

## Student- $t$

### Parametrization

The Student- $t$  likelihood is defined so that

$$\sqrt{s} \tau (y - \eta) \sim T_\nu$$

for continuous response  $y$  where

$\tau$  : is the precision parameter

$s$  : is a fixed scaling  $s > 0$

$\eta$  : is the linear predictor

$T_\nu$  : is a **reparameterized standard** Student- $t$  with  $\nu > 2$  degrees of freedom with **unit variance for all values of  $\nu$ . Please see the example for details!**

### Link-function

Identity

### Hyperparameters

This likelihood has two hyperparameters

$$\begin{aligned}\theta_1 &= \log(\tau) \\ \theta_2 &= \log(\nu - 2)\end{aligned}$$

and the prior is defined on  $\theta = (\theta_1, \theta_2)$ .

### Specification

- family="T"
- Required argument:  $y$  and  $s$  (keyword **scale**, default to 1).

### Hyperparameter specification and default values

`doc Student-t likelihood`

`hyper`

`theta1`

`hyperid 100001`

`name log precision`

`short.name prec`

`output.name precision for the student-t observations`

`output.name.intern log precision for the student-t observations`

`initial 0`

`fixed FALSE`

`prior loggamma`

`param 1 5e-05`

`to.theta function(x) log(x)`

```

    from.theta function(x) exp(x)
theta2
    hyperid 100002
    name log degrees of freedom
    short.name dof
    output.name degrees of freedom for student-t
    output.name.intern dof_intern for student-t
    initial 5
    fixed FALSE
    prior pc.dof
    param 15 0.5
    to.theta function(x) log(x - 2)
    from.theta function(x) 2 + exp(x)

survival FALSE

discrete FALSE

link default identity

pdf student-t

```

## Example

```

#simulate data
n=100
phi=0.85
mu=0.5
eta=rep(0,n)
for(i in 2:n)
  eta[i]=mu+phi*(eta[i-1]-mu)+rnorm(1)
nu=3
t=rt(n,df=nu)
y=eta+t/(sqrt(nu/(nu-2)))
data=list(y=y,z=seq(1:n))
#define the model and fit
formula=y~f(z,model="ar1")
result=inla(formula,family="T",data=data)

```

## Notes

None