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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Contents

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.lik,Y, Sig, N_mcmc,burn_in,N,flag)
```

Arguments

log.lik	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.
```

rcpp_matrix_ops *Matrix Operations Using Rcpp and RcppEigen*

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
```

rcpp_rmvnorm *Multivariate Normal Sampling and Log-Density Evaluation*

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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