

## 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

```
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

```
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
  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
  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
  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
  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
  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
  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
  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
  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
  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