Package ‘FastGP’

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Type Package

Title Efficiently Using Gaussian Processes with Rcpp and RcppEigen

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Description Contains Rcpp and RcppEigen implementations of matrix operations useful for Gaussian process models, such as the inversion of a symmetric Toeplitz matrix, sampling from multivariate normal distributions, evaluation of the log-density of a multivariate normal vector, and Bayesian inference for latent variable Gaussian process models with elliptical slice sampling (Murray, Adams, and MacKay 2010).

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Imports Rcpp, MASS, mvtnorm, rbenchmark, stats

LinkingTo Rcpp, RcppEigen

Repository CRAN

NeedsCompilation yes

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ess

Sampling from a Bayesian model with a multivariate normal prior distribution

Description

This function uses elliptical slice sampling to sample from a Bayesian model in which the prior is multivariate normal (JMLR Murray, Adams, and MacKay 2010)

Usage

ess(log.Nlik,Y, sig, n_mcmc,burn_in,n,flag)

Arguments

- log.Nlik: Log-lik function in model which is assumed to take two arguments: the first contains the parameters/latent variables and the second the observed data Y
- Y: Observed data.
- sig: Covariance matrix associated with the prior distribution on the parameters/latent variable vector.
- n_mcmc: Number of desired mcmc samples.
- burn_in: Number of burn-in iterations.
- n: Dimensionality of parameter/latent variable vector.
- flag: Set to TRUE for MASS implementation of mvrnorm (which may be more stable but slow), FALSE for FastGP implementation of rcpp_rmvnorm (which is faster but less stable)

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Examples

# See demo/FastGPDemo.r.
Description

Performs useful matrix operations using Rcpp and RcppEigen.

Usage

rcppeigen_invert_matrix(A)
rcppeigen_get_det(A)
rcppeigen_get_chol(A)
rcppeigen_get_chol_stable(A)
rcppeigen_get_chol_diag(A)
tinv(A)

Arguments

A  Matrix to perform operation on.

Details

Functions with "rcppeigen" directly call RcppEigen implementations of the associated functions; rcppeigen_get_chol_stable retrieves L and rcppeigen_get_chol_diag(A) retrieves D in $A = LDL^T$ form, whereas rcppeigen_get_chol(A) retrieves L in $A = LL^T$ form. Thanks to Jared Knowles who pointed out that the former variant is more stable (with a potential speed trade-off) and has found it useful for his package merTools. tinv inverts a symmetric Toeplitz matrix using methods from Trench and Durbin from "Matrix Computations" by Golub and Van Loan using Rcpp.

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Examples

# See demo/FastGPdemo.R

Description

These functions allow for the sampling of and evaluation of the log-density of a multivariate normal vector.
Usage

rcpp_log_dmvnorm(S, mu, x, istoep)
rcpp_rmvnorm(n, S, mu)
rcpp_rmvnorm_stable(n, S, mu)

Arguments

S    Covariance matrix of associated multivariate normal.

n    Number of (independent) samples to generate.

mu   Mean vector.

x    Vector of observations to evaluate the log-density of.

istoep set this to TRUE if S is Toeplitz.

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Examples

#See demo/FastGPdemo.R
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