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: $\texttt{event}= 1$ its observed as is. With $\texttt{event}= 0$ (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

- $\texttt{family="tpoisson"}$

- Data are given as an $\texttt{inla.mdata}$-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