Weibull

Parametrisation

The Weibull distribution is

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

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)

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 observatios, `time = time / max(time)` or similar, before running `inla()`.