Binomial

Parametrisation

The Binomial distribution is

$$\text{Prob}(y) = \binom{n}{y} p^n (1-p)^{n-y}$$

for responses $y = 0, 1, 2, \ldots, n$, where

n**:** number of trials.

p**:** probability of success in each trial.

Link-function

The mean and variance of y are given as

$$\mu = np \qquad \text{and} \qquad \sigma^2 = np(1-p)$$

and the probability p is linked to the linear predictor by

$$p(\eta) = \frac{\exp(\eta)}{1+\exp(\eta)}$$

Hyperparameters

None.

Hyperparameter spesification and default values

doc The Binomial likelihood

hyper

survival FALSE

discrete TRUE

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Specification

- family = `binomial`
- Required arguments: y and n (keyword `Ntrials`)

Expert version

There is also an "expert" version were you are supposed to know what you are doing. Here, we allow y and n to be non-integers, however, the condition $0 \le y \le n$ apply. The normalizing constant is computed as above using the integer part of y and n. This is similar to using `floor(y)` and `floor(n)` in `R`. The marginal likelihood estimate will in this case make less sense.

- family = `xbinomial`
- Required arguments: y and n (keyword `Ntrials`)

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survival FALSE

discrete TRUE

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Example

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

```
n=100
a = 1
b = 1
z = rnorm(n)
eta = a + b*z
Ntrials = sample(c(1,5,10,15), size=n, replace=TRUE)
prob = exp(eta)/(1 + exp(eta))
y = rbinom(n, size=Ntrials, prob = prob)

data = list(y=y,z=z)
formula = y ~ 1+z
result = inla(formula, family = "binomial", data = data, Ntrials=Ntrials)
summary(result)
```

Notes

If the response is a `factor` it must be converted to $\{0, 1\}$ before calling `inla()`, as this conversion is not done automatic (as for example in `glm()`).