

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

doc The Weibull likelihood

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 neglog quantile

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weibullsurv

doc The Weibull likelihood (survival)

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 quantile

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Example

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

```
n = 1000
alpha = 1.1
beta = 2.2
x = c(scale(runif(n)))
eta = 1+beta*x
lambda = exp(eta)

for(variant in 0:1) {
  y = rweibull(n,
               shape= alpha,
               scale= if (variant == 0)
                       lambda^(-1/alpha)
               else
                       1/lambda)

  print(paste("VARIANT=", variant))
  event = rep(1,n)
  data = list(y=y, event=event, x=x)

  formula=inla.surv(y,event)~ x
  r=inla(formula,
         family ="weibullsurv",
         data=data,
         control.family = list(list(variant = variant)))
  print("SURV")
  print(summary(r))
}
```

```

formula= y ~ x
r=inla(formula,
      family ="weibull",
      data=data,
      control.family = list(list(variant = variant)))
print("REGRESSION")
print(summary(r))
}

```

Notes

- Weibullsurv 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.