

Package ‘INLA’

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Type Package

Title Functions which Allow to Perform Full Bayesian Analysis of Latent Gaussian Models using Integrated Nested Laplace Approximations

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Description This package contains functions which allow to perform full Bayesian analysis of latent Gaussian models using Integrated Nested Laplace Approximation, and is a front-end to the inla-program.

Depends sp, Matrix

Suggests mvtnorm, numDeriv, Rgraphviz, graph, fields, rgl, parallel, pixmap, splancs, orthopolynom, compiler, devtools, knitr, markdown, shiny, rgdal, Deriv, HKprocess, FGN

Imports stats, graphics, grDevices, utils, methods, splines, MatrixModels

VignetteBuilder knitr

BuildVignettes true

ByteCompile no

LazyData true

License GPL (>= 2)

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INLA-package	<i>Integrated Nested Laplace Approximation</i>
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Description

Package to perform full Bayesian analysis on generalised additive mixed models using Integrated Nested Laplace Approximations.

Details

Package: INLA
 Type: Package
 Version: 0.0
 Date: TODAY
 License: GPL2

NOTE: This package has no version number yet; it is too heavily developed at the moment; see bitbucket.org/hrue/

See the web-site www.r-inla.org for further details.

Author(s)

Havard Rue, Sara Martino, Finn Lindgren, Daniel Simpson and Andrea Riebler

as.inla.mesh.segment *Convert sp curve objects to inla.mesh.segment objects.*

Description

Convert sp curve objects to inla.mesh.segment objects.

Usage

```
as.inla.mesh.segment(sp, ...)
inla.sp2segment(sp, ...) ## For backwards compatibility

## S3 method for class 'Line'
as.inla.mesh.segment(sp, reverse=FALSE, crs=NULL, ...)
## S3 method for class 'Lines'
as.inla.mesh.segment(sp, join=TRUE, crs=NULL, ...)
## S3 method for class 'SpatialLines'
as.inla.mesh.segment(sp, join=TRUE, grp=NULL, ...)
## S3 method for class 'SpatialLinesDataFrame'
as.inla.mesh.segment(sp, ...)
## S3 method for class 'Polygon'
as.inla.mesh.segment(sp, crs=NULL, ...)
## S3 method for class 'Polygons'
as.inla.mesh.segment(sp, join=TRUE, crs=NULL, ...)
## S3 method for class 'SpatialPolygons'
as.inla.mesh.segment(sp, join=TRUE, grp=NULL, ...)
## S3 method for class 'SpatialPolygonsDataFrame'
as.inla.mesh.segment(sp, ...)
```

Arguments

sp	An sp polygon object of class Polygon, Polygons, SpatialPolygons, or SpatialPolygonsDataFra
join	If TRUE, join multiple polygons into a single segment (possibly non-simply connected).
grp	Group ID specification for each polygon, as used by inla.mesh.segment , one ID per polygon.
reverse	Logical, indicating if the line sequence should be traversed backwards.
crs	An optional CRS or inla.CRS object
...	Additional arguments passed on to other methods.

Value

A [inla.mesh.segment](#) object, or a list of [inla.mesh.segment](#) objects.

Author(s)

Finn Lindgren <finn.lindgren@gmail.com>

See Also

[inla.mesh.segment](#)

BivMetaAnalysis*Bivariate Meta Analysis*

Description

Data are taken from a meta-analysis to compare the utility of three types of diagnostic imaging - lymphangiography (LAG), computed tomography (CT) and magnetic resonance (MR) - to detect lymph node metastases in patients with cervical cancer. The dataset consists of a total of 46 studies: the first 17 for LAG, the following 19 for CT and the last 10 for MR.

Usage

```
data(BivMetaAnalysis)
```

Format

A data frame with 92 observations on the following 9 variables.

N a numeric vector

Y a numeric vector

diid a numeric vector

lag.tp a numeric vector

lag.tn a numeric vector

ct.tp a numeric vector

ct.tn a numeric vector

mr.tp a numeric vector

mr.tn a numeric vector

References

J. Scheidler and H. Hricak and K. K. Yu and L. Subak and M. R. Segal, "Radiological evaluation of lymph node metastases in patients with cervical cancer: a meta-analysis", JAMA 1997

Examples

```
data(BivMetaAnalysis)
```

Cancer	~~ data name/kind ... ~~
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Description

~~ A concise (1-5 lines) description of the dataset. ~~

Usage

```
data(Cancer)
```

Format

A data frame with 6690 observations on the following 4 variables.

Y Number of cases

N a numeric vector

Age a numeric vector

region a numeric vector

References

Rue, H and Held, L. (2005) *Gaussian Markov Random Fields - Theory and Applications* Chapman and Hall

contrib.sd	<i>Computes the standard deviation for the structured (random) effects in an INLA model</i>
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Description

Computes the posterior distribution of the standard deviations for the structured (random) effects in an INLA model, starting from the default output based on the precisions

Usage

```
inla.contrib.sd(model, nsamples=1000)
```

Arguments

model	An INLA model, fitted calling the <code>inla()</code> -function. The formula specified for the model should include at least one structured (random) effect in the form <code>f(variable, model="iid")</code> .
nsamples	The number of simulations from the posterior distribution of the standard deviations used to compute the summary statistics

Value

`inla.contrib.sd` returns a matrix `samples` including the simulated values from the posterior distributions as well as a summary table hyper reporting the mean, sd and 95% credible interval for the posterior distributions of each random effect.

Author(s)

Gianluca Baio <gianluca@stats.ucl.ac.uk>

See Also

[inla](#)

Examples

```
# Data generation
n=12
Ntrials = sample(c(80:100), size=n, replace=TRUE)
eta = rnorm(n,0,0.5)
prob = exp(eta)/(1 + exp(eta))
y = rbinom(n, size=Ntrials, prob = prob)
data=data.frame(y=y,z=1:n)
formula=y~f(z,model="iid")
m=inla(formula,data=data,family="binomial",Ntrials=Ntrials)
summary(m)
s=inla.contrib.sd(m)
s$hyper
hist(s$samples,xlab="standard deviation for z",main="")
```

control.compute

Control variables in control.compute

Description

Control variables in control.compute for use in inla

Usage

```
inla.set.control.compute.default(...)
control.compute(config, cpo, dic, gdensity, graph, hyperpar, mlik, openmp.strategy, po, q, return.
```

Arguments

...	Possible arguments
openmp.strategy	The computational strategy to use: 'small', 'medium', 'large', 'huge' and 'default'. The difference is how the parallelisation is done, and is tuned for 'small'-sized models, 'medium'-sized models, etc. The default option tries to make an educated guess, but this allows to override this selection. Default is 'default'
hyperpar	A boolean variable if the marginal for the hyperparameters should be computed. Default TRUE.
return.marginals	A boolean variable if the marginals for the latent field should be returned (although it is computed). Default TRUE
dic	A boolean variable if the DIC-value should be computed. Default FALSE.
mlik	A boolean variable if the marginal likelihood should be computed. Default FALSE.

cpo	A boolean variable if the cross-validated predictive measures (cpo, pit) should be computed
po	A boolean variable if the predictive ordinate should be computed
waic	A boolean variable if the Watanabe-Akaike information criteria should be computed
q	A boolean variable if binary images of the precision matrix, the reordered precision matrix and the Cholesky triangle should be generated. (Default FALSE.)
config	A boolean variable if the internal GMRF approximations be stored. (Default FALSE. EXPERIMENTAL)
smtp	The sparse-matrix solver, one of 'smtp' (default) or 'band'
graph	A boolean variable if the graph itself should be returned. (Default FALSE.)
gdensity	A boolean variable if the Gaussian-densities itself should be returned. (Default FALSE.)

Value

The function `control.compute` is used to TAB-complete arguments and returns a list of given arguments. The function `inla.set.control.compute.default` returns a list with all the default values of all parameters within this control statement.

See Also

[control.update](#), [control.lincomb](#), [control.group](#), [control.mix](#), [control.link](#), [control.expert](#), [control.compute](#), [control.family](#), [control.fixed](#), [control.inla](#), [control.predictor](#), [control.results](#), [control.mode](#), [control.hazard](#), [inla](#)

control.expert	<i>Control variables in control.expert</i>
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Description

Control variables in `control.expert` for use in `inla`

Usage

```
inla.set.control.expert.default(...)
control.expert(cpo.idx, cpo.manual, disable.gaussian.check, jp.func, jp.RData, jp.Rfile)
```

Arguments

...	Possible arguments
cpo.manual	A boolean variable to decide if the inla-program is to be runned in a manual-cpo-mode. (EXPERT OPTION: DO NOT USE)
cpo.idx	The index/indices of the data point(s) to remove. (EXPERT OPTION: DO NOT USE)
disable.gaussian.check	Disable the check for fast computations with a Gaussian likelihood and identity link

jp.RData	The R-data file that contains global variables to be used by jp.func
jp.Rfile	The R-file to be sourced to set up a joint prior for the hyperparameters to be evaluated by jp.func
jp.func	The R-function which returns the joint prior, to be defined in jp.Rfile

Value

The function `control.expert` is used to TAB-complete arguments and returns a list of given arguments. The function `inla.set.control.expert.default` returns a list with all the default values of all parameters within this control statement.

See Also

[control.update](#), [control.lincomb](#), [control.group](#), [control.mix](#), [control.link](#), [control.expert](#), [control.compute](#), [control.family](#), [control.fixed](#), [control.inla](#), [control.predictor](#), [control.results](#), [control.mode](#), [control.hazard](#), [inla](#)

control.family	<i>Control variables in control.family</i>
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Description

Control variables in `control.family` for use in `inla`

Usage

```
inla.set.control.family.default(...)
control.family(cenpoisson.I, control.link, control.mix, fixed, gev.scale.xi, hyper, initial, link
```

Arguments

...	Possible arguments
hyper	Definition of the hyperparameters
initial	(OBSOLETE!) Initial value for the hyperparameter(s) of the likelihood in the internal scale.
prior	(OBSOLETE!) The name of the prior distribution(s) for othe hyperparameter(s).
param	(OBSOLETE!) The parameters for the prior distribution
fixed	(OBSOLETE!) Boolean variable(s) to say if the hyperparameter(s) is fixed or random.
link	(OBSOLETE! Use <code>control.link=list(model=)</code> instead.) The link function to use.
sn.shape.max	Maximum value for the shape-parameter for Skew Normal observations
gev.scale.xi	The internal scaling of the shape-parameter for the GEV distribution. (default 0.01)
cenpoisson.I	The censoring interval for the censored Poisson
quantile	The quantile to be used for the quantile parameterised likelihoods (default 0.5)
variant	This variable is used to give options for various variants of the likelihood, like chosing different parameterisations for example. See the relevant likelihood documentations for options (does only apply to some likelihoods).
control.mix	See <code>?control.mix</code>
control.link	See <code>?control.link</code>

Value

The function `control.family` is used to TAB-complete arguments and returns a list of given arguments. The function `inla.set.control.family.default` returns a list with all the default values of all parameters within this control statement.

See Also

`control.update`, `control.lincomb`, `control.group`, `control.mix`, `control.link`, `control.expert`, `control.compute`, `control.family`, `control.fixed`, `control.inla`, `control.predictor`, `control.results`, `control.mode`, `control.hazard`, `inla`

<code>control.fixed</code>	<i>Control variables in control.fixed</i>
----------------------------	---

Description

Control variables in `control.fixed` for use in `inla`

Usage

```
inla.set.control.fixed.default(...)
control.fixed(cdf, compute, correlation.matrix, expand.factor.strategy, mean, mean.intercept, prec
```

Arguments

<code>...</code>	Possible arguments
<code>cdf</code>	A list of values to compute the CDF for, for all fixed effects
<code>quantiles</code>	A list of quantiles to compute for all fixed effects
<code>expand.factor.strategy</code>	The strategy used to expand factors into fixed effects based on their levels. The default strategy is us use the <code>model.matrix</code> -function for which NA's are not allowed (<code>expand.factor.strategy="model.matrix"</code>) and levels are possible removed. The alternative option (<code>expand.factor.strategy="inla"</code>) use an <code>inla</code> -specific expansion which expand a factor into one fixed effects for each level, do allow for NA's and all levels are present in the model. In this case, factors MUST BE factors in the <code>data.frame/list</code> and NOT added as <code>.+factor(x1)+.</code> in the formula only.
<code>mean</code>	Prior mean for all fixed effects except the intercept. Alternatively, a named list with specific means where <code>name=default</code> applies to unmatched names. For example <code>control.fixed=list(mean=list(a=1, b=2, default=0))</code> assign 'mean=1' to fixed effect 'a', 'mean=2' to effect 'b' and 'mean=0' to all others.
<code>mean.intercept</code>	Prior mean for the intercept
<code>prec</code>	Default precision for all fixed effects except the intercept. Alternatively, a named list with specific means where <code>name=default</code> applies to unmatched names. For example <code>control.fixed=list(prec=list(a=1, b=2, default=0.01))</code> assign 'prec=1' to fixed effect 'a', 'prec=2' to effect 'b' and 'prec=0.01' to all others.
<code>prec.intercept</code>	Default precision the intercept (default 0.0)

`compute` Compute marginals for the fixed effects ? (default TRUE)

`correlation.matrix` Compute the posterior correlation matrix for all fixed effects? (default FALSE)
 OOPS: This option will set up appropriate linear combinations and the results are shown as the posterior correlation matrix of the linear combinations. This option will imply `control.inla=list(lincomb.derived.correlation.matrix=TRUE)`.

Value

The function `control.fixed` is used to TAB-complete arguments and returns a list of given arguments. The function `inla.set.control.fixed.default` returns a list with all the default values of all parameters within this control statement.

See Also

[control.update](#), [control.lincomb](#), [control.group](#), [control.mix](#), [control.link](#), [control.expert](#), [control.compute](#), [control.family](#), [control.fixed](#), [control.inla](#), [control.predictor](#), [control.results](#), [control.mode](#), [control.hazard](#), [inla](#)

<code>control.group</code>	<i>Control variables in control.group</i>
----------------------------	---

Description

Control variables in `control.group` for use in `inla`

Usage

```
inla.set.control.group.default(...)
control.group(adjust.for.con.comp, cyclic, fixed, graph, hyper, initial, model, order, param, prior)
```

Arguments

<code>...</code>	Possible arguments
<code>model</code>	Group model (one of 'exchangable', 'exchangablepos', 'ar1', 'ar', 'rw1', 'rw2', 'besag', or 'iid')
<code>order</code>	Defines the order of the model: for model ar this defines the order p, in AR(p). Not used for other models at the time being.
<code>cyclic</code>	Make the group model cyclic? (Only applies to models 'ar1', 'rw1' and 'rw2')
<code>graph</code>	The graph spesification (Only applies to model 'besag')
<code>scale.model</code>	Scale the intrinsic model (RW1, RW2, BESAG) so the generalized variance is 1. (Default <code>inla.getOption("scale.model.default")</code> .)
<code>adjust.for.con.comp</code>	Adjust for connected components when <code>scale.model=TRUE</code> ?
<code>hyper</code>	Definition of the hyperparameter(s)
<code>initial</code>	(OBSOLETE!) The initial value for the group correlation or precision in the internal scale.
<code>fixed</code>	(OBSOLETE!) A boolean variable if the group correction or precision is assumed to be fixed or random.

prior	(OBSOLETE!) The name of the prior distribution for the group correlation or precision in the internal scale
param	(OBSOLETE!) Prior parameters

Value

The function `control.group` is used to TAB-complete arguments and returns a list of given arguments. The function `inla.set.control.group.default` returns a list with all the default values of all parameters within this control statement.

See Also

`control.update`, `control.lincomb`, `control.group`, `control.mix`, `control.link`, `control.expert`, `control.compute`, `control.family`, `control.fixed`, `control.inla`, `control.predictor`, `control.results`, `control.mode`, `control.hazard`, `inla`

<code>control.hazard</code>	<i>Control variables in control.hazard</i>
-----------------------------	--

Description

Control variables in `control.hazard` for use in `inla`

Usage

```
inla.set.control.hazard.default(...)
control.hazard(constr, cutpoints, diagonal, fixed, hyper, initial, model, n.intervals, param, prior)
```

Arguments

<code>...</code>	Possible arguments
<code>model</code>	The model for the baseline hazard model. One of 'rw1' or 'rw2'. (Default 'rw1'.)
<code>hyper</code>	The definition of the hyperparameters.
<code>fixed</code>	(OBSOLETE!) A boolean variable; is the precision for 'model' fixed? (Default FALSE.)
<code>initial</code>	(OBSOLETE!) The initial value for the precision.
<code>prior</code>	(OBSOLETE!) The prior distribution for the precision for 'model'
<code>param</code>	(OBSOLETE!) The parameters in the prior distribution
<code>constr</code>	A boolean variable; shall the 'model' be constrained to sum to zero?
<code>diagonal</code>	An extra constant added to the diagonal of the precision matrix
<code>n.intervals</code>	Number of intervals in the baseline hazard. (Default 15)
<code>cutpoints</code>	The cutpoints to use. If not specified they are computed from 'n.intervals' and the maximum length of the interval. (Default NULL)
<code>strata.name</code>	The name of the stratification variable for the baseline hazard in the data.frame
<code>scale.model</code>	Scale the baseline hazard model (RW1, RW2) so the generalized variance is 1. (Default <code>inla.getOption("scale.model.default")</code> .)

Value

The function `control.hazard` is used to TAB-complete arguments and returns a list of given arguments. The function `inla.set.control.hazard.default` returns a list with all the default values of all parameters within this control statement.

See Also

`control.update`, `control.lincomb`, `control.group`, `control.mix`, `control.link`, `control.expert`, `control.compute`, `control.family`, `control.fixed`, `control.inla`, `control.predictor`, `control.results`, `control.mode`, `control.hazard`, `inla`

<code>control.inla</code>	<i>Control variables in control.inla</i>
---------------------------	--

Description

Control variables in `control.inla` for use in `inla`

Usage

```
inla.set.control.inla.default(...)
control.inla(adapt.hessian.max.trials, adapt.hessian.mode, adapt.hessian.scale, adjust.weights, c
```

Arguments

<code>...</code>	Possible arguments
<code>strategy</code>	Character The strategy to use for the approximations; one of 'gaussian', 'simplified.laplace' (default) or 'laplace'
<code>int.strategy</code>	Character The integration strategy to use; one of 'auto' (default), 'ccd', 'grid' or 'eb' (empirical bayes)
<code>interpolator</code>	Character The interpolator used to compute the marginals for the hyperparameters. One of 'auto', 'nearest', 'quadratic', 'weighted.distance', 'ccd', 'ccdintegrate', 'gridsum', 'gaussian'. Default is 'auto'.
<code>fast</code>	Logical If TRUE, then replace conditional modes in the Laplace approximation with conditional expectation (default TRUE)
<code>linear.correction</code>	Logical Default TRUE for the 'strategy = laplace' option.
<code>h</code>	Numerical The step-length for the gradient calculations for the hyperparameters. Default 0.01.
<code>dz</code>	Numerical The step-length in the standardised scale for the integration of the hyperparameters. Default 0.75.
<code>diff.logdens</code>	Numerical The difference of the log.density for the hyperparameters to stop numerical integration using <code>int.strategy='grid'</code> . Default 4.
<code>print.joint.hyper</code>	Logical If TRUE, the store also the joint distribution of the hyperparameters (without any costs). Default TRUE.
<code>force.diagonal</code>	Logical If TRUE, then force the Hessian to be diagonal. (Default FALSE.)

skip.configurations	Logical Skip configurations if the values at the main axis are too small. (Default TRUE.)
mode.known	Logical If TRUE then no optimisation is done. (Default FALSE.)
adjust.weights	Logical If TRUE then just more accurate integration weights. (Default TRUE.)
tolerance	Numerical The tolerance for the optimisation of the hyperparameters. If set, this is the default value for for 'tolerance.f^(2/3)', 'tolerance.g' and 'tolerance.x'; see below.
tolerance.f	Numerical The tolerance for the absolute change in the log posterior in the optimisation of the hyperparameters.
tolerance.g	Numerical The tolerance for the absolute change in the gradient of the log posterior in the optimisation of the hyperparameters.
tolerance.x	Numerical The tolerance for the change in the hyperparameters (root-mean-square) in the optimisation of the hyperparameters.
restart	Numerical To improve the optimisation, the optimiser is restarted at the found optimum 'restart' number of times.
optimiser	Character The optimiser to use; one of 'gsl', 'domin' or 'default'.
verbose	Logical Run in verbose mode? (Default FALSE)
reordering	Character Type of reordering to use. (EXPERT OPTION; one of "AUTO", "DEFAULT", "IDENTITY", "REVERSEIDENTITY", "BAND", "METIS", "GENMMD", "AMD", "MD", "MMD", "AMDBAR", "AMDC", "AMDBARC", or the output from inla.qreordering.)
cpo.diff	Numerical Threshold to define when the cpo-calculations are inaccurate. (EXPERT OPTION.)
npoints	Numerical Number of points to use in the 'strategy=laplace' approximation
cutoff	Numerical The cutoff used in the 'strategy=laplace' approximation. (Smaller value is more accurate and more slow.)
adapt.hessian.mode	Logical Should optimisation be continued if the Hessian estimate is void? (Default TRUE)
adapt.hessian.max.trials	Numerical Number of steps in the adaptive Hessian optimisation
adapt.hessian.scale	Numerical The scaling of the 'h' after each trial.
huge	Logical If TRUE then try to do some of the internal parallelisations differently. Hopefully this will be of benefit for 'HUGE' models. (Default FALSE.) [THIS OPTION IS OBSOLETE AND NOT USED!]
step.len	Numerical The step-length used to compute numerical derivatives of the log-likelihood
stencil	Numerical Number of points in the stencil used to compute the numerical derivatives of the log-likelihood (3, 5, 7 or 9).
lincomb.derived.only	Logical If TRUE the only compute the marginals for the derived linear combinations and if FALSE, the and also the linear combinations to the graph (Default TRUE)
lincomb.derived.correlation.matrix	Logical If TRUE compute also the correlations for the derived linear combinations, if FALSE do not (Default FALSE)

diagonal	Numerical Expert use only! Add a this value on the diagonal of the joint precision matrix.
numint.maxfeval	Numerical Maximum number of function evaluations in the the numerical integration for the hyperparameters. (Default 10000.)
numint.relerr	Numerical Relative error requirement in the the numerical integration for the hyperparameters. (Default 1e-5)
numint.abserr	Numerical Absolute error requirement in the the numerical integration for the hyperparameters. (Default 1e-6)
cmin	Numerical The minimum value for the negative Hessian from the likelihood. Increasing this value will stabalise the optimisation but can introduce bias in some estimates unless -Inf is used. (Default -Inf)
step.factor	Numerical The step factor in the Newton-Raphson algorithm saying how large step to take (Default 1.0)
global.node.factor	Numerical The factor which defines the degree required (how many neighbors), as a fraction of n-1, that is required to be classified as a global node and numbered last (whatever the reordering routine says). Here, n, is the size of the graph. (Disabled if larger than 1.)
global.node.degree	Numerical The degree required (number of neighbors) to be classified as a global node and numbered last (whatever the reordering routine says).
stupid.search	Logical Enable or disable the stupid-search-algorithm, if the Hessian calculations reveals that the mode is not found. (Default TRUE.)
stupid.search.max.iter	Numerical Maximum number of iterations allowed for the stupid-search-algorithm.
stupid.search.factor	Numerical Factor (≥ 1) to increase the step-length with after each new iteration.
correct	Logical Add correction for the Laplace approximation.
correct.factor	Numerical Factor used in adjusting the correction factor (default=10) if correct=TRUE
correct.strategy	Character The strategy used to compute the correction; one of 'simplified.laplace' (default) or 'laplace'
correct.verbose	Logical Be verbose when computing the correction?

Value

The function `control.inla` is used to TAB-complete arguments and returns a list of given arguments. The function `inla.set.control.inla.default` returns a list with all the default values of all parameters within this control statement.

See Also

[control.update](#), [control.lincomb](#), [control.group](#), [control.mix](#), [control.link](#), [control.expert](#), [control.compute](#), [control.family](#), [control.fixed](#), [control.inla](#), [control.predictor](#), [control.results](#), [control.mode](#), [control.hazard](#), [inla](#)

control.lincomb	<i>Control variables in control.lincomb</i>
-----------------	---

Description

Control variables in control.lincomb for use in inla

Usage

```
inla.set.control.lincomb.default(...)
control.lincomb(precision, verbose)
```

Arguments

...	Possible arguments
precision	The precision for the artificial tiny noise. Default 1e09.
verbose	Use verbose mode for linear combinations if verbose model is set globally. (Default TRUE)

Value

The function control.lincomb is used to TAB-complete arguments and returns a list of given arguments. The function inla.set.control.lincomb.default returns a list with all the default values of all parameters within this control statement.

See Also

[control.update](#), [control.lincomb](#), [control.group](#), [control.mix](#), [control.link](#), [control.expert](#), [control.compute](#), [control.family](#), [control.fixed](#), [control.inla](#), [control.predictor](#), [control.results](#), [control.mode](#), [control.hazard](#), [inla](#)

control.link	<i>Control variables in control.link</i>
--------------	--

Description

Control variables in control.link for use in inla

Usage

```
inla.set.control.link.default(...)
control.link(fixed, hyper, initial, model, nq, order, param, prior, variant)
```

Arguments

...	Possible arguments
model	The name of the link function/model
order	The order of the link function, where the interpretation of order is model-dependent.
variant	The variant of the link function, where the interpretation of variant is model-dependent.
nq	Number of quadrature-points used to do the numerical integration
hyper	Definition of the hyperparameter(s) for the link model chosen
initial	(OBSOLETE!) The initial value(s) for the hyperparameter(s)
fixed	(OBSOLETE!) A boolean variable if hyperparameter(s) is/are fixed or random
prior	(OBSOLETE!) The name of the prior distribution(s) for the hyperparameter(s)
param	(OBSOLETE!) The parameters for the prior distribution(s) for the hyperparameter(s)

Value

The `control.link`-list is set within the corresponding `control.family`-list as the link is likelihood-family specific. The function `control.link` is used to TAB-complete arguments and returns a list of given arguments. The function `inla.set.control.link.default` returns a list with all the default values of all parameters within this control statement.

See Also

[control.update](#), [control.lincomb](#), [control.group](#), [control.mix](#), [control.link](#), [control.expert](#), [control.compute](#), [control.family](#), [control.fixed](#), [control.inla](#), [control.predictor](#), [control.results](#), [control.mode](#), [control.hazard](#), [inla](#)

control.mix	<i>Control variables in control.mix</i>
-------------	---

Description

Control variables in `control.mix` for use in `inla`

Usage

```
inla.set.control.mix.default(...)
control.mix(fixed, hyper, initial, model, param, prior)
```

Arguments

...	Possible arguments
model	The model for the random effect. Currently, only <code>model='gaussian'</code> is implemented
hyper	Definition of the hyperparameter(s) for the random effect model chosen
initial	(OBSOLETE!) The initial value(s) for the hyperparameter(s)

fixed	(OBSOLETE!) A boolean variable if hyperparmater(s) is/are fixed or random
prior	(OBSOLETE!) The name of the prior distribution(s) for the hyperparmater(s)
param	(OBSOLETE!) The parameters for the prior distribution(s) for the hyperparmater(s)

Value

The `control.mix` -list is set within the corresponding `control.family`-list a the mixture of the likelihood is likelihood specific. (This option is EXPERIMENTAL.) The function `control.mix` is used to TAB-complete arguments and returns a list of given arguments. The function `inla.set.control.mix.default` returns a list with all the default values of all parameters within this control statement.

See Also

[control.update](#), [control.lincomb](#), [control.group](#), [control.mix](#), [control.link](#), [control.expert](#), [control.compute](#), [control.family](#), [control.fixed](#), [control.inla](#), [control.predictor](#), [control.results](#), [control.mode](#), [control.hazard](#), [inla](#)

control.mode	<i>Control variables in control.mode</i>
--------------	--

Description

Control variables in `control.mode` for use in `inla`

Usage

```
inla.set.control.mode.default(...)
control.mode(fixed, restart, result, theta, x)
```

Arguments

...	Possible arguments
result	Prevous result from <code>inla()</code> . Use the theta- and x-mode from this run.
theta	The theta-mode/initial values for theta. This option has preference over <code>result\$mode\$theta</code> .
x	The x-mode/intitital values for x. This option has preference over <code>result\$mode\$x</code> .
restart	A boolean variable; should we restart the optimisation from this configuration or fix the mode at this configuration? (Default FALSE.)
fixed	A boolean variable. If TRUE then treat all thetas as known and fixed, and if FALSE then treat all thetas as unknown and random (default).

Value

The function `control.mode` is used to TAB-complete arguments and returns a list of given arguments. The function `inla.set.control.mode.default` returns a list with all the default values of all parameters within this control statement.

See Also

[control.update](#), [control.lincomb](#), [control.group](#), [control.mix](#), [control.link](#), [control.expert](#),
[control.compute](#), [control.family](#), [control.fixed](#), [control.inla](#), [control.predictor](#), [control.results](#),
[control.mode](#), [control.hazard](#), [inla](#)

control.predictor

*Control variables in control.predictor***Description**

Control variables in `control.predictor` for use in `inla`

Usage

```
inla.set.control.predictor.default(...)
control.predictor(A, cdf, compute, cross, fixed, hyper, initial, link, param, precision, prior, qu
```

Arguments

<code>...</code>	Possible arguments
<code>hyper</code>	Definition of the hyperparameters.
<code>fixed</code>	(OBSOLETE!) If the precision for the artificial noise is fixed or not (default TRUE)
<code>prior</code>	(OBSOLETE!) The prior for the artificial noise
<code>param</code>	(OBSOLETE!) Prior parameters for the artificial noise
<code>initial</code>	(OBSOLETE!) The value of the log precision of the artificial noise
<code>compute</code>	A boolean variable; should the marginals for the linear predictor be computed? (Default FALSE.)
<code>cdf</code>	A list of values to compute the CDF for the linear predictor
<code>quantiles</code>	A list of quantiles to compute for the linear predictor
<code>cross</code>	Cross-sum-to-zero constraints with the linear predictor. All linear predictors with the same level of 'cross' are constrained to have sum zero. Use 'NA' for no contribution. 'Cross' has the same length as the linear predictor (including the 'A' matrix extention). (THIS IS AN EXPERIMENTAL OPTION, CHANGES MAY APPEAR.)
<code>A</code>	The observation matrix (matrix or <code>Matrix::sparseMatrix</code>).
<code>precision</code>	The precision for $\eta^* - A^* \eta$,
<code>link</code>	Define the family-connection for unobserved observations (NA). <code>link</code> is integer values which defines the family connection; <code>family[link[idx]]</code> unless <code>is.na(link[idx])</code> for which the identity-link is used. The <code>link</code> -argument only influence the fitted values in the result-object. If <code>is.null(link)</code> (default) then the identity-link is used for all missing observations. If the length of <code>link</code> is 1, then this value is replicated with the length of the response vector. If an element of the response vector is !NA then the corresponding entry in <code>link</code> is not used (but must still be a legal value). Setting this variable implies <code>compute=TRUE</code> .

Value

The function `control.predictor` is used to TAB-complete arguments and returns a list of given arguments. The function `inla.set.control.predictor.default` returns a list with all the default values of all parameters within this control statement.

See Also

`control.update`, `control.lincomb`, `control.group`, `control.mix`, `control.link`, `control.expert`, `control.compute`, `control.family`, `control.fixed`, `control.inla`, `control.predictor`, `control.results`, `control.mode`, `control.hazard`, `inla`

<code>control.results</code>	<i>Control variables in control.results</i>
------------------------------	---

Description

Control variables in `control.results` for use in `inla`

Usage

```
inla.set.control.results.default(...)
control.results(return.marginals.predictor, return.marginals.random)
```

Arguments

<code>...</code>	Possible arguments
<code>return.marginals.random</code>	A boolean variable; read the marginals for the fterms? (Default TRUE)
<code>return.marginals.predictor</code>	A boolean variable; read the marginals for the linear predictor? (Default TRUE)

Value

The function `control.results` is used to TAB-complete arguments and returns a list of given arguments. The function `inla.set.control.results.default` returns a list with all the default values of all parameters within this control statement.

See Also

`control.update`, `control.lincomb`, `control.group`, `control.mix`, `control.link`, `control.expert`, `control.compute`, `control.family`, `control.fixed`, `control.inla`, `control.predictor`, `control.results`, `control.mode`, `control.hazard`, `inla`

control.update	<i>Control variables in control.update</i>
----------------	--

Description

Control variables in control.update for use in inla

Usage

```
inla.set.control.update.default(...)
control.update(result)
```

Arguments

...	Possible arguments
result	Update the joint posterior for the hyperparameters from result

Value

The function control.update is used to TAB-complete arguments and returns a list of given arguments. The function inla.set.control.update.default returns a list with all the default values of all parameters within this control statement.

See Also

[control.update](#), [control.lincomb](#), [control.group](#), [control.mix](#), [control.link](#), [control.expert](#), [control.compute](#), [control.family](#), [control.fixed](#), [control.inla](#), [control.predictor](#), [control.results](#), [control.mode](#), [control.hazard](#), [inla](#)

debug.graph	<i>Debug a graph-file</i>
-------------	---------------------------

Description

Debug a graph specification on file (ascii-mode only), by checking the specification along the way.

Usage

```
inla.debug.graph(graph.file)
```

Arguments

graph.file	The filename of the graph (ascii-mode)
------------	--

Value

If an error is found, then an error message is shown, otherwise the graph-object returned by inla.read.graph() is returned.

Author(s)

Havard Rue <hrue@math.ntnu.no>

See Also

inla.read.graph

Examples

```
## Not run:  
## cat("3\n 1 1 2\n 2 1 1\n 3 4\n", file="g.dat")  
## g = inla.debug.graph("g.dat")  
## End(Not run)
```

Drivers

Time series with seasonal effect

Description

Montly total of car drivers killed or several injured in England from January 1969 to December 1984

NB: The last 12 lines of the data set have the first column set to NULL since these data where not observed but we want to predict them.

Usage

```
data(Drivers)
```

Format

A data frame with 204 observations on the following 4 variables.

y Number of deaths

belt Indicator of weather the belt was compulsory to use (1) or not (0)

trend time (in months)

seasonal time (in months)

References

Rue, H and Held, L. (2005) *Gaussian Markov Random Fields - Theory and Applications* Chapman and Hall

Examples

```
data(Drivers)
```

Epil

Repeated measures on Poisson counts

Description

Seizure counts in a randomised trial of anti-convulsant therapy in epilepsy for 59 patients.

Usage

```
data(Epil)
```

Format

A data frame with 236 observations on the following 7 variables.

y Number of seizures

Trt indicator for the presence of treatment

Base 8-week baseline seizure counts

Age Age of the patient

V4 indicator variable for the 4th visit.

rand a numeric vector

Ind indicator for the specific patient

Source

WinBUGS/OpenBUGS Manual Examples Vol I

Examples

```
data(Epil)
```

extract.groups

Extract tagged boundary/internal segments.

Description

Extract boundary or internal segments tagged by group id:s.

Usage

```
extract.groups(...)
```

```
## S3 method for class 'inla.mesh.segment'
extract.groups(
  segm, groups, groups.new = groups, ...)
```


Arguments

<code>segm</code>	An inla.mesh.segment object.
<code>groups</code>	The segment groups id:s to extract.
<code>groups.new</code>	Optional vector of group id remapping; <code>groups[k]</code> in the input will be replaced by <code>groups.new[k]</code> in the output.
<code>...</code>	Additional arguments, passed on to other methods.

Author(s)

Finn Lindgren <finn.lindgren@gmail.com>

See Also

[inla.mesh.segment](#)

f

Define general Gaussian models in the INLA formula

Description

Function used for defining of smooth and spatial terms within `inla` model formulae. The function does not evaluate anything - it exists purely to help set up a model. The function specifies one smooth function in the linear predictor (see [inla.models](#)) as

$$w f(x)$$

Usage

```
f(...,
  model = "iid",
  copy=NULL,
  same.as = NULL,
  n=NULL,
  nrep = NULL,
  replicate = NULL,
  ngroup = NULL,
  group = NULL,
  control.group = inla.set.control.group.default(),
  hyper = NULL,
  initial=NULL,
  prior=NULL,
  param = NULL,
  fixed = NULL,
  season.length=NULL,
  constr = NULL,
  extraconstr=list(A=NULL, e=NULL),
  values=NULL,
  cyclic = NULL,
  diagonal = NULL,
  graph=NULL,
```

```

graph.file=NULL,
cdf=NULL,
quantiles=NULL,
Cmatrix=NULL,
rankdef=NULL,
Z = NULL,
nrow = NULL,
ncol = NULL,
nu = NULL,
bvalue = NULL,
spde.prefix = NULL,
spde2.prefix = NULL,
spde2.transform = c("logit", "log", "identity"),
spde3.prefix = NULL,
spde3.transform = c("logit", "log", "identity"),
mean.linear = inla.set.control.fixed.default()$mean,
prec.linear = inla.set.control.fixed.default()$prec,
compute = TRUE,
of=NULL,
precision = exp(14),
range = NULL,
adjust.for.con.comp = TRUE,
order = NULL,
scale = NULL,
strata = NULL,
rgeneric = NULL,
scale.model = NULL,
args.slm = list(rho.min = NULL, rho.max = NULL, X = NULL, W = NULL, Q.beta = NULL),
correct = NULL,
debug = FALSE)

```

Arguments

...	Name of the covariate and, possibly of the weights vector. NB: order counts!!!! The first specified term is the covariate and the second one is the vector of weights (which can be negative).
model	A string indicating the choosen model. The default is iid. See <code>names(inla.models())\$latent</code> for a list of possible alternatives.
copy	TODO
same.as	TODO
n	An optional argument which defines the dimension of the model if this is different from <code>length(sort(unique(covariate)))</code>
nrep	TODO
replicate	We need to write documentation here
ngroup	TODO
group	TODO
control.group	TODO
hyper	Spesification of the hyperparameter, fixed or random, initial values, priors and its parameters. See <code>?inla.models</code> for the list of hyparameters for each model and its default options.

initial	THIS OPTION IS OBSOLETE; use hyper!!! Vector indicating the starting values for the optimization algorithm. The length of the vector depends on the number of hyperparameters in the chosen model. If fixed=T the value at which the parameters are fixed is determined through initial. See <code>inla.models()\$latent\$model name'</code> to have info about the chosen model.
prior	THIS OPTION IS OBSOLETE; use hyper!!! Prior distribution(s) for the hyperparameters of the !random model. The default value depends on the type of model, see !www.r-inla.org for a detailed description of the models. See <code>names(inla.models())\$priors</code> for possible prior choices
param	THIS OPTION IS OBSOLETE; use hyper!!! Vector indicating the parameters a and b of the prior distribution for the hyperparameters. The length of the vector depends on the chosen model. See <code>inla.models()\$latent\$model name'</code> to have info about the chosen model.
fixed	THIS OPTION IS OBSOLETE; use hyper!!! Vector of boolean variables indicating wheater the hyperparameters of the model are fixed or random. The length of the vector depends on the chosen model See <code>inla.models()\$latent\$model name'</code> to have info about the chosen model.
season.length	Lenght of the seasonal compoment (ONLY if model="seasonal")
constr	A boolean variable indicating whater to set a sum to 0 constraint on the term. By default the sum to 0 constraint is imposed on all intrinsic models ("iid","rw1","rw1","besag", etc..).
extraconstr	This argument defines extra linear constraints. The argument is a list with two elements, a matrix A and a vector e, which defines the extra constraint $Ax = e$; for example <code>extraconstr = list(A = A, e=e)</code> . The number of columns of A must correspond to the length of this f-model. Note that this constraint comes additional to the sum-to-zero constraint defined if <code>constr = TRUE</code> .
values	An optional vector giving all values assumed by the covariate for which we want estimated the effect. It must be a numeric vector, a vector of factors or NULL.
cyclic	A boolean specifying wheather the model is cyclical. Only valid for "rw1" and "rw2" models, is cyclic=T then the sum to 0 constraint is removed. For the correct form of the graph file see <i>Martino and Rue (2008)</i> .
diagonal	An extra constant added to the diagonal of the precision matrix.
graph	Defines the graph-object either as a file with a graph-description, an <code>inla.graph</code> -object, or as a (sparse) symmetric matrix.
graph.file	THIS OPTION IS OBSOLETE AND REPLACED BY THE MORE GENERAL ARGUMENT graph. PLEASE CHANGE YOUR CODE. Name of the file containing the graph of the model; see www.r-inla.org/faq .
cdf	A vector of maximum 10 values between 0 and 1 $x(0), x(1), \dots$. The function returns, for each posterior marginal the probabilities $\text{Prob}(X < x(p))$
quantiles	A vector of maximum 10 quantiles, $p(0), p(1), \dots$ to compute for each posterior marginal. The function returns, for each posterior marginal, the values $x(0), x(1), \dots$ such that $\text{Prob}(X < x(p)) = p$
Cmatrix	The specification of the precision matrix for the generic, generic3 or z models (up to a scaling constant). Cmatrix is either a (dense) matrix, a matrix created

	using <code>Matrix::sparseMatrix()</code> , or a filename which stores the non-zero elements of <code>Cmatrix</code> , in three columns: <code>i</code> , <code>j</code> and <code>Qij</code> . In case of the <code>generic3</code> model, it is a list of such specifications.
<code>rankdef</code>	A number defining the rank deficiency of the model, with sum-to-zero constraint and possible extra-constraints taken into account. See details.
<code>Z</code>	The matrix for the z-model
<code>nrow</code>	Number of rows for 2d-models
<code>ncol</code>	Number of columns for 2d-models
<code>nu</code>	Smoothing parameter for the Matern2d-model, possible values are <code>c(0, 1, 2, 3)</code>
<code>bvalue</code>	TODO
<code>spde.prefix</code>	TODO
<code>spde2.prefix</code>	TODO
<code>spde2.transform</code>	TODO
<code>spde3.prefix</code>	TODO
<code>spde3.transform</code>	TODO
<code>mean.linear</code>	Prior mean for the linear component, only used if <code>model="linear"</code>
<code>prec.linear</code>	Prior precision for the linear component, only used if <code>model="linear"</code>
<code>compute</code>	A boolean variable indicating wheather the marginal posterior distribution for the nodes in the <code>f()</code> model should be computed or not. This is usefull for large models where we are only interested in some posterior marginals.
<code>of</code>	TODO
<code>precision</code>	The precision for the artifical noise added when creating a copy of a model and others.
<code>range</code>	A vector of size two giving the lower and upper range for the scaling parameter <code>beta</code> in the model <code>COPY</code> , <code>CLINEAR</code> , <code>MEC</code> and <code>MEB</code> . If <code>low = high</code> then the identity mapping is used.
<code>adjust.for.con.comp</code>	If <code>TRUE</code> (default), adjust some of the models (currently: <code>besag</code> , <code>bym</code> , <code>bym2</code> and <code>besag2</code>) if the number of connected components in graph is larger than 1. If <code>FALSE</code> , do nothing.
<code>order</code>	Defines the order of the model: for model <code>ar</code> this defines the order <code>p</code> , in <code>AR(p)</code> . Not used for other models at the time being.
<code>scale</code>	A scaling vector. Its meaning depends on the model.
<code>strata</code>	A stratum vector. It meaning depends on the model.
<code>rgeneric</code>	A object of class <code>inla.rgeneric</code> which defines the model. (EXPERIMENTAL!)
<code>scale.model</code>	Logical. If <code>TRUE</code> then scale the <code>RW1</code> and <code>RW2</code> and <code>BESAG</code> and <code>BYM</code> and <code>BESAG2</code> and <code>RW2D</code> models so the their (generlized) variance is 1. Default value is <code>inla.getOption("scale.model.default")</code>
<code>args.slm</code>	Required arguments to the <code>model="slm"</code> ; see the documentation for further details.,
<code>correct</code>	Add this model component to the list of variables to be used in the corrected Laplace approximation? If <code>NULL</code> use default choice, otherwise <code>correct</code> if <code>TRUE</code> and do not if <code>FALSE</code> . (This option is currently experimental.),
<code>debug</code>	Enable local debug output

Details

There is no default value for rankdef, if it is not defined by the user then it is computed by the rank deficiency of the prior model (for the generic model, the default is zero), plus 1 for the sum-to-zero constraint if the prior model is proper, plus the number of extra constraints. **Oops:** This can be wrong, and then the user must define the rankdef explicitly.

