

Thinned Poisson (Experimental)

Parametrisation

The Poisson distribution is

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

for responses $y = 0, 1, 2, \dots$, 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

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

Specification

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

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

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

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