Package ‘longit’

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Title High Dimensional Longitudinal Data Analysis Using MCMC
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Description High dimensional longitudinal data analysis with Markov Chain Monte Carlo (MCMC). Currently support mixed effect regression with or without missing observations by considering covariance structures. It provides estimates by missing at random and missing not at random assumptions.

In this R package, we present Bayesian approaches that statisticians and clinical researchers can easily use. The functions' methodology is based on the book “Bayesian Approaches in Oncology Using R and OpenBUGS” by Bhattacharjee A (2020) <doi:10.1201/9780429329449-14>.

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R topics documented:

Bysmixed ................................................................. 2
Bayesian mixed effect model with MCMC

Description

Bayesian mixed effect model with random intercepts and random slopes. Fits using MCMC on longitudinal data set.

Usage

Bysmixed(m, n, t, group, chains, n.adapt, data)

Arguments

m  Starting number of column from where repeated observations begin
n  Ending number of columns till where the repeated observations ends
t  Timepoint information on which repeated observations were taken
group  A categorical variable either 0 or 1. i.e. Gender - 1 male and 0 female
chains  Number of MCMC chains to be performed
n.adapt  Number of iterations to run in the JAGS adaptive phase.
data  High dimensional longitudinal data

Value

Gives posterior means, standard deviation.

Author(s)

Atanu Bhattacharjee, Akash Pawar and Bhrigu Kumar Rajbongshi
References


Examples

```r
##
data(repdata)
Bysmixed(m=4,n=7,t="Age",group="Gender",chains=4,n.adapt=100,repdata)
##
```

BysmxDIC

Bayesian mixed effect model for high dimensional longitudinal data with deviance information criterion (DIC).

Description

Bayesian mixed effect model with random intercept and slopes provides inference with deviance information criterion (DIC). Data longitudinally measured missing value and having batched information. Fits using MCMC on longitudinal data set

Usage

BysmxDIC(m, tmax, t, group, chains, iter, out, data)

Arguments

- `m`: Starting number of column from where repeated observations begin
- `tmax`: Ending number of columns till where the repeated observations ends
- `t`: Timepoint information on which repeated observations were taken
- `group`: A categorical variable either 0 or 1. i.e. Gender - 1 male and 0 female
- `chains`: Number of MCMC chains to be performed
- `iter`: Number of iterations to be performed
- `out`: DIC/HPD outcome
- `data`: High dimensional longitudinal data

Value

Gives posterior means, standard deviation.

Author(s)

Atanu Bhattacharjee, Akash Pawar and Bhrigu Kumar Rajbongshi
### BysmHPD

Bayesian mixed effect model for high dimensional longitudinal data with highest posterior density interval (HPDI).

#### Description

Bayesian mixed effect model with random intercept and slopes provides inference with highest posterior density interval (HPDI). Data longitudinally measured missing value and having batched information. Fits using MCMC on longitudinal data set.

#### Usage

```r
BysmHPD(m, tmax, t, group, chains, iter, out, data)
```

#### Arguments

- `m`: Starting number of column from where repeated observations begin
- `tmax`: Ending number of columns till where the repeated observations ends
- `t`: Timepoint information on which repeated observations were taken
- `group`: A categorical variable either 0 or 1. i.e. Gender - 1 male and 0 female
- `chains`: Number of MCMC chains to be performed
- `iter`: Number of iterations to be performed
- `out`: DIC/HPD outcome
- `data`: High dimensional longitudinal data

#### Value

Gives posterior means, standard deviation.

