Exponential power likelihood

Parameterisation

The exponential power distribution is

$$f(y) = \exp\left(-\left(\frac{|y-\mu|}{\sigma\alpha(\beta)}\right)^{\beta}\right)\frac{\beta}{2\sigma\alpha(\beta)\Gamma(1/\beta)}$$

for continuously responses y where

μ**:** is the the mean

σ**:** is the standard deviation

and $\alpha(\beta) = \sqrt{\Gamma(1/\beta)/\Gamma(3/\beta)}$.

Link-function

The mean is given by the linear predictor η from the formula

$$\text{link}(\mu) = \eta$$

where the default is the *identity*-link. The precision τ is given as $\tau = 1/\sigma^2$.

Hyperparameters

The two hyperparameters in the model are

$$\theta_1 = \log(\tau)$$

and

$$\beta = 1 + \exp(\theta_2)$$

and the priors are given on (θ_1, θ_2).

Specification

- `family="exppower"`
- Required arguments:
- Required arguments: y and s (argument `scale`)

The scalings have default value 1.

Hyperparameter spesification and default values

`family="exppower"`

Example

```
library(gnorm)
n <- 10^4
x <- rnorm(n)
sigma <- 2.0
beta <- 1.5
alpha <- sqrt(gamma(1/beta)/gamma(3/beta)) * sigma
y <- 1 + x + rgnorm(n, alpha = alpha, beta = beta)
r <- inla(y ~ 1 + x,
          data = data.frame(y, x),
          family = "exppower",
          control.compute = list(cpo = TRUE),
          control.fixed = list(prec.intercept = 1),
          control.inla = list(cmin = 0))
summary(r)

n <- 10^5
x <- rnorm(n)
sigma <- 2.0
beta <- 1.5
alpha <- sqrt(gamma(1/beta)/gamma(3/beta)) * sigma
## this is the lin.pred for the quantile
eta.q <- 1 + x
quantile <- 0.9
## this is the mu/mean/median-parameter in the qgnorm
mu <- eta.q - qgnorm(quantile, alpha = alpha, beta = beta)
y <- rgnorm(n, mu = mu, alpha = alpha, beta = beta)
rr <- inla(y ~ 1 + x,
           data = data.frame(y, x),
           family = "exppower",
           control.compute = list(cpo = TRUE),
           control.family = list(control.link = list(model = "quantile",
                                                     quantile = quantile)),
           control.fixed = list(prec.intercept = 1),
           control.inla = list(cmin = 0))
summary(r)
```

Notes