Package ‘accrual’

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Description Subject recruitment for medical research is challenging. Slow patient accrual leads to delay in research. Accrual monitoring during the process of recruitment is critical. Researchers need reliable tools to manage the accrual rate. We developed a Bayesian method that integrates researcher's experience on previous trials and data from the current study, providing reliable prediction on accrual rate for clinical studies. In this R package, we present functions for Bayesian accrual prediction which can be easily used by statisticians and clinical researchers.
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Bayesian Accrual Prediction

Description

Description: Subject recruitment for medical research is challenging. Slow patient accrual leads to delay in research. Accrual monitoring during the process of recruitment is critical. Researchers need reliable tools to manage the accrual rate. We developed a Bayesian method that integrates researcher’s experience on previous trials and data from the current study, providing reliable prediction on accrual rate for clinical studies. In this R package, we present functions for Bayesian accrual prediction which can be easily used by statisticians and clinical researchers.

Details

Package: accrual
Type: Package
Version: 1.2
Date: 2016-06-18
License: GPL-2

There are major eight functions in the package. The accrual.gui function provides the gui version.

Author(s)

Junhao Liu, Yu Jiang, Cen Wu, Steve Simon, Matthew S. Mayo, Rama Raghavan, Byron J. Gajewski
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References


Examples

accrual.n.inform(n=300, T=36, P=0.5, m=100, tm=10, Tp=36)
accrual.data

Example Accrual Data

Description
An example dataset for subject accrual.

Usage
accrual.data

Examples
str(accrual.data)
plot(accrual.data)
accrual.plots(accrual.data)

accrual.gui

GUI Version of the Bayesian Accrual Prediction

Description
The R GUI interface only needs the researchers to input the original design information that are required information for IRBs (total time proposed and total subjects proposed) and the updated accrual data (time since start and subjects accrual). It uses Bayesian prediction model in the background of calculation.

Usage
accrual.gui()

Author(s)
Junhao Liu, Yu Jiang, Cen Wu, Steve Simon, Matthew S. Mayo, Rama Raghavan, Byron J. Gajewski

Examples
accrual.gui()
accrual.multi.n  

**Prediction of Multicenter Accrual with Informative Prior in Fixed Time Frame**

**Description**

Produce an output for prediction of the number of subjects can be recruited in a fixed time frame with Informative Prior for a multicenter trial.

**Usage**

```
accrual.multi.n(n,T,P,J,Tm,Tsj,m,Tpred,all)
```

**Arguments**

- `n`  
  Target sample size
- `T`  
  Target completion time
- `P`  
  The prior certainty, range 0-1
- `J`  
  The number of sites
- `Tm`  
  Time to date
- `Tsj`  
  The start date for each site
- `m`  
  Sample observed to date for each site
- `Tpred`  
  The specific time that want to predict the recruitment
- `all`  
  Using all the sites (True/False)

**Author(s)**

Junhao Liu, Yu Jiang, Cen Wu, Steve Simon, Matthew S. Mayo, Rama Raghavan, Byron J. Gajewski

**Examples**

```
accrual.multi.n(n=300,T=36,P=0.5,J=10,Tm=10,Tsj=c(0,0,0,0,0,0,0,0,0),
m=c(9,10,10,11,11,12,12,12),Tpred=36,all=TRUE)[[1]]
```
accrual.n.hedging  

**Prediction of Accrual with Hedging Prior in Fixed Time Frame**

**Description**

Produce an output for prediction of the number of subjects can be recruited in a fixed time frame with Hedging Prior.

**Usage**

```
accrual.n.hedging(n, T, m, tm, Tp)
```

**Arguments**

- `n`: Target sample size
- `T`: Target completion time
- `m`: Sample observed to date
- `tm`: Time to date
- `Tp`: The specific time that want to predict the recruitment

**Author(s)**

Junhao Liu, Yu Jiang, Cen Wu, Steve Simon, Matthew S. Mayo, Rama Raghavan, Byron J. Gajewski

**Examples**

```
accrual.n.hedging(n=300, T=36, m=100, tm=10, Tp=36)[[1]]
```

---

accrual.n.inform  

**Prediction of Accrual with Informative Prior in Fixed Time Frame**

**Description**

Produce an output for prediction of the number of subjects can be recruited in a fixed time frame with Informative Prior.

**Usage**

```
accrual.n.inform(n, T, P, m, tm, Tp)
```
Arguments

- \( n \)  Target sample size
- \( T \)  Target completion time
- \( p \)  The prior certainty, range 0-1
- \( m \)  Sample observed to date
- \( t_m \)  Time to date
- \( T_p \)  The specific time that want to predict the recruitment

Author(s)

Junhao Liu, Yu Jiang, Cen Wu, Steve Simon, Matthew S. Mayo, Rama Raghavan, Byron J. Gajewski

Examples

```r
accrual.n.plot(n=300, T=36, p=0.5, m=100, t_m=10, T_p=36)"informative prior"
```

Description

Produce a plot and output for prediction of the number of subjects can be recruited in a fixed time frame.