Value

TODO

Author(s)

Havard Rue <hrue@math.ntnu.no>

See Also

[inla](#), [hyperpar.inla](#)

geobugs2inla	<i>INLA utility functions</i>
--------------	-------------------------------

Description

Various utility functions for INLA

Usage

```
inla.geobugs2inla(adj, num, graph.file="graph.dat")
```

Arguments

adj	A vector listing the ID numbers of the adjacent areas for each area. This is a sparse representation of the full adjacency matrix for the study region, and can be generated using the Adjacency Tool from the Map menu in GeoBUGS.
num	A vector of length N (the total number of areas) giving the number of neighbours n.i for each area.
graph.file	Name of the file of the new graph in the INLA format.

Value

The return value is the name of the graph-file created.

Note

These are all the same function, and the two different names are due to backward-compatibility

Author(s)

Havard Rue <hrue@math.ntnu.no>

See Also

[inla](#), [inla.surv](#), [hyperpar.inla](#)

Germany

Disease Mapping

Description

Cases of Oral cavity cancer in Germany from 1986-1990

Usage

```
data(Germany)
```

Format

A data frame with 544 observations on the following 4 variables.

region Region of Germany

E Fixed quantity which accounts for number of people in the district (offset)

Y Number of cases

x covariate measuring smoking consumption

References

Rue, H and Held, L. (2005) *Gaussian Markov Random Fields - Theory and Applications* Chapman and Hall

Examples

```
data(Germany)
```

graph2matrix

Construct a neighbour-matrix from a graph

Description

Construct a neighbour-matrix from a graph and display it

Usage

```
inla.graph2matrix(graph, ...)
inla.spy(graph, ..., reordering = NULL, factor = 1.0, max.dim = NULL)
```

Arguments

graph	An <code>inla.graph</code> -object, a (sparse) symmetric matrix, a filename containing the graph, or a list or collection of characters and/or numbers defining the graph.
reordering	A possible reordering. Typical the one obtained from a <code>inla</code> -call, <code>result\$misc\$reordering</code> , or the result of <code>inla.qreordering</code> .
factor	A scaling of the <code>inla.graph</code> -object to reduce the size.
max.dim	Maximum dimension of the <code>inla.graph</code> -object plotted; if missing(<code>factor</code>) and <code>max.dim</code> is set, then <code>factor</code> is computed automatically to give the given <code>max.dim</code> .
...	Additional arguments to <code>inla.read.graph()</code>

Value

`inla.graph2matrix` returns a sparse symmetric matrix where the non-zero pattern is defined by the graph. The `inla.spy` function, plots a binary image of a graph. The reordering argument is typically the reordering used by `inla`, found in `result$misc$reordering`.

Author(s)

Havard Rue <hrue@math.ntnu.no>

See Also

[inla.read.graph](#), `inla.qreordering`

Examples

```
n = 50
Q = matrix(0, n, n)
idx = sample(1:n, 2*n, replace=TRUE)
Q[idx, idx] = 1
diag(Q) = 1
g = inla.read.graph(Q)
QQ = inla.graph2matrix(g)
inla.spy(QQ)
print(all.equal(as.matrix(Q), as.matrix(QQ)))

g.file = inla.write.graph(g)
inla.dev.new()
inla.spy(g.file)
inla.spy(g.file, reordering = inla.qreordering(g))

g = inla.read.graph(g.file)
inla.dev.new()
inla.spy(g)

inla.dev.new()
inla.spy(3, 1, "1 2 2 1 1 3 0")
inla.dev.new()
inla.spy(3, 1, "1 2 2 1 1 3 0", reordering = 3:1)
```

idx	<i>Convert indexes</i>
-----	------------------------

Description

Convert indexes given by triplet '(idx, group, replicate)' to the (one-dimensional) index used in the grouped and replicated model

Usage

```
inla.idx(idx, n = max(idx),
         group = rep(1, length(idx)), ngroup = max(group),
         replicate = rep(1, length(idx)), nrep = max(replicate))
```

Arguments

idx	The index within the basic model. (Legal values from '1' to 'n'.)
n	The length 'n' of the basic model.
group	The index within group. (Legal values from '1' to 'ngroup'.)
ngroup	Number of groups.
replicate	The index within replication. (Legal values from '1' to 'nrep'.)
nrep	Number of replications.

Value

inla.idx returns indexes in the range '1' to 'n*ngroup*nrep' representing where the triplet '(idx,group,replicate)' is stored internally in the full grouped and replicated model.

Author(s)

Havard Rue <hrue@math.ntnu.no>

Examples

```
##TODO
```

inla	<i>Bayesian analysis of structured additive models</i>
------	--

Description

inla performs a full Bayesian analysis of additive models using Integrated Nested Laplace approximation

Usage

```

inla(
  formula,
  family = "gaussian",
  contrasts = NULL,
  data,
  quantiles=c(0.025, 0.5, 0.975),
  E = NULL,
  offset=NULL,
  scale = NULL,
  weights = NULL,
  Ntrials = NULL,
  strata = NULL,
  link.covariates = NULL,
  verbose = FALSE,
  lincomb = NULL,
  control.compute = list(),
  control.predictor = list(),
  control.family = list(),
  control.inla = list(),
  control.results = list(),
  control.fixed = list(),
  control.mode = list(),
  control.expert = list(),
  control.hazard = list(),
  control.lincomb = list(),
  control.update = list(),
  only.hyperparam = FALSE,
  inla.call = inla.getOption("inla.call"),
  inla.arg = inla.getOption("inla.arg"),
  num.threads = inla.getOption("num.threads"),
  keep = inla.getOption("keep"),
  working.directory = inla.getOption("working.directory"),
  silent = inla.getOption("silent"),
  debug = inla.getOption("debug"),
  .parent.frame = parent.frame()
)

```

Arguments

formula	A inla formula like $y \sim 1 + z + f(\text{ind}, \text{model}="iid") + f(\text{ind2}, \text{weights}, \text{model}="ar1")$. This is much like the formula for a glm except that smooth or spatial terms can be added to the right hand side of the formula. See f for full details and the web site www.r-inla.org for several worked out examples. Each smooth or spatial term specified through <i>f</i> should correspond to separate column of the data frame <i>data</i> . The response variable, <i>y</i> can be a univariate response variable, a list or the output of the function <code>inla.surf</code> for survival analysis models.
family	A string indicating the likelihood family. The default is gaussian with identity link. See <code>names(inla.models())\$likelihood</code> for a list of possible alterna-

	tives.
contrasts	Optional contrasts for the fixed effects; see ?lm or ?glm for details.
data	A data frame or list containing the variables in the model. The data frame MUST be provided
quantiles	A vector of quantiles, $p(0), p(1), \dots$ to compute for each posterior marginal. The function returns, for each posterior marginal, the values $x(0), x(1), \dots$ such that $\text{Prob}(X < x(p)) = p$
E	Known component in the mean for the Poisson likelihoods defined as $E_i \exp(\eta_i)$ <p>where</p> η_i <p>is the linear predictor. If not provided it is set to <code>rep(1, n.data)</code>.</p>
offset	This argument is used to specify an a-priori known and fixed component to be included in the linear predictor during fitting. This should be NULL or a numeric vector of length either one or equal to the number of cases. One or more <code>offset()</code> terms can be included in the formula instead or as well, and if both are used, they are combined into a common offset. If the A-matrix is used in the linear predictor statement <code>control.predictor</code> , then the offset given in this argument is added to <code>eta*</code> , the linear predictor related to the observations, as <code>eta* = A eta + offset</code> , whereas an offset in the formula is added to <code>eta</code> , the linear predictor related to the formula, as <code>eta = ... + offset.formula</code> . So in this case, the offset defined here and in the formula has a different meaning and usage.
scale	Fixed (optional) scale parameters of the precision for Gaussian and Student-T response models. Default value is <code>rep(1, n.data)</code> .
weights	Fixed (optional) weights parameters of the likelihood, so the <code>log-likelihood[i]</code> is changed into <code>weights[i]*log-likelihood[i]</code> . Default value is <code>rep(1, n.data)</code> . Due to the danger of mis-interpreting the results (see below), this option is DISABLED by default. You can enable this option for the rest of your R session, doing <code>inla.setOption(enable.inla.argument.weights=TRUE)</code> . WARNING: The normalizing constant for the likelihood is NOT recomputed, so ALL marginals (and the marginal likelihood) must be interpreted with great care. Possibly, you may want to set the prior for the hyperparameters to "uniform" and the integration strategy to "eb" to mimic a maximum-likelihood approach.
Ntrials	A vector containing the number of trials for the binomial likelihood. Default value is <code>rep(1, n.data)</code> .
strata	Fixed (optional) strata indicators for tstrata likelihood model.
link.covariates	A vector or matrix with covariates for link functions
verbose	Boolean indicating if the inla-program should run in a verbose mode (default FALSE).
lincomb	Used to define linear combination of nodes in the latent field. The posterior distribution of such linear combination is computed by the inla function. See www.r-inla.org/faq for examples of how to define such linear combinations.
control.compute	See ?control.compute

<code>control.predictor</code>	See <code>?control.predictor</code>
<code>control.family</code>	See <code>?control.family</code>
<code>control.inla</code>	See <code>?control.inla</code>
<code>control.results</code>	See <code>?control.result</code>
<code>control.fixed</code>	See <code>?control.fixed</code>
<code>control.mode</code>	See <code>?control.mode</code>
<code>control.expert</code>	See <code>?control.expert</code>
<code>control.hazard</code>	See <code>?control.hazard</code>
<code>control.lincomb</code>	See <code>?control.lincomb</code>
<code>control.update</code>	See <code>?control.update</code>
<code>only.hyperparam</code>	A boolean variable saying if only the hyperparameters should be computed. This option is mainly used internally. (TODO: This option should not be located here, change it!)
<code>inla.call</code>	The path to, or the name of, the inla-program. This program is installed together with the R-package, but, for example, a native compiled version can be used instead to improve the performance.
<code>inla.arg</code>	A string indicating ALL arguments to the 'inla' program and do not include default arguments. (OOPS: This is an expert option!)
<code>num.threads</code>	Maximum number of threads the inla-program will use. xFor Windows this defaults to 1, otherwise its defaults to NULL (for which the system takes over control).
<code>keep</code>	A boolean variable indicating that the working files (ini file, data files and results files) should be kept. If TRUE and no <code>working.directory</code> is specified the working files are stored in a directory called "inla".
<code>working.directory</code>	A string giving the name of a non-existing directory where to store the working files.
<code>silent</code>	If equal to 1L or TRUE, then the inla-program would be "silent". If equal to 2L, then suppress also error messages from the inla-program.
<code>debug</code>	If TRUE, then enable some debug output.
<code>.parent.frame</code>	Internal use only

Value

`inla` returns an object of class "inla". This is a list containing at least the following arguments:

<code>summary.fixed</code>	Matrix containing the mean and standard deviation (plus, possibly quantiles and cdf) of the fixed effects of the model.
<code>marginals.fixed</code>	A list containing the posterior marginal densities of the fixed effects of the model.
<code>summary.random</code>	List of matrices containing the mean and standard deviation (plus, possibly quantiles and cdf) of the smooth or spatial effects defined through <code>f()</code> .

<code>marginals.random</code>	If <code>return.marginals.random=TRUE</code> in <code>control.results</code> (default), a list containing the posterior marginal densities of the random effects defined through <code>f</code> .
<code>summary.hyperpar</code>	A matrix containing the mean and sd (plus, possibly quantiles and cdf) of the hyperparameters of the model
<code>marginals.hyperpar</code>	A list containing the posterior marginal densities of the hyperparameters of the model.
<code>summary.linear.predictor</code>	A matrix containing the mean and sd (plus, possibly quantiles and cdf) of the linear predictors η in the model
<code>marginals.linear.predictor</code>	If <code>compute=TRUE</code> in <code>control.predictor</code> , a list containing the posterior marginals of the linear predictors η in the model.
<code>summary.fitted.values</code>	A matrix containing the mean and sd (plus, possibly quantiles and cdf) of the fitted values $g^{-1}(\eta)$ obtained by transforming the linear predictors by the inverse of the link function. This quantity is only computed if <code>marginals.fitted.values</code> is computed. Note that if an observation is NA then the identity link is used. You can manually transform a marginal using <code>inla.marginal.transform()</code> or set the argument <code>link</code> in the <code>control.predictor</code> -list; see <code>?control.predictor</code>
<code>marginals.fitted.values</code>	If <code>compute=TRUE</code> in <code>control.predictor</code> , a list containing the posterior marginals of the fitted values $g^{-1}(\eta)$ obtained by transforming the linear predictors by the inverse of the link function. Note that if an observation is NA then the identity link is used. You can manually transform a marginal using <code>inla.marginal.transform()</code> or set the argument <code>link</code> in the <code>control.predictor</code> -list; see <code>?control.predictor</code>
<code>summary.lincomb</code>	If <code>lincomb != NULL</code> a list of matrices containing the mean and sd (plus, possibly quantiles and cdf) of all linear combinations defined.
<code>marginals.lincomb</code>	If <code>lincomb != NULL</code> a list of posterior marginals of all linear combinations defined.
<code>joint.hyper</code>	A matrix containing the joint density of the hyperparameters (in the internal scale)
<code>dic</code>	If <code>dic=TRUE</code> in <code>control.compute</code> , the deviance information criteria and effective number of parameters, otherwise NULL
<code>cpo</code>	If <code>cpo=TRUE</code> in <code>control.compute</code> , a list of three elements: <code>cpo\$cpo</code> are the values of the conditional predictive ordinate (CPO), <code>cpo\$pit</code> are the values of the probability integral transform (PIT) and <code>cpo\$failure</code> indicates whether some assumptions are violated. In short, if <code>cpo\$failure[i] > 0</code> then some assumption is violated, the higher the value (maximum 1) the more seriously.
<code>po</code>	If <code>po=TRUE</code> in <code>control.compute</code> , a list of one elements: <code>po\$po</code> are the values of the predictive ordinate (CPO) ($\pi(y_i y)$)
<code>waic</code>	If <code>waic=TRUE</code> in <code>control.compute</code> , a list of two elements: <code>waic\$waic</code> is the Watanabe-Akaike information criteria, and <code>waic\$p.eff</code> is the estimated effective number of parameters

mlik	If mlik=TRUE in control.compute, the log marginal likelihood of the model (using two different estimates), otherwise NULL
neffp	Expected effective number of parameters in the model. The standard deviation of the expected number of parameters and the number of replicas for parameter are also returned
mode	A list of two elements: mode\$theta is the computed mode of the hyperparameters and mode\$x is the mode of the latent field given the modal value of the hyperparameters.
call	The matched call.
formula	The formula supplied
nhyper	The number of hyperparameters in the model
cpu.used	The cpu time used by the inla function

Author(s)

Havard Rue <hrue@math.ntnu.no> and Sara Martino

References

Rue, H. and Martino, S. and Chopin, N. (2009) *Approximate Bayesian Inference for latent Gaussian models using Integrated Nested Laplace Approximations*, *JRSS-series B (with discussion)*, vol 71, no 2, pp 319-392. Rue, H and Held, L. (2005) *Gaussian Markov Random Fields - Theory and Applications* Chapman and Hall

See Also

[f](#), [inla.hyperpar](#)

Examples

```
## Not run:
##See the web page \url{www.r-inla.org} for a series of worked out examples

## End(Not run)
```

inla.ar

Convert between parameterizations for the AR(p) model

Description

These functions convert between the AR(p) coefficients phi, the partial autocorrelation coefficients pacf and the autocorrelation function acf. The phi-parameterization is the same as used for arima-models in R; see ?arima and the parameter-vector a in Details.

Usage

```
inla.ar.pacf2phi(pac)
inla.ar.phi2pacf(phi)
inla.ar.pacf2acf(pac, lag.max = length(pac))
inla.ar.phi2acf(phi, lag.max = length(phi))
```

Arguments

pac	The partial autocorrelation coefficients
phi	The AR(p) parameters phi
lag.max	The maximum lag to compute the ACF for

Value

inla.ar.pacf2phi returns phi for given pacf. inla.ar.phi2pacf returns pac for given phi.
 inla.ar.phi2acf returns acf for given phi. inla.ar.pacf2acf returns acf for given pacf.

Author(s)

Havard Rue <hrue@math.ntnu.no>

Examples

```
pac = runif(5)
phi = inla.ar.pacf2phi(pac)
pac2 = inla.ar.phi2pacf(phi)
print(paste("Error:", max(abs(pac2-pac))))
print("Correlation matrix (from pac)")
print(toeplitz(inla.ar.pacf2acf(pac)))
print("Correlation matrix (from phi)")
print(toeplitz(inla.ar.phi2acf(phi)))
```

inla.as.sparse	<i>Convert a matrix or sparse matrix into the sparse formate used by INLA</i>
----------------	---

Description

Convert a matrix or sparse matrix into the sparse format used by INLA (dgTMatrix)

Usage

```
inla.as.sparse(...)
inla.as.dgTMatrix(A, unique = TRUE)
```

Arguments

...	The arguments. The matrix or sparse matrix, and the additonal arguments
A	The matrix
unique	If the internal representation needs to be unique or can have duplicated entries. Do not use this option unless you know what you are doing.

Value

inla.as.sparse and inla.as.dgTMatrix is the same function. The returned value is a sparse matrix in the sparse-format used by INLA

Author(s)

Havard Rue <hrue@math.ntnu.no>

Examples

```
A = matrix(1:9, 3, 3)
inla.as.sparse(A)
```

inla.changelog	<i>inla.changelog</i>
----------------	-----------------------

Description

List the recent changes in the inla-program and its R-interface

Usage

```
inla.changelog()
```

Author(s)

Havard Rue <hrue@math.ntnu.no>

See Also

[inla](#)

inla.collect.results	<i>Collect results from a inla-call</i>
----------------------	---

Description

`inla.collect.results` collect results from a inla-call

Usage

```
inla.collect.results(
  results.dir,
  control.results = inla.set.control.results.default(),
  debug=FALSE,
  only.hyperparam=FALSE,
  file.log = NULL,
  file.log2 = NULL)
```

Arguments

results.dir	The directory where the results of the inla run are stored
control.results	a list of parameters controlling the output of the function; see ?control.results
debug	Logical. If TRUE some debugging information are printed
only.hyperparam	Binary variable indicating wheather only the results for the hyperparameters should be collected
file.log	Character. The filename, if any, of the logfile for the internal calculations
file.log2	Character. The filename, if any, of the logfile2 for the internal calculations

Details

This function is mainly used inside inla to collect results after running the inla function. It can also be used to collect results into R after having runned a inla section outside R.

Value

The function returns an object of class "inla", see the help file for inla for details.

inla.compare.results *Compare INLA and MCMC results*

Description

A small utility to compare INLA and MCMC results (OBSOLETE)

Usage

```
inla.compare.results(dir.inla = NULL, dir.mcmc = NULL)
```

Arguments

dir.inla	The directory with the INLA results
dir.mcmc	The directory with the MCMC results

Value

Return nothing. This is an interactive function.

This function is OBSOLETE

Author(s)

Havard Rue <hrue@math.ntnu.no>

Examples

```
## See demo("Tokyo-compare")
```

inla.coxph	<i>Convert a Cox proportional hazard model into Poisson regression</i>
------------	--

Description

Tools to convert a Cox proportional hazard model into Poisson regression

Usage

```
inla.coxph(formula, data, control.hazard = list(), debug=FALSE)
inla.rbind.data.frames(...)
```

Arguments

formula	The formula for the coxph model where the response must be a <code>inla.surv</code> -object.
data	All the data used in the formula, as a list.
control.hazard	Control the model for the baseline-hazard; see <code>?control.hazard</code> .
debug	Print debug-information
...	Data.frames to be cbind-ed, padding with NA.

Value

`inla.coxph` returns a list of new expanded variables to be used in the `inla`-call. Note that element `data` and `data.list` needs to be merged into a list to be passed as the `data` argument. See the example for details. `inla.rbind.data.frames` returns the new `data.frame`.

Author(s)

Havard Rue <hrue@math.ntnu.no>

Examples

```
## How the cbind.data.frames works:
df1 = data.frame(x=1:2, y=2:3, z=3:4)
df2 = data.frame(x=3:4, yy=4:5, zz=5:6)
inla.rbind.data.frames(df1, df2)

## Standard example of how to convert a coxph into a Poisson regression
n = 1000
x = runif(n)
lambda = exp(1+x)
y = rexp(n, rate=lambda)
event = rep(1,n)
data = list(y=y, event=event, x=x)
y.surv = inla.surv(y, event)
intercept1 = rep(1, n)
p = inla.coxph(y.surv ~ -1 + intercept1 + x,
               list(y.surv = y.surv, x=x, intercept1 = intercept1))

r = inla(p$formula,
         family = p$family,
```

```

      data=c(as.list(p$data), p$data.list),
      E = p$E)
summary(r)

## How to use this in a joint model
intercept2 = rep(1, n)
y = 1 + x + rnorm(n, sd=0.1)
df = data.frame(intercept2, x, y)

## new need to cbind the data.frames, and then add the list-part of
## the data
df.joint = c(as.list(inla.rbind.data.frames(p$data, df)), p$data.list)
df.joint$Y = cbind(df.joint$y..coxph, df.joint$y)

## merge the formulas, recall to add '-1' and to use the new joint
## reponse 'Y'
formula = update(p$formula, Y ~ intercept2 -1 + .)

rr = inla(formula,
          family = c(p$family, "gaussian"),
          data = df.joint,
          E = df.joint$E)

```

inla.cpo

Improved estimates for the CPO/PIT-values

Description

Improve the estimates of the CPO/PIT-values by recomputing the model-fit by removing data-points.

Usage

```

inla.cpo(result,
         force = FALSE,
         verbose = TRUE,
         recompute.mode = TRUE)

```

Arguments

result	An object of class inla, ie a result of a call to inla()
force	If TRUE, then recompute all CPO/PIT values and not just those with result\$cpo\$failure > 0.
verbose	Run in verbose mode?
recompute.mode	Should be mode (and the integration points) be recomputed when a data-point is removed or not?

Value

The object returned is the same as result but the new improved estimates of the CPO/PIT values replaced.

Author(s)

Havard Rue <hrue@math.ntnu.no>

See Also

[inla](#)

Examples

```
n = 10
y = rnorm(n)
r = inla(y ~ 1, data = data.frame(y), control.compute = list(cpo=TRUE))

rr = inla.cpo(r, force=TRUE)
```

inla.CRS

Create a coordinate reference system object

Description

Creates either a CRS object or an inla.CRS object, describing a coordinate reference system

Usage

```
inla.CRS(projargs = NA_character_, doCheckCRSArgs = TRUE,
         args = NULL, oblique = NULL, ...)
```

Arguments

projargs	Either 1) a projection argument string suitable as input to <code>sp::CRS</code> , or 2) an existing CRS object, or 3) a shortcut reference string to a predefined projection (longlat, lambert, mollweide, hammer, and sphere).
doCheckCRSArgs	default TRUE, must be set to FALSE by package developers including CRS in an S4 class definition to avoid uncontrollable loading of the <code>rgdal</code> namespace.
args	An optional list of name/value pairs to add to and/or override the PROJ4 arguments in <code>projargs</code> . <code>name=value</code> is converted to <code>"name=value"</code> , and <code>name=NA</code> is converted to <code>"name"</code> .
oblique	Vector of length at most 4 of rotation angles (in degrees) for an oblique projection, all values defaulting to zero. The values indicate (longitude, latitude, orientation, orbit), as explained in the Details section below.
...	Additional parameters. Not currently in use.

Details

The first two elements of the oblique vector are the (longitude, latitude) coordinates for the oblique centre point. The third value (orientation) is a counterclockwise rotation angle for an observer looking at the centre point from outside the sphere. The fourth value is the quasi-longitude (orbit angle) for a rotation along the oblique observers equator.

Simple oblique: `oblique=c(0, 45)`

Polar: `oblique=c(0, 90)`

Quasi-transversal: `oblique=c(0, 0, 90)`

Satellite orbit viewpoint: `oblique=c(lon0-time*v1, 0, orbitangle, orbit0+time*v2)`, where `lon0` is the longitude at which a satellite orbit crosses the equator at `time=0`, when the satellite is at an angle `orbit0` further along in its orbit. The orbital angle relative to the equatorial plane is `orbitangle`, and `v1` and `v2` are the angular velocities of the planet and the satellite, respectively. Note that "forward" from the satellite's point of view is "to the right" in the projection.

When `oblique[2]` or `oblique[3]` are non-zero, the resulting projection is only correct for perfect spheres.

Value

Either an `sp::CRS` object or an `inla.CRS` object, depending on if the coordinate reference system described by the parameters can be expressed with a pure `sp::CRS` object or not.

An `S3 inla.CRS` object is a list, usually (but not necessarily) containing at least one element:

`crs` The basic `sp::CRS` object

Author(s)

Finn Lindgren <finn.lindgren@gmail.com>

See Also

[CRS](#), [inla.CRSargs](#), [plot.CRS](#), [inla.identical.CRS](#)

Examples

```
if (require(rgdal)) {
  halfroot <- "+a=0.7071067811865476 +b=0.7071067811865476"
  crs1 <- inla.CRS("+proj=longlat +ellps=sphere +a=1 +b=1")
  crs2 <- inla.CRS("+proj=cea +ellps=sphere +lat_ts=0 +units=m +a=1 +b=1")
  crs3 <- inla.CRS(paste("+proj=moll +ellps=sphere +units=m", halfroot))
  crs4 <- inla.CRS(paste("+proj=hammer +ellps=sphere +units=m", halfroot))
  crs5 <- inla.CRS("+proj=geocent +ellps=sphere +a=1 +b=1 +units=m")
  ## Shortcuts:
  crs1 <- inla.CRS("longlat")
  crs2 <- inla.CRS("lambert")
  crs3 <- inla.CRS("mollweide")
  crs4 <- inla.CRS("hammer")
  crs5 <- inla.CRS("sphere")
}
```

`inla.CRSargs`

Show expanded CRS arguments

Description

Wrapper for `sp::CRS` and `inla.CRS` objects to extract the coordinate reference system argument string.

Usage

```

inla.CRSargs(x, ...)
inla.as.list.CRS(x, ...)
inla.as.list.CRSargs(x, ...)
inla.as.CRS.list(x, ...)
inla.as.CRSargs.list(x, ...)

```

Arguments

<code>x</code>	An <code>sp::CRS</code> or <code>inla.CRS</code> object (for <code>inla.CRSargs</code> and <code>inla.as.list.CRS</code>), a character string (for <code>inla.as.list.CRSargs</code>), or a list (for <code>inla.as.CRS.list</code> and <code>inla.as.CRSargs.list</code>).
<code>...</code>	Additional arguments passed on to other methods.

Value

For `inla.CRSargs` and `inla.as.CRSargs.list`, a character string with PROJ.4 arguments.

For `inla.as.list.CRS` and `inla.as.list.CRSargs`, a list of name/value pairs.

For `inla.as.CRS.list`, a `CRS` or `inla.CRS` object.

Author(s)

Finn Lindgren <finn.lindgren@gmail.com>

See Also

[CRSargs](#), [inla.CRS](#)

Examples

```

if (require(rgdal)) {
  crs0 <- inla.CRS("longlat")
  p4s <- inla.CRSargs(crs0)
  lst <- inla.as.list.CRSargs(p4s)
  crs1 <- inla.as.CRS.list(lst)
  lst$a <- 2
  crs2 <- inla.CRS(p4s, args=lst)
  print(inla.CRSargs(crs0))
  print(inla.CRSargs(crs1))
  print(inla.CRSargs(crs2))
}

```

inla.dev.new

Opens a new device

Description

Open a new device using [dev.new](#) unless using RStudio

Usage

```
inla.dev.new(...)
```

Arguments

... Optional arguments to [dev.new](#)

Value

The value of [dev.new](#) if not running RStudio, otherwise NULL

Author(s)

Havard Rue <hrue@math.ntnu.no>

inla.diameter	<i>Diameter of a point set</i>
---------------	--------------------------------

Description

Find an upper bound to the convex hull of a point set

Usage

```
inla.diameter(x, ...)

## Default S3 method:
inla.diameter(x, manifold="", ...)
## S3 method for class 'inla.mesh'
inla.diameter(x, ...)
## S3 method for class 'inla.mesh.segment'
inla.diameter(x, ...)
## S3 method for class 'inla.mesh.lattice'
inla.diameter(x, ...)
## S3 method for class 'inla.mesh.1d'
inla.diameter(x, ...)
```

Arguments

x	A point set as an $n \times d$ matrix, or an <code>inla.mesh</code> related object.
manifold	Character string specifying the manifold type. Default is to treat the point set with Euclidean R^d metrics. Use <code>manifold="S2"</code> for great circle distances on the unit sphere (this is set automatically for <code>inla.mesh</code> objects).
...	Additional parameters passed on to other methods.

Value

A scalar, upper bound for the diameter of the convex hull of the point set.

Author(s)

Finn Lindgren <finn.lindgren@gmail.com>

Examples

```
inla.diameter(matrix(c(0,1,1,0, 0,0,1,1), 4, 2))
```

inla.doc

View documentation

Description

View documentation of latent, prior and likelihood models.

Usage

```
inla.doc(what, sec, verbose=FALSE)
```

Arguments

what	What to view documentation about; name of latent model, name of prior, etc. (A regular expression.)
sec	An optional section to look for the documentation. If missing, all sections are used.
verbose	Logical if TRUE then run in verbose mode

Author(s)

Havard Rue <hrue@math.ntnu.no>

See Also

www.r-inla.org

Examples

```
## Not run: inla.doc("rw2")
## Not run: inla.doc("gaussian")
```

inla.extract.el	<i>Extract elements by matching name from container objects.</i>
-----------------	--

Description

Extract elements by wildcard name matching from a `data.frame`, `list`, or `matrix`.

Usage

```
inla.extract.el(M, ...)

## S3 method for class 'data.frame'
inla.extract.el(M, match, by.row = TRUE, ...)
## S3 method for class 'list'
inla.extract.el(M, match, ...)
## S3 method for class 'matrix'
inla.extract.el(M, match, by.row = TRUE, ...)
```

Arguments

M	A container object.
match	A regex defining the matching criterion.
by.row	If TRUE, extract data by row, otherwise by column.
...	Additional arguments, not used.

Author(s)

Finn Lindgren <finn.lindgren@gmail.com>

inla.fmesher.smorg	<i>Compute various mesh related quantities.</i>
--------------------	---

Description

Low level function for computing finite element matrices, spherical harmonics, B-splines, and point mappings with barycentric triangle coordinates.

Usage

```
inla.fmesher.smorg(loc, tv,
  fem = NULL, aniso = NULL,
  gradients = FALSE,
  sph0 = NULL, sph = NULL, bspline = NULL,
  points2mesh = NULL,
  splitlines = NULL,
  output = NULL,
  keep = FALSE)
```


Arguments

loc	3-column triangle vertex coordinate matrix.
tv	3-column triangle vertex index matrix.
fem	Maximum finite element matrix order to be computed.
aniso	A two-element list with γ and v for an anisotropic operator $\nabla \cdot H \nabla$, where $H = \gamma I + vv^\top$
gradients	When TRUE, calculate derivative operator matrices dx, dy, and dz.
sph0	Maximal order of rotationally invariant spherical harmonics.
sph	Maximal order of general spherical harmonics.
bspline	Rotationally invariant B-splines on a sphere. 3-vector with number of basis functions n, basis degree degree, and a logical; TRUE uniform knot angles, FALSE for uniform spacing in $\sin(\text{latitude})$.
points2mesh	3-column matrix with points to be located in the mesh.
splitlines	A list with elements loc (3-column coordinate matrix) and idx (2-column index matrix) describing line segments that are to be split into sub-segments at triangle boundaries.
output	Names of objects to be included in the output, if different from defaults.
keep	When TRUE, for debugging purposes keep the fmasher I/O files on disk.

Value

A list of generated named quantities.

Author(s)

Finn Lindgren <finn.lindgren@gmail.com>

inla.generate.colors *Generate text RGB color specifications.*

Description

Generates a text RGB color specification matrix based on a color palette.

Usage

```
inla.generate.colors(color,
  color.axis = NULL,
  color.n = 512,
  color.palette = cm.colors,
  color.truncate = FALSE,
  alpha = NULL)
```

Arguments

color	character, matrix or vector
color.axis	The min/max limit values for the color mapping.
color.n	The number of colors to use in the color palette.
color.palette	A color palette function.
color.truncate	If TRUE, truncate the colors at the color axis limits.
alpha	Transparency/opaqueness values.

Author(s)

Finn Lindgren <finn.lindgren@gmail.com>

inla.group	<i>Group or cluster covariates</i>
------------	------------------------------------

Description

inla.group group or cluster covariates so to reduce the number of unique values

Usage

```
inla.group(x, n = 25, method = c("cut", "quantile"), idx.only = FALSE)
```

Arguments

x	The vector of covariates to group.
n	Number of classes or bins to group into.
method	Group either using bins with equal length intervals (method = "cut"), or equal distance in the ‘probability’ scale using the quantiles (method = "quantile").
idx.only	Option to return the index only and not the method.

Value

inla.group return the new grouped covariates where the classes are set to the median of all the covariates belonging to that group.

Author(s)

Havard Rue <hrue@math.ntnu.no>

See Also

[f](#)

Examples

```
## this gives groups 3 and 8
x = 1:10
x.group = inla.group(x, n = 2)

## this is the intended use, to reduce the number of unique values in
## the of first argument of f()
n = 100
x = rnorm(n)
y = x + rnorm(n)
result = inla(y ~ f(inla.group(x, n = 20), model = "iid"), data=data.frame(y=y,x=x))
```

inla.hyperpar	<i>Improved estimates for the hyperparameters</i>
---------------	---

Description

Improve the estimates of the posterior marginals for the hyperparameters of the model using the grid integration strategy.

Usage

```
inla.hyperpar(
  result,
  skip.configurations = TRUE,
  verbose = FALSE,
  dz = 0.75,
  diff.logdens = 10,
  h = NULL,
  restart = FALSE,
  quantiles = NULL,
  keep = FALSE)
```

Arguments

result	An object of class inla, ie a result of a call to inla()
skip.configurations	A boolean variable; skip configurations if the values at the main axis are too small. (Default TRUE)
verbose	Boolean indicating wheather the inla program should run in a verbose mode.
dz	Step length in the standardized scale used in the construction of the grid, default 0.75.
diff.logdens	The difference of the log.density for the hyperpameters to stop numerical integration using int.strategy='grid'. Default 10
h	The step-length for the gradient calculations for the hyperparameters. Default 0.01.
restart	A boolean defining wheather the optimizer should start again to ind the mode or if it should use the mode contained in the object
quantiles	A vector of quantiles, to compute for each posterior marginal.
keep	A boolean variable indicating the working files (ini file, data files and results files) should be kept

Value

The object returned is the same as `object` but the estimates of the hyperparameters are replaced by improved estimates.

Note

This function might take a long time or if the number of hyperparameters in the model is large. If it complains and says I cannot get enough memory, try to increase the value of the argument `dz` or decrease `diff.logdens`.

Author(s)

Havard Rue <hrue@math.ntnu.no>

References

See the references in `inla`

See Also

[inla](#)

<code>inla.hyperpar.sample</code>	<i>Produce samples from the approximated joint posterior for the hyperparameters</i>
-----------------------------------	--

Description

Produce samples from the approximated joint posterior for the hyperparameters

Usage

```
inla.hyperpar.sample(n, result, intern=FALSE, improve.marginals = FALSE)
```

Arguments

<code>n</code>	Integer. Number of samples required.
<code>result</code>	An <code>inla</code> -object, f.ex the output from an <code>inla</code> -call.
<code>intern</code>	Logical. If TRUE then produce samples in the internal scale for the hyperparameter, if FALSE then produce samples in the user-scale. (For example log-precision (intern) and precision (user-scale))
<code>improve.marginals</code>	Logical. If TRUE, then improve the samples taking into account possible better marginal estimates for the hyperparameters in <code>result</code> .

Value

A matrix where each sample is a row. The contents of the column is described in the rownames.

