

Package ‘JointScoreTest’

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Type Package

Title Joint Testing of Fixed and Random Effects in the GLMM

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Description A score test for jointly testing the fixed and random effects in generalized linear mixed models (GLMMs).

License GPL (>= 2)

Depends MASS, SKAT, pracma, splines, copula, RSpectra, lme4, compiler,
nnet, nlme, R (>= 3.2.0)

NeedsCompilation no

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JointScoreTest-package
Joint Testing of Fixed and Random Effects in the GLMM

Description

This package implements the score test for jointly testing the fixed and random effects in generalized linear mixed models (GLMMs).

Details

Package: JointScoreTest
Type: Package
Version: 0.1
Date: 2018-06-08
License: GPL (>= 2)

This package implements the score test for jointly testing the fixed and random effects in generalized linear mixed models (GLMMs). In order to get p-value of the score test, the user should provide the design matrix for fixed effects, random effects and the correlation matrix for the random effects in the 'JointScoreTest<92>' function.

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CrossSectional_Binom

Example dataset, a list of outcome variable, design matrices of fixed and random effects

Description

an example dataset from a cross sectional study design, a list of objects which contains 'y' for the vector of binomial outcomes (where the number of repeated trials of the binomial experiment is 6); 'X' for the design matrix of the fixed effects to be tested for; 'S' for the design matrix of the fixed effects to be adjusted for; 'U' for the design matrix of the random effects to be tested for; and 'SIGMA' for the scaled covariance matrix of the testing random effects.

Usage

```
data(CrossSectional_Binom)
```

Examples

```
data(CrossSectional_Binom)
head(CrossSectional_Binom$X)
head(CrossSectional_Binom$S)
head(CrossSectional_Binom$U)
head(CrossSectional_Binom$SIGMA)
```

CrossSectional_Gaussian

Example dataset, a list of outcome variable, design matrices of fixed and random effects

Description

an example dataset from a cross sectional study design, a list of objects which contains 'y' for the vector of continuous outcomes; 'X' for the design matrix of the fixed effects to be tested for; 'S' for the design matrix of the fixed effects to be adjusted for; 'U' for the design matrix of the random effects to be tested for; and 'SIGMA' for the scaled covariance matrix of the testing random effects.

Usage

```
data(CrossSectional_Gaussian)
```

Examples

```
data(CrossSectional_Gaussian)

head(CrossSectional_Gaussian$X)

head(CrossSectional_Gaussian$S)

head(CrossSectional_Gaussian$U)

head(CrossSectional_Gaussian$SIGMA)
```

JointScoreTest_withNuisanceVC

Joint testing of the fixed and random effects in a GLMM with nuisance random effects

Description

Implementing the score test for jointly testing the fixed and random effects in a GLMM with nuisance random effects in the null model.

Usage

```
JointScoreTest_withNuisanceVC(y, X, S, U, Z, group, SIGMA,
rho = c(0, 0.25, 0.5, 0.75, 1), out_type = "C", binom_size = 1, B0 = 500)
```

Arguments

<code>y</code>	A vector for the response variable.
<code>X</code>	The design matrix for the testing fixed effects.
<code>S</code>	The design matrix for the adjusting fixed effects.
<code>U</code>	The design matrix for the testing random effects.
<code>Z</code>	The design matrix for the adjusting random effects (i.e. the nuisance random effects).
<code>group</code>	A vector describing the clustering of the response variable.
<code>SIGMA</code>	The scaled covariance matrix for the testing random effects.
<code>rho</code>	A vector of possible values of ρ to be used, default = c(0, 0.25, 0.5, 0.75, 1).
<code>out_type</code>	an indicator for the outcome type. 'C' for continuous outcomes and 'D' for binomial outcomes.
<code>binom_size</code>	the number of repeated trials of the binomial experiment, for example, <code>binom_size = 1</code> if the outcome is a binary outcome.
<code>B0</code>	The number of iterations for the re-sampling based copula method, default is 500.

Value

<code>pvalue</code>	P-value of the score test.
<code>opt.rho</code>	The value in the <code>rho</code> sequence which yields the largest score statistic.
<code>score.each</code>	The score statistic for each of the <code>rho</code> value in the <code>rho</code> sequence.

