log1exp effect of a covariate

Parametrization

This model implements a non-linear effect of a positive covariate x as a part of the linear predictor,

$$\beta \log\left(1 + \exp(\alpha - \gamma x)\right)$$

where $\beta, \alpha, \gamma \in \Re$ and $x \geq 0$.

Hyperparameters

This model has three hyperparameters, the scaling β, halflife a and shape k,

$$\theta_1 = \beta \qquad \theta_2 = \alpha \qquad \theta_3 = \gamma$$

and the priors are given for θ_1, θ_2 and θ_3.

Specification

```
f(x, model="log1exp", hyper = ..., precision = <precision>)
```

where `precision` is the precision for the tiny noise used to implement this as a latent model.

Hyperparameter specification and default values

doc A nonlinear model of a covariate

hyper

theta1

- **hyperid** 39011
- **name** beta
- **short.name** b
- **initial** 1
- **fixed** FALSE
- **prior** normal
- **param** 0 1
- **to.theta** `function(x) x`
- **from.theta** `function(x) x`

theta2

- **hyperid** 39012
- **name** alpha
- **short.name** a
- **initial** 0
- **fixed** FALSE
- **prior** normal
- **param** 0 1
- **to.theta** `function(x) x`
- **from.theta** `function(x) x`

theta3

hyperid 39013
name gamma
short.name g
initial 0
fixed FALSE
prior normal
param 0 1
to.theta `function(x) x`
from.theta `function(x) x`

constr FALSE

nrow.ncol FALSE

augmented FALSE

aug.factor 1

aug.constr

n.div.by

n.required FALSE

set.default.values FALSE

status experimental

pdf log1exp

Example

```
log1exp = function(x, beta,  alpha, gamma)
{
    return (beta * log(1.0 + exp(alpha - gamma * x)))
}

n = 100
lambda = 2
s=0.1
x = rpois(n, lambda = lambda)
beta = 1
alpha = 0
gamma = .5

y = log1exp(x, beta,  alpha, gamma) + rnorm(n, sd = s)
r = inla(y ~ -1 + f(x, model="log1exp"),
        data = data.frame(y, x),
        family = "gaussian",
        control.inla = list(h=0.001),
        control.family = list(
                hyper = list(
                        prec = list(
                                initial = log(1/s^2),
```

```
                                          fixed = TRUE))))
summary(r)
```

Notes

None