Author(s)

Havard Rue <hrue@math.ntnu.no>

Examples

```
n = 100
r = inla(y ~ 1 + f(idx), data = data.frame(y=rnorm(n), idx = 1:n))
ns = 500
x = inla.hyperpar.sample(ns, r)

rr = inla.hyperpar(r)
xx = inla.hyperpar.sample(ns, rr, improve.marginals=TRUE)
```

inla.identical.CRS	<i>Test CRS and inla.CRS for equality</i>
--------------------	---

Description

Wrapper for identical, optionally testing only the CRS part of two objects

Usage

```
inla.identical.CRS(crs0, crs1, crsonly = FALSE)
```

Arguments

crs0	A CRS or inla.CRS object.
crs1	A CRS or inla.CRS object.
crsonly	Logical. If TRUE, only the CRS part of a inla.CRS object is compared.

Author(s)

Finn Lindgren <finn.lindgren@gmail.com>

See Also

[inla.CRS](#)

Examples

```
crs0 <- inla.CRS("longlat")
crs1 <- inla.CRS("longlat", oblique=c(0,90))
print(c(inla.identical.CRS(crs0, crs0),
        inla.identical.CRS(crs0, crs1),
        inla.identical.CRS(crs0, crs1, crsonly=TRUE)))
```

inla.ks.plot

Kolmogorov-Smirnov Test Plots

Description

Illustrate a one-sample Kolmogorov-Smirnov test by plotting the empirical distribution deviation.

Usage

```
inla.ks.plot(x, y, diff=TRUE, ...)
```

Arguments

x	a numeric vector of data values.
y	a cumulative distribution function such as 'pnorm'.
diff	logical, indicating if the normalised difference should be plotted. If FALSE, the absolute distribution functions are plotted.
...	additional arguments for ks.test , ignored in the plotting. In particular, only two-sided tests are illustrated.

Details

In addition to the (normalised) empirical distribution deviation, lines for the K-S test statistic are drawn, as well as \pm two standard deviations around the expectation under the null hypothesis.

Value

A list with class "htest", as generated by [ks.test](#)

Author(s)

Finn Lindgren <finn.lindgren@gmail.com>

See Also

[ks.test](#)

Examples

```
## Check for N(0,1) data
data = rowSums(matrix(runif(100*12)*2-1,100,12))/2
inla.ks.plot(data, pnorm)

## Not run:
## Check the goodness-of-fit of cross-validated predictions
result = inla(..., control.predictor=list(cpo=TRUE))
inla.ks.plot(result$pit, punif)

## End(Not run)
```

inla.load	<i>Load or source a file</i>
-----------	------------------------------

Description

Load or source a file: (internal use)

Usage

```
inla.load(filename, debug = TRUE)
```

Arguments

filename	The name of the file to be loaded, alternatively, sourced.
debug	Logical. Turn on/off debug information.

Details

Try to load the file into the global environment, if that fail, try to source the file into the global environment.

Value

None

Author(s)

Havard Rue <hrue@math.ntnu.no>

inla.matern.cov	<i>Numerical evaluation of Matern and related covariance functions.</i>
-----------------	---

Description

Calculates covariance and correlation functions for Matern models and related oscillating SPDE models, on R^d and on the sphere, S^2 .

Usage

```
inla.matern.cov(nu, kappa, x,
               d = 1,
               corr = FALSE,
               norm.corr = FALSE,
               theta,
               epsilon = 1e-08)

inla.matern.cov.s2(nu, kappa, x,
                  norm.corr = FALSE,
                  theta = 0)
```

Arguments

nu	The Matern smoothness parameter.
kappa	The spatial scale parameter.
x	Distance values.
d	Space dimension; the domain is R^d .
corr	If TRUE, calculate correlations, otherwise calculate covariances. Only used for pure Matern models (i.e. with $\theta = 0$).
norm.corr	If TRUE, normalise by the estimated variance, giving approximate correlations.
theta	Oscillation strength parameter.
epsilon	Tolerance for detecting points close to distance zero.

Details

On R^d , the models are *defined* by the spectral density given by

$$S(w) = \frac{1}{(2\pi)^d (\kappa^4 + 2\kappa^2 \cos(\pi\theta) |w|^2 + |w|^4)^{(\nu+d/2)/2}}$$

On S^2 , the models are *defined* by the spectral coefficients

$$S(k) = \frac{2k+1}{4\pi (\kappa^4 + 2\kappa^2 \cos(\pi\theta) k(k+1) + k^2(k+1)^2)^{(\nu+1)/2}}$$

Author(s)

Finn Lindgren <finn.lindgren@gmail.com>

inla.mdata

Create an mdata-object for INLA

Description

This defines an mdata-object for matrix valued response-families

Usage

```
inla.mdata(y, ...)
## S3 method for class 'inla.mdata'
print(x, ...)
is.inla.mdata(object)
as.inla.mdata(object)
```

Arguments

y	The response vector/matrix
...	Additional vectors/matrices of same length as y
object	Any R-object
x	An mdata object

Value

An object of class `inla.mdata`. There is method for `print`.

`is.inla.mdata` returns TRUE if object inherits from class `inla.mdata`, otherwise FALSE.

`as.inla.mdata` returns an object of class `inla.mdata`

Author(s)

Havard Rue

See Also

[inla](#)

inla.mesh.1d

Function space definition objects for 1D SPDE models.

Description

Create a 1D mesh specification `inla.mesh.1d` object, that defines a function space for 1D SPDE models.

Usage

```
inla.mesh.1d(loc,
             interval = range(loc),
             boundary = NULL,
             degree = 1,
             free.clamped = FALSE,
             ...)
```

Arguments

<code>loc</code>	B-spline knot locations.
<code>interval</code>	Interval domain endpoints.
<code>boundary</code>	Boundary condition specification. Valid conditions are <code>c('neumann', 'dirichlet', 'free', 'cy</code> . Two separate values can be specified, one applied to each endpoint.
<code>degree</code>	The B-spline basis degree. Supported values are 0, 1, and 2.
<code>free.clamped</code>	If TRUE, for 'free' boundaries, clamp the basis functions to the interval endpoints.
<code>...</code>	Additional option, currently unused.

Author(s)

Finn Lindgren <finn.lindgren@gmail.com>

inla.mesh.1d.A	<i>Mapping matrix for 1D meshes</i>
----------------	-------------------------------------

Description

Calculates barycentric coordinates and weight matrices for [inla.mesh.1d](#) objects.

Usage

```
inla.mesh.1d.A(mesh, loc, weights = NULL, derivatives = NULL,
               method = c("linear", "nearest", "quadratic"))

inla.mesh.1d.bary(mesh, loc, method = c("linear", "nearest"))
```

Arguments

mesh	An inla.mesh.1d object.
loc	Coordinate values.
weights	Weights to be applied to the A matrix rows.
derivatives	If TRUE, also compute derivative weight matrices dA and d2A.
method	Interpolation method. If not specified for inla.mesh.1d.A (recommended), it is determined by the mesh basis function properties.

Author(s)

Finn Lindgren <finn.lindgren@gmail.com>

inla.mesh.2d	<i>High-quality triangulations</i>
--------------	------------------------------------

Description

Create a triangle mesh based on initial point locations, specified or automatic boundaries, and mesh quality parameters.

Usage

```
inla.mesh.2d(loc = NULL,
             loc.domain = NULL,
             offset = NULL,
             n = NULL,
             boundary = NULL,
             interior = NULL,
             max.edge,
             min.angle = NULL,
             cutoff = 1e-12,
             max.n.strict = NULL,
             max.n = NULL,
             plot.delay = NULL,
             crs = NULL)
```

inla.mesh.basis	<i>Basis functions for inla.mesh</i>
-----------------	--------------------------------------

Description

Calculate basis functions on a 1d or 2d [inla.mesh](#)

Usage

```
inla.mesh.basis(mesh,
                type="b.spline",
                n=3,
                degree=2,
                knot.placement="uniform.area",
                rot.inv=TRUE,
                boundary="free",
                free.clamped=TRUE,
                ...)
```

Arguments

mesh	An <code>inla.mesh.1d</code> or <code>inla.mesh</code> object.
type	<code>b.spline</code> (default) for B-spline basis functions, <code>sph.harm</code> for spherical harmonics (available opnly for meshes on the sphere)
n	For B-splines, the number of basis functions in each direction (for 1d meshes n must be a scalar, and for planar 2d meshes a 2-vector). For spherical harmonics, n is the maximal harmonic order.
degree	Degree of B-spline polynomials. See inla.mesh.1d .
knot.placement	For B-splines on the sphere, controls the latitudinal placements of knots. <code>"uniform.area"</code> (default) gives uniform spacing in <code>sin(latitude)</code> , <code>"uniform.latitude"</code> gives uniform spacing in latitudes.
rot.inv	For spherical harmonics on a sphere, <code>rot.inv=TRUE</code> gives the rotationally invariant subset of basis functions.
boundary	Boundary specification, default is free boundaries. See inla.mesh.1d for more information.
free.clamped	If <code>TRUE</code> and boundary is <code>"free"</code> , the boundary basis functions are clamped to 0/1 at the interval boundary by repeating the boundary knots.
...	

Author(s)

Finn Lindgren <finn.lindgren@gmail.com>

See Also

[inla.mesh.1d](#) [inla.mesh.2d](#)

Examples

```

n = 100
loc = matrix(runif(n*2), n, 2)
mesh = inla.mesh.2d(loc, max.edge=0.05)
basis = inla.mesh.basis(mesh, n=c(4,5))

proj = inla.mesh.projector(mesh)
image(proj$x, proj$y, inla.mesh.project(proj, basis[,7]))

if (require(rgl)) {
  plot(mesh, rgl=TRUE, col=basis[,7], draw.edges=FALSE, draw.vertices=FALSE)
}

```

inla.mesh.boundary	<i>Constraint segment extraction for inla.mesh</i>
--------------------	--

Description

Constructs an list of `inla.mesh.segment` object from boundary or interior constraint information in an `inla.mesh` object.

Usage

```

inla.mesh.boundary(mesh, grp = NULL)
inla.mesh.interior(mesh, grp = NULL)

```

Arguments

mesh	An <code>inla.mesh</code> object.
grp	Group indices to extract. If <code>NULL</code> , all boundary/interior constrain groups are extracted.

Value

A list of `inla.mesh.segment` objects.

Author(s)

Finn Lindgren <finn.lindgren@gmail.com>

See Also

[inla.mesh.segment](#), [inla.mesh.create](#), [inla.mesh.create.helper](#)

Examples

```

loc = matrix(runif(100*2)*1000,100,2)
mesh = inla.mesh.create.helper(points.domain=loc, max.edge=c(50,500))
boundary = inla.mesh.boundary(mesh)
interior = inla.mesh.interior(mesh)

```

inla.mesh.create	<i>Low level function for high-quality triangulations</i>
------------------	---

Description

Create a constrained refined Delaunay triangulation (CRDT) for a set of spatial locations.

Usage

```
inla.mesh.create(loc = NULL,
                 tv = NULL,
                 boundary = NULL, interior = NULL,
                 extend = (missing(tv) || is.null(tv)),
                 refine = FALSE,
                 lattice = NULL,
                 globe = NULL,
                 cutoff = 1e-12,
                 plot.delay = NULL,
                 data.dir,
                 keep = (!missing(data.dir) && !is.null(data.dir)),
                 timings = FALSE,
                 quality.spec = NULL,
                 crs=NULL)

inla.delaunay(loc, ...)
```

Arguments

loc	Matrix of point locations. Can alternatively be a SpatialPoints or SpatialPointsDataFrame object.
tv	A triangle-vertex index matrix, specifying an existing triangulation.
boundary	A list of inla.mesh.segment objects, generated by inla.mesh.segment , specifying boundary constraint segments.
interior	A list of inla.mesh.segment objects, generated by inla.mesh.segment , specifying interior constraint segments.
extend	logical or list specifying whether to extend the data region, with parameters n the number of edges in the extended boundary (default=8) offset the extension distance. If negative, interpreted as a factor relative to the approximate data diameter (default=-0.10) Setting to FALSE is only useful in combination lattice or boundary.
refine	logical or list specifying whether to refine the triangulation, with parameters min.angle the minimum allowed interior angle in any triangle. The algorithm is guaranteed to converge for min.angle at most 21 (default=21) max.edge the maximum allowed edge length in any triangle. If negative, interpreted as a relative factor in an ad hoc formula depending on the data density (default=Inf) max.n.strict the maximum number of vertices allowed, overriding min.angle and max.edge (default=-1, meaning no limit)


```

                                extend=TRUE,
                                refine=list(max.edge=0.1))
plot(mesh)

loc2 = matrix(c(0,1,1,0, 0,0,1,1), 4, 2);
mesh2 = inla.mesh.create(loc=loc,
                        boundary=inla.mesh.segment(loc2),
                        interior=inla.mesh.segment(idx=1:2),
                        quality.spec=list(segm=0.2, loc=0.05),
                        refine=list(min.angle=26))
plot(mesh2)

```

inla.mesh.deriv	<i>Directional derivative matrices for functions on meshes.</i>
-----------------	---

Description

Calculates directional derivative matrices for functions on [inla.mesh](#) objects.

Usage

```
inla.mesh.deriv(mesh, loc)
```

Arguments

mesh	An inla.mesh object.
loc	Coordinates where the derivatives should be evaluated.

Value

A	The projection matrix, $u(\text{loc}_i) = \sum_j A_{ij} w_j$
dx, dy, dz	Derivative weight matrices, $du/dx(\text{loc}_i) = \sum_j dx_{ij} w_j$, etc.

Author(s)

Finn Lindgren <finn.lindgren@gmail.com>

inla.mesh.fem	<i>Finite element matrices</i>
---------------	--------------------------------

Description

Constructs finite element matrices for [inla.mesh](#) and [inla.mesh.1d](#) objects.

Usage

```

## 2D and 1D meshes
inla.mesh.fem(mesh, order = 2)

## 1D meshes, order 2 models only
inla.mesh.1d.fem(mesh)

```


Arguments

mesh	An inla.mesh or inla.mesh.1d object.
order	The model order.

Value

A list of sparse matrices based on basis functions `psi_i`:

<code>c0</code>	<code>c0[i,j] = < psi_i, 1 ></code>
<code>c1</code>	<code>c1[i,j] = < psi_i, psi_j ></code>
<code>g1</code>	<code>g1[i,j] = < grad psi_i, grad psi_j ></code>
<code>g2</code>	<code>g2 = g1 * c0^-1 * g1</code>
<code>gk</code>	<code>gk = g1 * (c0^-1 * g1)^(k-1)</code> , up to and including <code>k=order</code>

Author(s)

Finn Lindgren <finn.lindgren@gmail.com>

inla.mesh.lattice	<i>Lattice grids for inla.mesh</i>
-------------------	------------------------------------

Description

Construct a lattice grid for [inla.mesh](#)

Usage

```
inla.mesh.lattice(x = seq(0, 1, length.out=2),
  y = seq(0, 1, length.out=2),
  z = NULL,
  dims = if (is.matrix(x)) {
    dim(x)
  } else {
    c(length(x), length(y))
  },
  units = NULL,
  crs = NULL)
```

Arguments

x	
y	
z	
dims	
units	One of <code>c("default", "longlat", "longsinlat")</code> .
crs	An optional CRS or <code>inla.CRS</code> object

Arguments

loc	Coordinates to be mapped.
projection	The projection type.
inverse	If TRUE, loc are map coordinates and coordinates in the mesh domain are calculated. If FALSE, loc are coordinates in the mesh domain and the forward map projection is calculated.

Value

For inla.mesh.map.lim, a list:

xlim	X axis limits in the map domain
ylim	Y axis limits in the map domain

No attempt is made to find minimal limits for partial spherical domains.

Author(s)

Finn Lindgren <finn.lindgren@gmail.com>

See Also

[inla.mesh.project](#)

inla.mesh.project	<i>Methods for projecting to/from an inla.mesh</i>
-------------------	--

Description

Calculate a lattice projection to/from an [inla.mesh](#)

Usage

```
inla.mesh.project(...)
inla.mesh.projector(...)

## S3 method for class 'inla.mesh'
inla.mesh.projector(mesh,
  loc = NULL,
  lattice = NULL,
  xlim = NULL,
  ylim = NULL,
  dims = c(100,100),
  projection = NULL,
  crs = NULL,
  ...)

## S3 method for class 'inla.mesh.1d'
inla.mesh.projector(mesh,
  loc = NULL,
  xlim = mesh$interval,
```

```

        dims = 100, ...)

## S3 method for class 'inla.mesh.projector'
inla.mesh.project(projector, field, ...)

## S3 method for class 'inla.mesh'
inla.mesh.project(mesh, loc, field = NULL,
                  crs=NULL,
                  ...)
## S3 method for class 'inla.mesh.1d'
inla.mesh.project(mesh, loc, field = NULL, ...)

```

Arguments

mesh	An inla.mesh or inla.mesh.1d object.
loc	Projection locations. Can be a matrix or a <code>SpatialPoints</code> or a <code>SpatialPointsDataFrame</code> object.
lattice	An inla.mesh.lattice object.
xlim	X-axis limits for a lattice. For R2 meshes, defaults to covering the domain.
ylim	Y-axis limits for a lattice. For R2 meshes, defaults to covering the domain.
dims	Lattice dimensions.
projector	An <code>inla.mesh.projector</code> object.
field	Basis function weights, one per mesh basis function, describing the function to be evaluated at the projection locations. <code>ssFunction</code> values for on the mesh
projection	One of <code>c("default", "longlat", "longsinlat", "mollweide")</code> .
crs	An optional CRS or <code>inla.CRS</code> object associated with <code>loc</code> and/or <code>lattice</code> .
...	Additional arguments passed on to methods.

Details

The call `inla.mesh.project(mesh, loc, field=..., ...)`, is a shortcut to `inla.mesh.project(inla.mesh.projector(mesh, loc), field)`.

Value

For `inla.mesh.project(mesh, ...)`, a list with projection information. For `inla.mesh.projector(mesh, ...)`, an `inla.mesh.projector` object. For `inla.mesh.project(projector, field, ...)`, a field projected from the mesh onto the locations given by the projector object.

Author(s)

Finn Lindgren <finn.lindgren@gmail.com>

See Also

[inla.mesh](#), [inla.mesh.1d](#), [inla.mesh.lattice](#)

Examples

```

n = 20
loc = matrix(runif(n*2), n, 2)
mesh = inla.mesh.create(loc, refine=list(max.edge=0.05))
proj = inla.mesh.projector(mesh)
field = cos(mesh$loc[,1]*2*pi*3)*sin(mesh$loc[,2]*2*pi*7)
image(proj$x, proj$y, inla.mesh.project(proj, field))

if (require(rgl)) {
  plot(mesh, rgl=TRUE, col=field, draw.edges=FALSE, draw.vertices=FALSE)
}

```

inla.mesh.query	<i>High-quality triangulations</i>
-----------------	------------------------------------

Description

Query information about an inla.mesh object.

Usage

```
inla.mesh.query(mesh, ...)
```

Arguments

mesh	An inla.mesh object.
...	Query arguments. <ul style="list-style-type: none"> • tt.neighbours Compute neighbour triangles for triangles; list of vectors: list(triangles, orders) • vt.neighbours Compute neighbour triangles for vertices; list of vectors: list(vertices, orders)

Value

A list of query results.

Author(s)

Finn Lindgren <finn.lindgren@gmail.com>

See Also

[inla.mesh.create](#), [inla.mesh.segment](#), [inla.mesh.lattice](#)

Examples

```
loc = matrix(c(0.1,0.15),1,2)
lattice = inla.mesh.lattice(dims=c(10,10))
mesh = inla.mesh.create(loc=loc, lattice=lattice, extend=FALSE)

vt = which(inla.mesh.query(mesh,
                           vt.neighbours=list(mesh$idx$loc,
                                                4:6))$vt.neighbours)

mesh2 = inla.mesh.create(mesh$loc, tv=mesh$graph$tv[vt,,drop=FALSE],
                          refine=FALSE, extend=FALSE)
```

inla.mesh.segment	<i>Constraint segments for inla.mesh</i>
-------------------	--

Description

Constructs `inla.mesh.segment` objects that can be used to specify boundary and interior constraint edges in calls to [inla.mesh](#).

Usage

```
## Create or join inla.mesh.segment objects.
inla.mesh.segment(...)
## Default S3 method:
inla.mesh.segment(loc = NULL, idx = NULL, grp = NULL,
                  is.bnd = TRUE, crs = NULL, ...)
## S3 method for class 'inla.mesh.segment'
inla.mesh.segment(..., grp.default = 0)

inla.contour.segment(x = seq(0, 1, length.out = nrow(z)),
                     y = seq(0, 1, length.out = ncol(z)),
                     z,
                     nlevels = 10,
                     levels = pretty(range(z, na.rm = TRUE), nlevels),
                     groups = seq_len(length(levels)),
                     positive = TRUE,
                     eps = NULL,
                     crs = NULL)
```

Arguments

<code>loc</code>	Matrix of point locations.
<code>idx</code>	Segment index sequence vector or index pair matrix. The indices refer to the rows of <code>loc</code> . If <code>loc==NULL</code> , the indices will be interpreted as indices into the point specification supplied to inla.mesh.create . If <code>is.bnd==TRUE</code> , defaults to linking all the points in <code>loc</code> , as <code>c(1:nrow(loc), 1L)</code> , otherwise <code>1:nrow(loc)</code> .
<code>grp</code>	Vector of group labels for each segment. Set to <code>NULL</code> to let the labels be chosen automatically in a call to inla.mesh.create .
<code>is.bnd</code>	TRUE if the segments are boundary segments, otherwise FALSE.

grp.default	When joining segments, use this group label for segments that have grp=NULL.
x, y, z, nlevels, levels	Parameters specifying a set of surface contours, with syntax described in contour .
groups	Vector of group ID:s, one for each contour level.
positive	TRUE if the contours should encircle positive level excursions in a counter clock-wise direction.
eps	Tolerance for inla.simplify.curve .
crs	An optional CRS or inla.CRS object
...	Additional parameters. When joining segments, a list of inla.mesh.segment objects.

Value

An inla.mesh.segment object.

Author(s)

Finn Lindgren <finn.lindgren@gmail.com>

See Also

[inla.mesh.create](#), [inla.mesh.2d](#)

Examples

```
## Create a square boundary and a diagonal interior segment
loc.bnd = matrix(c(0,0, 1,0, 1,1, 0,1), 4, 2, byrow=TRUE)
loc.int = matrix(c(0.9,0.1, 0.1,0.6), 2, 2, byrow=TRUE)
segm.bnd = inla.mesh.segment(loc.bnd)
segm.int = inla.mesh.segment(loc.int, is.bnd=FALSE)

## Points to be meshed
loc = matrix(runif(10*2),10,2)*0.9+0.05
mesh = inla.mesh.create(loc,
                        boundary=segm.bnd,
                        interior=segm.int,
                        refine=list())

plot(mesh)

## Not run:
mesh = inla.mesh.create(loc, interior=list(segm.bnd, segm.int))
plot(mesh)

## End(Not run)
```

inla.models

*Valid models in INLA***Description**

This page describe the models implemented in inla, divided into sections: latent, group, mix, link, predictor, hazard, likelihood, prior, wrapper .

Usage

```
inla.models()
```

Value

Valid sections are: latent, group, mix, link, predictor, hazard, likelihood, prior, wrapper

Section ‘latent’. Valid models in this section are:

Model ‘linear’. Number of hyperparameters are 0.

Model ‘iid’. Number of hyperparameters are 1.

Hyperparameter ‘theta’ `hyperid = ‘1001’`

`name = ‘log precision’`

`short.name = ‘prec’`

`prior = ‘loggamma’`

`param = ‘1 5e-05’`

`initial = ‘4’`

`fixed = ‘FALSE’`

`to.theta = ‘function(x) log(x)’`

`from.theta = ‘function(x) exp(x)’`

Properties: `constr = ‘FALSE’`

`nrow.ncol = ‘FALSE’`

`augmented = ‘FALSE’`

`aug.factor = ‘1’`

`aug.constr = ‘NULL’`

`n.div.by = ‘NULL’`

`n.required = ‘FALSE’`

`set.default.values = ‘FALSE’`

`pdf = ‘indep’`

Model ‘mec’. Number of hyperparameters are 4.

Hyperparameter ‘theta1’ `hyperid = ‘2001’`

`name = ‘beta’`

`short.name = ‘b’`

`prior = ‘gaussian’`

`param = ‘1 0.001’`

`initial = ‘1’`

`fixed = ‘FALSE’`

`to.theta = ‘function(x) x’`


```

    from.theta = 'function(x) x'
Hyperparameter 'theta2' hyperid = '2002'
    name = 'prec.u'
    short.name = 'prec'
    prior = 'loggamma'
    param = '1 1e-04'
    initial = '9.21034037197618'
    fixed = 'TRUE'
    to.theta = 'function(x) log(x)'
    from.theta = 'function(x) exp(x)'
Hyperparameter 'theta3' hyperid = '2003'
    name = 'mean.x'
    short.name = 'mu.x'
    prior = 'gaussian'
    param = '0 1e-04'
    initial = '0'
    fixed = 'TRUE'
    to.theta = 'function(x) x'
    from.theta = 'function(x) x'
Hyperparameter 'theta4' hyperid = '2004'
    name = 'prec.x'
    short.name = 'prec.x'
    prior = 'loggamma'
    param = '1 10000'
    initial = '-9.21034037197618'
    fixed = 'TRUE'
    to.theta = 'function(x) log(x)'
    from.theta = 'function(x) exp(x)'
Properties: constr = 'FALSE'
    nrow.ncol = 'FALSE'
    augmented = 'FALSE'
    aug.factor = '1'
    aug.constr = 'NULL'
    n.div.by = 'NULL'
    n.required = 'FALSE'
    set.default.values = 'FALSE'
    status = 'experimental'
    pdf = 'mec'
Model 'meb'. Number of hyperparameters are 2.
Hyperparameter 'theta1' hyperid = '3001'
    name = 'beta'
    short.name = 'b'
    prior = 'gaussian'
    param = '1 0.001'
    initial = '1'

```

```

    fixed = 'FALSE'
    to.theta = 'function(x) x'
    from.theta = 'function(x) x'
Hyperparameter 'theta2' hyperid = '3002'
    name = 'prec.u'
    short.name = 'prec'
    prior = 'loggamma'
    param = '1 1e-04'
    initial = '6.90775527898214'
    fixed = 'FALSE'
    to.theta = 'function(x) log(x)'
    from.theta = 'function(x) exp(x)'
Properties: constr = 'FALSE'
    nrow.ncol = 'FALSE'
    augmented = 'FALSE'
    aug.factor = '1'
    aug.constr = 'NULL'
    n.div.by = 'NULL'
    n.required = 'FALSE'
    set.default.values = 'FALSE'
    status = 'experimental'
    pdf = 'meb'

```

Model 'rgeneric'. Number of hyperparameters are 0.

Model 'rw1'. Number of hyperparameters are 1.

```

Hyperparameter 'theta' hyperid = '4001'
    name = 'log precision'
    short.name = 'prec'
    prior = 'loggamma'
    param = '1 5e-05'
    initial = '4'
    fixed = 'FALSE'
    to.theta = 'function(x) log(x)'
    from.theta = 'function(x) exp(x)'
Properties: constr = 'TRUE'
    nrow.ncol = 'FALSE'
    augmented = 'FALSE'
    aug.factor = '1'
    aug.constr = 'NULL'
    n.div.by = 'NULL'
    n.required = 'FALSE'
    set.default.values = 'FALSE'
    min.diff = '1e-05'
    pdf = 'rw1'

```

Model 'rw2'. Number of hyperparameters are 1.

```

Hyperparameter 'theta' hyperid = '5001'

```

```

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

```

Properties: `constr = 'TRUE'`

```

nrow.ncol = 'FALSE'
augmented = 'FALSE'
aug.factor = '1'
aug.constr = 'NULL'
n.div.by = 'NULL'
n.required = 'FALSE'
set.default.values = 'FALSE'
min.diff = '0.001'
pdf = 'rw2'

```

Model 'crw2'. Number of hyperparameters are 1.

Hyperparameter 'theta' hyperid = '6001'

```

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

```

Properties: `constr = 'TRUE'`

```

nrow.ncol = 'FALSE'
augmented = 'FALSE'
aug.factor = '2'
aug.constr = '1'
n.div.by = 'NULL'
n.required = 'FALSE'
set.default.values = 'FALSE'
min.diff = '0.001'
pdf = 'crw2'

```

Model 'seasonal'. Number of hyperparameters are 1.

Hyperparameter 'theta' hyperid = '7001'

```

name = 'log precision'
short.name = 'prec'
prior = 'loggamma'
param = '1 5e-05'
initial = '4'

```

```

fixed = 'FALSE'
to.theta = 'function(x) log(x)'
from.theta = 'function(x) exp(x)'

```

Properties: `constr = 'FALSE'`

```

nrow.ncol = 'FALSE'
augmented = 'FALSE'
aug.factor = '1'
aug.constr = 'NULL'
n.div.by = 'NULL'
n.required = 'FALSE'
set.default.values = 'FALSE'
pdf = 'seasonal'

```

Model 'besag'. Number of hyperparameters are 1.

Hyperparameter 'theta' hyperid = '8001'

```

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

```

Properties: `constr = 'TRUE'`

```

nrow.ncol = 'FALSE'
augmented = 'FALSE'
aug.factor = '1'
aug.constr = 'NULL'
n.div.by = 'NULL'
n.required = 'TRUE'
set.default.values = 'TRUE'
pdf = 'besag'

```

Model 'besag2'. Number of hyperparameters are 2.

Hyperparameter 'theta1' hyperid = '9001'

```

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

```

Hyperparameter 'theta2' hyperid = '9002'

```

name = 'scaling parameter'
short.name = 'a'
prior = 'loggamma'

```

```

    param = '10 10'
    initial = '0'
    fixed = 'FALSE'
    to.theta = 'function(x) log(x)'
    from.theta = 'function(x) exp(x)'
Properties: constr = 'FALSE'
    nrow.ncol = 'FALSE'
    augmented = 'FALSE'
    aug.factor = '1'
    aug.constr = '1 2'
    n.div.by = '2'
    n.required = 'TRUE'
    set.default.values = 'TRUE'
    pdf = 'besag2'
Model 'bym'. Number of hyperparameters are 2.
    Hyperparameter 'theta1' hyperid = '10001'
        name = 'log unstructured precision'
        short.name = 'prec.unstruct'
        prior = 'loggamma'
        param = '1 5e-04'
        initial = '4'
        fixed = 'FALSE'
        to.theta = 'function(x) log(x)'
        from.theta = 'function(x) exp(x)'
    Hyperparameter 'theta2' hyperid = '10002'
        name = 'log spatial precision'
        short.name = 'prec.spatial'
        prior = 'loggamma'
        param = '1 5e-04'
        initial = '4'
        fixed = 'FALSE'
        to.theta = 'function(x) log(x)'
        from.theta = 'function(x) exp(x)'
    Properties: constr = 'TRUE'
        nrow.ncol = 'FALSE'
        augmented = 'TRUE'
        aug.factor = '2'
        aug.constr = '2'
        n.div.by = 'NULL'
        n.required = 'TRUE'
        set.default.values = 'TRUE'
        pdf = 'bym'
Model 'bym2'. Number of hyperparameters are 2.
    Hyperparameter 'theta1' hyperid = '11001'
        name = 'log precision'

```

```

    short.name = 'prec'
    prior = 'pc.prec'
    param = '1 0.01'
    initial = '4'
    fixed = 'FALSE'
    to.theta = 'function(x) log(x)'
    from.theta = 'function(x) exp(x)'
Hyperparameter 'theta2' hyperid = '11002'
    name = 'logit phi'
    short.name = 'phi'
    prior = 'pc'
    param = '0.5 0.5'
    initial = '-3'
    fixed = 'FALSE'
    to.theta = 'function(x) log(x/(1-x))'
    from.theta = 'function(x) exp(x)/(1+exp(x))'
Properties: constr = 'TRUE'
    nrow.ncol = 'FALSE'
    augmented = 'TRUE'
    aug.factor = '2'
    aug.constr = '2'
    n.div.by = 'NULL'
    n.required = 'TRUE'
    set.default.values = 'TRUE'
    status = 'experimental'
    pdf = 'bym2'
Model 'besagproper'. Number of hyperparameters are 2.
Hyperparameter 'theta1' hyperid = '12001'
    name = 'log precision'
    short.name = 'prec'
    prior = 'loggamma'
    param = '1 5e-04'
    initial = '2'
    fixed = 'FALSE'
    to.theta = 'function(x) log(x)'
    from.theta = 'function(x) exp(x)'
Hyperparameter 'theta2' hyperid = '12002'
    name = 'log diagonal'
    short.name = 'diag'
    prior = 'loggamma'
    param = '1 1'
    initial = '1'
    fixed = 'FALSE'
    to.theta = 'function(x) log(x)'
    from.theta = 'function(x) exp(x)'

```

```

Properties: constr = 'FALSE'
nrow.ncol = 'FALSE'
augmented = 'FALSE'
aug.factor = '1'
aug.constr = 'NULL'
n.div.by = 'NULL'
n.required = 'TRUE'
set.default.values = 'TRUE'
status = 'experimental'
pdf = 'besagproper'

```

Model 'besagproper2'. Number of hyperparameters are 2.

```

Hyperparameter 'theta1' hyperid = '13001'
name = 'log precision'
short.name = 'prec'
prior = 'loggamma'
param = '1 5e-04'
initial = '2'
fixed = 'FALSE'
to.theta = 'function(x) log(x)'
from.theta = 'function(x) exp(x)'

```

```

Hyperparameter 'theta2' hyperid = '13002'
name = 'logit lambda'
short.name = 'lambda'
prior = 'gaussian'
param = '0 0.45'
initial = '3'
fixed = 'FALSE'
to.theta = 'function(x) log(x/(1-x))'
from.theta = 'function(x) exp(x)/(1+exp(x))'

```

```

Properties: constr = 'FALSE'
nrow.ncol = 'FALSE'
augmented = 'FALSE'
aug.factor = '1'
aug.constr = 'NULL'
n.div.by = 'NULL'
n.required = 'TRUE'
set.default.values = 'TRUE'
status = 'experimental'
pdf = 'besagproper2'

```

Model 'fgn'. Number of hyperparameters are 2.

```

Hyperparameter 'theta1' hyperid = '13101'
name = 'log precision'
short.name = 'prec'
prior = 'pc.prec'
param = '3 0.01'

```

```

    initial = '1'
    fixed = 'FALSE'
    to.theta = 'function(x) log(x)'
    from.theta = 'function(x) exp(x)'
Hyperparameter 'theta2' hyperid = '13102'
    name = 'logit H'
    short.name = 'H'
    prior = 'pcfgnh'
    param = '0.9 0.1'
    initial = '2'
    fixed = 'FALSE'
    to.theta = 'function(x) log((2*x-1)/(2*(1-x)))'
    from.theta = 'function(x) 0.5 + 0.5*exp(x)/(1+exp(x))'
Properties: constr = 'FALSE'
    nrow.ncol = 'FALSE'
    augmented = 'TRUE'
    aug.factor = '4'
    aug.constr = '1'
    n.div.by = 'NULL'
    n.required = 'FALSE'
    set.default.values = 'TRUE'
    order.default = '3'
    order.defined = '3'
    pdf = 'fgn'
Model 'ar1'. Number of hyperparameters are 3.
Hyperparameter 'theta1' hyperid = '14001'
    name = 'log precision'
    short.name = 'prec'
    prior = 'loggamma'
    param = '1 5e-05'
    initial = '4'
    fixed = 'FALSE'
    to.theta = 'function(x) log(x)'
    from.theta = 'function(x) exp(x)'
Hyperparameter 'theta2' hyperid = '14002'
    name = 'logit lag one correlation'
    short.name = 'rho'
    prior = 'normal'
    param = '0 0.15'
    initial = '2'
    fixed = 'FALSE'
    to.theta = 'function(x) log((1+x)/(1-x))'
    from.theta = 'function(x) 2*exp(x)/(1+exp(x))-1'
Hyperparameter 'theta3' hyperid = '14003'
    name = 'mean'

```



```

short.name = 'mean'
prior = 'normal'
param = '0 1'
initial = '0'
fixed = 'TRUE'
to.theta = 'function(x) x'
from.theta = 'function(x) x'

```

```

Properties: constr = 'FALSE'
nrow.ncol = 'FALSE'
augmented = 'FALSE'
aug.factor = '1'
aug.constr = 'NULL'
n.div.by = 'NULL'
n.required = 'FALSE'
set.default.values = 'FALSE'
pdf = 'ar1'

```

Model 'ar'. Number of hyperparameters are 11.

Hyperparameter 'theta1' hyperid = '15001'

```

name = 'log precision'
short.name = 'prec'
initial = '4'
fixed = 'FALSE'
prior = 'pc.prec'
param = '3 0.01'
to.theta = 'function(x) log(x)'
from.theta = 'function(x) exp(x)'

```

Hyperparameter 'theta2' hyperid = '15002'

```

name = 'pacf1'
short.name = 'pacf1'
initial = '1'
fixed = 'FALSE'
prior = 'pc.cor0'
param = '0.5 0.5'
to.theta = 'function(x) log((1+x)/(1-x))'
from.theta = 'function(x) 2*exp(x)/(1+exp(x))-1'

```

Hyperparameter 'theta3' hyperid = '15003'

```

name = 'pacf2'
short.name = 'pacf2'
initial = '0'
fixed = 'FALSE'
prior = 'pc.cor0'
param = '0.5 0.4'
to.theta = 'function(x) log((1+x)/(1-x))'
from.theta = 'function(x) 2*exp(x)/(1+exp(x))-1'

```

Hyperparameter 'theta4' hyperid = '15004'

```

name = 'pacf3'
short.name = 'pacf3'
initial = '0'
fixed = 'FALSE'
prior = 'pc.cor0'
param = '0.5 0.3'
to.theta = 'function(x) log((1+x)/(1-x))'
from.theta = 'function(x) 2*exp(x)/(1+exp(x))-1'
Hyperparameter 'theta5' hyperid = '15005'
name = 'pacf4'
short.name = 'pacf4'
initial = '0'
fixed = 'FALSE'
prior = 'pc.cor0'
param = '0.5 0.2'
to.theta = 'function(x) log((1+x)/(1-x))'
from.theta = 'function(x) 2*exp(x)/(1+exp(x))-1'
Hyperparameter 'theta6' hyperid = '15006'
name = 'pacf5'
short.name = 'pacf5'
initial = '0'
fixed = 'FALSE'
prior = 'pc.cor0'
param = '0.5 0.1'
to.theta = 'function(x) log((1+x)/(1-x))'
from.theta = 'function(x) 2*exp(x)/(1+exp(x))-1'
Hyperparameter 'theta7' hyperid = '15007'
name = 'pacf6'
short.name = 'pacf6'
initial = '0'
fixed = 'FALSE'
prior = 'pc.cor0'
param = '0.5 0.1'
to.theta = 'function(x) log((1+x)/(1-x))'
from.theta = 'function(x) 2*exp(x)/(1+exp(x))-1'
Hyperparameter 'theta8' hyperid = '15008'
name = 'pacf7'
short.name = 'pacf7'
initial = '0'
fixed = 'FALSE'
prior = 'pc.cor0'
param = '0.5 0.1'
to.theta = 'function(x) log((1+x)/(1-x))'
from.theta = 'function(x) 2*exp(x)/(1+exp(x))-1'
Hyperparameter 'theta9' hyperid = '15009'

```

```

    name = 'pacf8'
    short.name = 'pacf8'
    initial = '0'
    fixed = 'FALSE'
    prior = 'pc.cor0'
    param = '0.5 0.1'
    to.theta = 'function(x) log((1+x)/(1-x))'
    from.theta = 'function(x) 2*exp(x)/(1+exp(x))-1'
Hyperparameter 'theta10' hyperid = '15010'
    name = 'pacf9'
    short.name = 'pacf9'
    initial = '0'
    fixed = 'FALSE'
    prior = 'pc.cor0'
    param = '0.5 0.1'
    to.theta = 'function(x) log((1+x)/(1-x))'
    from.theta = 'function(x) 2*exp(x)/(1+exp(x))-1'
Hyperparameter 'theta11' hyperid = '15011'
    name = 'pacf10'
    short.name = 'pacf10'
    initial = '0'
    fixed = 'FALSE'
    prior = 'pc.cor0'
    param = '0.5 0.1'
    to.theta = 'function(x) log((1+x)/(1-x))'
    from.theta = 'function(x) 2*exp(x)/(1+exp(x))-1'
Properties: constr = 'FALSE'
    nrow.ncol = 'FALSE'
    augmented = 'FALSE'
    aug.factor = '1'
    aug.constr = 'NULL'
    n.div.by = 'NULL'
    n.required = 'FALSE'
    set.default.values = 'FALSE'
    status = 'experimental'
    pdf = 'ar'
Model 'ou'. Number of hyperparameters are 2.
Hyperparameter 'theta1' hyperid = '16001'
    name = 'log precision'
    short.name = 'prec'
    prior = 'loggamma'
    param = '1 5e-05'
    initial = '4'
    fixed = 'FALSE'
    to.theta = 'function(x) log(x)'

```

```

    from.theta = 'function(x) exp(x)'
Hyperparameter 'theta2' hyperid = '16002'
    name = 'log phi'
    short.name = 'phi'
    prior = 'normal'
    param = '0 0.2'
    initial = '-1'
    fixed = 'FALSE'
    to.theta = 'function(x) log(x)'
    from.theta = 'function(x) exp(x)'
Properties: constr = 'FALSE'
    nrow.ncol = 'FALSE'
    augmented = 'FALSE'
    aug.factor = '1'
    aug.constr = 'NULL'
    n.div.by = 'NULL'
    n.required = 'FALSE'
    set.default.values = 'FALSE'
    pdf = 'ou'

```

Model 'generic'. Number of hyperparameters are 1.

```

Hyperparameter 'theta' hyperid = '17001'
    name = 'log precision'
    short.name = 'prec'
    prior = 'loggamma'
    param = '1 5e-05'
    initial = '4'
    fixed = 'FALSE'
    to.theta = 'function(x) log(x)'
    from.theta = 'function(x) exp(x)'
Properties: constr = 'FALSE'
    nrow.ncol = 'FALSE'
    augmented = 'FALSE'
    aug.factor = '1'
    aug.constr = 'NULL'
    n.div.by = 'NULL'
    n.required = 'TRUE'
    set.default.values = 'TRUE'
    pdf = 'generic0'

```

Model 'generic0'. Number of hyperparameters are 1.

```

Hyperparameter 'theta' hyperid = '18001'
    name = 'log precision'
    short.name = 'prec'
    prior = 'loggamma'
    param = '1 5e-05'
    initial = '4'

```

```

fixed = 'FALSE'
to.theta = 'function(x) log(x)'
from.theta = 'function(x) exp(x)'

```

Properties: `constr = 'FALSE'`

```

nrow.ncol = 'FALSE'
augmented = 'FALSE'
aug.factor = '1'
aug.constr = 'NULL'
n.div.by = 'NULL'
n.required = 'TRUE'
set.default.values = 'TRUE'
pdf = 'generic0'

```

Model 'generic1'. Number of hyperparameters are 2.

