Thinned Poisson (Experimental)

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 thinned Poisson allow the observations to have a known or unknown thinning: `event`$= 1$ its observed as is. With `event`$= 0$ (or $\neq 1$) its thinned, so the likelihood is Poisson with mean $p(\cdot)\lambda$ where

$$\text{logit}(p(\cdot)) = \text{offset} + \sum_{i=1} \beta_i x_i$$

Link-function

The mean λ is linked to the linear predictor by

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

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

Hyperparameters

$\beta_1, \beta_2, \ldots$ if in use. Maximum 10.

Specification

- `family="tpoisson"`
- Data are given as an `inla.mdata`-object, with format

  $$\text{inla.mdata}(y, E, \text{event}, \text{offset}, x_1, x_2, \ldots)$$

  where maximum 10 covariates can be given. Each argument is a vector. Note that the four first columns are required, and the covariates can be omitted if there are none.

Hyperparameter spesification and default values

doc `Thinned Poisson`

hyper

theta1

hyperid `66721`

name `beta1`

short.name `beta1`

output.name `beta1 tpoisson observations`

output.name.intern `beta1 tpoisson observations`

initial `0`

fixed `FALSE`

prior `normal`

param `0 100`

to.theta `function(x) x`

from.theta `function(x) x`

theta2

hyperid `66722`

name `beta2`

short.name `beta2`

output.name `beta2 tpoisson observations`

output.name.intern `beta2 tpoisson observations`

initial `0`

fixed `FALSE`

prior `normal`

param `0 100`

to.theta `function(x) x`

from.theta `function(x) x`

theta3

hyperid `66723`

name `beta3`

short.name `beta3`

output.name `beta3 tpoisson observations`

output.name.intern `beta3 tpoisson observations`

initial `0`

fixed `FALSE`

prior `normal`

param `0 100`

to.theta `function(x) x`

from.theta `function(x) x`

theta4

hyperid `66724`

name `beta4`

short.name `beta4`

output.name `beta4 tpoisson observations`

output.name.intern `beta4 tpoisson observations`

initial `0`

fixed `FALSE`

prior `normal`

param `0 100`

to.theta `function(x) x`

from.theta `function(x) x`

theta5

hyperid `66725`

name `beta5`

short.name `beta5`

output.name `beta5 tpoisson observations`

output.name.intern `beta5 tpoisson observations`

initial `0`

fixed FALSE

prior normal

param 0 100

to.theta function(x) x

from.theta function(x) x

theta6

hyperid 66726

name beta6

short.name beta6

output.name beta6 tpoisson observations

output.name.intern beta6 tpoisson observations

initial 0

fixed FALSE

prior normal

param 0 100

to.theta function(x) x

from.theta function(x) x

theta7

hyperid 66727

name beta7

short.name beta7

output.name beta7 tpoisson observations

output.name.intern beta7 tpoisson observations

initial 0

fixed FALSE

prior normal

param 0 100

to.theta function(x) x

from.theta function(x) x

theta8

hyperid 66728

name beta8

short.name beta8

output.name beta8 tpoisson observations

output.name.intern beta8 tpoisson observations

initial 0

fixed FALSE

prior normal

param 0 100

to.theta function(x) x

from.theta function(x) x

theta9

hyperid 66729

name beta9

short.name beta9

output.name beta9 tpoisson observations

output.name.intern beta9 tpoisson observations

initial 0

fixed FALSE

prior normal

param 0 100

to.theta function(x) x

from.theta function(x) x

theta10

hyperid 66730

name beta10

short.name beta10

output.name beta10 tpoisson observations

output.name.intern beta10 tpoisson observations

initial 0

fixed FALSE

prior normal

param 0 100

to.theta function(x) x

from.theta function(x) x

status experimental

survival FALSE

discrete TRUE

link default log

pdf tpoisson

Example

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

```
n <- 3000
x <- rnorm(n)
eta <- 1 + 0.2 * x
event <- rep(1, n)
E <- runif(n)

offset <- rnorm(n, sd = 0.3)
xx <- rnorm(n)
xxx <- rnorm(n)
eta.c <- offset + 0.3 * xx + 0.4 * xxx

y <- numeric(n)
prob <- 1/(1+exp(-eta.c))
event <- sample(c(1, 0), n, prob = c(0.6, 0.4), replace = TRUE)
```

```
prob[which(event == 1)] <- 1
y <- rpois(n, prob * E * exp(eta))

Y <- inla.mdata(y, E, event, offset, xx, xxx)
r <- inla(Y ~ 1 + x,
          data = list(Y = Y, x = x),
          family = "tpoisson",
          control.family = list(hyper = list(beta1 = list(param = c(0, 1)),
                                             beta2 = list(param = c(0, 2)))),
          verbose = TRUE,
          debug = TRUE)
summary(r)
```

Notes