Censored Poisson (version 2)

Parametrisation

The Poisson distribution is

$$\text{Prob}(y) = \frac{\lambda^y}{y!}\exp(-\lambda)$$

for responses $y = 0, 1, 2, \ldots$, where λ is the expected value. The cencored version is that response values in the interval $L \le y \le H$ are cencored (and reported as $y = L$, say), whereas other values are reported as is.

Link-function

The mean-parameter is λ and is linked to the linear predictor η by

$$\lambda = E\exp(\eta)$$

where $E > 0$ is a known constant (or $\log(E)$ is the offset of η).

Hyperparameters

None.

Specification

- family = `cenpoisson2`
- Required arguments: y, E, L and H. The vector of the triplet (y_i, L_i, H_i) must be given as a `inla.mdata`-object. L and H are vectors of same length as y hence the cencoring can be different for each observation. L and H must be integer valued or `Inf`.

  $L[i]$ =`Inf` and/or $H[i]$ =`Inf` are allowed, which is equivalent to $L[i] = -1$ and/or $H[i] = -1$. See the example for details.

  $L[i]$ =`Inf` (or -1) implies no interval censoring. $H[i]$ =`Inf` (or -1) and $0 \le L[i] < \infty$ implies right censoring.

Example

In the following example we estimate the parameters in a simulated example with Poisson responses.

```
n <- 300
a <- 0
b <- 1
x <- rnorm(n, sd = 0.3)
eta = a + b*x
low = sample(c(0, 1, 4, Inf), n, replace = TRUE)
high <- low + sample(c(0, 1, 2, Inf), n, replace = TRUE)

E = sample(1:10, n, replace=TRUE)
lambda = E*exp(eta)
y = rpois(n, lambda = lambda)

censored = which(y >= low & y <= high)
y[censored] = low[censored]

r = inla(inla.mdata(cbind(y, low, high))  ~ 1 + x,
         family = "cenpoisson2",
```

```
         data = data.frame(y, low, high, x),
         E=E)
summary(r)
```

Notes

For censored values, then y must be one arbitrary value in the interval; `NA` does not work!!!