Hyperparameter 'theta1' hyperid = '19001'

```

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

```

Hyperparameter 'theta2' hyperid = '19002'

```

name = 'beta'
short.name = 'beta'
initial = '2'
fixed = 'FALSE'
prior = 'gaussian'
param = '0 0.1'
to.theta = 'function(x) log(x/(1-x))'
from.theta = 'function(x) exp(x)/(1+exp(x))'

```

Properties: `constr = 'FALSE'`

```

nrow.ncol = 'FALSE'
augmented = 'FALSE'
aug.factor = '1'
aug.constr = 'NULL'
n.div.by = 'NULL'
n.required = 'TRUE'
set.default.values = 'TRUE'
pdf = 'generic1'

```

Model 'generic2'. Number of hyperparameters are 2.

Hyperparameter 'theta1' hyperid = '20001'

```

name = 'log precision cmatrix'
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)'
Hyperparameter 'theta2' hyperid = '20002'
    name = 'log precision random'
    short.name = 'prec.random'
    initial = '4'
    fixed = 'FALSE'
    prior = 'loggamma'
    param = '1 0.001'
    to.theta = 'function(x) log(x)'
    from.theta = 'function(x) exp(x)'
Properties: constr = 'FALSE'
    nrow.ncol = 'FALSE'
    augmented = 'FALSE'
    aug.factor = '2'
    aug.constr = '2'
    n.div.by = 'NULL'
    n.required = 'TRUE'
    set.default.values = 'TRUE'
    pdf = 'generic2'
Model 'generic3'. Number of hyperparameters are 11.
Hyperparameter '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)'
Hyperparameter '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)'
Hyperparameter '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)'
Hyperparameter '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)'
Hyperparameter '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)'
Hyperparameter '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)'
Hyperparameter '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)'
Hyperparameter '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)'
Hyperparameter '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)'
Hyperparameter '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)'
Hyperparameter '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)'
Properties: constr = 'FALSE'
    nrow.ncol = 'FALSE'
    augmented = 'FALSE'
    aug.factor = '1'
    aug.constr = 'NULL'
    n.div.by = 'NULL'
    n.required = 'TRUE'
    set.default.values = 'TRUE'
    status = 'experimental'
    pdf = 'generic3'
Model 'spde'. Number of hyperparameters are 4.
Hyperparameter 'theta1' hyperid = '22001'

```



```

    name = 'theta.T'
    short.name = 'T'
    initial = '2'
    fixed = 'FALSE'
    prior = 'normal'
    param = '0 1'
    to.theta = 'function(x) x'
    from.theta = 'function(x) x'
Hyperparameter 'theta2' hyperid = '22002'
    name = 'theta.K'
    short.name = 'K'
    initial = '-2'
    fixed = 'FALSE'
    prior = 'normal'
    param = '0 1'
    to.theta = 'function(x) x'
    from.theta = 'function(x) x'
Hyperparameter 'theta3' hyperid = '22003'
    name = 'theta.KT'
    short.name = 'KT'
    initial = '0'
    fixed = 'FALSE'
    prior = 'normal'
    param = '0 1'
    to.theta = 'function(x) x'
    from.theta = 'function(x) x'
Hyperparameter 'theta4' hyperid = '22004'
    name = 'theta.OC'
    short.name = 'OC'
    initial = '-20'
    fixed = 'TRUE'
    prior = 'normal'
    param = '0 0.2'
    to.theta = 'function(x) log(x/(1-x))'
    from.theta = 'function(x) exp(x)/(1+exp(x))'
Properties: constr = 'FALSE'
    nrow.ncol = 'FALSE'
    augmented = 'FALSE'
    aug.factor = '1'
    aug.constr = 'NULL'
    n.div.by = 'NULL'
    n.required = 'TRUE'
    set.default.values = 'TRUE'
    pdf = 'spde'
Model 'spde2'. Number of hyperparameters are 100.

```

Hyperparameter ‘theta1’ hyperid = ‘23001’

```
name = ‘theta1’
short.name = ‘t1’
initial = ‘0’
fixed = ‘FALSE’
prior = ‘mvnorm’
param = ‘1 1’
to.theta = ‘function(x) x’
from.theta = ‘function(x) x’
```

Hyperparameter ‘theta2’ hyperid = ‘23002’

```
name = ‘theta2’
short.name = ‘t2’
initial = ‘0’
fixed = ‘FALSE’
prior = ‘none’
param = ‘’
to.theta = ‘function(x) x’
from.theta = ‘function(x) x’
```

Hyperparameter ‘theta3’ hyperid = ‘23003’

```
name = ‘theta3’
short.name = ‘t3’
initial = ‘0’
fixed = ‘FALSE’
prior = ‘none’
param = ‘’
to.theta = ‘function(x) x’
from.theta = ‘function(x) x’
```

Hyperparameter ‘theta4’ hyperid = ‘23004’

```
name = ‘theta4’
short.name = ‘t4’
initial = ‘0’
fixed = ‘FALSE’
prior = ‘none’
param = ‘’
to.theta = ‘function(x) x’
from.theta = ‘function(x) x’
```

Hyperparameter ‘theta5’ hyperid = ‘23005’

```
name = ‘theta5’
short.name = ‘t5’
initial = ‘0’
fixed = ‘FALSE’
prior = ‘none’
param = ‘’
to.theta = ‘function(x) x’
from.theta = ‘function(x) x’
```

Hyperparameter ‘theta6’ hyperid = ‘23006’

```
name = ‘theta6’
short.name = ‘t6’
initial = ‘0’
fixed = ‘FALSE’
prior = ‘none’
param = ‘’
to.theta = ‘function(x) x’
from.theta = ‘function(x) x’
```

Hyperparameter ‘theta7’ hyperid = ‘23007’

```
name = ‘theta7’
short.name = ‘t7’
initial = ‘0’
fixed = ‘FALSE’
prior = ‘none’
param = ‘’
to.theta = ‘function(x) x’
from.theta = ‘function(x) x’
```

Hyperparameter ‘theta8’ hyperid = ‘23008’

```
name = ‘theta8’
short.name = ‘t8’
initial = ‘0’
fixed = ‘FALSE’
prior = ‘none’
param = ‘’
to.theta = ‘function(x) x’
from.theta = ‘function(x) x’
```

Hyperparameter ‘theta9’ hyperid = ‘23009’

```
name = ‘theta9’
short.name = ‘t9’
initial = ‘0’
fixed = ‘FALSE’
prior = ‘none’
param = ‘’
to.theta = ‘function(x) x’
from.theta = ‘function(x) x’
```

Hyperparameter ‘theta10’ hyperid = ‘23010’

```
name = ‘theta10’
short.name = ‘t10’
initial = ‘0’
fixed = ‘FALSE’
prior = ‘none’
param = ‘’
to.theta = ‘function(x) x’
from.theta = ‘function(x) x’
```

Hyperparameter ‘theta11’ hyperid = ‘23011’

```
name = ‘theta11’
short.name = ‘t11’
initial = ‘0’
fixed = ‘FALSE’
prior = ‘none’
param = ‘’
to.theta = ‘function(x) x’
from.theta = ‘function(x) x’
```

Hyperparameter ‘theta12’ hyperid = ‘23012’

```
name = ‘theta12’
short.name = ‘t12’
initial = ‘0’
fixed = ‘FALSE’
prior = ‘none’
param = ‘’
to.theta = ‘function(x) x’
from.theta = ‘function(x) x’
```

Hyperparameter ‘theta13’ hyperid = ‘23013’

```
name = ‘theta13’
short.name = ‘t13’
initial = ‘0’
fixed = ‘FALSE’
prior = ‘none’
param = ‘’
to.theta = ‘function(x) x’
from.theta = ‘function(x) x’
```

Hyperparameter ‘theta14’ hyperid = ‘23014’

```
name = ‘theta14’
short.name = ‘t14’
initial = ‘0’
fixed = ‘FALSE’
prior = ‘none’
param = ‘’
to.theta = ‘function(x) x’
from.theta = ‘function(x) x’
```

Hyperparameter ‘theta15’ hyperid = ‘23015’

```
name = ‘theta15’
short.name = ‘t15’
initial = ‘0’
fixed = ‘FALSE’
prior = ‘none’
param = ‘’
to.theta = ‘function(x) x’
from.theta = ‘function(x) x’
```

Hyperparameter ‘theta16’ hyperid = ‘23016’

```

name = ‘theta16’
short.name = ‘t16’
initial = ‘0’
fixed = ‘FALSE’
prior = ‘none’
param = ‘’
to.theta = ‘function(x) x’
from.theta = ‘function(x) x’

```

Hyperparameter ‘theta17’ hyperid = ‘23017’

```

name = ‘theta17’
short.name = ‘t17’
initial = ‘0’
fixed = ‘FALSE’
prior = ‘none’
param = ‘’
to.theta = ‘function(x) x’
from.theta = ‘function(x) x’

```

Hyperparameter ‘theta18’ hyperid = ‘23018’

```

name = ‘theta18’
short.name = ‘t18’
initial = ‘0’
fixed = ‘FALSE’
prior = ‘none’
param = ‘’
to.theta = ‘function(x) x’
from.theta = ‘function(x) x’

```

Hyperparameter ‘theta19’ hyperid = ‘23019’

```

name = ‘theta19’
short.name = ‘t19’
initial = ‘0’
fixed = ‘FALSE’
prior = ‘none’
param = ‘’
to.theta = ‘function(x) x’
from.theta = ‘function(x) x’

```

Hyperparameter ‘theta20’ hyperid = ‘23020’

```

name = ‘theta20’
short.name = ‘t20’
initial = ‘0’
fixed = ‘FALSE’
prior = ‘none’
param = ‘’
to.theta = ‘function(x) x’
from.theta = ‘function(x) x’

```

Hyperparameter ‘theta21’ hyperid = ‘23021’

```

name = ‘theta21’
short.name = ‘t21’
initial = ‘0’
fixed = ‘FALSE’
prior = ‘none’
param = ‘’
to.theta = ‘function(x) x’
from.theta = ‘function(x) x’

```

Hyperparameter ‘theta22’ hyperid = ‘23022’

```

name = ‘theta22’
short.name = ‘t22’
initial = ‘0’
fixed = ‘FALSE’
prior = ‘none’
param = ‘’
to.theta = ‘function(x) x’
from.theta = ‘function(x) x’

```

Hyperparameter ‘theta23’ hyperid = ‘23023’

```

name = ‘theta23’
short.name = ‘t23’
initial = ‘0’
fixed = ‘FALSE’
prior = ‘none’
param = ‘’
to.theta = ‘function(x) x’
from.theta = ‘function(x) x’

```

Hyperparameter ‘theta24’ hyperid = ‘23024’

```

name = ‘theta24’
short.name = ‘t24’
initial = ‘0’
fixed = ‘FALSE’
prior = ‘none’
param = ‘’
to.theta = ‘function(x) x’
from.theta = ‘function(x) x’

```

Hyperparameter ‘theta25’ hyperid = ‘23025’

```

name = ‘theta25’
short.name = ‘t25’
initial = ‘0’
fixed = ‘FALSE’
prior = ‘none’
param = ‘’
to.theta = ‘function(x) x’
from.theta = ‘function(x) x’

```

Hyperparameter ‘theta26’ hyperid = ‘23026’

```

name = ‘theta26’
short.name = ‘t26’
initial = ‘0’
fixed = ‘FALSE’
prior = ‘none’
param = ‘’
to.theta = ‘function(x) x’
from.theta = ‘function(x) x’

```

Hyperparameter ‘theta27’ hyperid = ‘23027’

```

name = ‘theta27’
short.name = ‘t27’
initial = ‘0’
fixed = ‘FALSE’
prior = ‘none’
param = ‘’
to.theta = ‘function(x) x’
from.theta = ‘function(x) x’

```

Hyperparameter ‘theta28’ hyperid = ‘23028’

```

name = ‘theta28’
short.name = ‘t28’
initial = ‘0’
fixed = ‘FALSE’
prior = ‘none’
param = ‘’
to.theta = ‘function(x) x’
from.theta = ‘function(x) x’

```

Hyperparameter ‘theta29’ hyperid = ‘23029’

```

name = ‘theta29’
short.name = ‘t29’
initial = ‘0’
fixed = ‘FALSE’
prior = ‘none’
param = ‘’
to.theta = ‘function(x) x’
from.theta = ‘function(x) x’

```

Hyperparameter ‘theta30’ hyperid = ‘23030’

```

name = ‘theta30’
short.name = ‘t30’
initial = ‘0’
fixed = ‘FALSE’
prior = ‘none’
param = ‘’
to.theta = ‘function(x) x’
from.theta = ‘function(x) x’

```

Hyperparameter ‘theta31’ hyperid = ‘23031’

```
name = ‘theta31’
short.name = ‘t31’
initial = ‘0’
fixed = ‘FALSE’
prior = ‘none’
param = ‘’
to.theta = ‘function(x) x’
from.theta = ‘function(x) x’
```

Hyperparameter ‘theta32’ hyperid = ‘23032’

```
name = ‘theta32’
short.name = ‘t32’
initial = ‘0’
fixed = ‘FALSE’
prior = ‘none’
param = ‘’
to.theta = ‘function(x) x’
from.theta = ‘function(x) x’
```

Hyperparameter ‘theta33’ hyperid = ‘23033’

```
name = ‘theta33’
short.name = ‘t33’
initial = ‘0’
fixed = ‘FALSE’
prior = ‘none’
param = ‘’
to.theta = ‘function(x) x’
from.theta = ‘function(x) x’
```

Hyperparameter ‘theta34’ hyperid = ‘23034’

```
name = ‘theta34’
short.name = ‘t34’
initial = ‘0’
fixed = ‘FALSE’
prior = ‘none’
param = ‘’
to.theta = ‘function(x) x’
from.theta = ‘function(x) x’
```

Hyperparameter ‘theta35’ hyperid = ‘23035’

```
name = ‘theta35’
short.name = ‘t35’
initial = ‘0’
fixed = ‘FALSE’
prior = ‘none’
param = ‘’
to.theta = ‘function(x) x’
from.theta = ‘function(x) x’
```


Hyperparameter ‘theta36’ hyperid = ‘23036’

```

name = ‘theta36’
short.name = ‘t36’
initial = ‘0’
fixed = ‘FALSE’
prior = ‘none’
param = ‘’
to.theta = ‘function(x) x’
from.theta = ‘function(x) x’

```

Hyperparameter ‘theta37’ hyperid = ‘23037’

```

name = ‘theta37’
short.name = ‘t37’
initial = ‘0’
fixed = ‘FALSE’
prior = ‘none’
param = ‘’
to.theta = ‘function(x) x’
from.theta = ‘function(x) x’

```

Hyperparameter ‘theta38’ hyperid = ‘23038’

```

name = ‘theta38’
short.name = ‘t38’
initial = ‘0’
fixed = ‘FALSE’
prior = ‘none’
param = ‘’
to.theta = ‘function(x) x’
from.theta = ‘function(x) x’

```

Hyperparameter ‘theta39’ hyperid = ‘23039’

```

name = ‘theta39’
short.name = ‘t39’
initial = ‘0’
fixed = ‘FALSE’
prior = ‘none’
param = ‘’
to.theta = ‘function(x) x’
from.theta = ‘function(x) x’

```

Hyperparameter ‘theta40’ hyperid = ‘23040’

```

name = ‘theta40’
short.name = ‘t40’
initial = ‘0’
fixed = ‘FALSE’
prior = ‘none’
param = ‘’
to.theta = ‘function(x) x’
from.theta = ‘function(x) x’

```

Hyperparameter ‘theta41’ hyperid = ‘23041’

```
name = ‘theta41’
short.name = ‘t41’
initial = ‘0’
fixed = ‘FALSE’
prior = ‘none’
param = ‘’
to.theta = ‘function(x) x’
from.theta = ‘function(x) x’
```

Hyperparameter ‘theta42’ hyperid = ‘23042’

```
name = ‘theta42’
short.name = ‘t42’
initial = ‘0’
fixed = ‘FALSE’
prior = ‘none’
param = ‘’
to.theta = ‘function(x) x’
from.theta = ‘function(x) x’
```

Hyperparameter ‘theta43’ hyperid = ‘23043’

```
name = ‘theta43’
short.name = ‘t43’
initial = ‘0’
fixed = ‘FALSE’
prior = ‘none’
param = ‘’
to.theta = ‘function(x) x’
from.theta = ‘function(x) x’
```

Hyperparameter ‘theta44’ hyperid = ‘23044’

```
name = ‘theta44’
short.name = ‘t44’
initial = ‘0’
fixed = ‘FALSE’
prior = ‘none’
param = ‘’
to.theta = ‘function(x) x’
from.theta = ‘function(x) x’
```

Hyperparameter ‘theta45’ hyperid = ‘23045’

```
name = ‘theta45’
short.name = ‘t45’
initial = ‘0’
fixed = ‘FALSE’
prior = ‘none’
param = ‘’
to.theta = ‘function(x) x’
from.theta = ‘function(x) x’
```

Hyperparameter ‘theta46’ hyperid = ‘23046’

```
name = ‘theta46’
short.name = ‘t46’
initial = ‘0’
fixed = ‘FALSE’
prior = ‘none’
param = ‘’
to.theta = ‘function(x) x’
from.theta = ‘function(x) x’
```

Hyperparameter ‘theta47’ hyperid = ‘23047’

```
name = ‘theta47’
short.name = ‘t47’
initial = ‘0’
fixed = ‘FALSE’
prior = ‘none’
param = ‘’
to.theta = ‘function(x) x’
from.theta = ‘function(x) x’
```

Hyperparameter ‘theta48’ hyperid = ‘23048’

```
name = ‘theta48’
short.name = ‘t48’
initial = ‘0’
fixed = ‘FALSE’
prior = ‘none’
param = ‘’
to.theta = ‘function(x) x’
from.theta = ‘function(x) x’
```

Hyperparameter ‘theta49’ hyperid = ‘23049’

```
name = ‘theta49’
short.name = ‘t49’
initial = ‘0’
fixed = ‘FALSE’
prior = ‘none’
param = ‘’
to.theta = ‘function(x) x’
from.theta = ‘function(x) x’
```

Hyperparameter ‘theta50’ hyperid = ‘23050’

```
name = ‘theta50’
short.name = ‘t50’
initial = ‘0’
fixed = ‘FALSE’
prior = ‘none’
param = ‘’
to.theta = ‘function(x) x’
from.theta = ‘function(x) x’
```

```

Hyperparameter ‘theta51’ hyperid = ‘23051’
  name = ‘theta51’
  short.name = ‘t51’
  initial = ‘0’
  fixed = ‘FALSE’
  prior = ‘none’
  param = ‘’
  to.theta = ‘function(x) x’
  from.theta = ‘function(x) x’
Hyperparameter ‘theta52’ hyperid = ‘23052’
  name = ‘theta52’
  short.name = ‘t52’
  initial = ‘0’
  fixed = ‘FALSE’
  prior = ‘none’
  param = ‘’
  to.theta = ‘function(x) x’
  from.theta = ‘function(x) x’
Hyperparameter ‘theta53’ hyperid = ‘23053’
  name = ‘theta53’
  short.name = ‘t53’
  initial = ‘0’
  fixed = ‘FALSE’
  prior = ‘none’
  param = ‘’
  to.theta = ‘function(x) x’
  from.theta = ‘function(x) x’
Hyperparameter ‘theta54’ hyperid = ‘23054’
  name = ‘theta54’
  short.name = ‘t54’
  initial = ‘0’
  fixed = ‘FALSE’
  prior = ‘none’
  param = ‘’
  to.theta = ‘function(x) x’
  from.theta = ‘function(x) x’
Hyperparameter ‘theta55’ hyperid = ‘23055’
  name = ‘theta55’
  short.name = ‘t55’
  initial = ‘0’
  fixed = ‘FALSE’
  prior = ‘none’
  param = ‘’
  to.theta = ‘function(x) x’
  from.theta = ‘function(x) x’

```

Hyperparameter ‘theta56’ hyperid = ‘23056’

```
name = ‘theta56’
short.name = ‘t56’
initial = ‘0’
fixed = ‘FALSE’
prior = ‘none’
param = ‘’
to.theta = ‘function(x) x’
from.theta = ‘function(x) x’
```

Hyperparameter ‘theta57’ hyperid = ‘23057’

```
name = ‘theta57’
short.name = ‘t57’
initial = ‘0’
fixed = ‘FALSE’
prior = ‘none’
param = ‘’
to.theta = ‘function(x) x’
from.theta = ‘function(x) x’
```

Hyperparameter ‘theta58’ hyperid = ‘23058’

```
name = ‘theta58’
short.name = ‘t58’
initial = ‘0’
fixed = ‘FALSE’
prior = ‘none’
param = ‘’
to.theta = ‘function(x) x’
from.theta = ‘function(x) x’
```

Hyperparameter ‘theta59’ hyperid = ‘23059’

```
name = ‘theta59’
short.name = ‘t59’
initial = ‘0’
fixed = ‘FALSE’
prior = ‘none’
param = ‘’
to.theta = ‘function(x) x’
from.theta = ‘function(x) x’
```

Hyperparameter ‘theta60’ hyperid = ‘23060’

```
name = ‘theta60’
short.name = ‘t60’
initial = ‘0’
fixed = ‘FALSE’
prior = ‘none’
param = ‘’
to.theta = ‘function(x) x’
from.theta = ‘function(x) x’
```

Hyperparameter ‘theta61’ hyperid = ‘23061’

```
name = ‘theta61’
short.name = ‘t61’
initial = ‘0’
fixed = ‘FALSE’
prior = ‘none’
param = ‘’
to.theta = ‘function(x) x’
from.theta = ‘function(x) x’
```

Hyperparameter ‘theta62’ hyperid = ‘23062’

```
name = ‘theta62’
short.name = ‘t62’
initial = ‘0’
fixed = ‘FALSE’
prior = ‘none’
param = ‘’
to.theta = ‘function(x) x’
from.theta = ‘function(x) x’
```

Hyperparameter ‘theta63’ hyperid = ‘23063’

```
name = ‘theta63’
short.name = ‘t63’
initial = ‘0’
fixed = ‘FALSE’
prior = ‘none’
param = ‘’
to.theta = ‘function(x) x’
from.theta = ‘function(x) x’
```

Hyperparameter ‘theta64’ hyperid = ‘23064’

```
name = ‘theta64’
short.name = ‘t64’
initial = ‘0’
fixed = ‘FALSE’
prior = ‘none’
param = ‘’
to.theta = ‘function(x) x’
from.theta = ‘function(x) x’
```

Hyperparameter ‘theta65’ hyperid = ‘23065’

```
name = ‘theta65’
short.name = ‘t65’
initial = ‘0’
fixed = ‘FALSE’
prior = ‘none’
param = ‘’
to.theta = ‘function(x) x’
from.theta = ‘function(x) x’
```

Hyperparameter ‘theta66’ hyperid = ‘23066’

```
name = ‘theta66’
short.name = ‘t66’
initial = ‘0’
fixed = ‘FALSE’
prior = ‘none’
param = ‘’
to.theta = ‘function(x) x’
from.theta = ‘function(x) x’
```

Hyperparameter ‘theta67’ hyperid = ‘23067’

```
name = ‘theta67’
short.name = ‘t67’
initial = ‘0’
fixed = ‘FALSE’
prior = ‘none’
param = ‘’
to.theta = ‘function(x) x’
from.theta = ‘function(x) x’
```

Hyperparameter ‘theta68’ hyperid = ‘23068’

```
name = ‘theta68’
short.name = ‘t68’
initial = ‘0’
fixed = ‘FALSE’
prior = ‘none’
param = ‘’
to.theta = ‘function(x) x’
from.theta = ‘function(x) x’
```

Hyperparameter ‘theta69’ hyperid = ‘23069’

```
name = ‘theta69’
short.name = ‘t69’
initial = ‘0’
fixed = ‘FALSE’
prior = ‘none’
param = ‘’
to.theta = ‘function(x) x’
from.theta = ‘function(x) x’
```

Hyperparameter ‘theta70’ hyperid = ‘23070’

```
name = ‘theta70’
short.name = ‘t70’
initial = ‘0’
fixed = ‘FALSE’
prior = ‘none’
param = ‘’
to.theta = ‘function(x) x’
from.theta = ‘function(x) x’
```

Hyperparameter ‘theta71’ hyperid = ‘23071’

```
name = ‘theta71’
short.name = ‘t71’
initial = ‘0’
fixed = ‘FALSE’
prior = ‘none’
param = ‘’
to.theta = ‘function(x) x’
from.theta = ‘function(x) x’
```

Hyperparameter ‘theta72’ hyperid = ‘23072’

```
name = ‘theta72’
short.name = ‘t72’
initial = ‘0’
fixed = ‘FALSE’
prior = ‘none’
param = ‘’
to.theta = ‘function(x) x’
from.theta = ‘function(x) x’
```

Hyperparameter ‘theta73’ hyperid = ‘23073’

```
name = ‘theta73’
short.name = ‘t73’
initial = ‘0’
fixed = ‘FALSE’
prior = ‘none’
param = ‘’
to.theta = ‘function(x) x’
from.theta = ‘function(x) x’
```

Hyperparameter ‘theta74’ hyperid = ‘23074’

```
name = ‘theta74’
short.name = ‘t74’
initial = ‘0’
fixed = ‘FALSE’
prior = ‘none’
param = ‘’
to.theta = ‘function(x) x’
from.theta = ‘function(x) x’
```

Hyperparameter ‘theta75’ hyperid = ‘23075’

```
name = ‘theta75’
short.name = ‘t75’
initial = ‘0’
fixed = ‘FALSE’
prior = ‘none’
param = ‘’
to.theta = ‘function(x) x’
from.theta = ‘function(x) x’
```


Hyperparameter ‘theta76’ hyperid = ‘23076’

```
name = ‘theta76’
short.name = ‘t76’
initial = ‘0’
fixed = ‘FALSE’
prior = ‘none’
param = ‘’
to.theta = ‘function(x) x’
from.theta = ‘function(x) x’
```

Hyperparameter ‘theta77’ hyperid = ‘23077’

```
name = ‘theta77’
short.name = ‘t77’
initial = ‘0’
fixed = ‘FALSE’
prior = ‘none’
param = ‘’
to.theta = ‘function(x) x’
from.theta = ‘function(x) x’
```

Hyperparameter ‘theta78’ hyperid = ‘23078’

```
name = ‘theta78’
short.name = ‘t78’
initial = ‘0’
fixed = ‘FALSE’
prior = ‘none’
param = ‘’
to.theta = ‘function(x) x’
from.theta = ‘function(x) x’
```

Hyperparameter ‘theta79’ hyperid = ‘23079’

```
name = ‘theta79’
short.name = ‘t79’
initial = ‘0’
fixed = ‘FALSE’
prior = ‘none’
param = ‘’
to.theta = ‘function(x) x’
from.theta = ‘function(x) x’
```

Hyperparameter ‘theta80’ hyperid = ‘23080’

```
name = ‘theta80’
short.name = ‘t80’
initial = ‘0’
fixed = ‘FALSE’
prior = ‘none’
param = ‘’
to.theta = ‘function(x) x’
from.theta = ‘function(x) x’
```

Hyperparameter ‘theta81’ hyperid = ‘23081’

```
name = ‘theta81’
short.name = ‘t81’
initial = ‘0’
fixed = ‘FALSE’
prior = ‘none’
param = ‘’
to.theta = ‘function(x) x’
from.theta = ‘function(x) x’
```

Hyperparameter ‘theta82’ hyperid = ‘23082’

```
name = ‘theta82’
short.name = ‘t82’
initial = ‘0’
fixed = ‘FALSE’
prior = ‘none’
param = ‘’
to.theta = ‘function(x) x’
from.theta = ‘function(x) x’
```

Hyperparameter ‘theta83’ hyperid = ‘23083’

```
name = ‘theta83’
short.name = ‘t83’
initial = ‘0’
fixed = ‘FALSE’
prior = ‘none’
param = ‘’
to.theta = ‘function(x) x’
from.theta = ‘function(x) x’
```

Hyperparameter ‘theta84’ hyperid = ‘23084’

```
name = ‘theta84’
short.name = ‘t84’
initial = ‘0’
fixed = ‘FALSE’
prior = ‘none’
param = ‘’
to.theta = ‘function(x) x’
from.theta = ‘function(x) x’
```

Hyperparameter ‘theta85’ hyperid = ‘23085’

```
name = ‘theta85’
short.name = ‘t85’
initial = ‘0’
fixed = ‘FALSE’
prior = ‘none’
param = ‘’
to.theta = ‘function(x) x’
from.theta = ‘function(x) x’
```

Hyperparameter ‘theta86’ hyperid = ‘23086’

```
name = ‘theta86’
short.name = ‘t86’
initial = ‘0’
fixed = ‘FALSE’
prior = ‘none’
param = ‘’
to.theta = ‘function(x) x’
from.theta = ‘function(x) x’
```

Hyperparameter ‘theta87’ hyperid = ‘23087’

```
name = ‘theta87’
short.name = ‘t87’
initial = ‘0’
fixed = ‘FALSE’
prior = ‘none’
param = ‘’
to.theta = ‘function(x) x’
from.theta = ‘function(x) x’
```

Hyperparameter ‘theta88’ hyperid = ‘23088’

```
name = ‘theta88’
short.name = ‘t88’
initial = ‘0’
fixed = ‘FALSE’
prior = ‘none’
param = ‘’
to.theta = ‘function(x) x’
from.theta = ‘function(x) x’
```

Hyperparameter ‘theta89’ hyperid = ‘23089’

```
name = ‘theta89’
short.name = ‘t89’
initial = ‘0’
fixed = ‘FALSE’
prior = ‘none’
param = ‘’
to.theta = ‘function(x) x’
from.theta = ‘function(x) x’
```

Hyperparameter ‘theta90’ hyperid = ‘23090’

```
name = ‘theta90’
short.name = ‘t90’
initial = ‘0’
fixed = ‘FALSE’
prior = ‘none’
param = ‘’
to.theta = ‘function(x) x’
from.theta = ‘function(x) x’
```

Hyperparameter ‘theta91’ hyperid = ‘23091’

```
name = ‘theta91’
short.name = ‘t91’
initial = ‘0’
fixed = ‘FALSE’
prior = ‘none’
param = ‘’
to.theta = ‘function(x) x’
from.theta = ‘function(x) x’
```

Hyperparameter ‘theta92’ hyperid = ‘23092’

```
name = ‘theta92’
short.name = ‘t92’
initial = ‘0’
fixed = ‘FALSE’
prior = ‘none’
param = ‘’
to.theta = ‘function(x) x’
from.theta = ‘function(x) x’
```

Hyperparameter ‘theta93’ hyperid = ‘23093’

```
name = ‘theta93’
short.name = ‘t93’
initial = ‘0’
fixed = ‘FALSE’
prior = ‘none’
param = ‘’
to.theta = ‘function(x) x’
from.theta = ‘function(x) x’
```

Hyperparameter ‘theta94’ hyperid = ‘23094’

```
name = ‘theta94’
short.name = ‘t94’
initial = ‘0’
fixed = ‘FALSE’
prior = ‘none’
param = ‘’
to.theta = ‘function(x) x’
from.theta = ‘function(x) x’
```

Hyperparameter ‘theta95’ hyperid = ‘23095’

```
name = ‘theta95’
short.name = ‘t95’
initial = ‘0’
fixed = ‘FALSE’
prior = ‘none’
param = ‘’
to.theta = ‘function(x) x’
from.theta = ‘function(x) x’
```

```

Hyperparameter ‘theta96’ hyperid = ‘23096’
  name = ‘theta96’
  short.name = ‘t96’
  initial = ‘0’
  fixed = ‘FALSE’
  prior = ‘none’
  param = ‘’
  to.theta = ‘function(x) x’
  from.theta = ‘function(x) x’
Hyperparameter ‘theta97’ hyperid = ‘23097’
  name = ‘theta97’
  short.name = ‘t97’
  initial = ‘0’
  fixed = ‘FALSE’
  prior = ‘none’
  param = ‘’
  to.theta = ‘function(x) x’
  from.theta = ‘function(x) x’
Hyperparameter ‘theta98’ hyperid = ‘23098’
  name = ‘theta98’
  short.name = ‘t98’
  initial = ‘0’
  fixed = ‘FALSE’
  prior = ‘none’
  param = ‘’
  to.theta = ‘function(x) x’
  from.theta = ‘function(x) x’
Hyperparameter ‘theta99’ hyperid = ‘23099’
  name = ‘theta99’
  short.name = ‘t99’
  initial = ‘0’
  fixed = ‘FALSE’
  prior = ‘none’
  param = ‘’
  to.theta = ‘function(x) x’
  from.theta = ‘function(x) x’
Hyperparameter ‘theta100’ hyperid = ‘23100’
  name = ‘theta100’
  short.name = ‘t100’
  initial = ‘0’
  fixed = ‘FALSE’
  prior = ‘none’
  param = ‘’
  to.theta = ‘function(x) x’
  from.theta = ‘function(x) x’

```

```

Properties: constr = 'FALSE'
nrow.ncol = 'FALSE'
augmented = 'FALSE'
aug.factor = '1'
aug.constr = 'NULL'
n.div.by = 'NULL'
n.required = 'TRUE'
set.default.values = 'TRUE'
pdf = 'spde2'

```

Model 'spde3'. Number of hyperparameters are 100.

