

Package ‘longit’

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Title High Dimensional Longitudinal Data Analysis Using MCMC

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LazyDataCompression xz

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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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Encoding UTF-8

NeedsCompilation no

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Bysmixed

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 Bhriugu Kumar Rajbongshi

References

- Bhattacharjee, A. (2020). Bayesian Approaches in Oncology Using R and OpenBUGS. CRC Press.
- Gelman, A., Carlin, J. B., Stern, H. S., Dunson, D. B., Vehtari, A., & Rubin, D. B. (2013). Bayesian data analysis. CRC press.
- Fitzmaurice, G. M., Laird, N. M., & Ware, J. H. (2012). Applied longitudinal analysis (Vol. 998). John Wiley & Sons.

Examples

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

BysmxDIC	<i>Bayesian mixed effect model for high dimensional longitudinal data with deviance information criterion (DIC).</i>
----------	--

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 Bhriku Kumar Rajbongshi

References

- Bhattacharjee, A. (2020). Bayesian Approaches in Oncology Using R and OpenBUGS. CRC Press.
- Gelman, A., Carlin, J. B., Stern, H. S., Dunson, D. B., Vehtari, A., & Rubin, D. B. (2013). Bayesian data analysis. CRC press.
- Fitzmaurice, G. M., Laird, N. M., & Ware, J. H. (2012). Applied longitudinal analysis (Vol. 998). John Wiley & Sons.

Examples

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

BysmxHPD	<i>Bayesian mixed effect model for high dimensional longitudinal data with highest posterior density interval (HPDI).</i>
----------	---

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

```
BysmxHPD(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 Bhriku Kumar Rajbongshi

References

- Bhattacharjee, A. (2020). Bayesian Approaches in Oncology Using R and OpenBUGS. CRC Press.
- Gelman, A., Carlin, J. B., Stern, H. S., Dunson, D. B., Vehtari, A., & Rubin, D. B. (2013). Bayesian data analysis. CRC press.
- Fitzmaurice, G. M., Laird, N. M., & Ware, J. H. (2012). Applied longitudinal analysis (Vol. 998). John Wiley & Sons.

Examples

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

Bysmxms	<i>Bayesian mixed model with random intercepts and random slopes for high dimensional longitudinal data</i>
---------	---

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 Bhriгу Kumar Rajbongshi

References

- Bhattacharjee, A. (2020). Bayesian Approaches in Oncology Using R and OpenBUGS. CRC Press.
- Gelman, A., Carlin, J. B., Stern, H. S., Dunson, D. B., Vehtari, A., & Rubin, D. B. (2013). Bayesian data analysis. CRC press.
- Fitzmaurice, G. M., Laird, N. M., & Ware, J. H. (2012). Applied longitudinal analysis (Vol. 998). John Wiley & Sons.

Examples

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

Bysmxmss	<i>Bayesian mixed model with random intercepts and random slopes for high dimensional longitudinal data with batch size.</i>
----------	--

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

- Bhattacharjee, A. (2020). Bayesian Approaches in Oncology Using R and OpenBUGS. CRC Press.
- Gelman, A., Carlin, J. B., Stern, H. S., Dunson, D. B., Vehtari, A., & Rubin, D. B. (2013). Bayesian data analysis. CRC press.
- Fitzmaurice, G. M., Laird, N. M., & Ware, J. H. (2012). Applied longitudinal analysis (Vol. 998). John Wiley & Sons.

Examples

```
##  
data(repdata)
```

creg	<i>Bayesian multivariate regression with unstructured covariance matrix for high dimensional longitudinal data.</i>
------	---

Description

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

Usage

```
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 Bhriгу Kumar Rajbongshi

References

- Bhattacharjee, A. (2020). Bayesian Approaches in Oncology Using R and OpenBUGS. CRC Press.
- Gelman, A., Carlin, J. B., Stern, H. S., Dunson, D. B., Vehtari, A., & Rubin, D. B. (2013). Bayesian data analysis. CRC press.
- Fitzmaurice, G. M., Laird, N. M., & Ware, J. H. (2012). Applied longitudinal analysis (Vol. 998). John Wiley & Sons.

Examples

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

gh

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	<i>Missing at ranom by MCMC</i>
---------	---------------------------------

Description

Missing at ranom by MCMC

Usage

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

Arguments

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

Value

A data table listing the posterior mean and sigma results

Author(s)

Atanu Bhattacharjee, Akash Pawar and Bhriгу Kumar Rajbongshi

References

Bhattacharjee, A. (2020). Bayesian Approaches in Oncology Using R and OpenBUGS. CRC Press.

Gelman, A., Carlin, J. B., Stern, H. S., Dunson, D. B., Vehtari, A., & Rubin, D. B. (2013). Bayesian data analysis. CRC press.

Fitzmaurice, G. M., Laird, N. M., & Ware, J. H. (2012). Applied longitudinal analysis (Vol. 998). John Wiley & Sons.

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

<code>m</code>	Starting column number of repeated observations
<code>n</code>	Ending column number of the repeated observations
<code>treatment</code>	Variable/column name containing the Treatment observations
<code>n.chains</code>	Number of MCMC chains
<code>n.iter</code>	Number of MCMC iterations
<code>dat</code>	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 Bhriгу Kumar Rajbongshi

References

Bhattacharjee, A. (2020). Bayesian Approaches in Oncology Using R and OpenBUGS. CRC Press.

Gelman, A., Carlin, J. B., Stern, H. S., Dunson, D. B., Vehtari, A., & Rubin, D. B. (2013). Bayesian data analysis. CRC press.

Fitzmaurice, G. M., Laird, N. M., & Ware, J. H. (2012). Applied longitudinal analysis (Vol. 998). John Wiley & Sons.

Examples

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

longitdata	<i>Repeatedly measured protein expression data</i>
------------	--

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	<i>longitudinal data</i>
-------	--------------------------

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	<i>Bayesian multivariate regression with independent covariance matrix for high dimensional longitudinal data.</i>
-----------	--

Description

Multivariate Regression with independent covariance matrix in longitudinal datasetup 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

mvncovarout lists posterior omega and sigma values.

Author(s)

Atanu Bhattacharjee, Akash Pawar and Bhrigu Kumar Rajbongshi

References

Bhattacharjee, A. (2020). Bayesian Approaches in Oncology Using R and OpenBUGS. CRC Press.

Gelman, A., Carlin, J. B., Stern, H. S., Dunson, D. B., Vehtari, A., & Rubin, D. B. (2013). Bayesian data analysis. CRC press.

Fitzmaurice, G. M., Laird, N. M., & Ware, J. H. (2012). Applied longitudinal analysis (Vol. 998). John Wiley & Sons.

Examples

```
##
data(repdata)
mvncovar1(m=4,n=7,time="Age",group="Gender",chains=10,iter=100,repdata)
##
```

mvncovar2	<i>Bayesian multivariate normal regression with unstructured covariance matrix for high dimensional longitudinal data.</i>
-----------	--

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

Bhattacharjee, A. (2020). Bayesian Approaches in Oncology Using R and OpenBUGS. CRC Press.

Gelman, A., Carlin, J. B., Stern, H. S., Dunson, D. B., Vehtari, A., & Rubin, D. B. (2013). Bayesian data analysis. CRC press.

Fitzmaurice, G. M., Laird, N. M., & Ware, J. H. (2012). Applied longitudinal analysis (Vol. 998). John Wiley & Sons.

Examples

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

repdata

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(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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