#### Author(s)

Atanu Bhattacharjee, Akash Pawar and Bhrigu Kumar Rajbongshi
References


Examples

```r
##
data(msrep)
BysmxHPD(m=c(4,8,12),tmax=4,t="Age",group="Gender",chains=4,iter=1000,out="hpD",data=msrep)
##
```

Bysmxms

Bayesian mixed model with random intercepts and random slopes for high dimensional longitudinal data

Description

Bayesian mixed effect model with random intercepts and slopes with longitudinally measured missing data. Fits using MCMC on longitudinal data set

Usage

`Bysmxms(m, n, time, group, chains, n.adapt, data)`

Arguments

- `m`: Starting number of column from where repeated observations begin
- `n`: Ending number of columns till where the repeated observations ends
- `time`: Timepoint information on which repeated observations were taken
- `group`: A categorical variable either 0 or 1. i.e. Gender - 1 male and 0 female
- `chains`: Number of MCMC chains to be performed
- `n.adapt`: Number of iterations to run in the JAGS adaptive phase.
- `data`: High dimensional longitudinal data

Value

Gives posterior means, standard deviation.

Author(s)

Atanu Bhattacharjee, Akash Pawar and Bhrigu Kumar Rajbongshi
References

data analysis. CRC press.
John Wiley & Sons.

Examples

```r
##
data(mesrep)
Bysmxms(m=4,n=7,time="Age",group="Gender",chains=4,n.adapt=100,data=msrep)
##
```

Bysmxmss  Bayesian mixed model with random intercepts and random slopes for
high dimensional longitudinal data with batch size.

Description

Bayesian mixed effect model with random intercept and slopes. Data longitudinally measured
missing value and having batched information. Fits using MCMC on longitudinal data set

Usage

`Bysmxmss(m, tmax, timepoints, group, chains, iter, data)`

Arguments

- `m`  Starting number of column from where repeated observations begin
- `tmax`  Maximum batch of visits considered as repeated measurements
- `timepoints`  Timepoint information on which repeated observations were taken
- `group`  A categorical variable either 0 or 1. i.e. Gender - 1 male and 0 female
- `chains`  Number of MCMC chains to be performed
- `iter`  Number of iterations to be performed
- `data`  High dimensional longitudinal data

Value

Gives posterior means, standard deviation.

Author(s)

Atanu Bhattacharjee and Akash Pawar
**References**


**Examples**

```r
##
data(repdat)
```

---

**creg**

*Bayesian multivariate regression with unstructured covariance matrix for high dimensional longitudinal data.*

**Description**

Multivariate Regression with unstructured covariance matrix in longitudinal datasetup with high dimensional.

**Usage**

```r
creg(m, n, chains, n.adapt, data)
```

**Arguments**

- `m` - Starting number of column from where repeated observations begin
- `n` - Ending number of columns till where the repeated observations ends
- `chains` - Number of MCMC chains to be performed
- `n.adapt` - Number of iterations to be performed
- `data` - High dimensional longitudinal data

**Value**

Results of posterior means and standard deviation.

**Author(s)**

Atanu Bhattacharjee, Akash Pawar and Bhrigu Kumar Rajbongshi
References


Examples

```r
##
data(repdata)
creg(m=4,n=7,chains=4,n.adapt=100,data=repdata)
##
```

gh

Description

High dimensional data on three consecutive measurements for and treatment arm information column.

Usage

data(gh)

Format

A tibble with 4 columns which are :

- **y1** Observation on first timepoint
- **y2** Observation on second timepoint
- **y3** Observation on first timepoint
- **Treatment** Treatment arm of the patient
hdmarjg

Missing at random by MCMC

Description

Missing at random by MCMC

Usage

hdmarjg(m, n, treatment, n.chains, n.iter, dat)

Arguments

  m            Starting column number of the Y observations
  n            Ending column number of the Y observations
  treatment    Variable/column name containing the Treatment observations
  n.chains     Number of MCMC chains
  n.iter       Number of MCMC iterations
  dat          Data set containing treatment column and repeated observations arranged by columns observations

Value

A data table listing the posterior mean and sigma results

Author(s)

Atanu Bhattacharjee, Akash Pawar and Bhrigu Kumar Rajbongshi

References


Examples

##
data(gh)
hdmarjg(m=1,n=3,treatment="Treatment",n.chains=2,n.iter=10,dat=gh)
##
hdmnarjg

Missing not at random by MCMC

Description

Missing not at random by MCMC

Usage

hdmnarjg(m, n, treatment, n.chains, n.iter, dat)

