

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

pdf weibull

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

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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.