Package: BayesReversePLLH (via r-universe)

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Type Package

Title Fits the Bayesian Piecewise Linear Log-Hazard Model

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Author Andrew G Chapple

Maintainer Andrew G Chapple <achapp@lsuhsc.edu>

Description Contains posterior samplers for the Bayesian piecewise linear log-hazard and piecewise exponential hazard models, including Cox models. Posterior mean restricted survival times are also computed for non-Cox an Cox models with only treatment indicators. The ApproxMean() function can be used to estimate restricted posterior mean survival times given a vector of patient covariates in the Cox model. Functions included to return the posterior mean hazard and survival functions for the piecewise exponential and piecewise linear log-hazard models. Chapple, AG, Peak, T, Hemal, A (2020). Under Revision.

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Imports Rcpp (>= 0.12.18)

LinkingTo Rcpp, RcppArmadillo

RoxygenNote 7.1.1

NeedsCompilation yes

Repository CRAN

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Contents

`ApproxMean` *Returns the approximate restricted posterior mean survival for the PLLH model.*

Description

Uses a grid and parameter values to approximate the restricted posterior mean survival for the PLLH model using the integral of the survival function.

Usage

```
ApproxMean(Y, s, lam, J)
```

Arguments

`Y`	Sequence from 0.01 to the maximum observed event time used to compute the approximate restricted mean survival time. Smaller spaced sequences results in better approximation but longer computation time.
`s`	Vector of split points. The first and last entries must be 0 and max(Y).
`lam`	Vector of log-hazard values at each split point location. Must be same length as s.
`J`	Number of split points.

Value

Returns the approximate restricted posterior mean survival time for the PLLH model.

Examples

```
##Generate Data
Y1=rweibull(100,4,1)
##Create sequence from (0,max(Y1)) for approximation
Y=seq(.01,max(Y1),.01)
##Parameters used to approximate the mean
s=c(0,1,max(Y1))
lam=c(-2,0,-2)
J=1
ApproxMean( Y, s, lam, J)
```

`BayesPiecewiseHazard` *Samples from the PEH model without covariates.*

Description

Samples from the Piecewise Exponential Hazard (PEH) model and returns a list containing posterior parameters and posterior restricted mean survival.

Usage

```
BayesPiecewiseHazard(Y, I1, Poi, B)
```

Arguments

`Y`	Vector of event or censoring times.
`I1`	Vector of event indicators.
`Poi`	Prior mean number of split points.
`B`	Number of iterations for MCMC.

Value

Returns a list containing posterior samples of (1) the split point locations, (2) the log-hazards at each split point, (3) the number of split points, (4) the variance parameter for the log-hazard values, (5) the posterior mean restricted survivial time.

Examples

```
##Generate Data
Y=rweibull(20,4,1)
I=rbinom(20,1,.5)
##Hyperparameter for number of split points
Poi=5
##Number of iterations for MCMC
B=200
BayesPiecewiseHazard( Y, I, Poi,  B)
```

BayesPiecewiseHazardCOV *Samples from the PEH Cox model with a patient covariate vector.*

Description

Samples from the Piecewise Exponential Hazard (PEH) Cox model with a patient covariate vector and returns a list containing posterior parameters and posterior restricted mean survival.

Usage

```
BayesPiecewiseHazardCOV(Y, I1, COV, Poi, B)
```

Arguments

Y	Vector of event or censoring times.
I1	Vector of event indicators.
COV	Matrix of size nxp containing p patient covariates.
Poi	Prior mean number of split points.
B	Number of iterations for MCMC.

Value

Returns a list containing posterior samples of (1) the split point locations, (2) the log-hazards at each split point, (3) the number of split points, (4) the variance parameter for the log-hazard values, (5) the coefficients in the Cox model.

Examples

```
##Generate Data
Y=rweibull(20,4,1)
I=rbinom(20,1,.5)
COV = matrix(rnorm(40,0,1),ncol=2)
##Hyperparameter for number of split points
Poi=5
##Number of iterations for MCMC
B=200
BayesPiecewiseHazardCOV( Y, I,COV, Poi,  B)
```

BayesPiecewiseHazardTrt *Samples from the PEH Cox model with a patient covariate vector.*

Description

Samples from the Piecewise Linear Log-Hazard (PLLH) Cox model and returns a list containing posterior parameters and posterior restricted mean survival.

