# Thinned Poisson (Experimental)

## Parametrisation

The Poisson distribution is

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

for responses y = 0, 1, 2, ..., where  $\lambda$  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

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

## **Link-function**

The mean  $\lambda$  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  $\eta$ ).

## Hyperparameters

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

## Specification

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

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

 $\operatorname{\mathbf{doc}}$  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)</pre>
```

Notes