or processors. Defaults to .Random.seed.

Value

a list with the following elements:

draws	A matrix with each draw in a row, and each parameter in a column
counts	The number of attempts that it took to get an accepted draw. The accepted draw counts, so the count will always be at least 1.
gt.1	A vector that indicates if the phi for that draw was greater than 1. Available as a diagnostic. Normally, these should all be FALSE. Any values of TRUE suggest that a change in proposal density might be warranted.
log.post.dens	A numeric vector. Log posterior density for each draw.
log.prop.dens	A numeric vector. Log of the proposal density for each draw.
log.thresholds	Vector of threshold draws (log u) from the accept-reject algorithm. Sorted in ascending order.
log.phi	A numeric vector. Value of log.phi for the accepted draws.

References

Braun, Michael and Paul Damien (2015). Scalable Rejection Sampling for Bayesian Hierarchical Models. Marketing Science. Articles in Advance. <http://doi.org/10.1287/mksc.2014.0901>

Index

*Topic **package**

- bayesGDS-package, 2
- bayesGDS (bayesGDS-package), 2
- bayesGDS-package, 2
- binary, 2
- binary-data, 3
- binary_large (binary-data), 3
- binary_large-data (binary-data), 3
- binary_small (binary-data), 3
- binary_small-data (binary-data), 3
- Deprecated, 3
- get.cutoffs, 4
- get.LML, 4
- inv.logit (Deprecated), 3
- inv.vech (Deprecated), 3
- log_inv.logit (Deprecated), 3
- logit (Deprecated), 3
- sample.GDS, 5
- vech (Deprecated), 3