

Weibull

Parametrisation

The Weibull distribution is

$$f(y) = \alpha y^{\alpha-1} \lambda \exp(-\lambda y^\alpha), \quad \alpha > 0, \quad \lambda > 0$$

where

α : shape parameter.

In survival analysis, models are generally specified through the hazard function. For Weibull model the hazard function is:

$$h(y) = \alpha y^{\alpha-1} \lambda$$

Link-function

The parameter λ is linked to the linear predictor as:

$$\lambda = \exp(\eta)$$

Hyperparameters

The α parameter is represented as

$$\theta = \log \alpha$$

and the prior is defined on θ .

Specification

- family = weibull
- Required arguments: y (to be given in a format by using `inla.surv()` function)

Hyperparameter specification and default values

hyper

theta

name log alpha

short.name a

initial 0

fixed FALSE

prior loggamma

param 25 25

to.theta function(x) log(x)

from.theta function(x) exp(x)

survival TRUE

discrete FALSE

link default log

pdf weibull

Example

In the following example we estimate the parameters in a simulated case

```
n = 1000
alpha = 2
beta = 2
x = runif(n)
eta = 1+beta*x
lambda = exp(eta)
y = rweibull(n, shape= alpha, scale= lambda^(1/-alpha))
event = rep(1,n)
data = list(y=y, event=event, x=x)
formula=inla.surv(y,event)~ x
model=inla(formula, family ="weibull", data=data, verbose=T)
```

Notes

- Weibull model can be used for right censored, left censored, interval censored data.
- A general frame work to represent time is given by `inla.surv`
- 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 observations, `time = time / max(time)` or similar, before running `inla()`.