

The dMatern model

Parametrisation

This model is the Gaussian field with a Matérn correlation function, directly, meaning **dense matrices**. This model is intended for a low-dimension only. The correlation function is

$$\text{Corr}(d) = \frac{1}{2^{\nu-1}\Gamma(\nu)} (\kappa d)^\nu K_\nu(\kappa d), \quad \alpha = \nu + d/2,$$

where K_ν is the modified Bessel function and $\Gamma(\cdot)$ is the Gamma-function. The range is *defined* to be

$$r = \sqrt{8\nu}/\kappa$$

which about the distance where the covariance function becomes about 0.1.

Hyperparameters

The hyperparameters are the precision parameter τ , the range r and the smoothness ν , where the internal representation are

$$\theta = (\log(\tau), \log(r), \log(\nu))$$

The latent field has marginal variance $1/\tau$ and range (as defined above) r .

We do **not recommend** to treat ν as random, and for this reason it is default fixed. You can change its value by changing the initial value.

Specification

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

```
f(idx, model="dmatern", locations = L, hyper = <hyper>)
```

where L is a matrix of the locations for which the Gaussian field is defined; row $L[i,]$ are the coordinates for the i 'th location. `idx` represent the location indexing the corresponding row in L , so $idx = 3$ means location $L[idx,]$. `idx` must be integers 1, 2, ..., `nrow(L)`, or `NA`.

Hyperparameter spesification and default values

doc Dense Matern covariance function

hyper

theta1

hyperid 35101

name log precision

short.name prec

initial 3

fixed FALSE

prior pc.prec

param 1 0.01

to.theta function(x) log(x)

from.theta function(x) exp(x)

theta2

hyperid 35102

```

    name log range
    short.name range
    initial 0
    fixed FALSE
    prior loggamma
    param 0.1 0.1
    to.theta function(x) log(x)
    from.theta function(x) exp(x)
  theta3
    hyperid 35103
    name log nu
    short.name nu
    initial -0.693147180559945
    fixed TRUE
    prior loggamma
    param 0.5 1
    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

  pdf dmatern

```

Example

Notes

Note that the above definition of range, might differ from the definition in other packages. It is the same used for the SPDE-models.