Package 'lrspline'

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Type Package

Title Low-rank Approximation of Smoothing Splines for Massive Data

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Description Functions for approximating the smoothing spline estimates: (1) Low-rank Approximation via Eigensystem Truncation, (2) Nystrom Methods.

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Encoding UTF-8

LazyData true

Imports assist, mgcv

RoxygenNote 7.1.1

R topics documented:

`eigenM` *An example of grid points and eigendecomposition for reprodcing kernel of cubic spline.*

Description

It contains `e` a list of eigenvalues and eigenfunctions at grid points, `xg` a vector of 1000 evenly spaced points.

Usage

```
data(eigenM)
```

Format

An object of class `list` of length 2.

Examples

```
data(eigenM)
## Not run:
# check the number of eigenvalues
length(eigenM$e$values)

## End(Not run)
```

`generate.eigen.cubic` *Grid Points and Eigendecomposition of Reproducing Kernal for Cubic Splines*

Description

Generates eigendecomposition from grid points from an interval.

Usage

```
generate.eigen.cubic(N = 1000, a = 0, b = 1)
```

Arguments

`N`	The number of grid points. It should be an integer. The default value is 1000.
`a`	The lower limit of the interval used for grid points. The default value is 0.
`b`	The upper limit of the interval used for grid points. The default value is 1.

Value

It returns (and saves) a list of following components:

`e`	A list of two elements of "values" and "vectors", which refer respectively, the eigenvalues and eigenfunctions of reproducing kernel for cubic splines at the pre-selected grid points.
`xg`	A vector of grid points.

Examples

```
## Not run:
eigen_res <- generate.eigen.cubic(N=1000,a=2,b=3)

## End(Not run)
```

hello — *Hello, World!*

Description

Prints 'Hello, world!'.

Usage

```
hello()
```

Examples

```
hello()
```

lrspline.cubic — *Low-rank Approximation Based on Eigenspaces for Cubic Smoothing Spline Estimates*

Description

Computes a low-rank approximation based on eigenspaces, where estimation utilizes functions for linear mixed effect model (LME).

Usage

```
lrspline.cubic(x, y, xg, e, K = 30, method = "REML", pstd = FALSE)
```

Arguments

x	The values of independent variable. It should be a vector.
y	The values of dependent variable. It should be a vector.
xg	The grid points used for approximation of eigensystem.
e	A list of two elements of "values" and "vectors", which refer respectively, the eigenvalues and eigenfunctions of reproducing kernel for cubic splines at the pre-selected grid points (must agree with xg).
K	An integer value. The truncation parameter indicates the number of eigenvalues/eigenfunctions used in approximation. The default value is 30.
method	A character string. If "REML" the LME model is fit by maximizing the restricted log-likelihood. If "ML" the log-likelihood is maximized. Defaults to "REML".
pstd	An indicator of whether standard deviation is desired. The default value is FALSE.

Value

A vector(s) of following component(s):

fit	The low-rank approximation of cubic smoothing spline estimate.
pstd	The corrsponding posterior standard deviation.

Examples

```
## Not run:
data(eigenM)
x <- runif(1000)
y <- sin(32*pi*x)-8*(x-.5)^2 + rnorm(1000)
lrspline.cubic(x,y,eigenM$xg,eigenM$e,K,method="REML",pstd=FALSE)

## End(Not run)
```

`nystrom.cubic` *Nystrom Approximation for Cubic Smoothing Spline Estimates*

Description

Computes a Nystrom approximation based on randomly selected columns of Σ matrix, where estimation utilizes functions for linear mixed effect model (LME).

Usage

```
nystrom.cubic(x, y, p = 30, method = "REML", pstd = FALSE)
```

Arguments

`x`	The values of independent variable. It should be a vector.
`y`	The values of dependent variable. It should be a vector.
`p`	An integer value. The selection parameter indicates the number of columns for random selection and approximation. The default value is 30.
`method`	A character string. If "REML" the LME model is fit by maximizing the restricted log-likelihood. If "ML" the log-likelihood is maximized. Defaults to "REML".
`pstd`	An indicator of whether standard deviation is desired. The default value is FALSE.
`e`	A list of two elements of "values" and "vectors", which refer respectively, the eigenvalues and eigenfunctions of reproducing kernel for cubic splines at the pre-selected gridpoints (must agree with xg).

Value

A vector(s) of following component(s):

`fit`	The Nystrom approximation of cubic smoothing spline estimate.
`pstd`	The corrsponding posterior standard deviation.

Examples

```
## Not run:
data(eigenM)
x <- runif(1000)
y <- sin(32*pi*x)-8*(x-.5)^2 + rnorm(1000)
nystrom.cubic(x,y,xg,e,K,method="REML",pstd=FALSE)

## End(Not run)
```

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