Package 'JMdesign'

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Type Package

Title Joint Modeling of Longitudinal and Survival Data - Power Calculation

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Author Emil A. Cornea, Liddy M. Chen, Bahjat F. Qaqish, Haitao Chu, and Joseph G. Ibrahim

Maintainer Shannon T. Holloway <shannon.t.holloway@gmail.com>

Description Performs power calculations for joint modeling of longitudinal and survival data with k-th order trajectories when the variance-covariance matrix, Sigma_theta, is unknown.

License GPL-2

Depends methods

NeedsCompilation no

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R topics documented:

JMdesign-package *Joint Modeling of Longitudinal and Survival Data - Power Calculation*

Description

R function for power determination in joint modeling of longitudinal and survival data with k-th order trajectories and unknown variance-covariance matrix Sigma_theta.

Details

Package:	JMdesign
Type:	Package
Version:	1.1
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License:	GPL-2

The package contains the R-function `powerLongSurv` to perform power calculations for joint modeling of longitudinal and survival data when trajectories are of k-th order and the variance-covariance matrix Sigma_theta is unknown.

Author(s)

Emil A. Cornea, Liddy M. Chen, Bahjat F. Qaqish, Haitao Chu, and Joseph G. Ibrahim

Maintainer: Shannon T. Holloway <sthollow@ncsu.edu>

References

L. M. Chen, J. G. Ibrahim, and H. Chu. Sample size and power determination in joint modeling of longitudinal and survival data. Statist. Med. 2011, 30 2295-2309

See Also

`powerLongSurv`, `powerLongSurv-class`, `show-methods`

Examples

```
## Example 1.
## **********
## Input elements of Sigma_theta in forumula 4.6;
SigmaTheta <- matrix(c(1.2,0.0,0.0,0.0,0.7,0.0,0.0,0.0,0.8),nrow=3,ncol=3)

N        <-  200; # Total sample size;
nevents  <-  140; # Number of events;
tmedian  <-  0.7; # median survival;
meantf   <-  1.4; # mean follow-up time;
beta     <-  0.2; # Effect of the trajectory;
```

```
alpha    <-  0.05;# Type-I Error (2-sided);
sigmae_2 <-  0.09; # measurement error;

## schedule of measurement;
t <- c(0.4, 0.8, 1.2, 1.6, 2) ; # maximum 2 year follow-up;

## Input estimated proportion subjects with 2,3,4,5,6 measurements;
## This is \xi in formula 4.6;
## The data is obtained from the simulated data for the calculation in table 2;
p <- c(0.3, 0.4, 0.15, 0.1, 0.05);

## Input the order of trajectories
ordtraj <- 1 ## linear trajectories

## Call function
## Linear Trajectories
pLSl <- powerLongSurv(N, nevents, tmedian, meantf, p, t, SigmaTheta,
                      sigmae_2, ordtraj, beta, alpha=0.05)
pLSl
show(pLSl)
unclass(pLSl)

## Constant Trajectories
powerLongSurv(N, nevents, tmedian, meantf, p, t, SigmaTheta, sigmae_2,
              ordtraj=0, beta, alpha=0.05)

## Quadratic Trajectories
powerLongSurv(N, nevents, tmedian, meantf, p, t, SigmaTheta,sigmae_2,
              ordtraj=2, beta, alpha=0.05)

## ************************************************************************

## Example 2.
## **********
## Input elements of Sigma_theta in forumula 4.6;
SigmaTheta <- matrix(c(1.2,0.0,0.0,0.0,0.7,0.0,0.0,0.0,0.8),nrow=3,ncol=3)

N        <-  200; # Total sample size;
nevents  <-  140; # Number of events;
tmedian  <-  0.7; # median survival;
meantf   <-  1.4; # mean follow-up time;
beta     <-  0.2; # Effect of the trajectory;
alpha    <-  0.05;# Type-I Error (2-sided);
sigmae_2 <-  0.09; # measurement error;

## schedule of measurement;
t <- c(0.4, 0.8, 1.2, 1.6);

## Input estimated proportion subjects with 2,3,4,5,6 measurements;
## This is \xi in formula 4.6;
## The data is obtained from the simulated data for the calculation in table 2;
p  <-  c(0.3, 0.4, 0.2, 0.1);
```

```
## Input the order of trajectories
ordtraj <- 2 ## quadratic trajectories

## Call function
## Quadratic Trajectories
pLSq <- powerLongSurv(N, nevents, tmedian, meantf, p, t, SigmaTheta,
                      sigmae_2, ordtraj, beta, alpha=0.05)
pLSq
show(pLSq)
unclass(pLSq)

## Constant Trajectories
powerLongSurv(N, nevents, tmedian, meantf, p, t, SigmaTheta, sigmae_2,
              ordtraj=0, beta, alpha=0.05)

## Linear Trajectories
powerLongSurv(N, nevents, tmedian, meantf, p, t, SigmaTheta, sigmae_2,
              ordtraj=1, beta, alpha=0.05)
```