Usage

```
BayesPiecewiseHazardTrt(Y, I1, Trt, Poi, B)
```

Arguments

Y	Vector of event or censoring times.
I1	Vector of event indicators.
Trt	Vector containing patient treatment/control assignment.
Poi	Prior mean number of split points.
B	Number of iterations for MCMC.

Value

Returns a list containing posterior samples of (1) the split point locations, (2) the log-hazards at each split point, (3) the number of split points, (4) the variance parameter for the log-hazard values, (5) the treatment coefficient, (6) the mean restricted survivial time of the control therapy, (7) the mean restricted survival time of the treatment therapy.

Examples

```
##Generate Data
Y=rweibull(20,4,1)
I=rbinom(20,1,.5)
Trt=rbinom(20,1,.5)
##Hyperparameter for number of split points
Poi=5
##Number of iterations for MCMC
B=200
BayesPiecewiseHazardTrt( Y, I,Trt, Poi,  B)
```

BayesPiecewiseLinearLogHazard
Samples from the PLLH model without covariates.

Description

Samples from the Piecewise Linear Log-Hazard (PLLH) model and returns a list containing posterior parameters and posterior restricted mean survival.

Usage

```
BayesPiecewiseLinearLogHazard(Y, I1, Poi, B)
```

Arguments

Y	Vector of event or censoring times.
I1	Vector of event indicators.
Poi	Prior mean number of split points.
B	Number of iterations for MCMC.

Value

Returns a list containing posterior samples of (1) the split point locations, (2) the log-hazards at each split point, (3) the number of split points, (4) the variance parameter for the log-hazard values, (5) the posterior mean restricted survivial time.

Examples

```
##Generate Data
Y=rweibull(20,4,1)
I=rbinom(20,1,.5)
##Hyperparameter for number of split points
Poi=5
##Number of iterations for MCMC
B=200
BayesPiecewiseLinearLogHazard( Y, I, Poi,  B)
```

BayesPiecewiseLinearLogHazardCOV *Samples from the PLLH Cox model with a patient covariate vector.*

Description

Samples from the Piecewise Linear Log-Hazard (PLLH) Cox model with a patient covariate vector and returns a list containing posterior parameters and posterior restricted mean survival.

Usage

```
BayesPiecewiseLinearLogHazardCOV(Y, I1, COV, Poi, B)
```

Arguments

Y	Vector of event or censoring times.
I1	Vector of event indicators.
COV	Matrix of size nxp containing p patient covariates.
Poi	Prior mean number of split points.
B	Number of iterations for MCMC.

Value

Returns a list containing posterior samples of (1) the split point locations, (2) the log-hazards at each split point, (3) the number of split points, (4) the variance parameter for the log-hazard values, (5) the coefficients in the Cox model.

Examples

```
##Generate Data
Y=rweibull(20,4,1)
I=rbinom(20,1,.5)
COV = matrix(rnorm(40,0,1),ncol=2)
##Hyperparameter for number of split points
Poi=5
##Number of iterations for MCMC
B=200
BayesPiecewiseLinearLogHazardCOV( Y, I,COV, Poi,  B)
```

BayesPiecewiseLinearLogHazardTrt *Samples from the PEH Cox model with a treatment indicator.*

Description

Samples from the Piecewise Exponential Hazard (PEH) Cox model with a treatment indicator and returns a list containing posterior parameters and posterior restricted mean survival.

Usage

```
BayesPiecewiseLinearLogHazardTrt(Y, I1, Trt, Poi, B)
```

Arguments

Y	Vector of event or censoring times.
I1	Vector of event indicators.
Trt	Vector containing patient treatment/control assignment.
Poi	Prior mean number of split points.
B	Number of iterations for MCMC.

Value

Returns a list containing posterior samples of (1) the split point locations, (2) the log-hazards at each split point, (3) the number of split points, (4) the variance parameter for the log-hazard values, (5) the treatment coefficient, (6) the mean restricted survivial time of the control therapy, (7) the mean restricted survival time of the treatment therapy.

