Package 'Homework1'

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Title Advanced Statistical Computing - Homework 1

Description This package contains functions for Homework 1 for Advanced
Statistical Computing. It has functions for fast calculation of the beta
coefficients in linear regression and for the fast calculation of the multivariate normal density.

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Author Leslie Myint <lmyint1@jhu.edu>

Maintainer Leslie Myint <lmyint1@jhu.edu>

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Collate 'dmvnorm.R' 'fastlm.R'

R topics documented:

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dmvnorm   *Fast multivariate normal density*

Description

Fast evaluation of the multivariate normal density

Usage

```
dmvnorm(x, mu, S, log = TRUE)
```

Arguments

x	The n by k matrix of points at which to evaluate the density. Each row of the matrix corresponds to one point (of dimension k).
mu	The length k vector of means of the multivariate normal.
S	The k by k covariance matrix of the multivariate normal.
log	If TRUE, returns the natural logarithm of the density. If FALSE, returns the density.

Details

This function checks that S is positive-definite. If not, the function will stop.

Value

A vector of length n containing the multivariate normal evaulated at the n points of x.

Author(s)

Leslie Myint

References

Roger Peng. http://rdpeng.github.io/Biostat778_HW1/

See Also

mvrnorm

Examples

```
## Create the covariance matrix
n <- 10
n2 <- n^2
xg <- seq(0, 1, length = n)
yg <- xg
g <- data.matrix(expand.grid(xg, yg))
D <- as.matrix(dist(g))
phi <- 5

S <- exp(-phi * D)
mu <- rep(0, n2)
set.seed(1)
x <- matrix(rnorm(n2), byrow = TRUE, ncol = n2)

dmvnorm(x, mu, S, log = TRUE)
```

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  fastlm   *Fast linear regression*

Description

Efficiently calculate the beta coefficients and their variances in a standard linear model: $Y = X\beta + \epsilon$

Usage

```
fastlm(X, y, na.rm = FALSE)
```

Arguments

X	The design matrix of the linear model
y	The vector of observations
na.rm	Should missing values be removed? If TRUE, missing values are removed. If FALSE, missing values are not removed.

Details

This function is designed to be faster than `lm.fit`. It does not perform the entire suite of tasks that `lm` does.

Value

coefficients	A vector of the estimated beta coefficients
vcov	The variance-covariance matrix of the estimated beta coefficients

Author(s)

Leslie Myint

References

Roger Peng. http://rdpeng.github.io/Biostat778_HW1/

See Also

`lm`,`lm.fit`

Examples

```
set.seed(2)
## Generate predictor matrix
n <- 1000
p <- 50
X <- cbind(1, matrix(rnorm(n * (p - 1)), n, p - 1))

## Coefficents
b <- rnorm(p)

## Response
y <- X

fit <- fastlm(X, y)
```

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