Weibull

Parametrisation

The Weibull distribution is (`variant=0`)

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

and (`variant=1`)

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

where

α**:** shape parameter.

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` for regression and family = `weibullsurv` for survival
- Required arguments: y (to be given using `inla.surv()` for survival models), and `variant`=0 (default) or 1 to define the parameterisation.

Hyperparameter spesification and default values

weibull

hyper

theta

hyperid 79001
name log alpha
short.name alpha
initial 0
fixed FALSE
prior loggamma
param 25 25
to.theta `function(x) log(x)`
from.theta `function(x) exp(x)`

survival FALSE

discrete FALSE

link default log

pdf weibull

weibullsurv

hyper

theta

hyperid 79101

name log alpha

short.name alpha

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 neglog

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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 ="weibullsurv", data=data)
summary(model)

formula= y ~ x
model=inla(formula, family ="weibull", data=data)
summary(model)

## variant 1
y = rweibull(n, shape= alpha, scale= 1/lambda)
event = rep(1,n)
data = list(y=y, event=event, x=x)

formula=inla.surv(y,event)~ x
model=inla(formula, family ="weibullsurv", data=data,
           control.family = list(variant=1))
summary(model)
```

```
formula= y ~ x
model=inla(formula, family ="weibull", data=data,
           control.family = list(variant=1))
summary(model)
```

Notes

- Weibull model can be used for right censored, left censored, interval censored data. If the observed times y are large/huge, then this can cause numerical overflow in the likelihood routine. If you encounter this problem, try to scale the observatios, `time = time / max(time)` or similar.