# Gaussian

## Parametrisation

The Gaussian distribution is

$$f(y) = \frac{\sqrt{w\tau}}{\sqrt{2\pi}} \exp\left(-\frac{1}{2}w\tau\,(y-\mu)^2\right)$$

for continuously responses $y$ where

$\mu$: is the the mean

$\tau$: is the precision

$w$: is a fixed weight, $w > 0$.

## Link-function

The mean and variance of $y$ are given as

$$\mu \quad \text{and} \quad \sigma^2 = \frac{1}{w\tau}$$

and the mean is linked to the linear predictor by

$$\mu = \eta$$

## Hyperparameters

The precision is represented as

$$\theta = \log \tau$$

and the prior is defined on $\theta$.

## Specification

- family = `gaussian`
- Required arguments: $y$ and $w$ (keyword `weights`)

The weights has default value 1.

**Hyperparameter spesification and default values**

**hyper**

    **theta**

        **name**   log precision
        **short.name**   prec
        **initial**   4
        **fixed**   FALSE
        **prior**   loggamma
        **param**   1 5e-05
        **to.theta**   `function(x) log(x)`
        **from.theta**   `function(x) exp(x)`

**survival**   FALSE

**discrete**   FALSE

**link**   default identity

## Example

In the following example we estimate the parameters in a simulated example with Gaussian responses, giving $\tau$ a Gamma-prior with parameters $(1, 0.01)$ and initial value (for the optimisations) of $\exp(2.0)$.

```
n=100
a = 1
b = 1
z = rnorm(n)
eta = a + b*z
tau = 100
scale = exp(rnorm(n))
prec = scale*tau
y = rnorm(n, mean = eta, sd = 1/sqrt(prec))

data = list(y=y, z=z)
formula = y ~ 1+z
result = inla(formula, family = "gaussian", data = data,
        control.data = list(hyper = list(
                                  prec = list(
                                          prior = "loggamma",
                                          param = c(1.0,0.01),
                                          initial = 2))),
              scale=scale, keep=TRUE)
summary(result)
```

## Notes

None.