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,

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

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

Hyperparameters

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

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

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

Specification

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

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

Hyperparameter specification and default values

```
\operatorname{\mathbf{doc}} A nonlinear model of a covariate \operatorname{\mathbf{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