Hyperparameter 'theta1' hyperid = '24001'

```

name = 'theta1'
short.name = 't1'
initial = '0'
fixed = 'FALSE'
prior = 'mvnorm'
param = '1 1'
to.theta = 'function(x) x'
from.theta = 'function(x) x'

```

Hyperparameter 'theta2' hyperid = '24002'

```

name = 'theta2'
short.name = 't2'
initial = '0'
fixed = 'FALSE'
prior = 'none'
param = ''
to.theta = 'function(x) x'
from.theta = 'function(x) x'

```

Hyperparameter 'theta3' hyperid = '24003'

```

name = 'theta3'
short.name = 't3'
initial = '0'
fixed = 'FALSE'
prior = 'none'
param = ''
to.theta = 'function(x) x'
from.theta = 'function(x) x'

```

Hyperparameter 'theta4' hyperid = '24004'

```

name = 'theta4'
short.name = 't4'
initial = '0'
fixed = 'FALSE'
prior = 'none'
param = ''
to.theta = 'function(x) x'

```

```

    from.theta = 'function(x) x'
Hyperparameter 'theta5' hyperid = '24005'
    name = 'theta5'
    short.name = 't5'
    initial = '0'
    fixed = 'FALSE'
    prior = 'none'
    param = ''
    to.theta = 'function(x) x'
    from.theta = 'function(x) x'
Hyperparameter 'theta6' hyperid = '24006'
    name = 'theta6'
    short.name = 't6'
    initial = '0'
    fixed = 'FALSE'
    prior = 'none'
    param = ''
    to.theta = 'function(x) x'
    from.theta = 'function(x) x'
Hyperparameter 'theta7' hyperid = '24007'
    name = 'theta7'
    short.name = 't7'
    initial = '0'
    fixed = 'FALSE'
    prior = 'none'
    param = ''
    to.theta = 'function(x) x'
    from.theta = 'function(x) x'
Hyperparameter 'theta8' hyperid = '24008'
    name = 'theta8'
    short.name = 't8'
    initial = '0'
    fixed = 'FALSE'
    prior = 'none'
    param = ''
    to.theta = 'function(x) x'
    from.theta = 'function(x) x'
Hyperparameter 'theta9' hyperid = '24009'
    name = 'theta9'
    short.name = 't9'
    initial = '0'
    fixed = 'FALSE'
    prior = 'none'
    param = ''
    to.theta = 'function(x) x'

```

```

    from.theta = 'function(x) x'
Hyperparameter 'theta10' hyperid = '24010'
    name = 'theta10'
    short.name = 't10'
    initial = '0'
    fixed = 'FALSE'
    prior = 'none'
    param = ''
    to.theta = 'function(x) x'
    from.theta = 'function(x) x'
Hyperparameter 'theta11' hyperid = '24011'
    name = 'theta11'
    short.name = 't11'
    initial = '0'
    fixed = 'FALSE'
    prior = 'none'
    param = ''
    to.theta = 'function(x) x'
    from.theta = 'function(x) x'
Hyperparameter 'theta12' hyperid = '24012'
    name = 'theta12'
    short.name = 't12'
    initial = '0'
    fixed = 'FALSE'
    prior = 'none'
    param = ''
    to.theta = 'function(x) x'
    from.theta = 'function(x) x'
Hyperparameter 'theta13' hyperid = '24013'
    name = 'theta13'
    short.name = 't13'
    initial = '0'
    fixed = 'FALSE'
    prior = 'none'
    param = ''
    to.theta = 'function(x) x'
    from.theta = 'function(x) x'
Hyperparameter 'theta14' hyperid = '24014'
    name = 'theta14'
    short.name = 't14'
    initial = '0'
    fixed = 'FALSE'
    prior = 'none'
    param = ''
    to.theta = 'function(x) x'

```



```

    from.theta = 'function(x) x'
Hyperparameter 'theta15' hyperid = '24015'
    name = 'theta15'
    short.name = 't15'
    initial = '0'
    fixed = 'FALSE'
    prior = 'none'
    param = ''
    to.theta = 'function(x) x'
    from.theta = 'function(x) x'
Hyperparameter 'theta16' hyperid = '24016'
    name = 'theta16'
    short.name = 't16'
    initial = '0'
    fixed = 'FALSE'
    prior = 'none'
    param = ''
    to.theta = 'function(x) x'
    from.theta = 'function(x) x'
Hyperparameter 'theta17' hyperid = '24017'
    name = 'theta17'
    short.name = 't17'
    initial = '0'
    fixed = 'FALSE'
    prior = 'none'
    param = ''
    to.theta = 'function(x) x'
    from.theta = 'function(x) x'
Hyperparameter 'theta18' hyperid = '24018'
    name = 'theta18'
    short.name = 't18'
    initial = '0'
    fixed = 'FALSE'
    prior = 'none'
    param = ''
    to.theta = 'function(x) x'
    from.theta = 'function(x) x'
Hyperparameter 'theta19' hyperid = '24019'
    name = 'theta19'
    short.name = 't19'
    initial = '0'
    fixed = 'FALSE'
    prior = 'none'
    param = ''
    to.theta = 'function(x) x'

```

```

    from.theta = 'function(x) x'
Hyperparameter 'theta20' hyperid = '24020'
    name = 'theta20'
    short.name = 't20'
    initial = '0'
    fixed = 'FALSE'
    prior = 'none'
    param = ''
    to.theta = 'function(x) x'
    from.theta = 'function(x) x'
Hyperparameter 'theta21' hyperid = '24021'
    name = 'theta21'
    short.name = 't21'
    initial = '0'
    fixed = 'FALSE'
    prior = 'none'
    param = ''
    to.theta = 'function(x) x'
    from.theta = 'function(x) x'
Hyperparameter 'theta22' hyperid = '24022'
    name = 'theta22'
    short.name = 't22'
    initial = '0'
    fixed = 'FALSE'
    prior = 'none'
    param = ''
    to.theta = 'function(x) x'
    from.theta = 'function(x) x'
Hyperparameter 'theta23' hyperid = '24023'
    name = 'theta23'
    short.name = 't23'
    initial = '0'
    fixed = 'FALSE'
    prior = 'none'
    param = ''
    to.theta = 'function(x) x'
    from.theta = 'function(x) x'
Hyperparameter 'theta24' hyperid = '24024'
    name = 'theta24'
    short.name = 't24'
    initial = '0'
    fixed = 'FALSE'
    prior = 'none'
    param = ''
    to.theta = 'function(x) x'

```

```

    from.theta = 'function(x) x'
Hyperparameter 'theta25' hyperid = '24025'
    name = 'theta25'
    short.name = 't25'
    initial = '0'
    fixed = 'FALSE'
    prior = 'none'
    param = ''
    to.theta = 'function(x) x'
    from.theta = 'function(x) x'
Hyperparameter 'theta26' hyperid = '24026'
    name = 'theta26'
    short.name = 't26'
    initial = '0'
    fixed = 'FALSE'
    prior = 'none'
    param = ''
    to.theta = 'function(x) x'
    from.theta = 'function(x) x'
Hyperparameter 'theta27' hyperid = '24027'
    name = 'theta27'
    short.name = 't27'
    initial = '0'
    fixed = 'FALSE'
    prior = 'none'
    param = ''
    to.theta = 'function(x) x'
    from.theta = 'function(x) x'
Hyperparameter 'theta28' hyperid = '24028'
    name = 'theta28'
    short.name = 't28'
    initial = '0'
    fixed = 'FALSE'
    prior = 'none'
    param = ''
    to.theta = 'function(x) x'
    from.theta = 'function(x) x'
Hyperparameter 'theta29' hyperid = '24029'
    name = 'theta29'
    short.name = 't29'
    initial = '0'
    fixed = 'FALSE'
    prior = 'none'
    param = ''
    to.theta = 'function(x) x'

```

```

    from.theta = 'function(x) x'
Hyperparameter 'theta30' hyperid = '24030'
    name = 'theta30'
    short.name = 't30'
    initial = '0'
    fixed = 'FALSE'
    prior = 'none'
    param = ''
    to.theta = 'function(x) x'
    from.theta = 'function(x) x'
Hyperparameter 'theta31' hyperid = '24031'
    name = 'theta31'
    short.name = 't31'
    initial = '0'
    fixed = 'FALSE'
    prior = 'none'
    param = ''
    to.theta = 'function(x) x'
    from.theta = 'function(x) x'
Hyperparameter 'theta32' hyperid = '24032'
    name = 'theta32'
    short.name = 't32'
    initial = '0'
    fixed = 'FALSE'
    prior = 'none'
    param = ''
    to.theta = 'function(x) x'
    from.theta = 'function(x) x'
Hyperparameter 'theta33' hyperid = '24033'
    name = 'theta33'
    short.name = 't33'
    initial = '0'
    fixed = 'FALSE'
    prior = 'none'
    param = ''
    to.theta = 'function(x) x'
    from.theta = 'function(x) x'
Hyperparameter 'theta34' hyperid = '24034'
    name = 'theta34'
    short.name = 't34'
    initial = '0'
    fixed = 'FALSE'
    prior = 'none'
    param = ''
    to.theta = 'function(x) x'

```

```

    from.theta = 'function(x) x'
Hyperparameter 'theta35' hyperid = '24035'
    name = 'theta35'
    short.name = 't35'
    initial = '0'
    fixed = 'FALSE'
    prior = 'none'
    param = ''
    to.theta = 'function(x) x'
    from.theta = 'function(x) x'
Hyperparameter 'theta36' hyperid = '24036'
    name = 'theta36'
    short.name = 't36'
    initial = '0'
    fixed = 'FALSE'
    prior = 'none'
    param = ''
    to.theta = 'function(x) x'
    from.theta = 'function(x) x'
Hyperparameter 'theta37' hyperid = '24037'
    name = 'theta37'
    short.name = 't37'
    initial = '0'
    fixed = 'FALSE'
    prior = 'none'
    param = ''
    to.theta = 'function(x) x'
    from.theta = 'function(x) x'
Hyperparameter 'theta38' hyperid = '24038'
    name = 'theta38'
    short.name = 't38'
    initial = '0'
    fixed = 'FALSE'
    prior = 'none'
    param = ''
    to.theta = 'function(x) x'
    from.theta = 'function(x) x'
Hyperparameter 'theta39' hyperid = '24039'
    name = 'theta39'
    short.name = 't39'
    initial = '0'
    fixed = 'FALSE'
    prior = 'none'
    param = ''
    to.theta = 'function(x) x'

```

```

    from.theta = 'function(x) x'
Hyperparameter 'theta40' hyperid = '24040'
    name = 'theta40'
    short.name = 't40'
    initial = '0'
    fixed = 'FALSE'
    prior = 'none'
    param = ''
    to.theta = 'function(x) x'
    from.theta = 'function(x) x'
Hyperparameter 'theta41' hyperid = '24041'
    name = 'theta41'
    short.name = 't41'
    initial = '0'
    fixed = 'FALSE'
    prior = 'none'
    param = ''
    to.theta = 'function(x) x'
    from.theta = 'function(x) x'
Hyperparameter 'theta42' hyperid = '24042'
    name = 'theta42'
    short.name = 't42'
    initial = '0'
    fixed = 'FALSE'
    prior = 'none'
    param = ''
    to.theta = 'function(x) x'
    from.theta = 'function(x) x'
Hyperparameter 'theta43' hyperid = '24043'
    name = 'theta43'
    short.name = 't43'
    initial = '0'
    fixed = 'FALSE'
    prior = 'none'
    param = ''
    to.theta = 'function(x) x'
    from.theta = 'function(x) x'
Hyperparameter 'theta44' hyperid = '24044'
    name = 'theta44'
    short.name = 't44'
    initial = '0'
    fixed = 'FALSE'
    prior = 'none'
    param = ''
    to.theta = 'function(x) x'

```

```

    from.theta = 'function(x) x'
Hyperparameter 'theta45' hyperid = '24045'
    name = 'theta45'
    short.name = 't45'
    initial = '0'
    fixed = 'FALSE'
    prior = 'none'
    param = ''
    to.theta = 'function(x) x'
    from.theta = 'function(x) x'
Hyperparameter 'theta46' hyperid = '24046'
    name = 'theta46'
    short.name = 't46'
    initial = '0'
    fixed = 'FALSE'
    prior = 'none'
    param = ''
    to.theta = 'function(x) x'
    from.theta = 'function(x) x'
Hyperparameter 'theta47' hyperid = '24047'
    name = 'theta47'
    short.name = 't47'
    initial = '0'
    fixed = 'FALSE'
    prior = 'none'
    param = ''
    to.theta = 'function(x) x'
    from.theta = 'function(x) x'
Hyperparameter 'theta48' hyperid = '24048'
    name = 'theta48'
    short.name = 't48'
    initial = '0'
    fixed = 'FALSE'
    prior = 'none'
    param = ''
    to.theta = 'function(x) x'
    from.theta = 'function(x) x'
Hyperparameter 'theta49' hyperid = '24049'
    name = 'theta49'
    short.name = 't49'
    initial = '0'
    fixed = 'FALSE'
    prior = 'none'
    param = ''
    to.theta = 'function(x) x'

```

```

    from.theta = 'function(x) x'
Hyperparameter 'theta50' hyperid = '24050'
    name = 'theta50'
    short.name = 't50'
    initial = '0'
    fixed = 'FALSE'
    prior = 'none'
    param = ''
    to.theta = 'function(x) x'
    from.theta = 'function(x) x'
Hyperparameter 'theta51' hyperid = '24051'
    name = 'theta51'
    short.name = 't51'
    initial = '0'
    fixed = 'FALSE'
    prior = 'none'
    param = ''
    to.theta = 'function(x) x'
    from.theta = 'function(x) x'
Hyperparameter 'theta52' hyperid = '24052'
    name = 'theta52'
    short.name = 't52'
    initial = '0'
    fixed = 'FALSE'
    prior = 'none'
    param = ''
    to.theta = 'function(x) x'
    from.theta = 'function(x) x'
Hyperparameter 'theta53' hyperid = '24053'
    name = 'theta53'
    short.name = 't53'
    initial = '0'
    fixed = 'FALSE'
    prior = 'none'
    param = ''
    to.theta = 'function(x) x'
    from.theta = 'function(x) x'
Hyperparameter 'theta54' hyperid = '24054'
    name = 'theta54'
    short.name = 't54'
    initial = '0'
    fixed = 'FALSE'
    prior = 'none'
    param = ''
    to.theta = 'function(x) x'

```



```

    from.theta = 'function(x) x'
Hyperparameter 'theta55' hyperid = '24055'
    name = 'theta55'
    short.name = 't55'
    initial = '0'
    fixed = 'FALSE'
    prior = 'none'
    param = ''
    to.theta = 'function(x) x'
    from.theta = 'function(x) x'
Hyperparameter 'theta56' hyperid = '24056'
    name = 'theta56'
    short.name = 't56'
    initial = '0'
    fixed = 'FALSE'
    prior = 'none'
    param = ''
    to.theta = 'function(x) x'
    from.theta = 'function(x) x'
Hyperparameter 'theta57' hyperid = '24057'
    name = 'theta57'
    short.name = 't57'
    initial = '0'
    fixed = 'FALSE'
    prior = 'none'
    param = ''
    to.theta = 'function(x) x'
    from.theta = 'function(x) x'
Hyperparameter 'theta58' hyperid = '24058'
    name = 'theta58'
    short.name = 't58'
    initial = '0'
    fixed = 'FALSE'
    prior = 'none'
    param = ''
    to.theta = 'function(x) x'
    from.theta = 'function(x) x'
Hyperparameter 'theta59' hyperid = '24059'
    name = 'theta59'
    short.name = 't59'
    initial = '0'
    fixed = 'FALSE'
    prior = 'none'
    param = ''
    to.theta = 'function(x) x'

```

```

    from.theta = 'function(x) x'
Hyperparameter 'theta60' hyperid = '24060'
    name = 'theta60'
    short.name = 't60'
    initial = '0'
    fixed = 'FALSE'
    prior = 'none'
    param = ''
    to.theta = 'function(x) x'
    from.theta = 'function(x) x'
Hyperparameter 'theta61' hyperid = '24061'
    name = 'theta61'
    short.name = 't61'
    initial = '0'
    fixed = 'FALSE'
    prior = 'none'
    param = ''
    to.theta = 'function(x) x'
    from.theta = 'function(x) x'
Hyperparameter 'theta62' hyperid = '24062'
    name = 'theta62'
    short.name = 't62'
    initial = '0'
    fixed = 'FALSE'
    prior = 'none'
    param = ''
    to.theta = 'function(x) x'
    from.theta = 'function(x) x'
Hyperparameter 'theta63' hyperid = '24063'
    name = 'theta63'
    short.name = 't63'
    initial = '0'
    fixed = 'FALSE'
    prior = 'none'
    param = ''
    to.theta = 'function(x) x'
    from.theta = 'function(x) x'
Hyperparameter 'theta64' hyperid = '24064'
    name = 'theta64'
    short.name = 't64'
    initial = '0'
    fixed = 'FALSE'
    prior = 'none'
    param = ''
    to.theta = 'function(x) x'

```

```

    from.theta = 'function(x) x'
Hyperparameter 'theta65' hyperid = '24065'
    name = 'theta65'
    short.name = 't65'
    initial = '0'
    fixed = 'FALSE'
    prior = 'none'
    param = ''
    to.theta = 'function(x) x'
    from.theta = 'function(x) x'
Hyperparameter 'theta66' hyperid = '24066'
    name = 'theta66'
    short.name = 't66'
    initial = '0'
    fixed = 'FALSE'
    prior = 'none'
    param = ''
    to.theta = 'function(x) x'
    from.theta = 'function(x) x'
Hyperparameter 'theta67' hyperid = '24067'
    name = 'theta67'
    short.name = 't67'
    initial = '0'
    fixed = 'FALSE'
    prior = 'none'
    param = ''
    to.theta = 'function(x) x'
    from.theta = 'function(x) x'
Hyperparameter 'theta68' hyperid = '24068'
    name = 'theta68'
    short.name = 't68'
    initial = '0'
    fixed = 'FALSE'
    prior = 'none'
    param = ''
    to.theta = 'function(x) x'
    from.theta = 'function(x) x'
Hyperparameter 'theta69' hyperid = '24069'
    name = 'theta69'
    short.name = 't69'
    initial = '0'
    fixed = 'FALSE'
    prior = 'none'
    param = ''
    to.theta = 'function(x) x'

```

```

    from.theta = 'function(x) x'
Hyperparameter 'theta70' hyperid = '24070'
    name = 'theta70'
    short.name = 't70'
    initial = '0'
    fixed = 'FALSE'
    prior = 'none'
    param = ''
    to.theta = 'function(x) x'
    from.theta = 'function(x) x'
Hyperparameter 'theta71' hyperid = '24071'
    name = 'theta71'
    short.name = 't71'
    initial = '0'
    fixed = 'FALSE'
    prior = 'none'
    param = ''
    to.theta = 'function(x) x'
    from.theta = 'function(x) x'
Hyperparameter 'theta72' hyperid = '24072'
    name = 'theta72'
    short.name = 't72'
    initial = '0'
    fixed = 'FALSE'
    prior = 'none'
    param = ''
    to.theta = 'function(x) x'
    from.theta = 'function(x) x'
Hyperparameter 'theta73' hyperid = '24073'
    name = 'theta73'
    short.name = 't73'
    initial = '0'
    fixed = 'FALSE'
    prior = 'none'
    param = ''
    to.theta = 'function(x) x'
    from.theta = 'function(x) x'
Hyperparameter 'theta74' hyperid = '24074'
    name = 'theta74'
    short.name = 't74'
    initial = '0'
    fixed = 'FALSE'
    prior = 'none'
    param = ''
    to.theta = 'function(x) x'

```

```

    from.theta = 'function(x) x'
Hyperparameter 'theta75' hyperid = '24075'
    name = 'theta75'
    short.name = 't75'
    initial = '0'
    fixed = 'FALSE'
    prior = 'none'
    param = ''
    to.theta = 'function(x) x'
    from.theta = 'function(x) x'
Hyperparameter 'theta76' hyperid = '24076'
    name = 'theta76'
    short.name = 't76'
    initial = '0'
    fixed = 'FALSE'
    prior = 'none'
    param = ''
    to.theta = 'function(x) x'
    from.theta = 'function(x) x'
Hyperparameter 'theta77' hyperid = '24077'
    name = 'theta77'
    short.name = 't77'
    initial = '0'
    fixed = 'FALSE'
    prior = 'none'
    param = ''
    to.theta = 'function(x) x'
    from.theta = 'function(x) x'
Hyperparameter 'theta78' hyperid = '24078'
    name = 'theta78'
    short.name = 't78'
    initial = '0'
    fixed = 'FALSE'
    prior = 'none'
    param = ''
    to.theta = 'function(x) x'
    from.theta = 'function(x) x'
Hyperparameter 'theta79' hyperid = '24079'
    name = 'theta79'
    short.name = 't79'
    initial = '0'
    fixed = 'FALSE'
    prior = 'none'
    param = ''
    to.theta = 'function(x) x'

```

```

    from.theta = 'function(x) x'
Hyperparameter 'theta80' hyperid = '24080'
    name = 'theta80'
    short.name = 't80'
    initial = '0'
    fixed = 'FALSE'
    prior = 'none'
    param = ''
    to.theta = 'function(x) x'
    from.theta = 'function(x) x'
Hyperparameter 'theta81' hyperid = '24081'
    name = 'theta81'
    short.name = 't81'
    initial = '0'
    fixed = 'FALSE'
    prior = 'none'
    param = ''
    to.theta = 'function(x) x'
    from.theta = 'function(x) x'
Hyperparameter 'theta82' hyperid = '24082'
    name = 'theta82'
    short.name = 't82'
    initial = '0'
    fixed = 'FALSE'
    prior = 'none'
    param = ''
    to.theta = 'function(x) x'
    from.theta = 'function(x) x'
Hyperparameter 'theta83' hyperid = '24083'
    name = 'theta83'
    short.name = 't83'
    initial = '0'
    fixed = 'FALSE'
    prior = 'none'
    param = ''
    to.theta = 'function(x) x'
    from.theta = 'function(x) x'
Hyperparameter 'theta84' hyperid = '24084'
    name = 'theta84'
    short.name = 't84'
    initial = '0'
    fixed = 'FALSE'
    prior = 'none'
    param = ''
    to.theta = 'function(x) x'

```

```

    from.theta = 'function(x) x'
Hyperparameter 'theta85' hyperid = '24085'
    name = 'theta85'
    short.name = 't85'
    initial = '0'
    fixed = 'FALSE'
    prior = 'none'
    param = ''
    to.theta = 'function(x) x'
    from.theta = 'function(x) x'
Hyperparameter 'theta86' hyperid = '24086'
    name = 'theta86'
    short.name = 't86'
    initial = '0'
    fixed = 'FALSE'
    prior = 'none'
    param = ''
    to.theta = 'function(x) x'
    from.theta = 'function(x) x'
Hyperparameter 'theta87' hyperid = '24087'
    name = 'theta87'
    short.name = 't87'
    initial = '0'
    fixed = 'FALSE'
    prior = 'none'
    param = ''
    to.theta = 'function(x) x'
    from.theta = 'function(x) x'
Hyperparameter 'theta88' hyperid = '24088'
    name = 'theta88'
    short.name = 't88'
    initial = '0'
    fixed = 'FALSE'
    prior = 'none'
    param = ''
    to.theta = 'function(x) x'
    from.theta = 'function(x) x'
Hyperparameter 'theta89' hyperid = '24089'
    name = 'theta89'
    short.name = 't89'
    initial = '0'
    fixed = 'FALSE'
    prior = 'none'
    param = ''
    to.theta = 'function(x) x'

```

```

    from.theta = 'function(x) x'
Hyperparameter 'theta90' hyperid = '24090'
    name = 'theta90'
    short.name = 't90'
    initial = '0'
    fixed = 'FALSE'
    prior = 'none'
    param = ''
    to.theta = 'function(x) x'
    from.theta = 'function(x) x'
Hyperparameter 'theta91' hyperid = '24091'
    name = 'theta91'
    short.name = 't91'
    initial = '0'
    fixed = 'FALSE'
    prior = 'none'
    param = ''
    to.theta = 'function(x) x'
    from.theta = 'function(x) x'
Hyperparameter 'theta92' hyperid = '24092'
    name = 'theta92'
    short.name = 't92'
    initial = '0'
    fixed = 'FALSE'
    prior = 'none'
    param = ''
    to.theta = 'function(x) x'
    from.theta = 'function(x) x'
Hyperparameter 'theta93' hyperid = '24093'
    name = 'theta93'
    short.name = 't93'
    initial = '0'
    fixed = 'FALSE'
    prior = 'none'
    param = ''
    to.theta = 'function(x) x'
    from.theta = 'function(x) x'
Hyperparameter 'theta94' hyperid = '24094'
    name = 'theta94'
    short.name = 't94'
    initial = '0'
    fixed = 'FALSE'
    prior = 'none'
    param = ''
    to.theta = 'function(x) x'

```



```

    from.theta = 'function(x) x'
Hyperparameter 'theta95' hyperid = '24095'
    name = 'theta95'
    short.name = 't95'
    initial = '0'
    fixed = 'FALSE'
    prior = 'none'
    param = ''
    to.theta = 'function(x) x'
    from.theta = 'function(x) x'
Hyperparameter 'theta96' hyperid = '24096'
    name = 'theta96'
    short.name = 't96'
    initial = '0'
    fixed = 'FALSE'
    prior = 'none'
    param = ''
    to.theta = 'function(x) x'
    from.theta = 'function(x) x'
Hyperparameter 'theta97' hyperid = '24097'
    name = 'theta97'
    short.name = 't97'
    initial = '0'
    fixed = 'FALSE'
    prior = 'none'
    param = ''
    to.theta = 'function(x) x'
    from.theta = 'function(x) x'
Hyperparameter 'theta98' hyperid = '24098'
    name = 'theta98'
    short.name = 't98'
    initial = '0'
    fixed = 'FALSE'
    prior = 'none'
    param = ''
    to.theta = 'function(x) x'
    from.theta = 'function(x) x'
Hyperparameter 'theta99' hyperid = '24099'
    name = 'theta99'
    short.name = 't99'
    initial = '0'
    fixed = 'FALSE'
    prior = 'none'
    param = ''
    to.theta = 'function(x) x'

```

```

from.theta = 'function(x) x'
Hyperparameter 'theta100' hyperid = '24100'
  name = 'theta100'
  short.name = 't100'
  initial = '0'
  fixed = 'FALSE'
  prior = 'none'
  param = ''
  to.theta = 'function(x) x'
  from.theta = 'function(x) x'
Properties: constr = 'FALSE'
  nrow.ncol = 'FALSE'
  augmented = 'FALSE'
  aug.factor = '1'
  aug.constr = 'NULL'
  n.div.by = 'NULL'
  n.required = 'TRUE'
  set.default.values = 'TRUE'
  pdf = 'spde3'

```

Model 'iid1d'. Number of hyperparameters are 1.

```

Hyperparameter 'theta' hyperid = '25001'
  name = 'precision'
  short.name = 'prec'
  initial = '4'
  fixed = 'FALSE'
  prior = 'wishart1d'
  param = '2 1e-04'
  to.theta = 'function(x) log(x)'
  from.theta = 'function(x) exp(x)'
Properties: constr = 'FALSE'
  nrow.ncol = 'FALSE'
  augmented = 'FALSE'
  aug.factor = '1'
  aug.constr = 'NULL'
  n.div.by = 'NULL'
  n.required = 'FALSE'
  set.default.values = 'TRUE'
  pdf = 'iid123d'

```

Model 'iid2d'. Number of hyperparameters are 3.

```

Hyperparameter 'theta1' hyperid = '26001'
  name = 'log precision1'
  short.name = 'prec1'
  initial = '4'
  fixed = 'FALSE'
  prior = 'wishart2d'

```

```

    param = '4 1 1 0'
    to.theta = 'function(x) log(x)'
    from.theta = 'function(x) exp(x)'
Hyperparameter 'theta2' hyperid = '26002'
    name = 'log precision2'
    short.name = 'prec2'
    initial = '4'
    fixed = 'FALSE'
    prior = 'none'
    param = ''
    to.theta = 'function(x) log(x)'
    from.theta = 'function(x) exp(x)'
Hyperparameter 'theta3' hyperid = '26003'
    name = 'logit correlation'
    short.name = 'cor'
    initial = '4'
    fixed = 'FALSE'
    prior = 'none'
    param = ''
    to.theta = 'function(x) log((1+x)/(1-x))'
    from.theta = 'function(x) 2*exp(x)/(1+exp(x))-1'
Properties: constr = 'FALSE'
    nrow.ncol = 'FALSE'
    augmented = 'TRUE'
    aug.factor = '1'
    aug.constr = '1 2'
    n.div.by = '2'
    n.required = 'TRUE'
    set.default.values = 'TRUE'
    pdf = 'iid123d'
Model 'iid3d'. Number of hyperparameters are 6.
Hyperparameter 'theta1' hyperid = '27001'
    name = 'log precision1'
    short.name = 'prec1'
    initial = '4'
    fixed = 'FALSE'
    prior = 'wishart3d'
    param = '7 1 1 1 0 0 0'
    to.theta = 'function(x) log(x)'
    from.theta = 'function(x) exp(x)'
Hyperparameter 'theta2' hyperid = '27002'
    name = 'log precision2'
    short.name = 'prec2'
    initial = '4'
    fixed = 'FALSE'

```

```

    prior = 'none'
    param = ''
    to.theta = 'function(x) log(x)'
    from.theta = 'function(x) exp(x)'
Hyperparameter 'theta3' hyperid = '27003'
    name = 'log precision3'
    short.name = 'prec3'
    initial = '4'
    fixed = 'FALSE'
    prior = 'none'
    param = ''
    to.theta = 'function(x) log(x)'
    from.theta = 'function(x) exp(x)'
Hyperparameter 'theta4' hyperid = '27004'
    name = 'logit correlation12'
    short.name = 'cor12'
    initial = '0'
    fixed = 'FALSE'
    prior = 'none'
    param = ''
    to.theta = 'function(x) log((1+x)/(1-x))'
    from.theta = 'function(x) 2*exp(x)/(1+exp(x))-1'
Hyperparameter 'theta5' hyperid = '27005'
    name = 'logit correlation13'
    short.name = 'cor13'
    initial = '0'
    fixed = 'FALSE'
    prior = 'none'
    param = ''
    to.theta = 'function(x) log((1+x)/(1-x))'
    from.theta = 'function(x) 2*exp(x)/(1+exp(x))-1'
Hyperparameter 'theta6' hyperid = '27006'
    name = 'logit correlation23'
    short.name = 'cor23'
    initial = '0'
    fixed = 'FALSE'
    prior = 'none'
    param = ''
    to.theta = 'function(x) log((1+x)/(1-x))'
    from.theta = 'function(x) 2*exp(x)/(1+exp(x))-1'
Properties: constr = 'FALSE'
    nrow.ncol = 'FALSE'
    augmented = 'TRUE'
    aug.factor = '1'
    aug.constr = '1 2 3'

```

```

n.div.by = '3'
n.required = 'TRUE'
set.default.values = 'TRUE'
pdf = 'iid123d'

```

Model 'iid4d'. Number of hyperparameters are 10.

Hyperparameter 'theta1' hyperid = '28001'

```

name = 'log precision1'
short.name = 'prec1'
initial = '4'
fixed = 'FALSE'
prior = 'wishart4d'
param = '11 1 1 1 1 0 0 0 0 0'
to.theta = 'function(x) log(x)'
from.theta = 'function(x) exp(x)'

```

Hyperparameter 'theta2' hyperid = '28002'

```

name = 'log precision2'
short.name = 'prec2'
initial = '4'
fixed = 'FALSE'
prior = 'none'
param = ''
to.theta = 'function(x) log(x)'
from.theta = 'function(x) exp(x)'

```

Hyperparameter 'theta3' hyperid = '28003'

```

name = 'log precision3'
short.name = 'prec3'
initial = '4'
fixed = 'FALSE'
prior = 'none'
param = ''
to.theta = 'function(x) log(x)'
from.theta = 'function(x) exp(x)'

```

Hyperparameter 'theta4' hyperid = '28004'

```

name = 'log precision4'
short.name = 'prec4'
initial = '4'
fixed = 'FALSE'
prior = 'none'
param = ''
to.theta = 'function(x) log(x)'
from.theta = 'function(x) exp(x)'

```

Hyperparameter 'theta5' hyperid = '28005'

```

name = 'logit correlation12'
short.name = 'cor12'
initial = '0'

```

```

    fixed = 'FALSE'
    prior = 'none'
    param = ''
    to.theta = 'function(x) log((1+x)/(1-x))'
    from.theta = 'function(x) 2*exp(x)/(1+exp(x))-1'
Hyperparameter 'theta6' hyperid = '28006'
    name = 'logit correlation13'
    short.name = 'cor13'
    initial = '0'
    fixed = 'FALSE'
    prior = 'none'
    param = ''
    to.theta = 'function(x) log((1+x)/(1-x))'
    from.theta = 'function(x) 2*exp(x)/(1+exp(x))-1'
Hyperparameter 'theta7' hyperid = '28007'
    name = 'logit correlation14'
    short.name = 'cor14'
    initial = '0'
    fixed = 'FALSE'
    prior = 'none'
    param = ''
    to.theta = 'function(x) log((1+x)/(1-x))'
    from.theta = 'function(x) 2*exp(x)/(1+exp(x))-1'
Hyperparameter 'theta8' hyperid = '28008'
    name = 'logit correlation23'
    short.name = 'cor23'
    initial = '0'
    fixed = 'FALSE'
    prior = 'none'
    param = ''
    to.theta = 'function(x) log((1+x)/(1-x))'
    from.theta = 'function(x) 2*exp(x)/(1+exp(x))-1'
Hyperparameter 'theta9' hyperid = '28009'
    name = 'logit correlation24'
    short.name = 'cor24'
    initial = '0'
    fixed = 'FALSE'
    prior = 'none'
    param = ''
    to.theta = 'function(x) log((1+x)/(1-x))'
    from.theta = 'function(x) 2*exp(x)/(1+exp(x))-1'
Hyperparameter 'theta10' hyperid = '28010'
    name = 'logit correlation34'
    short.name = 'cor34'
    initial = '0'

```

```

fixed = 'FALSE'
prior = 'none'
param = ''
to.theta = 'function(x) log((1+x)/(1-x))'
from.theta = 'function(x) 2*exp(x)/(1+exp(x))-1'

```

Properties: `constr = 'FALSE'`

```

nrow.ncol = 'FALSE'
augmented = 'TRUE'
aug.factor = '1'
aug.constr = '1 2 3 4'
n.div.by = '4'
n.required = 'TRUE'
set.default.values = 'TRUE'
pdf = 'iid123d'

```

Model 'iid5d'. Number of hyperparameters are 15.

Hyperparameter 'theta1' hyperid = '29001'

```

name = 'log precision1'
short.name = 'prec1'
initial = '4'
fixed = 'FALSE'
prior = 'wishart5d'
param = '16 1 1 1 1 1 0 0 0 0 0 0 0 0 0'
to.theta = 'function(x) log(x)'
from.theta = 'function(x) exp(x)'

```

Hyperparameter 'theta2' hyperid = '29002'

```

name = 'log precision2'
short.name = 'prec2'
initial = '4'
fixed = 'FALSE'
prior = 'none'
param = ''
to.theta = 'function(x) log(x)'
from.theta = 'function(x) exp(x)'

```

Hyperparameter 'theta3' hyperid = '29003'

```

name = 'log precision3'
short.name = 'prec3'
initial = '4'
fixed = 'FALSE'
prior = 'none'
param = ''
to.theta = 'function(x) log(x)'
from.theta = 'function(x) exp(x)'

```

Hyperparameter 'theta4' hyperid = '29004'

```

name = 'log precision4'
short.name = 'prec4'

```

```

    initial = '4'
    fixed = 'FALSE'
    prior = 'none'
    param = ''
    to.theta = 'function(x) log(x)'
    from.theta = 'function(x) exp(x)'
Hyperparameter 'theta5' hyperid = '29005'
    name = 'log precision5'
    short.name = 'prec5'
    initial = '4'
    fixed = 'FALSE'
    prior = 'none'
    param = ''
    to.theta = 'function(x) log(x)'
    from.theta = 'function(x) exp(x)'
Hyperparameter 'theta6' hyperid = '29006'
    name = 'logit correlation12'
    short.name = 'cor12'
    initial = '0'
    fixed = 'FALSE'
    prior = 'none'
    param = ''
    to.theta = 'function(x) log((1+x)/(1-x))'
    from.theta = 'function(x) 2*exp(x)/(1+exp(x))-1'
Hyperparameter 'theta7' hyperid = '29007'
    name = 'logit correlation13'
    short.name = 'cor13'
    initial = '0'
    fixed = 'FALSE'
    prior = 'none'
    param = ''
    to.theta = 'function(x) log((1+x)/(1-x))'
    from.theta = 'function(x) 2*exp(x)/(1+exp(x))-1'
Hyperparameter 'theta8' hyperid = '29008'
    name = 'logit correlation14'
    short.name = 'cor14'
    initial = '0'
    fixed = 'FALSE'
    prior = 'none'
    param = ''
    to.theta = 'function(x) log((1+x)/(1-x))'
    from.theta = 'function(x) 2*exp(x)/(1+exp(x))-1'
Hyperparameter 'theta9' hyperid = '29009'
    name = 'logit correlation15'
    short.name = 'cor15'

```



```

initial = '0'
fixed = 'FALSE'
prior = 'none'
param = ''
to.theta = 'function(x) log((1+x)/(1-x))'
from.theta = 'function(x) 2*exp(x)/(1+exp(x))-1'
Hyperparameter 'theta10' hyperid = '29010'
name = 'logit correlation23'
short.name = 'cor23'
initial = '0'
fixed = 'FALSE'
prior = 'none'
param = ''
to.theta = 'function(x) log((1+x)/(1-x))'
from.theta = 'function(x) 2*exp(x)/(1+exp(x))-1'
Hyperparameter 'theta11' hyperid = '29011'
name = 'logit correlation24'
short.name = 'cor24'
initial = '0'
fixed = 'FALSE'
prior = 'none'
param = ''
to.theta = 'function(x) log((1+x)/(1-x))'
from.theta = 'function(x) 2*exp(x)/(1+exp(x))-1'
Hyperparameter 'theta12' hyperid = '29012'
name = 'logit correlation25'
short.name = 'cor25'
initial = '0'
fixed = 'FALSE'
prior = 'none'
param = ''
to.theta = 'function(x) log((1+x)/(1-x))'
from.theta = 'function(x) 2*exp(x)/(1+exp(x))-1'
Hyperparameter 'theta13' hyperid = '29013'
name = 'logit correlation34'
short.name = 'cor34'
initial = '0'
fixed = 'FALSE'
prior = 'none'
param = ''
to.theta = 'function(x) log((1+x)/(1-x))'
from.theta = 'function(x) 2*exp(x)/(1+exp(x))-1'
Hyperparameter 'theta14' hyperid = '29014'
name = 'logit correlation35'
short.name = 'cor35'

```

```

initial = '0'
fixed = 'FALSE'
prior = 'none'
param = ''
to.theta = 'function(x) log((1+x)/(1-x))'
from.theta = 'function(x) 2*exp(x)/(1+exp(x))-1'
Hyperparameter 'theta15' hyperid = '29015'
  name = 'logit correlation45'
  short.name = 'cor45'
  initial = '0'
  fixed = 'FALSE'
  prior = 'none'
  param = ''
  to.theta = 'function(x) log((1+x)/(1-x))'
  from.theta = 'function(x) 2*exp(x)/(1+exp(x))-1'
Properties: constr = 'FALSE'
  nrow.ncol = 'FALSE'
  augmented = 'TRUE'
  aug.factor = '1'
  aug.constr = '1 2 3 4 5'
  n.div.by = '5'
  n.required = 'TRUE'
  set.default.values = 'TRUE'
  pdf = 'iid123d'

```

Model '2diid'. Number of hyperparameters are 3.

```

Hyperparameter 'theta1' hyperid = '30001'
  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)'
Hyperparameter 'theta2' hyperid = '30002'
  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)'
Hyperparameter 'theta3' hyperid = '30003'
  name = 'correlation'

```

```

short.name = 'cor'
initial = '4'
fixed = 'FALSE'
prior = 'normal'
param = '0 0.15'
to.theta = 'function(x) log((1+x)/(1-x))'
from.theta = 'function(x) 2*exp(x)/(1+exp(x))-1'
Properties: constr = 'FALSE'
nrow.ncol = 'FALSE'
augmented = 'FALSE'
aug.factor = '1'
aug.constr = '1 2'
n.div.by = '2'
n.required = 'TRUE'
set.default.values = 'TRUE'
pdf = 'iid123d'

```

Model 'z'. Number of hyperparameters are 1.

Hyperparameter 'theta' hyperid = '31001'

```

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)'

```

Properties: constr = 'FALSE'

```

nrow.ncol = 'FALSE'
augmented = 'FALSE'
aug.factor = '1'
aug.constr = 'NULL'
n.div.by = 'NULL'
n.required = 'TRUE'
set.default.values = 'TRUE'
pdf = 'z'
status = 'experimental'

```

Model 'rw2d'. Number of hyperparameters are 1.

Hyperparameter 'theta' hyperid = '32001'

```

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)'
Properties: constr = 'TRUE'
nrow.ncol = 'TRUE'
augmented = 'FALSE'
aug.factor = '1'
aug.constr = 'NULL'
n.div.by = 'NULL'
n.required = 'FALSE'
set.default.values = 'TRUE'
pdf = 'rw2d'

```

Model 'rw2diid'. Number of hyperparameters are 2.

```

Hyperparameter 'theta1' hyperid = '33001'
name = 'log precision'
short.name = 'prec'
prior = 'pc.prec'
param = '1 0.01'
initial = '4'
fixed = 'FALSE'
to.theta = 'function(x) log(x)'
from.theta = 'function(x) exp(x)'

```

```

Hyperparameter 'theta2' hyperid = '33002'
name = 'logit phi'
short.name = 'phi'
prior = 'pc'
param = '0.5 0.5'
initial = '3'
fixed = 'FALSE'
to.theta = 'function(x) log(x/(1-x))'
from.theta = 'function(x) exp(x)/(1+exp(x))'

```

```

Properties: constr = 'TRUE'
nrow.ncol = 'TRUE'
augmented = 'TRUE'
aug.factor = '2'
aug.constr = '2'
n.div.by = 'NULL'
n.required = 'FALSE'
set.default.values = 'TRUE'
status = 'experimental'
pdf = 'rw2diid'

```

Model 'slm'. Number of hyperparameters are 2.

```

Hyperparameter 'theta1' hyperid = '34001'
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)'
Hyperparameter 'theta2' hyperid = '34002'
    name = 'rho'
    short.name = 'rho'
    initial = '0'
    fixed = 'FALSE'
    prior = 'normal'
    param = '0 10'
    to.theta = 'function(x) log(x/(1-x))'
    from.theta = 'function(x) 1/(1+exp(-x))'
Properties: constr = 'FALSE'
    nrow.ncol = 'FALSE'
    augmented = 'FALSE'
    aug.factor = '1'
    aug.constr = 'NULL'
    n.div.by = 'NULL'
    n.required = 'TRUE'
    set.default.values = 'TRUE'
    pdf = 'slm'
    status = 'experimental'
Model 'matern2d'. Number of hyperparameters are 2.
Hyperparameter 'theta1' hyperid = '35001'
    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)'
Hyperparameter 'theta2' hyperid = '35002'
    name = 'log range'
    short.name = 'range'
    initial = '2'
    fixed = 'FALSE'
    prior = 'loggamma'
    param = '1 0.01'
    to.theta = 'function(x) log(x)'
    from.theta = 'function(x) exp(x)'
Properties: constr = 'FALSE'
    nrow.ncol = 'TRUE'
    augmented = 'FALSE'

```

```

aug.factor = '1'
aug.constr = 'NULL'
n.div.by = 'NULL'
n.required = 'FALSE'
set.default.values = 'TRUE'
pdf = 'matern2d'

```

Model 'copy'. Number of hyperparameters are 1.

```

Hyperparameter 'theta' hyperid = '36001'
  name = 'beta'
  short.name = 'b'
  initial = '1'
  fixed = 'TRUE'
  prior = 'normal'
  param = '1 10'
  to.theta = 'function(x, REPLACE.ME.low, REPLACE.ME.high) {}'
  from.theta = 'function(x, REPLACE.ME.low, REPLACE.ME.high) {}'

```

```

Properties: constr = 'FALSE'
  nrow.ncol = 'FALSE'
  augmented = 'FALSE'
  aug.factor = '1'
  aug.constr = 'NULL'
  n.div.by = 'NULL'
  n.required = 'FALSE'
  set.default.values = 'FALSE'
  pdf = 'NA'

```

Model 'clinear'. Number of hyperparameters are 1.

```

Hyperparameter 'theta' hyperid = '37001'
  name = 'beta'
  short.name = 'b'
  initial = '1'
  fixed = 'FALSE'
  prior = 'normal'
  param = '1 10'
  to.theta = 'function(x, REPLACE.ME.low, REPLACE.ME.high) {}'
  from.theta = 'function(x, REPLACE.ME.low, REPLACE.ME.high) {}'

```

```

Properties: constr = 'FALSE'
  nrow.ncol = 'FALSE'
  augmented = 'FALSE'
  aug.factor = '1'
  aug.constr = 'NULL'
  n.div.by = 'NULL'
  n.required = 'FALSE'
  set.default.values = 'FALSE'
  pdf = 'clinear'

```

Model 'sigm'. Number of hyperparameters are 3.