Examples

```
#####

# load the example data
data(Longi_Gaussian)
data(Longi_Binom)

#####
# Joint testing of the fixed and random effects in a GLMM with nuisance
# random effects in the null model, the outcome variable is of the
# continuous response type

JointScoreTest_withNuisanceVC(Longi_Gaussian$y[,1], Longi_Gaussian$X,
Longi_Gaussian$S, Longi_Gaussian$U, Longi_Gaussian$Z,
Longi_Gaussian$group, Longi_Gaussian$SIGMA, out_type = "C")

#####
# Joint testing of the fixed and random effects in a GLMM with nuisance
# random effects in the null model, the outcome variable is of the
# binomial response type

JointScoreTest_withNuisanceVC(Longi_Binom$y[,1], Longi_Binom$X,
```

```
Longi_Binom$S, Longi_Binom$U, Longi_Binom$Z, Longi_Binom$group,
Longi_Binom$SIGMA, out_type = "D", binom_size = 6)
```

JointScoreTest_withoutNuisanceVC

Joint testing of the fixed and random effects in a GLMM with no nuisance random effects.

Description

Implementing the score test for jointly testing the fixed and random effects in a GLMM with no nuisance random effects in the null model.

Usage

```
JointScoreTest_withoutNuisanceVC(y, X, S, U, SIGMA,
rho = c(0, 0.25, 0.5, 0.75, 1), out_type = "C", binom_size = 1, B0 = 500)
```

Arguments

y	A vector for the response variable.
X	The design matrix for the testing fixed effects.
S	The design matrix for the adjusting fixed effects.
U	The design matrix for the testing random effects.
SIGMA	The scaled covariance matrix for the testing random effects.
rho	A vector of possible values of ρ to be used, default = c(0, 0.25, 0.5, 0.75, 1).
out_type	an indicator for the outcome type. 'C' for continuous outcomes and 'D' for binomial outcomes.
binom_size	the number of repeated trials of the binomial experiment, for example, binom_size = 1 if the outcome is a binary outcome.
B0	The number of iterations for the re-sampling based copula method, default is 500.

Value

pvalue	P-value of the score test.
opt.rho	The value in the rho sequence which yields the largest score statistic.
score.each	The score statistic for each of the rho value in the rho sequence.

Examples

```
#####

# load the example data
data(CrossSectional_Gaussian)
data(CrossSectional_Binom)

#####
# Joint testing of the fixed and random effects in a GLMM without nuisance
# random effects in the null model, the outcome variable is of the
# continuous response type

JointScoreTest_withoutNuisanceVC(CrossSectional_Gaussian$y[,1],
CrossSectional_Gaussian$X, CrossSectional_Gaussian$S,
CrossSectional_Gaussian$U, CrossSectional_Gaussian$SIGMA,
out_type = "C")

#####
# Joint testing of the fixed and random effects in a GLMM without nuisance
# random effects in the null model, the outcome variable is of the
# binomial response type

JointScoreTest_withoutNuisanceVC(CrossSectional_Binom$y[,1],
CrossSectional_Binom$X, CrossSectional_Binom$S,
CrossSectional_Binom$U, CrossSectional_Binom$SIGMA,
out_type = "D", binom_size = 6)
```

Longi_Binom

*Example dataset, a list of outcome variable, design matrices of fixed
and random effects*

Description

an example dataset from a longitudinal study design, a list of objects which contains ‘y’ for the vector of binomial outcomes (where the number of repeated trials of the binomial experiment is 6); ‘X’ for the design matrix of the fixed effects to be tested for; ‘S’ for the design matrix of the fixed effects to be adjusted for; ‘U’ for the design matrix of the random effects to be tested for; ‘Z’ for the design matrix of the random effects to be adjusted for; ‘SIGMA’ for the scaled covariance matrix of the testing random effects; and ‘group’ for the vector describing the clustering of the response variable.

Usage

```
data(Longi_Binom)
```

Examples

```
data(Longi_Binom)

head(Longi_Binom$X)

head(Longi_Binom$S)

head(Longi_Binom$U)

head(Longi_Binom$Z)

head(Longi_Binom$SIGMA)

head(Longi_Binom$group)
```

Longi_Gaussian	<i>Example dataset, a list of outcome variable, design matrices of fixed and random effects</i>
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Description

an example dataset from a longitudinal study design, a list of objects which contains 'y' for the vector of continuous outcomes; 'X' for the design matrix of the fixed effects to be tested for; 'S' for the design matrix of the fixed effects to be adjusted for; 'U' for the design matrix of the random effects to be tested for; 'Z' for the design matrix of the random effects to be adjusted for; 'SIGMA' for the scaled covariance matrix of the testing random effects; and 'group' for the vector describing the clustering of the response variable.

Usage

```
data(Longi_Gaussian)
```

Examples

```
data(Longi_Gaussian)

head(Longi_Gaussian$X)

head(Longi_Gaussian$S)

head(Longi_Gaussian$U)

head(Longi_Gaussian$Z)

head(Longi_Gaussian$SIGMA)
```

```
head(Longi_Gaussian$group)
```


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