

## Generic3 model

### Parametrization

The generic3 model implements the following precision matrix

$$\mathbf{Q} = \tau_{\text{common}} \sum_{i=1}^m \tau_i \mathbf{R}_i, \quad 1 < m \leq 10, \quad (1)$$

where each  $\mathbf{R}_i \geq 0$ , and  $\tau_i$  is the specific precision parameter and  $\tau_{\text{common}}$  is a shared one.

### Hyperparameters

The hyperparameters are defined as

$$\theta_i = \log(\tau_i), \quad i = 1, 10$$

and

$$\theta_{11} = \log(\tau_{\text{common}})$$

and priors are assigned to  $(\theta_1, \theta_2, \dots)$ .

### Specification

The generic3 model is specified inside the `f()` function as

```
f(<whatever>, model="generic3", Cmatrix = <list.of.Cmat>, hyper = <hyper>)
```

where `<list.of.Cmat>` a list of length  $m$  (maximum 10) of  $\mathbf{R}_i$ -matrices. By default,  $\theta_j$  for  $j = m + 1, \dots, 11$  is set to fixed (this includes  $\tau_{\text{common}}$ ).

### Hyperparameter spesification and default values

**hyper**

**theta1**

```
hyperid 21001
name log precision1
short.name prec1
initial 4
fixed FALSE
prior loggamma
param 1 5e-05
to.theta function(x) log(x)
from.theta function(x) exp(x)
```

**theta2**

```
hyperid 21002
name log precision2
short.name prec2
initial 4
fixed FALSE
prior loggamma
```

```

    param 1 5e-05
    to.theta function(x) log(x)
    from.theta function(x) exp(x)
theta3
    hyperid 21003
    name log precision3
    short.name prec3
    initial 4
    fixed FALSE
    prior loggamma
    param 1 5e-05
    to.theta function(x) log(x)
    from.theta function(x) exp(x)
theta4
    hyperid 21004
    name log precision4
    short.name prec4
    initial 4
    fixed FALSE
    prior loggamma
    param 1 5e-05
    to.theta function(x) log(x)
    from.theta function(x) exp(x)
theta5
    hyperid 21005
    name log precision5
    short.name prec5
    initial 4
    fixed FALSE
    prior loggamma
    param 1 5e-05
    to.theta function(x) log(x)
    from.theta function(x) exp(x)
theta6
    hyperid 21006
    name log precision6
    short.name prec6
    initial 4
    fixed FALSE
    prior loggamma
    param 1 5e-05
    to.theta function(x) log(x)
    from.theta function(x) exp(x)
theta7

```

```

hyperid 21007
name log precision7
short.name prec7
initial 4
fixed FALSE
prior loggamma
param 1 5e-05
to.theta function(x) log(x)
from.theta function(x) exp(x)
theta8
hyperid 21008
name log precision8
short.name prec8
initial 4
fixed FALSE
prior loggamma
param 1 5e-05
to.theta function(x) log(x)
from.theta function(x) exp(x)
theta9
hyperid 21009
name log precision9
short.name prec9
initial 4
fixed FALSE
prior loggamma
param 1 5e-05
to.theta function(x) log(x)
from.theta function(x) exp(x)
theta10
hyperid 21010
name log precision10
short.name prec10
initial 4
fixed FALSE
prior loggamma
param 1 5e-05
to.theta function(x) log(x)
from.theta function(x) exp(x)
theta11
hyperid 21011
name log precision common
short.name prec.common
initial 0

```

```

    fixed TRUE
    prior loggamma
    param 1 5e-05
    to.theta function(x) log(x)
    from.theta function(x) exp(x)

constr FALSE

nrow.ncol FALSE

augmented FALSE

aug.factor 1

aug.constr

n.div.by

n.required TRUE

set.default.values TRUE

status experimental

pdf generic3

```

## Example

```

make.sm = function(n, prob = 0.1)
{
  A = matrix(runif(n*n), n, n)
  Patt = matrix(runif(n*n), n, n)
  Patt[Patt > prob] = 0
  A = A * Patt
  diag(A) = runif(n)
  A = A %*% t(A)
  A = A / max(diag(A))
  return (inla.as.sparse(A))
}

nsim = 100
n = 5
m = 3
Cmat = list()
Q = inla.as.sparse(matrix(0, n, n))
for(i in 1:m) {
  Cmat[[i]] = make.sm(n)
  Q = Q + i*Cmat[[i]]
}

yy = inla.qsample(nsim, Q)
y = c(yy)
idx = rep(1:n, nsim)
r = rep(1:nsim, each = n)

r = inla(y ~ -1 +
  f(idx, model="generic3",
    Cmatrix = Cmat, replicate = r,

```

```
hyper = list(
  prec1 = list(initial = log(1)),
  prec2 = list(initial = log(2)),
  prec3 = list(initial = log(3))),
data = list(y=y, Cmat=Cmat, r=r),
verbose=TRUE,
control.family = list(
  hyper = list(
    prec = list(
      initial = 10,
      fixed = TRUE))))
summary(r)
```

## Notes