Hyperparameter ‘theta1’ hyperid = ‘38001’

```
name = ‘beta’
short.name = ‘b’
initial = ‘1’
fixed = ‘FALSE’
prior = ‘normal’
param = ‘1 10’
to.theta = ‘function(x) x’
from.theta = ‘function(x) x’
```

Hyperparameter ‘theta2’ hyperid = ‘38002’

```
name = ‘loghalflife’
short.name = ‘halflife’
initial = ‘3’
fixed = ‘FALSE’
prior = ‘loggamma’
param = ‘3 1’
to.theta = ‘function(x) log(x)’
from.theta = ‘function(x) exp(x)’
```

Hyperparameter ‘theta3’ hyperid = ‘38003’

```
name = ‘logshape’
short.name = ‘shape’
initial = ‘0’
fixed = ‘FALSE’
prior = ‘loggamma’
param = ‘10 10’
to.theta = ‘function(x) log(x)’
from.theta = ‘function(x) exp(x)’
```

Properties: constr = ‘FALSE’

```
nrow.ncol = ‘FALSE’
augmented = ‘FALSE’
aug.factor = ‘1’
aug.constr = ‘NULL’
n.div.by = ‘NULL’
n.required = ‘FALSE’
set.default.values = ‘FALSE’
status = ‘experimental’
pdf = ‘sigm’
```

Model ‘revsigm’. Number of hyperparameters are 3.

Hyperparameter ‘theta1’ hyperid = ‘39001’

```
name = ‘beta’
short.name = ‘b’
initial = ‘1’
fixed = ‘FALSE’
prior = ‘normal’
param = ‘1 10’
```

```

    to.theta = 'function(x) x'
    from.theta = 'function(x) x'
Hyperparameter 'theta2' hyperid = '39002'
    name = 'loghalflife'
    short.name = 'halflife'
    initial = '3'
    fixed = 'FALSE'
    prior = 'loggamma'
    param = '3 1'
    to.theta = 'function(x) log(x)'
    from.theta = 'function(x) exp(x)'
Hyperparameter 'theta3' hyperid = '39003'
    name = 'logshape'
    short.name = 'shape'
    initial = '0'
    fixed = 'FALSE'
    prior = 'loggamma'
    param = '10 10'
    to.theta = 'function(x) log(x)'
    from.theta = 'function(x) exp(x)'
Properties: constr = 'FALSE'
    nrow.ncol = 'FALSE'
    augmented = 'FALSE'
    aug.factor = '1'
    aug.constr = 'NULL'
    n.div.by = 'NULL'
    n.required = 'FALSE'
    set.default.values = 'FALSE'
    status = 'experimental'
    pdf = 'sigm'
Model 'log1exp'. Number of hyperparameters are 3.
Hyperparameter 'theta1' hyperid = '39011'
    name = 'beta'
    short.name = 'b'
    initial = '1'
    fixed = 'FALSE'
    prior = 'normal'
    param = '0 1'
    to.theta = 'function(x) x'
    from.theta = 'function(x) x'
Hyperparameter 'theta2' hyperid = '39012'
    name = 'alpha'
    short.name = 'a'
    initial = '0'
    fixed = 'FALSE'

```



```

    prior = 'normal'
    param = '0 1'
    to.theta = 'function(x) x'
    from.theta = 'function(x) x'
Hyperparameter 'theta3' hyperid = '39013'
    name = 'gamma'
    short.name = 'g'
    initial = '0'
    fixed = 'FALSE'
    prior = 'normal'
    param = '0 1'
    to.theta = 'function(x) x'
    from.theta = 'function(x) x'
Properties: constr = 'FALSE'
    nrow.ncol = 'FALSE'
    augmented = 'FALSE'
    aug.factor = '1'
    aug.constr = 'NULL'
    n.div.by = 'NULL'
    n.required = 'FALSE'
    set.default.values = 'FALSE'
    status = 'experimental'
    pdf = 'log1exp'
Model 'logdist'. Number of hyperparameters are 3.
Hyperparameter 'theta1' hyperid = '39021'
    name = 'beta'
    short.name = 'b'
    initial = '1'
    fixed = 'FALSE'
    prior = 'normal'
    param = '0 1'
    to.theta = 'function(x) x'
    from.theta = 'function(x) x'
Hyperparameter 'theta2' hyperid = '39022'
    name = 'alpha1'
    short.name = 'a1'
    initial = '0'
    fixed = 'FALSE'
    prior = 'loggamma'
    param = '0.1 1'
    to.theta = 'function(x) log(x)'
    from.theta = 'function(x) exp(x)'
Hyperparameter 'theta3' hyperid = '39023'
    name = 'alpha2'
    short.name = 'a2'

```

```

initial = '0'
fixed = 'FALSE'
prior = 'loggamma'
param = '0.1 1'
to.theta = 'function(x) log(x)'
from.theta = 'function(x) exp(x)'
Properties: constr = 'FALSE'
nrow.ncol = 'FALSE'
augmented = 'FALSE'
aug.factor = '1'
aug.constr = 'NULL'
n.div.by = 'NULL'
n.required = 'FALSE'
set.default.values = 'FALSE'
status = 'experimental'
pdf = 'logdist'

```

Section ‘group’. Valid models in this section are:

Model ‘exchangeable’. Number of hyperparameters are 1.

```

Hyperparameter ‘theta’ hyperid = '40001'
name = 'logit correlation'
short.name = 'rho'
initial = '1'
fixed = 'FALSE'
prior = 'normal'
param = '0 0.2'
to.theta = 'function(x, REPLACE.ME.ngroup) log((1+x*(ngroup-1))/(1-x))'
from.theta = 'function(x, REPLACE.ME.ngroup) (exp(x)-1)/(exp(x) + ngroup -1)'
Properties:

```

Model ‘exchangeablepos’. Number of hyperparameters are 1.

```

Hyperparameter ‘theta’ hyperid = '40101'
name = 'logit correlation'
short.name = 'rho'
initial = '1'
fixed = 'FALSE'
prior = 'pc.cor0'
param = '0.5 0.5'
to.theta = 'function(x) log(x/(1-x))'
from.theta = 'function(x) exp(x)/(1+exp(x))'
Properties:

```

Model ‘ar1’. Number of hyperparameters are 1.

```

Hyperparameter ‘theta’ hyperid = '41001'
name = 'logit correlation'
short.name = 'rho'
initial = '2'
fixed = 'FALSE'

```

```

prior = 'normal'
param = '0 0.15'
to.theta = 'function(x) log((1+x)/(1-x))'
from.theta = 'function(x) 2*exp(x)/(1+exp(x))-1'

```

Properties:

Model 'ar'. Number of hyperparameters are 11.

Hyperparameter 'theta1' hyperid = '42001'

```

name = 'log precision'
short.name = 'prec'
initial = '0'
fixed = 'TRUE'
prior = 'pc.prec'
param = '3 0.01'
to.theta = 'function(x) log(x)'
from.theta = 'function(x) exp(x)'

```

Hyperparameter 'theta2' hyperid = '42002'

```

name = 'pacf1'
short.name = 'pacf1'
initial = '2'
fixed = 'FALSE'
prior = 'pc.cor0'
param = '0.5 0.5'
to.theta = 'function(x) log((1+x)/(1-x))'
from.theta = 'function(x) 2*exp(x)/(1+exp(x))-1'

```

Hyperparameter 'theta3' hyperid = '42003'

```

name = 'pacf2'
short.name = 'pacf2'
initial = '0'
fixed = 'FALSE'
prior = 'pc.cor0'
param = '0.5 0.4'
to.theta = 'function(x) log((1+x)/(1-x))'
from.theta = 'function(x) 2*exp(x)/(1+exp(x))-1'

```

Hyperparameter 'theta4' hyperid = '42004'

```

name = 'pacf3'
short.name = 'pacf3'
initial = '0'
fixed = 'FALSE'
prior = 'pc.cor0'
param = '0.5 0.3'
to.theta = 'function(x) log((1+x)/(1-x))'
from.theta = 'function(x) 2*exp(x)/(1+exp(x))-1'

```

Hyperparameter 'theta5' hyperid = '42005'

```

name = 'pacf4'
short.name = 'pacf4'

```

```

initial = '0'
fixed = 'FALSE'
prior = 'pc.cor0'
param = '0.5 0.2'
to.theta = 'function(x) log((1+x)/(1-x))'
from.theta = 'function(x) 2*exp(x)/(1+exp(x))-1'
Hyperparameter 'theta6' hyperid = '42006'
  name = 'pacf5'
  short.name = 'pacf5'
  initial = '0'
  fixed = 'FALSE'
  prior = 'pc.cor0'
  param = '0.5 0.1'
  to.theta = 'function(x) log((1+x)/(1-x))'
  from.theta = 'function(x) 2*exp(x)/(1+exp(x))-1'
Hyperparameter 'theta7' hyperid = '42007'
  name = 'pacf6'
  short.name = 'pacf6'
  initial = '0'
  fixed = 'FALSE'
  prior = 'pc.cor0'
  param = '0.5 0.1'
  to.theta = 'function(x) log((1+x)/(1-x))'
  from.theta = 'function(x) 2*exp(x)/(1+exp(x))-1'
Hyperparameter 'theta8' hyperid = '42008'
  name = 'pacf7'
  short.name = 'pacf7'
  initial = '0'
  fixed = 'FALSE'
  prior = 'pc.cor0'
  param = '0.5 0.1'
  to.theta = 'function(x) log((1+x)/(1-x))'
  from.theta = 'function(x) 2*exp(x)/(1+exp(x))-1'
Hyperparameter 'theta9' hyperid = '42009'
  name = 'pacf8'
  short.name = 'pacf8'
  initial = '0'
  fixed = 'FALSE'
  prior = 'pc.cor0'
  param = '0.5 0.1'
  to.theta = 'function(x) log((1+x)/(1-x))'
  from.theta = 'function(x) 2*exp(x)/(1+exp(x))-1'
Hyperparameter 'theta10' hyperid = '42010'
  name = 'pacf9'
  short.name = 'pacf9'

```

```

initial = '0'
fixed = 'FALSE'
prior = 'pc.cor0'
param = '0.5 0.1'
to.theta = 'function(x) log((1+x)/(1-x))'
from.theta = 'function(x) 2*exp(x)/(1+exp(x))-1'
Hyperparameter 'theta11' hyperid = '42011'
name = 'pacf10'
short.name = 'pacf10'
initial = '0'
fixed = 'FALSE'
prior = 'pc.cor0'
param = '0.5 0.1'
to.theta = 'function(x) log((1+x)/(1-x))'
from.theta = 'function(x) 2*exp(x)/(1+exp(x))-1'

```

Properties:

Model 'rw1'. Number of hyperparameters are 1.

```

Hyperparameter 'theta' hyperid = '43001'
name = 'log precision'
short.name = 'prec'
prior = 'loggamma'
param = '1 5e-05'
initial = '0'
fixed = 'TRUE'
to.theta = 'function(x) log(x)'
from.theta = 'function(x) exp(x)'

```

Properties:

Model 'rw2'. Number of hyperparameters are 1.

```

Hyperparameter 'theta' hyperid = '44001'
name = 'log precision'
short.name = 'prec'
prior = 'loggamma'
param = '1 5e-05'
initial = '0'
fixed = 'TRUE'
to.theta = 'function(x) log(x)'
from.theta = 'function(x) exp(x)'

```

Properties:

Model 'besag'. Number of hyperparameters are 1.

```

Hyperparameter 'theta' hyperid = '45001'
name = 'log precision'
short.name = 'prec'
prior = 'loggamma'
param = '1 5e-05'
initial = '0'

```

```

fixed = 'TRUE'
to.theta = 'function(x) log(x)'
from.theta = 'function(x) exp(x)'

```

Properties:

Model 'iid'. Number of hyperparameters are 1.

Hyperparameter 'theta' hyperid = '46001'

```

name = 'log precision'
short.name = 'prec'
prior = 'loggamma'
param = '1 5e-05'
initial = '0'
fixed = 'TRUE'
to.theta = 'function(x) log(x)'
from.theta = 'function(x) exp(x)'

```

Properties:

Section 'mix'. Valid models in this section are:

Model 'gaussian'. Number of hyperparameters are 1.

Hyperparameter 'theta' hyperid = '47001'

```

name = 'log precision'
short.name = 'prec'
prior = 'loggamma'
param = '1 0.01'
initial = '0'
fixed = 'FALSE'
to.theta = 'function(x) log(x)'
from.theta = 'function(x) exp(x)'

```

Properties:

Section 'link'. Valid models in this section are:

Model 'default'. Number of hyperparameters are 0.

Model 'cloglog'. Number of hyperparameters are 0.

Model 'loglog'. Number of hyperparameters are 0.

Model 'identity'. Number of hyperparameters are 0.

Model 'log'. Number of hyperparameters are 0.

Model 'neglog'. Number of hyperparameters are 0.

Model 'logit'. Number of hyperparameters are 0.

Model 'probit'. Number of hyperparameters are 0.

Model 'cauchit'. Number of hyperparameters are 0.

Model 'tan'. Number of hyperparameters are 0.

Model 'sslogit'. Number of hyperparameters are 2.

Hyperparameter 'theta1' hyperid = '48001'

```

name = 'sensitivity'
short.name = 'sens'
prior = 'logitbeta'
param = '10 5'
initial = '1'

```

```

    fixed = 'FALSE'
    to.theta = 'function(x) log(x/(1-x))'
    from.theta = 'function(x) exp(x)/(1+exp(x))'
Hyperparameter 'theta2' hyperid = '48002'
    name = 'specificity'
    short.name = 'spec'
    prior = 'logitbeta'
    param = '10 5'
    initial = '1'
    fixed = 'FALSE'
    to.theta = 'function(x) log(x/(1-x))'
    from.theta = 'function(x) exp(x)/(1+exp(x))'

```

Properties: pdf = 'NA'

Model 'logoffset'. Number of hyperparameters are 1.

```

Hyperparameter 'theta' hyperid = '49001'
    name = 'beta'
    short.name = 'b'
    prior = 'normal'
    param = '0 100'
    initial = '0'
    fixed = 'TRUE'
    to.theta = 'function(x) log(x)'
    from.theta = 'function(x) exp(x)'

```

Properties: pdf = 'logoffset'

Model 'logitoffset'. Number of hyperparameters are 1.

```

Hyperparameter 'theta' hyperid = '49011'
    name = 'prob'
    short.name = 'p'
    prior = 'normal'
    param = '-1 100'
    initial = '-1'
    fixed = 'FALSE'
    to.theta = 'function(x) log(x/(1-x))'
    from.theta = 'function(x) exp(x)/(1+exp(x))'

```

Properties: status = 'experimental'

pdf = 'logitoffset'

Model 'test1'. Number of hyperparameters are 1.

```

Hyperparameter 'theta' hyperid = '50001'
    name = 'beta'
    short.name = 'b'
    prior = 'normal'
    param = '0 100'
    initial = '0'
    fixed = 'FALSE'
    to.theta = 'function(x) x'

```

```

    from.theta = 'function(x) x'
Properties: pdf = 'NA'
Model 'special1'. Number of hyperparameters are 11.
Hyperparameter 'theta1' hyperid = '51001'
    name = 'log precision'
    short.name = 'prec'
    initial = '0'
    fixed = 'FALSE'
    prior = 'loggamma'
    param = '1 1'
    to.theta = 'function(x) x'
    from.theta = 'function(x) x'
Hyperparameter 'theta2' hyperid = '51002'
    name = 'beta1'
    short.name = 'beta1'
    initial = '0'
    fixed = 'FALSE'
    prior = 'mvnorm'
    param = '0 100'
    to.theta = 'function(x) x'
    from.theta = 'function(x) x'
Hyperparameter 'theta3' hyperid = '51003'
    name = 'beta2'
    short.name = 'beta2'
    initial = '0'
    fixed = 'FALSE'
    prior = 'none'
    param = ''
    to.theta = 'function(x) x'
    from.theta = 'function(x) x'
Hyperparameter 'theta4' hyperid = '51004'
    name = 'beta3'
    short.name = 'beta3'
    initial = '0'
    fixed = 'FALSE'
    prior = 'none'
    param = ''
    to.theta = 'function(x) x'
    from.theta = 'function(x) x'
Hyperparameter 'theta5' hyperid = '51005'
    name = 'beta4'
    short.name = 'beta4'
    initial = '0'
    fixed = 'FALSE'
    prior = 'none'

```



```

    param = ''
    to.theta = 'function(x) x'
    from.theta = 'function(x) x'
Hyperparameter 'theta6' hyperid = '51006'
    name = 'beta5'
    short.name = 'beta5'
    initial = '0'
    fixed = 'FALSE'
    prior = 'none'
    param = ''
    to.theta = 'function(x) x'
    from.theta = 'function(x) x'
Hyperparameter 'theta7' hyperid = '51007'
    name = 'beta6'
    short.name = 'beta6'
    initial = '0'
    fixed = 'FALSE'
    prior = 'none'
    param = ''
    to.theta = 'function(x) x'
    from.theta = 'function(x) x'
Hyperparameter 'theta8' hyperid = '51008'
    name = 'beta7'
    short.name = 'beta7'
    initial = '0'
    fixed = 'FALSE'
    prior = 'none'
    param = ''
    to.theta = 'function(x) x'
    from.theta = 'function(x) x'
Hyperparameter 'theta9' hyperid = '51009'
    name = 'beta8'
    short.name = 'beta8'
    initial = '0'
    fixed = 'FALSE'
    prior = 'none'
    param = ''
    to.theta = 'function(x) x'
    from.theta = 'function(x) x'
Hyperparameter 'theta10' hyperid = '51010'
    name = 'beta9'
    short.name = 'beta9'
    initial = '0'
    fixed = 'FALSE'
    prior = 'none'

```

```

param = ''
to.theta = 'function(x) x'
from.theta = 'function(x) x'
Hyperparameter 'theta11' hyperid = '51011'
name = 'beta10'
short.name = 'beta10'
initial = '0'
fixed = 'FALSE'
prior = 'none'
param = ''
to.theta = 'function(x) x'
from.theta = 'function(x) x'

```

Properties: pdf = 'NA'

Model 'special2'. Number of hyperparameters are 1.

```

Hyperparameter 'theta' hyperid = '52001'
name = 'beta'
short.name = 'b'
prior = 'normal'
param = '0 10'
initial = '0'
fixed = 'FALSE'
to.theta = 'function(x) x'
from.theta = 'function(x) x'

```

Properties: pdf = 'NA'

Section 'predictor'. Valid models in this section are:

Model 'predictor'. Number of hyperparameters are 1.

```

Hyperparameter 'theta' hyperid = '53001'
name = 'log precision'
short.name = 'prec'
initial = '12'
fixed = 'TRUE'
prior = 'loggamma'
param = '1 1e-05'
to.theta = 'function(x) log(x)'
from.theta = 'function(x) exp(x)'

```

Properties:

Section 'hazard'. Valid models in this section are:

Model 'rw1'. Number of hyperparameters are 1.

```

Hyperparameter 'theta' hyperid = '54001'
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)'

```

Properties:

Model 'rw2'. Number of hyperparameters are 1.

Hyperparameter 'theta' hyperid = '55001'

```

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)'

```

Properties:

Section 'likelihood'. Valid models in this section are:

Model 'poisson'. Number of hyperparameters are 0.

Model 'qpoisson'. Number of hyperparameters are 0.

Model 'cenpoisson'. Number of hyperparameters are 0.

Model 'gpoisson'. Number of hyperparameters are 2.

Hyperparameter 'theta1' hyperid = '56001'

```

name = 'overdispersion'
short.name = 'phi'
initial = '0'
fixed = 'FALSE'
prior = 'loggamma'
param = '1 1'
to.theta = 'function(x) log(x)'
from.theta = 'function(x) exp(x)'

```

Hyperparameter 'theta2' hyperid = '56002'

```

name = 'p'
short.name = 'p'
initial = '1'
fixed = 'TRUE'
prior = 'normal'
param = '1 100'
to.theta = 'function(x) x'
from.theta = 'function(x) x'

```

Properties: survival = 'FALSE'

```

discrete = 'TRUE'
link = 'default log logoffset'
pdf = 'gpoisson'
status = 'experimental'

```

Model 'binomial'. Number of hyperparameters are 0.

Model 'testbinomial1'. Number of hyperparameters are 2.

Hyperparameter 'theta1' hyperid = '57001'

```

    name = 'sensitivity'
    short.name = 's'
    initial = '3'
    fixed = 'FALSE'
    prior = 'logitbeta'
    param = '2 1'
    to.theta = 'function(x) log(x/(1-x))'
    from.theta = 'function(x) exp(x)/(1+exp(x))'
Hyperparameter 'theta2' hyperid = '57002'
    name = 'specificity'
    short.name = 'e'
    initial = '3'
    fixed = 'FALSE'
    prior = 'logitbeta'
    param = '2 1'
    to.theta = 'function(x) log(x/(1-x))'
    from.theta = 'function(x) exp(x)/(1+exp(x))'
Properties: status = 'experimental'
    survival = 'FALSE'
    discrete = 'TRUE'
    link = 'default logit cauchit probit cloglog loglog log'
    pdf = 'testbinomial1'
Model 'gamma'. Number of hyperparameters are 1.
Hyperparameter 'theta' hyperid = '58001'
    name = 'precision parameter'
    short.name = 'prec'
    initial = '4.60517018598809'
    fixed = 'FALSE'
    prior = 'loggamma'
    param = '1 0.01'
    to.theta = 'function(x) log(x)'
    from.theta = 'function(x) exp(x)'
Properties: survival = 'FALSE'
    discrete = 'FALSE'
    link = 'default log'
    pdf = 'gamma'
Model 'gammacount'. Number of hyperparameters are 1.
Hyperparameter 'theta' hyperid = '59001'
    name = 'log alpha'
    short.name = 'alpha'
    initial = '0'
    fixed = 'FALSE'
    prior = 'loggamma'
    param = '10 10'
    to.theta = 'function(x) log(x)'

```

```

from.theta = 'function(x) exp(x)'
Properties: survival = 'FALSE'
discrete = 'FALSE'
link = 'default log'
status = 'experimental'
pdf = 'gammacount'
Model 'qkumar'. Number of hyperparameters are 1.
Hyperparameter 'theta' hyperid = '60001'
name = 'precision parameter'
short.name = 'prec'
initial = '0'
fixed = 'FALSE'
prior = 'loggamma'
param = '1 0.001'
to.theta = 'function(x) log(x)'
from.theta = 'function(x) exp(x)'
Properties: survival = 'FALSE'
discrete = 'FALSE'
link = 'default logit cauchit'
pdf = 'qkumar'
Model 'qloglogistic'. Number of hyperparameters are 1.
Hyperparameter 'theta' hyperid = '60011'
name = 'precision parameter'
short.name = 'prec'
initial = '2'
fixed = 'FALSE'
prior = 'loggamma'
param = '1 0.001'
to.theta = 'function(x) log(x)'
from.theta = 'function(x) exp(x)'
Properties: survival = 'FALSE'
discrete = 'FALSE'
link = 'default log'
pdf = 'qloglogistic'
Model 'beta'. Number of hyperparameters are 1.
Hyperparameter 'theta' hyperid = '61001'
name = 'precision parameter'
short.name = 'phi'
initial = '2.30258509299405'
fixed = 'FALSE'
prior = 'loggamma'
param = '1 0.1'
to.theta = 'function(x) log(x)'
from.theta = 'function(x) exp(x)'
Properties: survival = 'FALSE'

```

```

discrete = 'FALSE'
link = 'default logit cauchit probit cloglog loglog'
pdf = 'beta'

```

Model 'betabinomial'. Number of hyperparameters are 1.

```

Hyperparameter 'theta' hyperid = '62001'
  name = 'overdispersion'
  short.name = 'rho'
  initial = '0'
  fixed = 'FALSE'
  prior = 'gaussian'
  param = '0 0.4'
  to.theta = 'function(x) log(x/(1-x))'
  from.theta = 'function(x) exp(x)/(1+exp(x))'

```

```

Properties: survival = 'FALSE'
discrete = 'TRUE'
link = 'default logit cauchit probit cloglog loglog'
pdf = 'betabinomial'

```

Model 'cbinomial'. Number of hyperparameters are 0.

Model 'nbinomial'. Number of hyperparameters are 1.

```

Hyperparameter 'theta' hyperid = '63001'
  name = 'size'
  short.name = 'size'
  initial = '2.30258509299405'
  fixed = 'FALSE'
  prior = 'loggamma'
  param = '1 0.1'
  to.theta = 'function(x) log(x)'
  from.theta = 'function(x) exp(x)'

```

```

Properties: survival = 'FALSE'
discrete = 'TRUE'
link = 'default log logoffset'
pdf = 'nbinomial'

```

Model 'simplex'. Number of hyperparameters are 1.

```

Hyperparameter 'theta' hyperid = '64001'
  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)'

```

```

Properties: survival = 'FALSE'
discrete = 'FALSE'
link = 'default logit cauchit probit cloglog loglog'

```

pdf = 'simplex'

Model 'gaussian'. Number of hyperparameters are 1.

Hyperparameter 'theta' hyperid = '65001'

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)'

Properties: survival = 'FALSE'

discrete = 'FALSE'

link = 'default identity logit cauchit log logoffset'

pdf = 'gaussian'

Model 'normal'. Number of hyperparameters are 1.

Hyperparameter 'theta' hyperid = '66001'

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)'

Properties: survival = 'FALSE'

discrete = 'FALSE'

link = 'default identity'

pdf = 'gaussian'

Model 'circularnormal'. Number of hyperparameters are 1.

Hyperparameter 'theta' hyperid = '67001'

name = 'log precision parameter'

short.name = 'prec'

initial = '2'

fixed = 'FALSE'

prior = 'loggamma'

param = '1 0.01'

to.theta = 'function(x) log(x)'

from.theta = 'function(x) exp(x)'

Properties: survival = 'FALSE'

discrete = 'FALSE'

link = 'default tan'

pdf = 'circular-normal'

status = 'experimental'

Model 'wrappedcauchy'. Number of hyperparameters are 1.

```

Hyperparameter ‘theta’ hyperid = ‘68001’
  name = ‘log precision parameter’
  short.name = ‘prec’
  initial = ‘2’
  fixed = ‘FALSE’
  prior = ‘loggamma’
  param = ‘1 0.005’
  to.theta = ‘function(x) log(x/(1-x))’
  from.theta = ‘function(x) exp(x)/(1+exp(x))’

```

```

Properties: survival = ‘FALSE’
  discrete = ‘FALSE’
  link = ‘default tan’
  pdf = ‘wrapped-cauchy’
  status = ‘disabled’

```

Model ‘iidgamma’. Number of hyperparameters are 2.

```

Hyperparameter ‘theta1’ hyperid = ‘69001’
  name = ‘logshape’
  short.name = ‘shape’
  initial = ‘0’
  fixed = ‘FALSE’
  prior = ‘loggamma’
  param = ‘100 100’
  to.theta = ‘function(x) log(x)’
  from.theta = ‘function(x) exp(x)’

```

```

Hyperparameter ‘theta2’ hyperid = ‘69002’
  name = ‘lograte’
  short.name = ‘rate’
  initial = ‘0’
  fixed = ‘FALSE’
  prior = ‘loggamma’
  param = ‘100 100’
  to.theta = ‘function(x) log(x)’
  from.theta = ‘function(x) exp(x)’

```

```

Properties: survival = ‘FALSE’
  discrete = ‘FALSE’
  link = ‘default identity’
  pdf = ‘iidgamma’
  status = ‘experimental’

```

Model ‘iidlogitbeta’. Number of hyperparameters are 2.

```

Hyperparameter ‘theta1’ hyperid = ‘70001’
  name = ‘log.a’
  short.name = ‘a’
  initial = ‘1’
  fixed = ‘FALSE’
  prior = ‘loggamma’

```



```

    param = '1 1'
    to.theta = 'function(x) log(x)'
    from.theta = 'function(x) exp(x)'
Hyperparameter 'theta2' hyperid = '70002'
    name = 'log.b'
    short.name = 'b'
    initial = '1'
    fixed = 'FALSE'
    prior = 'loggamma'
    param = '1 1'
    to.theta = 'function(x) log(x)'
    from.theta = 'function(x) exp(x)'
Properties: survival = 'FALSE'
    discrete = 'FALSE'
    link = 'default logit'
    pdf = 'iidlogitbeta'
    status = 'experimental'
Model 'loggammafrailty'. Number of hyperparameters are 1.
Hyperparameter 'theta' hyperid = '71001'
    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)'
Properties: survival = 'FALSE'
    discrete = 'FALSE'
    link = 'default identity'
    pdf = 'loggammafrailty'
Model 'logistic'. Number of hyperparameters are 1.
Hyperparameter 'theta' hyperid = '72001'
    name = 'log precision'
    short.name = 'prec'
    initial = '1'
    fixed = 'FALSE'
    prior = 'loggamma'
    param = '1 5e-05'
    to.theta = 'function(x) log(x)'
    from.theta = 'function(x) exp(x)'
Properties: survival = 'FALSE'
    discrete = 'FALSE'
    link = 'default identity'
    pdf = 'logistic'

```

Model ‘skewnormal’. Number of hyperparameters are 2.

Hyperparameter ‘theta1’ hyperid = ‘73001’

name = ‘inverse.scale’
short.name = ‘iscale’
initial = ‘4’
fixed = ‘FALSE’
prior = ‘loggamma’
param = ‘1 5e-05’

Hyperparameter ‘theta2’ hyperid = ‘73002’

name = ‘skewness’
short.name = ‘skew’
initial = ‘4’
fixed = ‘FALSE’
prior = ‘gaussian’
param = ‘0 10’

Properties: survival = ‘FALSE’

discrete = ‘FALSE’
link = ‘default identity’
pdf = ‘sn’

Model ‘sn’. Number of hyperparameters are 2.

Hyperparameter ‘theta1’ hyperid = ‘74001’

name = ‘log inverse scale’
short.name = ‘iscale’
initial = ‘4’
fixed = ‘FALSE’
prior = ‘loggamma’
param = ‘1 5e-05’

Hyperparameter ‘theta2’ hyperid = ‘74002’

name = ‘logit skewness’
short.name = ‘skew’
initial = ‘0’
fixed = ‘FALSE’
prior = ‘gaussian’
param = ‘0 10’
to.theta = ‘function(x, shape.max = 1) log((1+x/shape.max)/(1-x/shape.max))’
from.theta = ‘function(x, shape.max = 1) shape.max*(2*exp(x)/(1+exp(x))-1)’

Properties: survival = ‘FALSE’

discrete = ‘FALSE’
link = ‘default identity’
pdf = ‘sn’

Model ‘sn2’. Number of hyperparameters are 2.

Hyperparameter ‘theta1’ hyperid = ‘75001’

name = ‘log precision’
short.name = ‘prec’
initial = ‘1’

```

fixed = 'FALSE'
prior = 'loggamma'
param = '1 5e-05'
Hyperparameter 'theta2' hyperid = '75002'
  name = 'logit skewness'
  short.name = 'skew'
  initial = '0'
  fixed = 'FALSE'
  prior = 'gaussian'
  param = '0 10'
  to.theta = 'function(x) log((1+x)/(1-x))'
  from.theta = 'function(x) (2*exp(x)/(1+exp(x))-1)'
Properties: survival = 'FALSE'
  discrete = 'FALSE'
  link = 'default identity'
  status = 'experimental'
  pdf = 'sn2'

```

Model 'gev'. Number of hyperparameters are 2.

```

Hyperparameter 'theta1' hyperid = '76001'
  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)'
Hyperparameter 'theta2' hyperid = '76002'
  name = 'gev parameter'
  short.name = 'gev'
  initial = '0'
  fixed = 'FALSE'
  prior = 'gaussian'
  param = '0 25'
  to.theta = 'function(x) x'
  from.theta = 'function(x) x'
Properties: survival = 'FALSE'
  discrete = 'FALSE'
  link = 'default identity'
  status = 'experimental'
  pdf = 'gev'

```

Model 'lognormal'. Number of hyperparameters are 1.

```

Hyperparameter 'theta' hyperid = '77101'
  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)'

```

```

Properties: survival = 'FALSE'
discrete = 'FALSE'
link = 'default identity'
pdf = 'lognormal'

```

Model 'lognormalsurv'. Number of hyperparameters are 1.

```

Hyperparameter 'theta' hyperid = '78001'
name = 'log precision'
short.name = 'prec'
initial = '2'
fixed = 'FALSE'
prior = 'loggamma'
param = '1 5e-05'
to.theta = 'function(x) log(x)'
from.theta = 'function(x) exp(x)'

```

```

Properties: survival = 'TRUE'
discrete = 'FALSE'
link = 'default identity'
pdf = 'lognormal'

```

Model 'exponential'. Number of hyperparameters are 0.

Model 'exponentialsurv'. Number of hyperparameters are 0.

Model 'coxph'. Number of hyperparameters are 0.

Model 'weibull'. Number of hyperparameters are 1.

```

Hyperparameter 'theta' hyperid = '79001'
name = 'log alpha'
short.name = 'alpha'
initial = '0'
fixed = 'FALSE'
prior = 'loggamma'
param = '25 25'
to.theta = 'function(x) log(x)'
from.theta = 'function(x) exp(x)'

```

```

Properties: survival = 'FALSE'
discrete = 'FALSE'
link = 'default log'
pdf = 'weibull'

```

Model 'weibullsurv'. Number of hyperparameters are 1.

```

Hyperparameter 'theta' hyperid = '79101'
name = 'log alpha'
short.name = 'alpha'

```

```

initial = '0'
fixed = 'FALSE'
prior = 'loggamma'
param = '25 25'
to.theta = 'function(x) log(x)'
from.theta = 'function(x) exp(x)'

```

```

Properties: survival = 'TRUE'
discrete = 'FALSE'
link = 'default log neglog'
pdf = 'weibull'

```

Model 'loglogistic'. Number of hyperparameters are 1.

```

Hyperparameter 'theta' hyperid = '80001'
name = 'log alpha'
short.name = 'alpha'
initial = '1'
fixed = 'FALSE'
prior = 'loggamma'
param = '25 25'
to.theta = 'function(x) log(x)'
from.theta = 'function(x) exp(x)'

```

```

Properties: survival = 'TRUE'
discrete = 'FALSE'
link = 'default log neglog'
pdf = 'loglogistic'

```

Model 'weibullcure'. Number of hyperparameters are 2.

```

Hyperparameter 'theta1' hyperid = '81001'
name = 'log alpha'
short.name = 'a'
initial = '4'
fixed = 'FALSE'
prior = 'loggamma'
param = '25 25'
to.theta = 'function(x) log(x)'
from.theta = 'function(x) exp(x)'

```

```

Hyperparameter 'theta2' hyperid = '81002'
name = 'logit probability'
short.name = 'prob'
initial = '-1'
fixed = 'FALSE'
prior = 'gaussian'
param = '-1 0.2'
to.theta = 'function(x) log(x/(1-x))'
from.theta = 'function(x) exp(x)/(1+exp(x))'

```

```

Properties: survival = 'TRUE'
discrete = 'FALSE'

```

```
link = 'default log neglog'
pdf = 'NA'
```

Model 'stochvol'. Number of hyperparameters are 1.

```
Hyperparameter 'theta' hyperid = '82001'
  name = 'log precision'
  short.name = 'prec'
  initial = '500'
  fixed = 'TRUE'
  prior = 'loggamma'
  param = '1 0.005'
  to.theta = 'function(x) log(x)'
  from.theta = 'function(x) exp(x)'
```

```
Properties: survival = 'FALSE'
  discrete = 'FALSE'
  link = 'default log'
  pdf = 'stochvolgaussian'
```

Model 'stochvolt'. Number of hyperparameters are 1.

```
Hyperparameter 'theta' hyperid = '83001'
  name = 'log degrees of freedom'
  short.name = 'dof'
  initial = '4'
  fixed = 'FALSE'
  prior = 'loggamma'
  param = '1 0.5'
  to.theta = 'function(x) log(x-2)'
  from.theta = 'function(x) 2+exp(x)'
```

```
Properties: survival = 'FALSE'
  discrete = 'FALSE'
  link = 'default log'
  pdf = 'stochvolt'
```

Model 'stochvolnig'. Number of hyperparameters are 2.

```
Hyperparameter 'theta1' hyperid = '84001'
  name = 'skewness'
  short.name = 'skew'
  initial = '0'
  fixed = 'FALSE'
  prior = 'gaussian'
  param = '0 10'
  to.theta = 'function(x) x'
  from.theta = 'function(x) x'
```

```
Hyperparameter 'theta2' hyperid = '84002'
  name = 'shape'
  short.name = 'shape'
  initial = '0'
  fixed = 'FALSE'
```

```

prior = 'loggamma'
param = '1 0.5'
to.theta = 'function(x) log(x-1)'
from.theta = 'function(x) 1+exp(x)'

```

```

Properties: survival = 'FALSE'
discrete = 'FALSE'
link = 'default log'
pdf = 'stochvolnig'

```

Model 'zeroinflatedpoisson0'. Number of hyperparameters are 1.

```

Hyperparameter 'theta' hyperid = '85001'
name = 'logit probability'
short.name = 'prob'
initial = '-1'
fixed = 'FALSE'
prior = 'gaussian'
param = '-1 0.2'
to.theta = 'function(x) log(x/(1-x))'
from.theta = 'function(x) exp(x)/(1+exp(x))'

```

```

Properties: survival = 'FALSE'
discrete = 'FALSE'
link = 'default log'
pdf = 'zeroinflated'

```

Model 'zeroinflatedpoisson1'. Number of hyperparameters are 1.

```

Hyperparameter 'theta' hyperid = '86001'
name = 'logit probability'
short.name = 'prob'
initial = '-1'
fixed = 'FALSE'
prior = 'gaussian'
param = '-1 0.2'
to.theta = 'function(x) log(x/(1-x))'
from.theta = 'function(x) exp(x)/(1+exp(x))'

```

```

Properties: survival = 'FALSE'
discrete = 'FALSE'
link = 'default log'
pdf = 'zeroinflated'

```

Model 'zeroinflatedpoisson2'. Number of hyperparameters are 1.

```

Hyperparameter 'theta' hyperid = '87001'
name = 'log alpha'
short.name = 'a'
initial = '0.693147180559945'
fixed = 'FALSE'
prior = 'gaussian'
param = '0.693147180559945 1'
to.theta = 'function(x) log(x)'

```

```

from.theta = 'function(x) exp(x)'
Properties: survival = 'FALSE'
discrete = 'FALSE'
link = 'default log'
pdf = 'zeroinflated'
Model 'zeroinflatedbetabinomial0'. Number of hyperparameters are 2.
Hyperparameter 'theta1' hyperid = '88001'
  name = 'overdispersion'
  short.name = 'rho'
  initial = '0'
  fixed = 'FALSE'
  prior = 'gaussian'
  param = '0 0.4'
  to.theta = 'function(x) log(x/(1-x))'
  from.theta = 'function(x) exp(x)/(1+exp(x))'
Hyperparameter 'theta2' hyperid = '88002'
  name = 'logit probability'
  short.name = 'prob'
  initial = '-1'
  fixed = 'FALSE'
  prior = 'gaussian'
  param = '-1 0.2'
  to.theta = 'function(x) log(x/(1-x))'
  from.theta = 'function(x) exp(x)/(1+exp(x))'
Properties: survival = 'FALSE'
discrete = 'TRUE'
link = 'default logit cauchit probit cloglog loglog'
pdf = 'zeroinflated'
Model 'zeroinflatedbetabinomial1'. Number of hyperparameters are 2.
Hyperparameter 'theta1' hyperid = '89001'
  name = 'overdispersion'
  short.name = 'rho'
  initial = '0'
  fixed = 'FALSE'
  prior = 'gaussian'
  param = '0 0.4'
  to.theta = 'function(x) log(x/(1-x))'
  from.theta = 'function(x) exp(x)/(1+exp(x))'
Hyperparameter 'theta2' hyperid = '89002'
  name = 'logit probability'
  short.name = 'prob'
  initial = '-1'
  fixed = 'FALSE'
  prior = 'gaussian'
  param = '-1 0.2'

```



```

to.theta = 'function(x) log(x/(1-x))'
from.theta = 'function(x) exp(x)/(1+exp(x))'
Properties: survival = 'FALSE'
discrete = 'TRUE'
link = 'default logit cauchit probit cloglog loglog'
pdf = 'zeroinflated'

```

Model 'zeroinflatedbinomial0'. Number of hyperparameters are 1.

```

Hyperparameter 'theta' hyperid = '90001'
  name = 'logit probability'
  short.name = 'prob'
  initial = '-1'
  fixed = 'FALSE'
  prior = 'gaussian'
  param = '-1 0.2'
  to.theta = 'function(x) log(x/(1-x))'
  from.theta = 'function(x) exp(x)/(1+exp(x))'
Properties: survival = 'FALSE'
discrete = 'FALSE'
link = 'default logit cauchit probit cloglog loglog'
pdf = 'zeroinflated'

```

Model 'zeroinflatedbinomial1'. Number of hyperparameters are 1.

```

Hyperparameter 'theta' hyperid = '91001'
  name = 'logit probability'
  short.name = 'prob'
  initial = '-1'
  fixed = 'FALSE'
  prior = 'gaussian'
  param = '-1 0.2'
  to.theta = 'function(x) log(x/(1-x))'
  from.theta = 'function(x) exp(x)/(1+exp(x))'
Properties: survival = 'FALSE'
discrete = 'FALSE'
link = 'default logit cauchit probit cloglog loglog'
pdf = 'zeroinflated'

```

Model 'zeroinflatedbinomial2'. Number of hyperparameters are 1.

```

Hyperparameter 'theta' hyperid = '92001'
  name = 'alpha'
  short.name = 'alpha'
  initial = '-1'
  fixed = 'FALSE'
  prior = 'gaussian'
  param = '-1 0.2'
  to.theta = 'function(x) log(x)'
  from.theta = 'function(x) exp(x)'
Properties: survival = 'FALSE'

```

```

discrete = 'FALSE'
link = 'default logit cauchit probit cloglog loglog'
pdf = 'zeroinflated'

```

Model 'zeroninflatedbinomial2'. Number of hyperparameters are 2.