`powerLongSurv` *Power calculation in joint modeling of longitudinal and survival data - k-th Order Trajectories and Unknown Sigma*

Description

Compute the power in joint modeling of longitudinal and survival data when the variance-covariance matrix Sigma_Theta is unknown and the trajectories are order k.

The function computes power for a one-sided test, either

$$H_0 : \beta = 0 \quad \text{and} \quad H_{1A} : \beta > 0$$

or

$$H_0 : \beta = 0 \quad \text{and} \quad H_{1B} : \beta < 0$$

with Type I error α. The choice of the alternative is determined by the sign of β. Negative values for β indicate that the alternative hypothesis is H_{1B}, while $\beta \geq 0$ indicates that it is H_{1A}.

It creates a `powerLongSurv` object.

Usage

```
powerLongSurv(N, nevents, tmedian, meantf, p, t, SigmaTheta, sigmae_2, ordtraj,
              beta = 0, alpha = 0.05, tol = 1.5e-8)
```

Arguments

`N`	numeric specifying the total sample size; minimum 20.
`nevents`	numeric specifying the number of events; at least 20 and at most N.
`tmedian`	numeric specifying the median survival time; positive

meantf	numeric specifying the mean follow-up time; positive and no greater than max(t).
p	numeric vector of estimated subject proportions with 2,3,... measurements, respectively, zero proportions allowed.
t	numeric vector of measurement times, distinct positive components; same length as p.
SigmaTheta	numeric matrix specifying the covariance matrix Sigma_Theta
sigmae_2	numeric specifying the measurement error; positive.
ordtraj	integer specifying the order of trajectories, must be less the order of Sigma_Theta
beta	numeric specifying the effect of the trajectory; default value 0.
alpha	numeric, strictly between 0.0 and 1.0, specifying the Type-I Error (2-sided), default value 0.05.
tol	numeric, For floating point objects x and y, if |x-y| <= tol, x==y. Passed to R function all.equal.

Details

The function powerLongSurv is used to calculate the power in joint modeling of longitudinal and survival data.

Value

An object of S4 class powerLongSurv, which has the following 12 components

title	character string
subtitle	character string
t	numeric vector
p	numeric vector
N	integer
nevents	integer
censr	numeric
tmedian	numeric
meantf	numeric
SigmaTheta	numeric matrix
ordtraj	integer
BSigma	numeric matrix
beta	numeric
alpha	numeric
power	numeric

Author(s)

Emil A. Cornea, Liddy M. Chen, Bahjat F. Qaqish, Haitao Chu, and Joseph G. Ibrahim

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References

L. M. Chen, J. G. Ibrahim, and H. Chu. Sample size and power determination in joint modeling of longitudinal and survival data. Statist. Med. 2011, 30 2295-2309