Usage

```r
accrual.n.plot(n, T, p, m, t_m, T_p, Method)
```

Arguments

- \( n \)  Target sample size
- \( T \)  Target completion time
- \( p \)  The prior certainty, range 0-1; For Accelerated Prior, \( P = 1 - m/n \)
- \( m \)  Sample observed to date
- \( t_m \)  Time to date
- \( T_p \)  The specific time that want to predict the recruitment
- \( Method \)  Informative Prior, Accelerated Prior, Hedging Prior

Author(s)

Junhao Liu, Yu Jiang, Cen Wu, Steve Simon, Matthew S. Mayo, Rama Raghavan, Byron J. Gajewski

Examples

```r
accrual.n.plot(n=300, T=36, P=0.5, m=100, t_m=10, T_p=36, Method="Informative Prior")
accrual.n.plot(n=300, T=36, m=100, t_m=10, T_p=36, Method="Accelerated Prior")
accrual.n.plot(n=300, T=36, m=100, t_m=10, T_p=36, Method="Hedging Prior")
```
accrual.plot.multicenter

*Plot for Prediction of Multicenter Accrual in Fixed Time Frame*

**Description**

Produce a plot and output for prediction of the number of subjects for a multicenter trial can be recruited in a fixed time frame.

**Usage**

`accrual.plot.multicenter(n,T,P,J,Tm,Tsj,m,all)`

**Arguments**

- `n`: Target sample size
- `T`: Target completion time
- `P`: The prior certainty, range 0-1
- `J`: The number of sites
- `Tm`: Time to date
- `Tsj`: The start date for each site
- `m`: Sample observed to date for each site
- `all`: Using all the sites (True/False)

**Author(s)**

Junhao Liu, Yu Jiang, Cen Wu, Steve Simon, Matthew S. Mayo, Rama Raghavan, Byron J. Gajewski

**Examples**

```r
accrual.plot.multicenter(n=300,T=36,P=0.5,J=10,Tm=10,Tsj=c(0,0,0,0,0,0,0,0,0,0),
m=c(9,10,10,11,11,11,12,12,12),all=TRUE)
```

---

**accrual.plots**

*Dignostic Plots*

**Description**

The diagnostic panel shows four figures that help to understand the data distribution. The figure on the top left is the exponential quantile plot, which checks whether the distribution of waiting times is exponential. The top right figure shows the histogram of the waiting times, with the red line is the theoretical exponential distribution. The figure of waiting time verse cumulative accrual time is shown on the bottom left. The figure of total accrual verse cumulative accrual time is shown on the bottom right.
accrual.T.hedging

Usage

accrual.plots(w)

Arguments

w
The accrual dataset

Author(s)

Junhao Liu, Yu Jiang, Cen Wu, Steve Simon, Matthew S. Mayo, Rama Raghavan, Byron J. Gajewski

Examples

accrual.plots(accrual.data)

accrual.T.hedging Prediction of Time with Hedging Prior

Description

Prediction of time frame with Hedging Prior for a certain number of subjects.

Usage

accrual.T.hedging(n, T, m, tm, np)

Arguments

n
Target sample size
T
Target completion time
m
Sample observed to date
tm
Time to date
np
The specific number of subjects want to be predicted

Author(s)

Junhao Liu, Yu Jiang, Cen Wu, Steve Simon, Matthew S. Mayo, Rama Raghavan, Byron J. Gajewski

Examples

accrual.T.hedging(n=300, T=36, m=100, tm=10, np=300)[[1]]
accrual.T.inform  Prediction of Time with Informative Prior

Description

Prediction of time frame with Informative Prior for a certain number of subjects.

Usage

accrual.T.inform(n, T, P, m, tm, np)

Arguments

n  Target sample size
T  Target completion time
P  The prior certainty, range 0-1
m  Sample observed to date
tm  Time to date
np  The specific number of subjects want to be predicted

Author(s)

Junhao Liu, Yu Jiang, Cen Wu, Steve Simon, Matthew S. Mayo, Rama Raghavan, Byron J. Gajewski

Examples

accrual.T.inform(n=300, T=36, P=0.5, m=100, tm=10, np=300)[[1]]

accrual.T.plot  Plot for Prediction of Time

Description

Produce a plot and output for prediction of time frame for a certain number of subjects.

Usage

accrual.T.plot(n, T, P, m, tm, np, Method)
Arguments

- **n**: Target sample size
- **T**: Target completion time
- **P**: The prior certainty, range 0-1; For Accelerated Prior, \( P = 1 - m/n \)
- **m**: Sample observed to date
- **tm**: Time to date
- **np**: The specific number of subjects want to be predicted

**Method**

Informative Prior, Accelerated Prior, Hedging Prior

Author(s)

Junhao Liu, Yu Jiang, Cen Wu, Steve Simon, Matthew S. Mayo, Rama Raghavan, Byron J. Gajewski

Examples

```r
accrual.T.plot(n=300, T=36, P=0.5, m=100, tm=10, np=300, Method="Informative Prior")
accrual.T.plot(n=300, T=36, m=100, tm=10, np=300, Method="Accelerated Prior")
accrual.T.plot(n=300, T=36, m=100, tm=10, np=300, Method="Hedging Prior")
```
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