Hyperparameter 'theta1' hyperid = '93001'

```

name = 'alpha1'
short.name = 'alpha1'
initial = '-1'
fixed = 'FALSE'
prior = 'gaussian'
param = '-1 0.2'
to.theta = 'function(x) log(x)'
from.theta = 'function(x) exp(x)'

```

Hyperparameter 'theta2' hyperid = '93002'

```

name = 'alpha2'
short.name = 'alpha2'
initial = '-1'
fixed = 'FALSE'
prior = 'gaussian'
param = '-1 0.2'
to.theta = 'function(x) log(x)'
from.theta = 'function(x) exp(x)'

```

Properties: survival = 'FALSE'

```

discrete = 'FALSE'
link = 'default logit cauchit probit cloglog loglog'
pdf = 'NA'

```

Model 'zeroninflatedbinomial3'. Number of hyperparameters are 2.

Hyperparameter 'theta1' hyperid = '93101'

```

name = 'alpha0'
short.name = 'alpha0'
initial = '1'
fixed = 'FALSE'
prior = 'loggamma'
param = '1 1'
to.theta = 'function(x) log(x)'
from.theta = 'function(x) exp(x)'

```

Hyperparameter 'theta2' hyperid = '93102'

```

name = 'alphaN'
short.name = 'alphaN'
initial = '1'
fixed = 'FALSE'
prior = 'loggamma'
param = '1 1'
to.theta = 'function(x) log(x)'
from.theta = 'function(x) exp(x)'

```

Properties: `status = 'experimental'`
`survival = 'FALSE'`
`discrete = 'FALSE'`
`link = 'default logit cauchit probit cloglog loglog'`
`pdf = 'zeroinflated'`

Model 'zeroinflatedbetabinomial2'. Number of hyperparameters are 2.

Hyperparameter 'theta1' hyperid = '94001'
`name = 'log alpha'`
`short.name = 'a'`
`initial = '0.693147180559945'`
`fixed = 'FALSE'`
`prior = 'gaussian'`
`param = '0.693147180559945 1'`
`to.theta = 'function(x) log(x)'`
`from.theta = 'function(x) exp(x)'`

Hyperparameter 'theta2' hyperid = '94002'
`name = 'beta'`
`short.name = 'b'`
`initial = '0'`
`fixed = 'FALSE'`
`prior = 'gaussian'`
`param = '0 1'`
`to.theta = 'function(x) log(x)'`
`from.theta = 'function(x) exp(x)'`

Properties: `survival = 'FALSE'`
`discrete = 'FALSE'`
`link = 'default logit cauchit probit cloglog loglog'`
`pdf = 'zeroinflated'`

Model 'zeroinflatednbinomial0'. Number of hyperparameters are 2.

Hyperparameter 'theta1' hyperid = '95001'
`name = 'log size'`
`short.name = 'size'`
`initial = '2.30258509299405'`
`fixed = 'FALSE'`
`prior = 'loggamma'`
`param = '1 1'`
`to.theta = 'function(x) log(x)'`
`from.theta = 'function(x) exp(x)'`

Hyperparameter 'theta2' hyperid = '95002'
`name = 'logit probability'`
`short.name = 'prob'`
`initial = '-1'`
`fixed = 'FALSE'`
`prior = 'gaussian'`
`param = '-1 0.2'`

```

to.theta = 'function(x) log(x/(1-x))'
from.theta = 'function(x) exp(x)/(1+exp(x))'
Properties: survival = 'FALSE'
discrete = 'FALSE'
link = 'default log'
pdf = 'zeroinflated'

```

Model 'zeroinflatednbinomial1'. Number of hyperparameters are 2.

Hyperparameter 'theta1' hyperid = '96001'

```

name = 'log size'
short.name = 'size'
initial = '2.30258509299405'
fixed = 'FALSE'
prior = 'loggamma'
param = '1 1'
to.theta = 'function(x) log(x)'
from.theta = 'function(x) exp(x)'

```

Hyperparameter 'theta2' hyperid = '96002'

```

name = 'logit probability'
short.name = 'prob'
initial = '-1'
fixed = 'FALSE'
prior = 'gaussian'
param = '-1 0.2'
to.theta = 'function(x) log(x/(1-x))'
from.theta = 'function(x) exp(x)/(1+exp(x))'

```

```

Properties: survival = 'FALSE'
discrete = 'FALSE'
link = 'default log'
pdf = 'zeroinflated'

```

Model 'zeroinflatednbinomial1strata2'. Number of hyperparameters are 11.

Hyperparameter 'theta1' hyperid = '97001'

```

name = 'log size'
short.name = 'size'
initial = '2.30258509299405'
fixed = 'FALSE'
prior = 'loggamma'
param = '1 0.1'
to.theta = 'function(x) log(x)'
from.theta = 'function(x) exp(x)'

```

Hyperparameter 'theta2' hyperid = '97002'

```

name = 'logit probability 1'
short.name = 'prob1'
initial = '-1'
fixed = 'FALSE'
prior = 'gaussian'

```

```

    param = '-1 0.2'
    to.theta = 'function(x) log(x/(1-x))'
    from.theta = 'function(x) exp(x)/(1+exp(x))'
Hyperparameter 'theta3' hyperid = '97003'
    name = 'logit probability 2'
    short.name = 'prob2'
    initial = '-1'
    fixed = 'FALSE'
    prior = 'gaussian'
    param = '-1 0.2'
    to.theta = 'function(x) log(x/(1-x))'
    from.theta = 'function(x) exp(x)/(1+exp(x))'
Hyperparameter 'theta4' hyperid = '97004'
    name = 'logit probability 3'
    short.name = 'prob3'
    initial = '-1'
    fixed = 'TRUE'
    prior = 'gaussian'
    param = '-1 0.2'
    to.theta = 'function(x) log(x/(1-x))'
    from.theta = 'function(x) exp(x)/(1+exp(x))'
Hyperparameter 'theta5' hyperid = '97005'
    name = 'logit probability 4'
    short.name = 'prob4'
    initial = '-1'
    fixed = 'TRUE'
    prior = 'gaussian'
    param = '-1 0.2'
    to.theta = 'function(x) log(x/(1-x))'
    from.theta = 'function(x) exp(x)/(1+exp(x))'
Hyperparameter 'theta6' hyperid = '97006'
    name = 'logit probability 5'
    short.name = 'prob5'
    initial = '-1'
    fixed = 'TRUE'
    prior = 'gaussian'
    param = '-1 0.2'
    to.theta = 'function(x) log(x/(1-x))'
    from.theta = 'function(x) exp(x)/(1+exp(x))'
Hyperparameter 'theta7' hyperid = '97007'
    name = 'logit probability 6'
    short.name = 'prob6'
    initial = '-1'
    fixed = 'TRUE'
    prior = 'gaussian'

```

```

    param = '-1 0.2'
    to.theta = 'function(x) log(x/(1-x))'
    from.theta = 'function(x) exp(x)/(1+exp(x))'
Hyperparameter 'theta8' hyperid = '97008'
    name = 'logit probability 7'
    short.name = 'prob7'
    initial = '-1'
    fixed = 'TRUE'
    prior = 'gaussian'
    param = '-1 0.2'
    to.theta = 'function(x) log(x/(1-x))'
    from.theta = 'function(x) exp(x)/(1+exp(x))'
Hyperparameter 'theta9' hyperid = '97009'
    name = 'logit probability 8'
    short.name = 'prob8'
    initial = '-1'
    fixed = 'TRUE'
    prior = 'gaussian'
    param = '-1 0.2'
    to.theta = 'function(x) log(x/(1-x))'
    from.theta = 'function(x) exp(x)/(1+exp(x))'
Hyperparameter 'theta10' hyperid = '97010'
    name = 'logit probability 9'
    short.name = 'prob9'
    initial = '-1'
    fixed = 'TRUE'
    prior = 'gaussian'
    param = '-1 0.2'
    to.theta = 'function(x) log(x/(1-x))'
    from.theta = 'function(x) exp(x)/(1+exp(x))'
Hyperparameter 'theta11' hyperid = '97011'
    name = 'logit probability 10'
    short.name = 'prob10'
    initial = '-1'
    fixed = 'TRUE'
    prior = 'gaussian'
    param = '-1 0.2'
    to.theta = 'function(x) log(x/(1-x))'
    from.theta = 'function(x) exp(x)/(1+exp(x))'
Properties: status = 'experimental'
    survival = 'FALSE'
    discrete = 'FALSE'
    link = 'default log'
    pdf = 'zeroinflated'

```

Model 'zeroinflatednbinomial1strata3'. Number of hyperparameters are 11.

```

Hyperparameter 'theta1' hyperid = '98001'
  name = 'logit probability'
  short.name = 'prob'
  initial = '-1'
  fixed = 'FALSE'
  prior = 'gaussian'
  param = '-1 0.2'
  to.theta = 'function(x) log(x/(1-x))'
  from.theta = 'function(x) exp(x)/(1+exp(x))'

Hyperparameter 'theta2' hyperid = '98002'
  name = 'log size 1'
  short.name = 'size1'
  initial = '2.30258509299405'
  fixed = 'FALSE'
  prior = 'loggamma'
  param = '1 0.1'
  to.theta = 'function(x) log(x)'
  from.theta = 'function(x) exp(x)'

Hyperparameter 'theta3' hyperid = '98003'
  name = 'log size 2'
  short.name = 'size2'
  initial = '2.30258509299405'
  fixed = 'FALSE'
  prior = 'loggamma'
  param = '1 0.1'
  to.theta = 'function(x) log(x)'
  from.theta = 'function(x) exp(x)'

Hyperparameter 'theta4' hyperid = '98004'
  name = 'log size 3'
  short.name = 'size3'
  initial = '2.30258509299405'
  fixed = 'TRUE'
  prior = 'loggamma'
  param = '1 0.1'
  to.theta = 'function(x) log(x)'
  from.theta = 'function(x) exp(x)'

Hyperparameter 'theta5' hyperid = '98005'
  name = 'log size 4'
  short.name = 'size4'
  initial = '2.30258509299405'
  fixed = 'TRUE'
  prior = 'loggamma'
  param = '1 0.1'
  to.theta = 'function(x) log(x)'
  from.theta = 'function(x) exp(x)'

```

Hyperparameter ‘theta6’ hyperid = ‘98006’

```

name = ‘log size 5’
short.name = ‘size5’
initial = ‘2.30258509299405’
fixed = ‘TRUE’
prior = ‘loggamma’
param = ‘1 0.1’
to.theta = ‘function(x) log(x)’
from.theta = ‘function(x) exp(x)’

```

Hyperparameter ‘theta7’ hyperid = ‘98007’

```

name = ‘log size 6’
short.name = ‘size6’
initial = ‘2.30258509299405’
fixed = ‘TRUE’
prior = ‘loggamma’
param = ‘1 0.1’
to.theta = ‘function(x) log(x)’
from.theta = ‘function(x) exp(x)’

```

Hyperparameter ‘theta8’ hyperid = ‘98008’

```

name = ‘log size 7’
short.name = ‘size7’
initial = ‘2.30258509299405’
fixed = ‘TRUE’
prior = ‘loggamma’
param = ‘1 0.1’
to.theta = ‘function(x) log(x)’
from.theta = ‘function(x) exp(x)’

```

Hyperparameter ‘theta9’ hyperid = ‘98009’

```

name = ‘log size 8’
short.name = ‘size8’
initial = ‘2.30258509299405’
fixed = ‘TRUE’
prior = ‘loggamma’
param = ‘1 0.1’
to.theta = ‘function(x) log(x)’
from.theta = ‘function(x) exp(x)’

```

Hyperparameter ‘theta10’ hyperid = ‘98010’

```

name = ‘log size 9’
short.name = ‘size9’
initial = ‘2.30258509299405’
fixed = ‘TRUE’
prior = ‘loggamma’
param = ‘1 0.1’
to.theta = ‘function(x) log(x)’
from.theta = ‘function(x) exp(x)’

```


Hyperparameter ‘theta11’ hyperid = ‘98011’

```

name = ‘log size 10’
short.name = ‘size10’
initial = ‘2.30258509299405’
fixed = ‘TRUE’
prior = ‘loggamma’
param = ‘1 0.1’
to.theta = ‘function(x) log(x)’
from.theta = ‘function(x) exp(x)’

```

Properties: status = ‘experimental’

```

survival = ‘FALSE’
discrete = ‘FALSE’
link = ‘default log’
pdf = ‘zeroinflated’

```

Model ‘zeroinflatednbinomial2’. Number of hyperparameters are 2.

Hyperparameter ‘theta1’ hyperid = ‘99001’

```

name = ‘log size’
short.name = ‘size’
initial = ‘2.30258509299405’
fixed = ‘FALSE’
prior = ‘loggamma’
param = ‘1 0.1’
to.theta = ‘function(x) log(x)’
from.theta = ‘function(x) exp(x)’

```

Hyperparameter ‘theta2’ hyperid = ‘99002’

```

name = ‘log alpha’
short.name = ‘a’
initial = ‘0.693147180559945’
fixed = ‘FALSE’
prior = ‘gaussian’
param = ‘2 1’
to.theta = ‘function(x) log(x)’
from.theta = ‘function(x) exp(x)’

```

Properties: survival = ‘FALSE’

```

discrete = ‘FALSE’
link = ‘default log’
pdf = ‘zeroinflated’

```

Model ‘t’. Number of hyperparameters are 2.

Hyperparameter ‘theta1’ hyperid = ‘100001’

```

name = ‘log precision’
short.name = ‘prec’
initial = ‘0’
fixed = ‘FALSE’
prior = ‘loggamma’
param = ‘1 5e-05’

```

```

    to.theta = 'function(x) log(x)'
    from.theta = 'function(x) exp(x)'
Hyperparameter 'theta2' hyperid = '100002'
    name = 'log degrees of freedom'
    short.name = 'dof'
    initial = '5'
    fixed = 'FALSE'
    prior = 'loggamma'
    param = '1 0.5'
    to.theta = 'function(x) log(x-2)'
    from.theta = 'function(x) 2+exp(x)'
Properties: survival = 'FALSE'
    discrete = 'FALSE'
    link = 'default identity'
    pdf = 'student-t'
Model 'tstrata'. Number of hyperparameters are 11.
Hyperparameter 'theta1' hyperid = '101001'
    name = 'log degrees of freedom'
    short.name = 'dof'
    initial = '4'
    fixed = 'FALSE'
    prior = 'loggamma'
    param = '1 0.01'
    to.theta = 'function(x) log(x-5)'
    from.theta = 'function(x) 5+exp(x)'
Hyperparameter 'theta2' hyperid = '101002'
    name = 'log precision1'
    short.name = 'prec1'
    initial = '2'
    fixed = 'FALSE'
    prior = 'loggamma'
    param = '1 5e-05'
    to.theta = 'function(x) log(x)'
    from.theta = 'function(x) exp(x)'
Hyperparameter 'theta3' hyperid = '101003'
    name = 'log precision2'
    short.name = 'prec2'
    initial = '2'
    fixed = 'FALSE'
    prior = 'loggamma'
    param = '1 5e-05'
    to.theta = 'function(x) log(x)'
    from.theta = 'function(x) exp(x)'
Hyperparameter 'theta4' hyperid = '101004'
    name = 'log precision3'

```

```

    short.name = 'prec3'
    initial = '2'
    fixed = 'FALSE'
    prior = 'loggamma'
    param = '1 5e-05'
    to.theta = 'function(x) log(x)'
    from.theta = 'function(x) exp(x)'
Hyperparameter 'theta5' hyperid = '101005'
    name = 'log precision4'
    short.name = 'prec4'
    initial = '2'
    fixed = 'FALSE'
    prior = 'loggamma'
    param = '1 5e-05'
    to.theta = 'function(x) log(x)'
    from.theta = 'function(x) exp(x)'
Hyperparameter 'theta6' hyperid = '101006'
    name = 'log precision5'
    short.name = 'prec5'
    initial = '2'
    fixed = 'FALSE'
    prior = 'loggamma'
    param = '1 5e-05'
    to.theta = 'function(x) log(x)'
    from.theta = 'function(x) exp(x)'
Hyperparameter 'theta7' hyperid = '101007'
    name = 'log precision6'
    short.name = 'prec6'
    initial = '2'
    fixed = 'FALSE'
    prior = 'loggamma'
    param = '1 5e-05'
    to.theta = 'function(x) log(x)'
    from.theta = 'function(x) exp(x)'
Hyperparameter 'theta8' hyperid = '101008'
    name = 'log precision7'
    short.name = 'prec7'
    initial = '2'
    fixed = 'FALSE'
    prior = 'loggamma'
    param = '1 5e-05'
    to.theta = 'function(x) log(x)'
    from.theta = 'function(x) exp(x)'
Hyperparameter 'theta9' hyperid = '101009'
    name = 'log precision8'

```

```

    short.name = 'prec8'
    initial = '2'
    fixed = 'FALSE'
    prior = 'loggamma'
    param = '1 5e-05'
    to.theta = 'function(x) log(x)'
    from.theta = 'function(x) exp(x)'
Hyperparameter 'theta10' hyperid = '101010'
    name = 'log precision9'
    short.name = 'prec9'
    initial = '2'
    fixed = 'FALSE'
    prior = 'loggamma'
    param = '1 5e-05'
    to.theta = 'function(x) log(x)'
    from.theta = 'function(x) exp(x)'
Hyperparameter 'theta11' hyperid = '101011'
    name = 'log precision10'
    short.name = 'prec10'
    initial = '2'
    fixed = 'FALSE'
    prior = 'loggamma'
    param = '1 5e-05'
    to.theta = 'function(x) log(x)'
    from.theta = 'function(x) exp(x)'
Properties: survival = 'FALSE'
    discrete = 'FALSE'
    link = 'default identity'
    pdf = 'tstrata'
Model 'nmix'. Number of hyperparameters are 5.
Hyperparameter 'theta1' hyperid = '101101'
    name = 'beta1'
    short.name = 'beta1'
    initial = '2.30258509299405'
    fixed = 'FALSE'
    prior = 'normal'
    param = '0 0.5'
    to.theta = 'function(x) x'
    from.theta = 'function(x) x'
Hyperparameter 'theta2' hyperid = '101102'
    name = 'beta2'
    short.name = 'beta2'
    initial = '0'
    fixed = 'FALSE'
    prior = 'normal'

```

```

    param = '0 1'
    to.theta = 'function(x) x'
    from.theta = 'function(x) x'
Hyperparameter 'theta3' hyperid = '101103'
    name = 'beta3'
    short.name = 'beta3'
    initial = '0'
    fixed = 'FALSE'
    prior = 'normal'
    param = '0 1'
    to.theta = 'function(x) x'
    from.theta = 'function(x) x'
Hyperparameter 'theta4' hyperid = '101104'
    name = 'beta4'
    short.name = 'beta4'
    initial = '0'
    fixed = 'FALSE'
    prior = 'normal'
    param = '0 1'
    to.theta = 'function(x) x'
    from.theta = 'function(x) x'
Hyperparameter 'theta5' hyperid = '101105'
    name = 'beta5'
    short.name = 'beta5'
    initial = '0'
    fixed = 'FALSE'
    prior = 'normal'
    param = '0 1'
    to.theta = 'function(x) x'
    from.theta = 'function(x) x'
Properties: status = 'experimental'
    survival = 'FALSE'
    discrete = 'TRUE'
    link = 'default logit probit'
    pdf = 'nmix'

```

Model 'logperiodogram'. Number of hyperparameters are 0.

Section 'prior'. Valid models in this section are:

Model 'normal'. Number of parameters in the prior = 2
Model 'gaussian'. Number of parameters in the prior = 2
Model 'wishart1d'. Number of parameters in the prior = 2
Model 'wishart2d'. Number of parameters in the prior = 4
Model 'wishart3d'. Number of parameters in the prior = 7
Model 'wishart4d'. Number of parameters in the prior = 11
Model 'wishart5d'. Number of parameters in the prior = 16
Model 'loggamma'. Number of parameters in the prior = 2

Model ‘minuslogsqrtruncnormal’. Number of parameters in the prior = 2

Model ‘logtnormal’. Number of parameters in the prior = 2

Model ‘logtgaussian’. Number of parameters in the prior = 2

Model ‘flat’. Number of parameters in the prior = 0

Model ‘logflat’. Number of parameters in the prior = 0

Model ‘logiflat’. Number of parameters in the prior = 0

Model ‘mvnorm’. Number of parameters in the prior = -1

Model ‘pc.ar’. Number of parameters in the prior = 1

Model ‘none’. Number of parameters in the prior = 0

Model ‘invalid’. Number of parameters in the prior = 0

Model ‘betacorrelation’. Number of parameters in the prior = 2

Model ‘logitbeta’. Number of parameters in the prior = 2

Model ‘pc.prec’. Number of parameters in the prior = 2

Model ‘pc.dof’. Number of parameters in the prior = 2

Model ‘pc.cor0’. Number of parameters in the prior = 2

Model ‘pc.cor1’. Number of parameters in the prior = 2

Model ‘pc.fgnh’. Number of parameters in the prior = 2

Model ‘pc.spde.GA’. Number of parameters in the prior = 4

Model ‘pc.matern’. Number of parameters in the prior = 3

Model ‘pc.range’. Number of parameters in the prior = 2

Model ‘pc’. Number of parameters in the prior = 2

Model ‘ref.ar’. Number of parameters in the prior = 0

Model ‘jeffreystdf’. Number of parameters in the prior = 0

Model ‘expression:’. Number of parameters in the prior = -1

Model ‘table:’. Number of parameters in the prior = -1

Section ‘wrapper’. Valid models in this section are:

Model ‘joint’. Number of hyperparameters are 1.

Hyperparameter ‘theta’ `hyperid = ‘102001’`

`name = ‘log precision’`

`short.name = ‘prec’`

`initial = ‘0’`

`fixed = ‘TRUE’`

`prior = ‘loggamma’`

`param = ‘1 5e-05’`

`to.theta = ‘function(x) log(x)’`

`from.theta = ‘function(x) exp(x)’`

Properties: `constr = ‘FALSE’`

`nrow.ncol = ‘FALSE’`

`augmented = ‘FALSE’`

`aug.factor = ‘1’`

`aug.constr = ‘NULL’`

`n.div.by = ‘NULL’`

`n.required = ‘FALSE’`

`set.default.values = ‘FALSE’`

`pdf = ‘NA’`

Examples

```
## How to set hyperparameters to pass as the argument 'hyper'. This
## format is compatible with the old style (using 'initial', 'fixed',
## 'prior', 'param'), but the new style using 'hyper' take precedence
## over the old style. The two styles can also be mixed. The old style
## might be removed from the code in the future...

## Only a subset need to be given
hyper = list(theta = list(initial = 2))
## The 'name' can be used instead of 'theta', or 'theta1', 'theta2',...
hyper = list(precision = list(initial = 2))
hyper = list(precision = list(prior = "flat", param = numeric(0)))
hyper = list(theta2 = list(initial=3), theta1 = list(prior = "gaussian"))
## The 'short.name' can be used instead of 'name'
hyper = list(rho = list(param = c(0,1)))
```

inla.nonconvex.hull *Nonconvex set extensions.*

Description

Constructs a nonconvex boundary for a point set using morphological operations.

Usage

```
inla.nonconvex.hull(points,
                    convex = -0.15,
                    concave = convex,
                    resolution = 40,
                    eps = NULL,
                    crs = NULL)

inla.nonconvex.hull.basic(points,
                          convex = -0.15,
                          resolution = 40,
                          eps = NULL,
                          crs = NULL)
```

Arguments

points	2D point coordinates (2-column matrix). Can alternatively be a <code>SpatialPoints</code> or <code>SpatialPointsDataFrame</code> object.
convex	The desired extension radius. Also determines the smallest allowed convex curvature radius. Negative values are interpreted as fractions of the approximate initial set diameter.
concave	The desired minimal concave curvature radius. Default is <code>concave=convex</code> .
resolution	The internal computation resolution. A warning will be issued when this needs to be increased for higher accuracy, with the required resolution stated.
eps	The polygonal curve simplification tolerance used for simplifying the resulting boundary curve. See inla.simplify.curve for details.
crs	An optional CRS or <code>inla.CRS</code> object

Details

Morphological dilation by convex, followed by closing by concave, with minimum concave curvature radius concave. If the dilated set has no gaps of width between

$$2convex(\sqrt{1 + 2concave/convex} - 1)$$

and $2concave$, then the minimum convex curvature radius is convex. Special case $concave=0$ delegates to `inla.nonconvex.hull.basic`

The implementation is based on the identity

$$dilation(a) \& closing(b) = dilation(a + b) \& erosion(b)$$

where all operations are with respect to disks with the specified radii.

Value

An `inla.mesh.segment` object.

Note

Requires `nndistF` from the `splancs` package.

Author(s)

Finn Lindgren <finn.lindgren@gmail.com>

Examples

```
if (require(splancs)) {
  loc = matrix(runif(20), 10, 2)
  boundary = inla.nonconvex.hull(loc, convex=0.2)
  lines(boundary, add=FALSE)
  points(loc)
}
```

inla.option

Set and get global options for INLA

Description

Set and get global options for INLA

Usage

```
inla.setOption(...)
inla.getOption(option)
```


Arguments

... Option and value, like option=value or option, value; see the Examples

option The option to get. If option = NULL then inla.getOption then inla.getOption will display the current defaults, otherwise, option must be one of

inla.call: The path to the inla-program.

inla.arg: Additional arguments to inla.call

fmesher.call: The path to the fmesher-program

fmesher.arg: Additional arguments to fmesher.call

num.threads: Number of threads to use.

keep: Keep temporary files?

working.directory: The name of the working directory.

silent: Run the inla-program in a silent mode?

debug : Run the inla-program in a debug mode?

internal.binary.mode : if FALSE the (some) output are in ascii format instead of binary format. Using this option, then inla.collect.results will fail (Expert mode)

internal.experimental.mode : Expert option

cygwin : The home of the Cygwin installation (default "C:/cygwin") [Remote computing for Windows only]

ssh.auth.sock: The ssh bind-address (value of \$SSH_AUTH_SOCK int the Cygwin-shell). [Remote computing for Windows only]

enable.inla.argument.weights : if TRUE the inla accepts argument weights

show.warning.graph.file : Give a warning for using the obsolete argument graph.file instead of graph

scale.model.default : The default value of argument scale.model which optionally scale intrinsic models to have generalized unit average variance

The options are stored in the variable inla.options in the .GlobalEnv-environment.

Author(s)

Havard Rue <hrue@math.ntnu.no>

Examples

```
## set number of threads
inla.setOption("num.threads", 2)
## alternative format
inla.setOption(num.threads=2)
## check it
inla.getOption("num.threads")
```

inla.qstat

Control and view a remote inla-queue

Description

Control and view a remote inla-queue of submitted jobs

Usage

```

inla.qget(id, remove = TRUE)
inla.qdel(id)
inla.qstat(id)
inla.qlog(id)
inla.qnuke()
## S3 method for class 'inla.q'
summary(object,...)
## S3 method for class 'inla.q'
print(x,...)

```

Arguments

<code>id</code>	The job-id which is the output from <code>inla</code> when the job is submitted, the job-number or job-name. For <code>inla.qstat</code> , <code>id</code> is optional and if omitted all the jobs will be listed.
<code>remove</code>	Logical If FALSE, leave the job on the server after retrieval, otherwise remove it (default).
<code>x</code>	An <code>inla.q</code> -object which is the output from <code>inla.qstat</code>
<code>object</code>	An <code>inla.q</code> -object which is the output from <code>inla.qstat</code>
<code>...</code>	other arguments.

Details

`inla.qstat` show job(s) on the server, `inla.qget` fetch the results (and by default remove the files on the server), `inla.qdel` removes a job on the server and `inla.qnuke` remove all jobs on the server. `inla.qlog` fetches the logfile only.

The recommended procedure is to use `r=inla(..., inla.call="submit")` and then do `r=inla.qget(r)` at a later stage. If the job is not finished, then `r` will not be overwritten and this step can be repeated. The reason for this procedure, is that some information usually stored in the result object does not go through the remote server, hence have to be appended to the results that are retrieved from the server. Hence doing `r=inla(..., inla.call="submit")` and then later retrieve it using `r=inla.qget(1)`, say, then `r` does not contain all the usual information. All the main results are there, but administrative information which is required to call `inla.hyperpar` or `inla.rerun` are not there.

Value

`inla.qstat` returns an `inla.q`-object with information about current jobs.

Author(s)

Havard Rue

See Also

[inla](#)

Examples

```
## Not run:
r = inla(y~1, data = data.frame(y=rnorm(10)), inla.call="submit")
inla.qstat()
r = inla.qget(r, remove=FALSE)
inla.qdel(1)
inla.qnuke()

## End(Not run)
```

inla.reorderings

Reorderings methods for sparse matrices

Description

Provide the names of all implemented reordering schemes

Usage

```
inla.reorderings()
```

Arguments

None

Value

The names of all available reorderings

Author(s)

Havard Rue <hrue@math.ntnu.no>

Examples

```
inla.reorderings()
```

inla.rerun

Rerun an analysis

Description

Rerun [inla](#) on an inla-object (output from `link{inla}`)

Usage

```
inla.rerun(object, plain=FALSE)
```

Arguments

object	An inla-object, ie the output from an inla-call
plain	Logical. If FALSE (default), then make changes in object to improve the performance

Value

This function will take the result in object, and rerun inla again. If plain is FALSE, start the optimization from the mode in object so that we can obtain an improvement the mode for the hyperparameters. Otherwise, start from the same configuration as for object. The returned value is an inla-object.

See Also

[inla](#)

Examples

```
r = inla(y ~ 1, data = data.frame(y=1:10))
r = inla.rerun(r)
```

inla.row.kron	<i>Row-wise Kronecker products</i>
---------------	------------------------------------

Description

Takes two Matrices and computes the row-wise Kronecker product. Optionally applies row-wise weights and/or applies an additional 0/1 row-wise Kronecker matrix product, as needed by [inla.spde.make.A](#).

Usage

```
inla.row.kron(M1, M2, repl = NULL, n.repl = NULL, weights = NULL)
```

Arguments

M1	A matrix that can be transformed into a sparse Matrix.
M2	A matrix that can be transformed into a sparse Matrix.
repl	An optional index vector. For each entry, specifies which replicate the row belongs to, in the sense used in inla.spde.make.A .
n.repl	The maximum replicate index, in the sense used in inla.spde.make.A .
weights	Optional scaling weights to be applied row-wise to the resulting matrix.

Value

A sparseMatrix object.

Author(s)

Finn Lindgren <finn.lindgren@gmail.com>

See Also

[inla.spde.make.A](#)

inla.sample	<i>Generate samples from an approximated posterior of a fitted model</i>
-------------	--

Description

This function generate samples from an approximated posterior of a fitted model (an inla-object

Usage

```
inla.posterior.sample(n = 1L, result, intern = FALSE, use.improved.mean = TRUE,
  add.names = TRUE, seed = 0L)
```

Arguments

n	Number of samples.
result	The inla-object, ie the output from an inla-call. The inla-object must be created with <code>control.compute=list(config=TRUE)</code> .
use.improved.mean	Logical. If TRUE then use the marginal mean values when constructing samples. If FALSE then use the mean in the Gaussian approximations.
intern	Logical. If TRUE then produce samples in the internal scale for the hyperparameter, if FALSE then produce samples in the user-scale. (For example log-precision (intern) and precision (user-scale))
add.names	Logical. If TRUE then add name for each elements of each sample. If FALSE, only add name for the first sample. (This save space.)
seed	Control the RNG of inla.qsample, see <code>?inla.qsample</code> for further information. If <code>seed=0L</code> then GMRFLib will set the seed intelligently/at 'random'. If <code>seed < 0L</code> then the saved state of the RNG will be reused if possible, otherwise, GMRFLib will set the seed intelligently/at 'random'. If <code>seed > 0L</code> then this value is used as the seed for the RNG. If you want reproducible results, you ALSO need to control the seed for the RNG in R by controlling the variable <code>.Random.seed</code> or using the function <code>set.seed</code> , the example for how this can be done.

Details

The hyperparameters are sampled from the configurations used to do the numerical integration, hence if you want a higher resolution, you need to to change the `int.strategy` variable and friends. The latent field is sampled from the Gaussian approximation conditioned on the hyperparameters, but with a correction for the mean (default).

Value

A list of the samples, where each sample is a list with names `hyperpar` and `latent`, and with their marginal densities in `logdens$hyperpar` and `logdens$latent` and the joint density is in `logdens$joint`.

Author(s)

Havard Rue <hrue@math.ntnu.no>

Examples

```
r = inla(y ~ 1 ,data = data.frame(y=rnorm(1)), control.compute = list(config=TRUE))
samples = inla.posterior.sample(2,r)

## reproducible results:
set.seed(1234)
inla.seed = as.integer(runif(1)*.Machine$integer.max)
x = inla.posterior.sample(100, r, seed = inla.seed)
set.seed(1234)
xx = inla.posterior.sample(100, r, seed = inla.seed)
all.equal(x, xx)
```

inla.sens

Testing code for sensitivity

Description

TODO: Write a description

Usage

```
inla.sens(inlaObj)
```

Arguments

inlaObj The result from a run of inla.

Value

TODO: This is an EXPERIMENTAL function!

Author(s)

Geir-Arne Fuglstad <geirarne.fuglstad@gmail.com>

See Also

[inla](#)

Examples

```
## Case 1: Simple linear regression on simulated data
# Number of observations
nObs = 100

# Measurement noise
sdNoise = 0.1

# Coefficients
```

```

mu = 2
beta = 1

# Covariate
x = runif(nObs)

# Generate data
y = mu + beta*x + rnorm(nObs)*sdNoise

# Make some data unobserved
nUnObs = 20
y[(nObs-nUnObs+1):nObs] = NA

# Fit the model
mod = inla(y ~ x,
           data = list(x = x, y = y))

# Calculate sensitivities
inla.sens(mod)

## Case 2: Time series
# Length of time-series
nObs = 100

# Measurement noise
sdNoise = 0.1

# Autoregressive process
rho = 0.6
sdProc = 0.1
arP = matrix(0, nrow = nObs, ncol = 1)
for(i in 2:nObs)
  arP[i] = rho*arP[i-1] + rnorm(1)*sdProc
tIdx = 1:nObs

# Coefficients
mu = 2

# Generate data
y = mu + arP + rnorm(nObs)*sdNoise

# Make some data unobserved
nUnObs = 20
y[(nObs-nUnObs+1):nObs] = NA
idx = 1:nObs

# Run INLA
mod = inla(y ~ f(tIdx, model = "ar1"),
           data = list(y = y, tIdx = tIdx),
           control.inla = list(reordering = "metis"))

# Calculate sensitivities
inla.sens(mod)

## Case 3: Epil dataset
data(Epil)
my.center = function(x) (x - mean(x))

```

```

# make centered covariates
Epil$CTrt = my.center(Epil$Trt)
Epil$ClBase4 = my.center(log(Epil$Base/4))
Epil$CV4 = my.center(Epil$V4)
Epil$ClAge = my.center(log(Epil$Age))
Epil$CBT = my.center(Epil$Trt*Epil$ClBase4)

# Define the model
formula = y ~ ClBase4 + CTrt + CBT+ ClAge + CV4 +
          f(Ind, model="iid") + f(rand,model="iid")

mod = inla(formula,family="poisson", data = Epil)

# Calculate sensitivities
inla.sens(mod)

## Case 4: Spatial data
# Number of observations
nObs = 100

# Measurement noise
sdNoise = 0.2

# Spatial process
sdProc = 1.0
rho0 = 0.2

# Coefficients
beta0 = 1
beta1 = 2

# Generate spatial data + measurement noise
loc = cbind(runif(nObs), runif(nObs))
dd = as.matrix(dist(loc))
Sig = sdProc^2*inla.matern.cov(nu = 1, kappa = sqrt(8)/rho0, dd, corr = TRUE)
L = t(chol(Sig))
u = L

# Generate Covariate
x = runif(nObs)-0.5

# Combine to observations
y = beta0 + beta1*x + u

# Number of unobserved
nUnObs = 2
y[1:nUnObs] = NA

# Mesh
mesh = inla.mesh.2d(loc, max.edge = 0.05, cutoff = 0.05)

# Make SPDE object
spde = inla.spde2.matern(mesh)
spde2 = inla.spde2.matern(mesh, constr = TRUE)

# Make A matrix

```



```

A = inla.spde.make.A(mesh, loc)

# Stack
X = cbind(1, x)
stk = inla.stack(data = list(y = y), A = list(A, 1),
                 effects = list(field = 1:spde$n.spde,
                                X = X))

# Run INLA
mod1 = inla(y ~ -1 + X + f(field, model = spde),
            data = inla.stack.data(stk),
            control.predictor = list(A = inla.stack.A(stk)),
            control.family = list(prior = "pcprec",
                                  param = c(3, 0.05)))
mod2 = inla(y ~ -1 + X + f(field, model = spde2),
            data = inla.stack.data(stk),
            control.predictor = list(A = inla.stack.A(stk)),
            control.family = list(prior = "pcprec",
                                  param = c(3, 0.05)))

# Calculate sensitivities
res1 = inla.sens(mod1)
res2 = inla.sens(mod2)

```

inla.sens

Calculate sensitivity measurements

Description

TODO

Usage

```
inla.sens(inlaRes)
```

Arguments

inlaRes Object returned by inla function.

