

Weibull

Parametrisation

The Weibull distribution is (**variant=0**)

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

and (**variant=1**)

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

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

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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 observations, `time = time / max(time)` or similar.