See Also

powerLongSurv-class, show-methods

Examples

```
## Example 1.
## **********
## Input elements of Sigma_theta in forumula 4.6;
SigmaTheta <- matrix(c(1.2,0.0,0.0,0.0,0.7,0.0,0.0,0.0,0.8),nrow=3,ncol=3)

N        <-  200; # Total sample size;
nevents  <-  140; # Number of events;
tmedian  <-  0.7; # median survival;
meantf   <-  1.4; # mean follow-up time;
beta     <-  0.2; # Effect of the trajectory;
alpha    <-  0.05;# Type-I Error (2-sided);
sigmae_2 <-  0.09; # measurement error;

## schedule of measurement;
t <- c(0.4, 0.8, 1.2, 1.6, 2) ; # maximum 2 year follow-up;

## Input estimated proportion subjects with 2,3,4,5,6 measurements;
## This is \xi in formula 4.6;
## The data is obtained from the simulated data for the calculation in table 2;
p <- c(0.3, 0.4, 0.15, 0.1, 0.05);

## Input the order of trajectories
ordtraj <- 1 ## linear trajectories

## Call function
## Linear Trajectories
pLSl <- powerLongSurv(N, nevents, tmedian, meantf, p, t, SigmaTheta,
                      sigmae_2, ordtraj, beta, alpha=0.05)
pLSl
show(pLSl)
unclass(pLSl)

## Constant Trajectories
powerLongSurv(N, nevents, tmedian, meantf, p, t, SigmaTheta, sigmae_2,
              ordtraj=0, beta, alpha=0.05)

## Quadratic Trajectories
powerLongSurv(N, nevents, tmedian, meantf, p, t, SigmaTheta, sigmae_2,
              ordtraj=2, beta, alpha=0.05)

## ************************************************************************
```

```
## Example 2.
## **********
## Input elements of Sigma_theta in forumula 4.6;
SigmaTheta <- matrix(c(1.2,0.0,0.0,0.0,0.7,0.0,0.0,0.0,0.8),nrow=3,ncol=3)

N        <-  200; # Total sample size;
nevents  <-  140; # Number of events;
tmedian  <-  0.7; # median survival;
meantf   <-  1.4; # mean follow-up time;
beta     <-  0.2; # Effect of the trajectory;
alpha    <-  0.05;# Type-I Error (2-sided);
sigmae_2 <-  0.09; # measurement error;

## schedule of measurement;
t <- c(0.4, 0.8, 1.2, 1.6);

## Input estimated proportion subjects with 2,3,4,5,6 measurements;
## This is \xi in formula 4.6;
## The data is obtained from the simulated data for the calculation in table 2;
p <- c(0.3, 0.4, 0.2, 0.1);

## Input the order of trajectories
ordtraj <- 2 ## quadratic trajectories

## Call function
## Quadratic Trajectories
pLSq <- powerLongSurv(N,nevents,tmedian,meantf,p,t,SigmaTheta,sigmae_2,ordtraj,beta, alpha = 0.05)
pLSq
show(pLSq)
unclass(pLSq)

## Constant Trajectories
powerLongSurv(N, nevents, tmedian, meantf, p, t, SigmaTheta, sigmae_2,
              ordtraj=0, beta, alpha=0.05)

## Linear Trajectories
powerLongSurv(N, nevents, tmedian, meantf, p, t, SigmaTheta, sigmae_2,
              ordtraj=1, beta, alpha=0.05)
```

`powerLongSurv-class` *Class* "powerLongSurv"

Description

Class of objects like the output of function "powerLongSurv()".

Objects from the Class

Objects can be created by calls of the form new("powerLongSurv", ...).

Slots

`title`: Object of class `"character"`
`subtitle`: Object of class `"character"`
`t`: Object of class `"vector"`
`p`: Object of class `"vector"`
`N`: Object of class `"integer"`
`nevents`: Object of class `"integer"`
`censr`: Object of class `"numeric"`
`tmedian`: Object of class `"numeric"`
`meantf`: Object of class `"numeric"`
`SigmaTheta`: Object of class `"matrix"`
`ordtraj`: Object of class `"integer"`
`BSigma`: Object of class `"matrix"`
`beta`: Object of class `"numeric"`
`alpha`: Object of class `"numeric"`
`power`: Object of class `"numeric"`

Methods

show `signature(object = "powerLongSurv")`

Author(s)

Emil A. Cornea, Liddy M. Chen, Bahjat F. Qaqish, Haitao Chu, and Joseph G. Ibrahim
Maintainer: Shannon T. Holloway <sthollow@ncsu.edu>

See Also

powerLongSurv, show-methods

Examples

```
showClass("powerLongSurv")
```

---

show-methods *Methods for Function* show

Description

Methods for function show

Methods

`signature(object = "powerLongSurv")`

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