Cox Proportional Hazards Model

Parametrisation

In the Cox proportional hazards model, defines the hazard rate as:

$$h(t) = h_0(t) \exp(\eta)$$

where

 $h_0(\cdot)$: baseline hazard

 η : linear predictor

We start from a finite partition of the time axis $0 = s_0 < s_1 < \dots, s_K$ and assume the baseline hazard to be constant in each time interval

$$h_0(t) = \exp(b_k) \text{ for } t \in (s_{k-1}, s_k], \qquad k = 1, \dots, K$$

and assign $\mathbf{b} = (b_1, \dots, b_K)$ a Gaussian prior (RW1 or RW2) with unknown precision τ_b

Link-function

The parameter η is the linear predictor

Hyperparameters

The log precision $\log \tau_b$ for the piecewise constant hazard

Specification

- family = coxph
- Required arguments:
 - -y (to be given in a format by using inla.surv() function)
 - control.hazard = list() to control the prior for the piecewise constant hazar, see
 ?control.hazard for more information.

Hyperparameter spesification and default values

The "RW1" model for the hazard

doc A random walk of order 1 for the log-hazard

hyper

theta

hyperid 54001
name log precision
short.name prec
initial 4
fixed FALSE
prior loggamma
param 1 5e-05
to.theta function(x) log(x)
from.theta function(x) exp(x)

The "RW2" model for the hazard

doc A random walk of order 2 for the log-hazard

hyper

```
theta
```

```
hyperid 55001
name log precision
short.name prec
initial 4
fixed FALSE
prior loggamma
param 1 5e-05
to.theta function(x) log(x)
from.theta function(x) exp(x)
```

Example

In the following example we estimate the baseline hazard in a simulated case

Notes

- The Cox model can be used only for uncensored or right censored data.
- The model for the piecewise constant baseline hazard is specified through control.hazard
- A general frame work to represent time is given by inla.surv
- \bullet If the observed times y are large/huge, then this can cause numerical overflow in the likelihood routines giving error messages like

```
file: smtp-taucs.c hgid: 891deb69ae0c date: Tue Nov 09 22:34:28 2010 +0100 Function: GMRFLib_build_sparse_matrix_TAUCS(), Line: 611, Thread: 0 Variable evaluates to NAN/INF. This does not make sense. Abort...
```

If you encounter this problem, try to scale the observatios, time = time / max(time) or similar, before running inla().