Examples

```
##Generate Data
Y=rweibull(20,4,1)
I=rbinom(20,1,.5)
Trt=rbinom(20,1,.5)
##Hyperparameter for number of split points
Poi=5
##Number of iterations for MCMC
B=200
BayesPiecewiseLinearLogHazardTrt( Y, I,Trt, Poi,  B)
```

GetALLHazLogSlope *Computes the posterior distribution of hazard value for a vector x for the Piecewise Linear Log Hazard model (PLLH)*

Description

Computes the posterior distribution of hazard value for a vector x for the Piecewise Linear Log Hazard model (PLLH)

Usage

```
GetALLHazLogSlope(x, G1)
```

Arguments

x	Vector of times to compute the posterior mean hazard function
G1	List of posterior samples from the BayesPiecewiseLinearLogHazard function.

Value

Matrix containing the posterior distribution of hazard values h(x)

GetALLHazPiece *Computes the posterior hazard values for a vector x for the Piecewise Exponential Hazard model (PEH)*

Description

Computes the posterior hazard values for a vector x for the Piecewise Exponential Hazard model (PEH)

Usage

```
GetALLHazPiece(x, G1)
```

Arguments

x	Vector of times to compute the hazard.
G1	List of posterior samples from the BayesPiecewiseHazard function.

Value

Matrix containing the posterior distribution of hazard values h(x)

GetALLSurvPEH *Computes the posterior distribution of survival probabilities for a vector x for the Piecewise Exponential Hazard model (PEH)*

Description

Computes the posterior distribution of survival probabilities for a vector x for the Piecewise Exponential Hazard model (PEH)

Usage

```
GetALLSurvPEH(x, G1)
```

Arguments

x	Vector of times to compute the posterior mean survival probability.
G1	List of posterior samples from the BayesPiecewiseLinearHazard function.

Value

Matrix containing the posterior distribution of survival probabilities S(x)

GetALLSurvPLLH *Computes posterior distribution of survival probabilities for a vector x for the Piecewise Linear Log Hazard model (PLLH)*

Description

Computes posterior distribution of survival probabilities for a vector x for the Piecewise Linear Log Hazard model (PLLH)

Usage

```
GetALLSurvPLLH(x, G1)
```

Arguments

x	Vector of times to compute the posterior mean survival probability.
G1	List of posterior samples from the BayesPiecewiseLinearLogHazard function.

Value

Matrix containing the posterior distribution survival probabilities S(x)

PostMeanHazLogSlope *Computes the posterior mean hazard value for a vector x for the Piecewise Linear Log Hazard model (PLLH)*

Description

Computes the posterior mean hazard value for a vector x for the Piecewise Linear Log Hazard model (PLLH)

Usage

```
PostMeanHazLogSlope(x, G1)
```

Arguments

x	Vector of times to compute the posterior mean hazard function
G1	List of posterior samples from the BayesPiecewiseLinearLogHazard function.

Value

Vector containing the posterior mean hazard values h(x)

PostMeanHazPiece *Computes the posterior mean hazard values for a vector x for the Piecewise Exponential Hazard model (PEH)*

Description

Computes the posterior mean hazard values for a vector x for the Piecewise Exponential Hazard model (PEH)

Usage

```
PostMeanHazPiece(x, G1)
```

Arguments

x	Vector of times to compute the posterior mean hazard.
G1	List of posterior samples from the BayesPiecewiseHazard function.

Value

Vector containing the posterior mean hazard values h(x)

PostMeanSurvPEH *Computes the posterior mean survival probabilities for a vector x for the Piecewise Exponential Hazard model (PEH)*

Description

Computes the posterior mean survival probabilities for a vector x for the Piecewise Exponential Hazard model (PEH)

Usage

```
PostMeanSurvPEH(x, G1)
```

Arguments

x	Vector of times to compute the posterior mean survival probability.
G1	List of posterior samples from the BayesPiecewiseLinearHazard function.

Value

Vector containing the posterior mean survival probabilities S(x)

PostMeanSurvPLLH *Computes the posterior mean survival probabilities for a vector x for the Piecewise Linear Log Hazard model (PLLH)*

Description

Computes the posterior mean survival probabilities for a vector x for the Piecewise Linear Log Hazard model (PLLH)

Usage

```
PostMeanSurvPLLH(x, G1)
```

Arguments

x	Vector of times to compute the posterior mean survival probability.
G1	List of posterior samples from the BayesPiecewiseLinearLogHazard function.

Value

Vector containing the posterior mean survival probabilities S(x)

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