Arguments

m Starting column number of repeated observations
n Ending column number of the repeated observations
treatment Variable/column name containing the Treatment observations
n.chains Number of MCMC chains
n.iter Number of MCMC iterations
dat Data set containing treatment column and repeated observations

Value

Results containing a data table listing the means and sigma results

Author(s)

Atanu Bhattacharjee, Akash Pawar and Bhrigu Kumar Rajbongshi

References


Examples

##
data(gh)
hdmnarjg(m=1,n=3,treatment="Treatment",n.chains=2,n.iter=10,dat=gh)
##
longitdata

Repeatedly measured protein expression data

Description

Longitudinal observation on single variable from different observations. Observations arranged in a column as the patient with corresponding column of ID.

Usage

data(longitdata)

Format

A tibble with 2 columns which are :

ID  Patient ID
y  Repeated observations on the patient arranged in a row as per a subject

msrep

longitudinal data

Description

Longitudinal observation on single variable at different timepoints. Observations arranged in a column as the patient with corresponding column of ID.

Usage

data(msrep)

Format

A tibble with 7 columns which are :

Subject  Patient ID
Gender  Categorical numeric variable, 1 if Males and 0 if female
Age  Time or age at which observations were taken from every subjects
x1,...,x4  Columns stating number of observations at age 18,10,12 and 14
mvncovar1

Bayesian multivariate regression with independent covariance matrix for high dimensional longitudinal data.

Description
Multivariate Regression with independent covariance matrix in longitudinal dataset up with high dimensional.

Usage
mvncovar1(m, n, time, group, chains, iter, data)

Arguments

- **m**: Starting number of column from where repeated observations begin
- **n**: Ending number of columns till where the repeated observations ends
- **time**: Timepoint information on which repeated observations were taken
- **group**: A categorical variable either 0 or 1. i.e. Gender - 1 male and 0 female
- **chains**: Number of MCMC chains to be performed
- **iter**: Number of iterations to be performed
- **data**: High dimensional longitudinal data

Value
mvncovar1out lists posterior omega and sigma values.

Author(s)
Atanu Bhattacharjee, Akash Pawar and Bhrigu Kumar Rajbongshi

References


Examples

```r
##
data(repdata)
mvncovar1(m=4,n=7,time="Age",group="Gender",chains=10,iter=100,repdata)
##
```
**mvncovar2**  
*Bayesian multivariate normal regression with unstructured covariance matrix for high dimensional longitudinal data.*

**Description**  
Multivariate normal regression with group covaraites and unstructured covariance matrix.

**Usage**  
`mvncovar2(m, n, time, group, chains, iter, data)`

**Arguments**  
- `m` Starting number of column from where repeated observations begin
- `n` Ending number of columns till where the repeated observations ends
- `time` Timepoint information on which repeated observations were taken
- `group` A categorical variable either 0 or 1. i.e. Gender - 1 male and 0 female
- `chains` Number of MCMC chains to be performed
- `iter` Number of iterations to be performed
- `data` High dimensional longitudinal data

**Value**  
`mvncovarout`

**Author(s)**  
Atanu Bhattacharjee, Akash Pawar and Bhrigu Kumar Rajbongshi

**References**  

**Examples**  
```r
##
data(repdata)
mvncovar2(m=4,n=7,time="Age",group="Gender",chains=4,iter=100,data=repdata)
##
```
Description

Longitudinal observation on single variable at different timepoints. Observations arranged in a column as the patient with corresponding column of ID.

Usage

data(repdata)

Format

A tibble with 7 columns which are:

Subject  Patient ID
Gender  Categorical numeric variable, 1 if Males and 0 if female
Age  Time or age at which observations were taken from every subjects
x1,...,x4  Columns stating number of observations at age 18,10,12 and 14
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