Value

inla.sens plots robustness and returns object with different robustnesses

Author(s)

Geir-Arne Fuglstad <geirarne.fuglstad@gmail.com>

Examples

TODO

inla.simplify.curve	<i>Recursive curve simplification.</i>
---------------------	--

Description

Attempts to simplify a polygonal curve by joining nearly colinear segments.

Usage

```
inla.simplify.curve(loc, idx, eps)
```

Arguments

loc	Coordinate matrix.
idx	Index vector into loc specifying a polygonal curve.
eps	Straightness tolerance.

Details

Uses a variation of the binary splitting Ramer-Douglas-Peucker algorithm, with a width eps ellipse instead of a rectangle, motivated by prediction ellipse for Brownian bridge.

Value

An index vector into loc specifying the simplified polygonal curve.

Author(s)

Finn Lindgren <finn.lindgren@gmail.com>

Examples

```
theta = seq(0, 2*pi, length=1000)
loc = cbind(cos(theta), sin(theta))
idx = inla.simplify.curve(loc=loc, idx=1:nrow(loc), eps=0.01)
print(c(nrow(loc), length(idx)))
plot(loc, type="l")
lines(loc[idx,], col="red")
```

inla.spde.make.A	<i>Observation/prediction matrices for mesh models.</i>
------------------	---

Description

Constructs observation/prediction weight matrices for models based on [inla.mesh](#) and [inla.mesh.1d](#) objects.

Usage

```
inla.spde.make.A(mesh = NULL, loc = NULL, index = NULL,
  group = NULL, repl = 1L,
  n.spde = NULL, n.group = NULL, n.repl = NULL,
  group.mesh = NULL,
  weights = NULL,
  A.loc = NULL, A.group = NULL, group.index = NULL,
  block = NULL, n.block = NULL,
  block.rescale = c("none", "count", "weights", "sum"),
  ...)
```

Arguments

mesh	An inla.mesh or inla.mesh.1d object specifying a function basis on a mesh domain.
loc	Observation/prediction coordinates. mesh and loc defines a matrix A.loc of mapping weights between basis function weights and field values. If loc is NULL, A.loc is defined as Diagonal(n.spde, 1).
index	For each observation/prediction value, an index into loc. Default is seq_len(nrow(A.loc)).
group	For each observation/prediction value, an index into the group model.
repl	For each observation/prediction value, the replicate index.
n.spde	The number of basis functions in the mesh model. (Note: may be different than the number of mesh vertices/nodes/knots.)
n.group	The size of the group model.
n.repl	The total number of replicates.
group.mesh	An optional inla.mesh.1d object for the group model.
weights	Optional scaling weights to be applied row-wise to the resulting matrix.
A.loc	Optional precomputed observation/prediction matrix. A.loc can be specified instead of mesh+loc, optionally with index supplied.
A.group	Optional precomputed observation/prediction matrix for the group model. A.group can be specified instead of group and/or group.mesh, optionally with group.index supplied.
group.index	For each observation/prediction value, an index into the rows of A.group.
block	Optional indices specifying block groupings: Entries with the same block value are joined into a single row in the resulting matrix, and the block values are the row indices. This is intended for construction of approximate integration schemes for regional data problems. See inla.spde.make.block.A for details.
n.block	The number of blocks.
block.rescale	Specifies what scaling method should be used when joining entries as grouped by a block specification. See inla.spde.make.block.A for details.
...	Additional parameters. Currently unused.

Author(s)

Finn Lindgren <finn.lindgren@gmail.com>

See Also

[inla.spde.make.index](#)

Examples

```
loc = matrix(runif(10000*2)*1000,10000,2)
mesh = inla.mesh.2d(loc=loc,
                    cutoff=50,
                    max.edge=c(50,500))
A = inla.spde.make.A(mesh, loc=loc)
```

```
inla.spde.make.block.A
```

Observation matrices for mesh models.

Description

Constructs observation/prediction weight matrices for numerical integration schemes for regional data problems. Primarily intended for internal use by [inla.spde.make.A](#).

Usage

```
inla.spde.make.block.A(A, block, n.block = max(block),
                      weights = NULL,
                      rescale = c("none", "count", "weights", "sum"))
```

Arguments

A	A precomputed observation/prediction matrix for locations that are to be joined.
block	Indices specifying block groupings: Entries with the same block value are joined into a single row in the resulting matrix, and the block values are the row indices.
n.block	The number of blocks.
weights	Optional scaling weights to be applied row-wise to the input A matrix.
rescale	Specifies what scaling method should be used when joining the rows of the A matrix as grouped by the block specification. <ul style="list-style-type: none"> • 'none': Straight sum, no rescaling. • 'count': Divide by the number of entries in the block. • 'weights': Divide by the sum of the weight values within each block. • 'sum': Divide by the resulting row sums.

Author(s)

Finn Lindgren <finn.lindgren@gmail.com>

See Also

[inla.spde.make.A](#)

inla.spde.make.index *SPDE model index vector generation*

Description

Generates a list of named index vectors for an SPDE model.

Usage

```
inla.spde.make.index(name,
                     n.spde,
                     n.group = 1,
                     n.repl = 1,
                     ...)
```

Arguments

name	A character string with the base name of the effect.
n.spde	The size of the model, typically from <code>spde\$n.spde</code> .
n.group	The size of the group model.
n.repl	The number of model replicates.
...	Additional parameters. Currently unused.

Value

A list of named index vectors.

name	Indices into the vector of latent variables
name.group	'group' indices
name.repl	Indices for replicates

Author(s)

Finn Lindgren <finn.lindgren@gmail.com>

See Also

[inla.spde.make.A](#), [inla.spde2.result](#)

Examples

```
loc = matrix(runif(100*2),100,2)
mesh = inla.mesh.create.helper(points.domain=loc, max.edge=c(0.1,0.5))
spde = inla.spde2.matern(mesh)
index = inla.spde.make.index("spatial", spde$n.spde, n.repl=2)
spatial.A = inla.spde.make.A(mesh, loc,
                             index=rep(1:nrow(loc), 2),
                             repl=rep(1:2, each=nrow(loc)))

y = 10+rnorm(100*2)
stack = inla.stack(data=list(y=y),
                  A=list(spatial.A),
```

```

        effects=list(c(index, list(intercept=1))),
        tag="tag")
data = inla.stack.data(stack, spde=spde)
formula = y ~ -1 + intercept + f(spatial, model=spde,
                                replicate=spatial.repl)
result = inla(formula, family="gaussian", data=data,
              control.predictor=list(A=inla.stack.A(stack)))
spde.result = inla.spde2.result(result, "spatial", spde)

```

inla.spde.models	<i>List SPDE models supported by inla.spde objects</i>
------------------	--

Description

List SPDE models supported by inla.spde objects

Usage

```

inla.spde.models(function.names=FALSE)
inla.spde1.models()
inla.spde2.models()

```

Arguments

`function.names` If FALSE, return list model name lists. If TRUE, return list of model object constructor function names.

Details

Returns a list of available SPDE model type name lists, one for each inla.spde model class (currently [inla.spde1](#) and [inla.spde2](#)).

Value

List of available SPDE model type name lists.

Author(s)

Finn Lindgren <finn.lindgren@gmail.com>

Examples

```

## Display help for each supported inla.spde2 model:
for (model in inla.spde2.models())
  print(help(paste("inla.spde2.", model, sep="")))

## Display help for each supported inla.spde* model:
models = inla.spde.models()
for (type in names(models))
  for (model in models[[type]])
    print(help(paste("inla.", type, ".", model, sep="")))

## Display help for each supported inla.spde* model (equivalent to above):
for (model in inla.spde.models(function.names=TRUE))
  print(help(model))

```

inla.spde.precision *Precision matrices for SPDE models*

Description

Calculates the precision matrix for given parameter values based on an `inla.spde` model object.

Usage

```
inla.spde.precision(...)

## S3 method for class 'inla.spde2'
inla.spde.precision(spde,
  theta = NULL,
  phi0 = inla.spde2.theta2phi0(spde, theta),
  phi1 = inla.spde2.theta2phi1(spde, theta),
  phi2 = inla.spde2.theta2phi2(spde, theta), ...)
inla.spde2.precision(spde,
  theta = NULL,
  phi0 = inla.spde2.theta2phi0(spde, theta),
  phi1 = inla.spde2.theta2phi1(spde, theta),
  phi2 = inla.spde2.theta2phi2(spde, theta), ...)

## For deprecated inla.spde1 models:
## S3 method for class 'inla.spde1'
inla.spde.precision(spde, ...)
inla.spde1.precision(spde, ...)
```

Arguments

<code>spde</code>	An <code>inla.spde</code> object.
<code>theta</code>	The parameter vector.
<code>phi0</code>	Internal parameter for a generic model. Expert option only.
<code>phi1</code>	Internal parameter for a generic model. Expert option only.
<code>phi2</code>	Internal parameter for a generic model. Expert option only.
<code>...</code>	Additional parameters passed on to other methods.

Value

A sparse precision matrix.

Author(s)

Finn Lindgren <finn.lindgren@gmail.com>


```

marginals.log.tau
    Marginal densities for log(tau)
marginals.log.variance.nominal
    Marginal densities for log(variance)
marginals.range.nominal
    Marginal densities for range
marginals.tau
    Marginal densities for tau
marginals.theta
    Marginal densities for the theta parameters
marginals.values
    Marginal densities for the field values
marginals.variance.nominal
    Marginal densities for variance
summary.hyperpar
    The SPDE related part of the inla hyperpar output summary
summary.log.kappa
    Summary statistics for log(kappa)
summary.log.range.nominal
    Summary statistics for log(range)
summary.log.tau
    Summary statistics for log(tau)
summary.log.variance.nominal
    Summary statistics for log(kappa)
summary.theta
    Summary statistics for the theta parameters
summary.values
    Summary statistics for the field values

```

Author(s)

Finn Lindgren <finn.lindgren@gmail.com>

See Also

[inla.spde.models](#), [inla.spde2.matern](#)

Examples

```

loc = matrix(runif(100*2),100,2)
mesh = inla.mesh.create.helper(points.domain=loc, max.edge=c(0.1,0.5))
spde = inla.spde2.matern(mesh)
index = inla.spde.make.index("spatial", mesh$n, n.repl=2)
spatial.A = inla.spde.make.A(mesh, loc,
                             index=rep(1:nrow(loc), 2),
                             repl=rep(1:2, each=nrow(loc)))
## Toy example with no spatial correlation (range=zero)
y = 10+rmnorm(100*2)
stack = inla.stack(data=list(y=y),
                  A=list(spatial.A),
                  effects=list(c(index, list(intercept=1))),
                  tag="tag")
data = inla.stack.data(stack, spde=spde)
formula = y ~ -1 + intercept + f(spatial, model=spde,

```

```

                                replicate=spatial.repl)
result = inla(formula, family="gaussian", data=data,
              control.predictor=list(A=inla.stack.A(stack)))
spde.result = inla.spde.result(result, "spatial", spde)
plot(spde.result$marginals.range.nominal[[1]], type="l")

```

inla.spde.sample	<i>Sample from SPDE models</i>
------------------	--------------------------------

Description

Old methods for sampling from a SPDE model. For new code, use [inla.spde.precision](#) and [inla.qsample](#) instead.

Usage

```

inla.spde.sample(...)

## Default S3 method:
inla.spde.sample(precision, seed=NULL, ...)
## S3 method for class 'inla.spde'
inla.spde.sample(spde, seed=NULL, ...)

```

Arguments

precision	A precision matrix.
seed	The seed for the pseudo-random generator.
spde	An inla.spde object.
...	Parameters passed on to other methods.

Author(s)

Finn Lindgren <finn.lindgren@gmail.com>

See Also

[inla.spde.precision](#), [inla.qsample](#)

inla.spde1.create	<i>Old SPDE model objects for INLA</i>
-------------------	--

Description

Create an inla.spde1 model object.

Usage

```
## Create an SPDE model object:
inla.spde1.create(mesh,
                  model = c("matern", "imatern", "matern.osc"),
                  param = NULL,
                  ...)

## Shortcuts to the matern, imatern and matern.osc models:
inla.spde1.matern(mesh, ...)
inla.spde1.imatern(mesh, ...)
inla.spde1.matern.osc(mesh, ...)
```

Arguments

mesh	The mesh to build the model on, as an inla.mesh object.
model	The name of the model.
param	Model specific parameters.
...	Additional parameters passed on to other methods.

Details

Note: This is an old spde object format retained for backwards compatibility. Please use [inla.spde2](#) models for new code.

This method constructs an object for SPDE models. Currently implemented:

model="matern"

$$(\kappa^2(u) - \Delta)^{\alpha/2}(\tau(u)x(u)) = W(u)$$

param:

- alpha = 1 or 2
- basis.T = Matrix of basis functions for $\log \tau(u)$
- basis.K = Matrix of basis functions for $\log \kappa^2(u)$

model="imatern"

$$(-\Delta)^{\alpha/2}(\tau(u)x(u)) = W(u)$$

param:

- alpha = 1 or 2
- basis.T = Matrix of basis functions for $\log \tau(u)$

Value

An inla.spde1 object.

Author(s)

Finn Lindgren <finn.lindgren@gmail.com>

See Also

[inla.spde2.matern](#), [inla.mesh.2d](#), [inla.mesh.basis](#)

Examples

```
n = 100
field.fcn = function(loc) (10*cos(2*pi*2*(loc[,1]+loc[,2])))
loc = matrix(runif(n*2),n,2)
## One field, 2 observations per location
idx.y = rep(1:n,2)
y = field.fcn(loc[idx.y,]) + rnorm(length(idx.y))

mesh = inla.mesh.create(loc, refine=list(max.edge=0.05))
spde = inla.spde.create(mesh, model="matern")
data = list(y=y, field=mesh$idx$loc[idx.y])
formula = y ~ -1 + f(field, model=spde)
result = inla(formula, data=data, family="normal")

## Plot the mesh structure:
plot(mesh)

if (require(rgl)) {
  ## Plot the posterior mean:
  plot(mesh, rgl=TRUE,
        result$summary.random$field[, "mean"],
        color.palette = colorRampPalette(c("blue", "green", "red")))
  ## Plot residual field:
  plot(mesh, rgl=TRUE,
        result$summary.random$field[, "mean"]-field.fcn(mesh$loc),
        color.palette = colorRampPalette(c("blue", "green", "red")))
}
```

inla.spde2.generic	<i>Generic spde2 model creation.</i>
--------------------	--------------------------------------

Description

Creates and inla.spde2 object describing the internal structure of an 'spde2' model.

Usage

```
inla.spde2.generic(M0, M1, M2, B0, B1, B2, theta.mu, theta.Q,
                  transform = c("logit", "log", "identity"),
                  theta.initial = theta.mu,
                  fixed = rep(FALSE, length(theta.mu)),
                  theta.fixed = theta.initial[fixed],
                  BLC = cbind(0, diag(nrow = length(theta.mu))),
                  ...)

## Map theta values to internal phi values
inla.spde2.theta2phi0(spde, theta)
inla.spde2.theta2phi1(spde, theta)
inla.spde2.theta2phi2(spde, theta)
```

Arguments

<code>M0</code>	The symmetric M_0 matrix.
<code>M1</code>	The square M_1 matrix.
<code>M2</code>	The symmetric M_2 matrix.
<code>B0</code>	Basis definition matrix for ϕ_0 .
<code>B1</code>	Basis definition matrix for ϕ_2 .
<code>B2</code>	Basis definition matrix for ϕ_2 .
<code>theta.mu</code>	Prior expectation for the θ vector
<code>theta.Q</code>	Prior precision for the θ vector
<code>transform</code>	Transformation link for ϕ_2 . Valid settings are "logit", "log", and "identity"
<code>theta.initial</code>	Initial value for the θ vector. Default <code>theta.mu</code>
<code>fixed</code>	Logical vector. For every TRUE value, treat the corresponding theta value as known.
<code>theta.fixed</code>	Vector holding the values of fixed theta values. Default <code>=theta.initial[fixed]</code>
<code>BLC</code>	Basis definition matrix for linear combinations of theta.
<code>...</code>	Additional parameters, currently unused.
<code>spde</code>	An <code>inla.sdpe2</code> object.
<code>theta</code>	parameter values to be mapped.

Value

For `inla.spde2.generic`, an [inla.spde2](#) object.

For `inla.spde2.theta2phi0/1/2`, a vector of ϕ values.

Author(s)

Finn Lindgren <finn.lindgren@gmail.com>

See Also

[inla.spde2.models](#), [inla.spde2.matern](#)

<code>inla.spde2.matern</code>	<i>Matern SPDE model object for INLA</i>
--------------------------------	--

Description

Create an `inla.spde2` model object for a Matern model. Use `inla.spde2.pcmatern` instead for a PC prior for the parameters.

Usage

```
inla.spde2.matern(mesh,
  alpha = 2,
  param = NULL,
  constr = FALSE,
  extraconstr.int = NULL,
  extraconstr = NULL,
  fractional.method = c("parsimonious", "null"),
  B.tau = matrix(c(0,1,0),1,3),
  B.kappa = matrix(c(0,0,1),1,3),
  prior.variance.nominal = 1,
  prior.range.nominal = NULL,
  prior.tau = NULL,
  prior.kappa = NULL,
  theta.prior.mean = NULL,
  theta.prior.prec = 0.1,
  n.iid.group = 1,
  ...)
```

Arguments

mesh	The mesh to build the model on, as an inla.mesh or inla.mesh.1d object.
alpha	Fractional operator order, $0 < \alpha \leq 2$ supported. ($\nu = \alpha - d/2$)
param	Parameter, e.g. generated by <code>param2.matern.orig</code>
constr	If TRUE, apply an integrate-to-zero constraint. Default FALSE.
extraconstr.int	Field integral constraints.
extraconstr	Direct linear combination constraints on the basis weights.
fractional.method	Specifies the approximation method to use for fractional (non-integer) alpha values. 'parsimonious' gives an overall approximate minimal covariance error, 'null' uses approximates low-order properties.
B.tau	Matrix with specification of log-linear model for τ .
B.kappa	Matrix with specification of log-linear model for κ .
prior.variance.nominal	Nominal prior mean for the field variance
prior.range.nominal	Nominal prior mean for the spatial range
prior.tau	Prior mean for tau (overrides <code>prior.variance.nominal</code>)
prior.kappa	Prior mean for kappa (overrides <code>prior.range.nominal</code>)
theta.prior.mean	(overrides <code>prior.*</code>)
theta.prior.prec	Scalar, vector or matrix, specifying the joint prior precision for <i>theta</i> .
n.iid.group	If greater than 1, build an explicitly iid replicated model, to support constraints applied to the combined replicates, for example in a time-replicated spatial model. Constraints can either be specified for a single mesh, in which case it's applied to the average of the replicates (<code>ncol(A)</code> should be <code>mesh\$n</code> for 2D

meshes, mesh\$m for 1D), or as general constraints on the collection of replicates (ncol(A) should be mesh\$n * n.iid.group for 2D meshes, mesh\$m * n.iid.group for 1D).

... Additional parameters for special uses.

Details

This method constructs a Matern SPDE model, with spatial scale parameter $\kappa(u)$ and variance rescaling parameter $\tau(u)$.

$$(\kappa^2(u) - \Delta)^{\alpha/2}(\tau(u)x(u)) = W(u)$$

Stationary models are supported for $0 < \alpha \leq 2$, with spectral approximation methods used for non-integer α , with approximation method determined by `fractional.method`.

Non-stationary models are supported for $\alpha = 2$ only, with

- $\log \tau(u) = B_0^\tau(u) + \sum_{k=1}^p B_k^\tau(u)\theta_k$
- $\log \kappa(u) = B_0^\kappa(u) + \sum_{k=1}^p B_k^\kappa(u)\theta_k$

The same parameterisation is used in the stationary cases, but with B_0^τ , B_k^τ , B_0^κ , and B_k^κ constant across u .

Integration and other general linear constraints are supported via the `constr`, `extraconstr.int`, and `extraconstr` parameters, which also interact with `n.iid.group`.

Value

An `inla.spde2` object.

Author(s)

Finn Lindgren <finn.lindgren@gmail.com>

See Also

[inla.mesh.2d](#), [inla.mesh.create](#), [inla.mesh.1d](#), [inla.mesh.basis](#), [inla.spde2.pcmatern](#), [inla.spde2.generic](#)

Examples

```
n = 100
field.fcn = function(loc) (10*cos(2*pi*2*(loc[,1]+loc[,2])))
loc = matrix(runif(n*2),n,2)
## One field, 2 observations per location
idx.y = rep(1:n,2)
y = field.fcn(loc[idx.y,]) + rnorm(length(idx.y))

mesh = inla.mesh.create(loc, refine=list(max.edge=0.05))
spde = inla.spde2.matern(mesh)
data = list(y=y, field=mesh$idx$loc[idx.y])
formula = y ~ -1 + f(field, model=spde)
result = inla(formula, data=data, family="normal")

## Plot the mesh structure:
plot(mesh)
```

```

if (require(rgl)) {
  col.pal = colorRampPalette(c("blue", "cyan", "green", "yellow", "red"))
  ## Plot the posterior mean:
  plot(mesh, rgl=TRUE,
        result$summary.random$field[, "mean"],
        color.palette = col.pal)
  ## Plot residual field:
  plot(mesh, rgl=TRUE,
        result$summary.random$field[, "mean"]-field.fcn(mesh$loc),
        color.palette = col.pal)
}

result$field = inla.spde.result(result, "field", spde)
plot(result$field$marginals.range.nominal[[1]])

```

inla.spde2.matern.sd.basis

Approximate variance-compensating basis functions

Description

Calculates an approximate basis for tau and kappa for an inla.spde2.matern model where tau is a rescaling parameter.

Usage

```

inla.spde2.matern.sd.basis(mesh, B.sd, B.range, method = 1,
                           local.offset.compensation = FALSE,
                           alpha = 2, ...)

```

Arguments

mesh	An inla.mesh object.
B.sd	Desired basis for log-standard deviations.
B.range	Desired basis for spatial range.
method	Construction method selector. Expert option only.
local.offset.compensation	If FALSE, only compensate in the average for the tau offset.
alpha	The model alpha parameter.
...	Additional parameters passed on to internal inla.spde2.matern calls.

Value

List of basis specifications

B.tau	Basis for log(tau)
B.kappa	Basis for log(kappa)

Intended for passing on to [inla.spde2.matern](#).

Author(s)

Finn Lindgren <finn.lindgren@gmail.com>

See Also

[inla.spde2.matern](#)

inla.spde2.pcmatern *Matern SPDE model object with PC prior for INLA*

Description

Create an `inla.spde2` model object for a Matern model, using a PC prior for the parameters.

Usage

```
inla.spde2.pcmatern(mesh,
                     alpha = 2,
                     param = NULL,
                     constr = FALSE,
                     extraconstr.int = NULL,
                     extraconstr = NULL,
                     fractional.method = c("parsimonious", "null"),
                     n.iid.group = 1,
                     prior.range = NULL,
                     prior.sigma = NULL)
```

Arguments

<code>mesh</code>	The mesh to build the model on, as an inla.mesh or inla.mesh.1d object.
<code>alpha</code>	Fractional operator order, $0 < \alpha \leq 2$ supported, for $\nu = \alpha - d/2 > 0$.
<code>param</code>	Further model parameters. Not currently used.
<code>constr</code>	If TRUE, apply an integrate-to-zero constraint. Default FALSE.
<code>extraconstr.int</code>	Field integral constraints.
<code>extraconstr</code>	Direct linear combination constraints on the basis weights.
<code>fractional.method</code>	Specifies the approximation method to use for fractional (non-integer) alpha values. 'parsimonious' gives an overall approximate minimal covariance error, 'null' uses approximates low-order properties.
<code>n.iid.group</code>	If greater than 1, build an explicitly iid replicated model, to support constraints applied to the combined replicates, for example in a time-replicated spatial model. Constraints can either be specified for a single mesh, in which case it's applied to the average of the replicates (<code>ncol(A)</code> should be <code>mesh\$n</code> for 2D meshes, <code>mesh\$m</code> for 1D), or as general constraints on the collection of replicates (<code>ncol(A)</code> should be <code>mesh\$n * n.iid.group</code> for 2D meshes, <code>mesh\$m * n.iid.group</code> for 1D).

prior.range	A length 2 vector, with (range0, Prange) specifying that $P(\rho < \rho_0) = p_\rho$, where ρ is the spatial range of the random field. If Prange is NA, then range0 is used as a fixed range value.
prior.sigma	A length 2 vector, with (sigma0, Psigma) specifying that $P(\sigma > \sigma_0) = p_\sigma$, where σ is the marginal standard deviation of the field. If Psigma is NA, then sigma0 is used as a fixed range value.

Details

This method constructs a Matern SPDE model, with spatial range ρ and standard deviation parameter σ . In the parameterisation

$$(\kappa^2 - \Delta)^{\alpha/2}(\tau x(u)) = W(u)$$

the spatial scale parameter $\kappa = \sqrt{8\nu}/\rho$, where $\nu = \alpha - d/2$, and τ is proportional to $1/\sigma$.

Stationary models are supported for $0 < \alpha \leq 2$, with spectral approximation methods used for non-integer α , with approximation method determined by `fractional.method`.

Integration and other general linear constraints are supported via the `constr`, `extraconstr.int`, and `extraconstr` parameters, which also interact with `n.iid.group`.

The joint PC prior density for the spatial range, ρ , and the marginal standard deviation, σ , and is

$$\pi(\rho, \sigma) = \frac{d\lambda_\rho}{2} \rho^{-1-d/2} \exp(-\lambda_\rho \rho^{-d/2}) \lambda_\sigma \exp(-\lambda_\sigma \sigma)$$

where λ_ρ and λ_σ are hyperparameters that must be determined by the analyst. The practical approach for this in INLA is to require the user to indirectly specify these hyperparameters through

$$P(\rho < \rho_0) = p_\rho$$

and

$$P(\sigma > \sigma_0) = p_\sigma$$

where the user specifies the lower tail quantile and probability for the range (ρ_0 and p_ρ) and the upper tail quantile and probability for the standard deviation (σ_0 and p_σ).

This allows the user to control the priors of the parameters by supplying knowledge of the scale of the problem. What is a reasonable upper magnitude for the spatial effect and what is a reasonable lower scale at which the spatial effect can operate? The shape of the prior was derived through a construction that shrinks the spatial effect towards a base model of no spatial effect in the sense of distance measured by Kullback-Leibler divergence.

The prior is constructed in two steps, under the idea that having a spatial field is an extension of not having a spatial field. First, a spatially constant random effect ($\rho = \infty$) with finite variance is more complex than not having a random effect ($\sigma = 0$). Second, a spatial field with spatial variation ($\rho < \infty$) is more complex than the random effect with no spatial variation. Each of these extensions are shrunk towards the simpler model and, as a result, we shrink the spatial field towards the base model of no spatial variation and zero variance ($\rho = \infty$ and $\sigma = 0$).

The details behind the construction of the prior is presented in Fuglstad, et al. (2016) and is based on the PC prior framework (Simpson, et al., 2015).

Value

An `inla.spde2` object.

Author(s)

Finn Lindgren <finn.lindgren@gmail.com>

References

Fuglstad, G.-A., Simpson, D., Lindgren, F., and Rue, H. (2016) Constructing Priors that Penalize the Complexity of Gaussian Random Fields. arXiv:1503.00256

Simpson, D., Rue, H., Martins, T., Riebler, A., and Sørbye, S. (2015) Penalising model component complexity: A principled, practical approach to constructing priors. arXiv:1403.4630

See Also

[inla.mesh.2d](#), [inla.mesh.create](#), [inla.mesh.1d](#), [inla.mesh.basis](#), [inla.spde2.matern](#), [inla.spde2.generic](#)

Examples

```
## Spatial interpolation
n = 100
field.fcn = function(loc) (10*cos(2*pi*2*(loc[,1]+loc[,2])))
loc = matrix(runif(n*2),n,2)
## One field, 2 observations per location
idx.y = rep(1:n,2)
y = field.fcn(loc[idx.y,]) + rnorm(length(idx.y))

mesh = inla.mesh.2d(loc, max.edge=0.05, cutoff=0.01)
spde = inla.spde2.pcmatern(mesh,
  prior.range=c(0.01,0.1), prior.sigma=c(100,0.1))
data = list(y=y, field=mesh$idx$loc[idx.y])
formula = y ~ -1 + f(field, model=spde)
result = inla(formula, data=data, family="normal")

## Plot the mesh structure:
plot(mesh)

if (require(rgl)) {
  col.pal = colorRampPalette(c("blue","cyan","green","yellow","red"))
  ## Plot the posterior mean:
  plot(mesh, rgl=TRUE,
    result$summary.random$field[, "mean"],
    color.palette = col.pal)
  ## Plot residual field:
  plot(mesh, rgl=TRUE,
    result$summary.random$field[, "mean"]-field.fcn(mesh$loc),
    color.palette = col.pal)
}

result.field = inla.spde.result(result, "field", spde)
par(mfrow=c(2,1))
plot(result.field$marginals.range.nominal[[1]],
  type="l", main="Posterior density for range")
plot(inla.tmarginal(sqrt, result.field$marginals.variance.nominal[[1]]),
  type="l", main="Posterior density for std.dev.")
par(mfrow=c(1,1))

## Spatial model
```

```

set.seed(1234234)

## Generate spatial locations
nObs = 200
loc = matrix(runif(nObs*2), nrow = nObs, ncol = 2)

## Generate observation of spatial field
nu = 1.0
rhoT = 0.2
kappaT = sqrt(8*nu)/rhoT
sigT = 1.0
Sig = sigT^2*inla.matern.cov(nu = nu,
                             kappa = kappaT,
                             x = as.matrix(dist(loc)),
                             d = 2,
                             corr = TRUE)

L = t(chol(Sig))
u = L %*% rnorm(nObs)

## Construct observation with nugget
sigN = 0.1
y = u + sigN*rnorm(nObs)

## Create the mesh and spde object
mesh = inla.mesh.2d(loc,
                    max.edge = 0.05,
                    cutoff = 0.01)
spde = inla.spde2.pcmatern(mesh,
                          prior.range = c(0.01, 0.05),
                          prior.sigma = c(10, 0.05))

## Create projection matrix for observations
A = inla.spde.make.A(mesh = mesh,
                    loc = loc)

## Run model without any covariates
idx = 1:spde$n.spde
res = inla(y ~ f(idx, model = spde) - 1,
          data = list(y = y, idx = idx, spde = spde),
          control.predictor = list(A = A))

## Re-run model with fixed range
spde.fixed = inla.spde2.pcmatern(mesh,
                                prior.range = c(0.2, NA),
                                prior.sigma = c(10, 0.05))

res.fixed = inla(y ~ f(idx, model = spde) - 1,
                data = list(y = y, idx = idx, spde = spde.fixed),
                control.predictor = list(A = A))

```

Description

Handles transformation of various inla objects according to coordinate reference systems of `sp::CRS` or `inla.CRS` class.

Usage

```
inla.spTransform(x, ...)
## Default S3 method:
inla.spTransform(x, crs0, crs1,
                 passthrough=FALSE, ...)
## S3 method for class 'SpatialPoints'
inla.spTransform(x, CRSobj,
                 passthrough=FALSE, ...)
## S3 method for class 'inla.mesh.lattice'
inla.spTransform(x, CRSobj,
                 passthrough=FALSE, ...)
## S3 method for class 'inla.mesh.segment'
inla.spTransform(x, CRSobj,
                 passthrough=FALSE, ...)
## S3 method for class 'inla.mesh'
inla.spTransform(x, CRSobj,
                 passthrough=FALSE, ...)
```

Arguments

<code>x</code>	The object that should be transformed from its current CRS to a new CRS
<code>crs0</code>	The source <code>sp::CRS</code> or <code>inla.CRS</code> object
<code>crs1</code>	The target <code>sp::CRS</code> or <code>inla.CRS</code> object
<code>CRSobj</code>	The target <code>sp::CRS</code> or <code>inla.CRS</code> object
<code>passthrough</code>	default FALSE. Setting to TRUE allows objects with no CRS information to be passed through without transformation.
<code>...</code>	Potential additional arguments

Value

The object is returned with its coordinates transformed

Author(s)

Finn Lindgren <finn.lindgren@gmail.com>

See Also

[inla.CRS](#)

Examples

```
if (require(rgdal)) {
  latt <- inla.mesh.lattice(-10:10, 40:60)
  mesh1 <- inla.mesh.create(lattice=latt, extend=FALSE, refine=FALSE,
                           crs=inla.CRS("longlat"))
  mesh2 <- inla.spTransform(mesh1, inla.CRS("lambert"))
}
```

```
summary(mesh1)
summary(mesh2)
}
```

inla.ssh.copy.id	<i>Setup remote computing</i>
------------------	-------------------------------

Description

Initialize the definition file and print the path to the internal script to transfer ssh-keys

Usage

```
inla.remote()
inla.ssh.copy.id()
```

Arguments

None

Value

inla.remote is used once to setup the remote host information file (definition file) in the users home directory; see the FAQ entry on this issue for more information. inla.ssh.copy.id will return the path to the internal script to transfer ssh-keys.

Author(s)

Havard Rue <hrue@math.ntnu.no>

Examples

```
##See the FAQ entry on this issue on r-inla.org.
```

inla.stack	<i>Data stacking for advanced INLA models</i>
------------	---

Description

Functions for combining data, effects and observation matrices into inla.stack object, and extracting information from such objects.

Usage

```
## Create data stack as a sum of predictors:
inla.stack.sum(data, A, effects, tag="", compress=TRUE, remove.unused=TRUE)

## Join two or more data stacks:
inla.stack.join(..., compress=TRUE, remove.unused=TRUE)

## Shorthand for inla.stack.join and inla.stack.sum:
inla.stack(..., compress=TRUE, remove.unused=TRUE)

## Compress an existing stack:
inla.stack.compress(stack, remove.unused=TRUE)

## Remove unused entries from an existing stack:
inla.stack.remove.unused(stack)

## Extract tagged indices:
inla.stack.index(stack, tag)

## Extract data for inla call, and optionally join with other variables:
inla.stack.data(stack, ...)

## Extract "A matrix" for control.predictor:
inla.stack.A(stack)

## Extract data associated with the "left hand side" of the model:
## (e.g. the data itself, Ntrials, link, E, ...)
inla.stack.LHS(stack)

## Extract data associated with the "right hand side" of the model
## (all the covariates/predictors)
inla.stack.RHS(stack)
```

Arguments

<code>data</code>	A list of data vectors.
<code>A</code>	A list of observation matrices.
<code>effects</code>	A collection of effects/predictors. Each list element corresponds to an observation matrix, and must either be a single vector or a list of vectors.
<code>tag</code>	A string specifying a tag for later identification.
<code>compress</code>	If TRUE, compress the model by removing duplicated rows of effects, replacing the corresponding A-matrix columns with a single column containing the sum.
<code>remove.unused</code>	If TRUE, compress the model by removing rows of effects corresponding to all-zero columns in the A matrix (and removing those columns).
<code>stack</code>	An <code>inla.data.stack</code> object, created by a call to <code>inla.stack</code> , <code>inla.stack.sum</code> , or <code>inla.stack.join</code> .
<code>...</code>	For <code>inla.stack.join</code> , two or more data stacks of class <code>inla.data.stack</code> , created by a call to <code>inla.stack</code> , <code>inla.stack.sum</code> , or <code>inla.stack.join</code> . For <code>inla.stack.data</code> , a list of variables to be joined with the data list.

Details

n_l effect blocks

n_k effects

n_i data values

$n_{j,l}$ effect size for block l

$n_j = \sum_{l=1}^{n_l} n_{j,l}$ total effect size

Input:

data (y^1, \dots, y^p) p vectors, each of length n_i

A (A^1, \dots, A^{n_l}) matrices of size $n_i \times n_{j,l}$

effects $((x^{1,1}, \dots, x^{n_k,1}), \dots, (x^{1,n_l}, \dots, x^{n_k,n_l}))$ collections of effect vectors of length $n_{j,l}$

$$\text{predictor}(y^1, \dots, y^p) \sim \sum_{l=1}^{n_l} A^l \sum_{k=1}^{n_k} g(k, x^{k,l}) = \tilde{A} \sum_{k=1}^{n_k} g(k, \tilde{x}^k)$$

where

$$\tilde{A} = \text{cbind}(A^1, \dots, A^{n_l})$$

$$\tilde{x}^k = \text{rbind}(x^{k,1}, \dots, x^{k,n_l})$$

and for each block l , any missing $x^{k,l}$ is replaced by an NA vector.

Value

A data stack of class `inla.data.stack`. Elements:

- data $= (y^1, \dots, y^p, \tilde{x}^1, \dots, \tilde{x}^{n_k})$
- A $= \tilde{A}$
- data.names List of data names, length p
- effect.names List of effect names, length n_k
- n.data Data length, n_i
- index List indexed by tags, each element indexing into $i = 1, \dots, n_i$

See Also

[inla.spde.make.A](#), [inla.spde.make.index](#)

Examples

```
n = 200
loc = matrix(runif(n*2),n,2)
mesh = inla.mesh.create.helper(points.domain=loc,
                               max.edge=c(0.05, 0.2))
proj.obs = inla.mesh.projector(mesh, loc=loc)
proj.pred = inla.mesh.projector(mesh, loc=mesh$loc)
spde = inla.spde2.matern(mesh,
                          B.tau=cbind(log(1), 1, 0),
                          B.kappa=matrix(c(log(sqrt(8))/0.2), 0, 1), 1, 3))

covar = rnorm(n)
field = inla.qsample(n=1, Q=inla.spde2.precision(spde, theta=c(0,0)))[,1]
```



```

y = 2*covar + inla.mesh.project(proj.obs, field)

A.obs = inla.spde.make.A(mesh, loc=loc)
A.pred = inla.spde.make.A(mesh, loc=proj.pred$loc)
stack.obs =
  inla.stack(data=list(y=y),
             A=list(A.obs, 1),
             effects=list(c(list(intercept=rep(1, mesh$n)),
                           inla.spde.make.index("spatial", spde$n.spde)),
                           covar=covar),
             tag="obs")
stack.pred =
  inla.stack(data=list(y=NA),
             A=list(A.pred),
             effects=list(c(list(intercept=rep(1, mesh$n)),
                           inla.spde.make.index("spatial", mesh$n))),
             tag="pred")
stack = inla.stack(stack.obs, stack.pred)

formula = y ~ -1 + intercept + covar + f(spatial, model=spde)
result1 = inla(formula,
               data=inla.stack.data(stack.obs, spde=spde),
               family="gaussian",
               control.predictor=list(A=inla.stack.A(stack.obs), compute=TRUE),
               verbose=TRUE)

plot(y,result1$summary.fitted.values[inla.stack.index(stack.obs,"obs")$data,"mean"])

result2 = inla(formula,
               data=inla.stack.data(stack, spde=spde),
               family="gaussian",
               control.predictor=list(A=inla.stack.A(stack), compute=TRUE),
               verbose=TRUE)

field.pred = inla.mesh.project(proj.pred,
                              result2$summary.fitted.values[inla.stack.index(stack,"pred")$data, "mean"])

dev.new()
plot(field, field.pred)
dev.new()
image(inla.mesh.project(mesh,
                        field=field,
                        dims=c(200,200)))
dev.new()
image(inla.mesh.project(mesh,
                        field=field.pred,
                        dims=c(200,200)))

```

inla.surv

Create a Survival Object for INLA

Description

Create a survival object, to be used as a response variable in a model formula for the [inla](#) function for survival models.

inla.upgrade	<i>Upgrade the INLA-package</i>
--------------	---------------------------------

Functions to upgrade the INLA-package to the current version.

```
inla.upgrade(lib = NULL, testing=FALSE, ask = TRUE)
inla.update(lib = NULL, testing=FALSE, ask = TRUE)
```

lib	Location to install the library.
testing	If TRUE, then look for a test-version if the INLA-package.
ask	same argument as in <code>update.packages</code>

`inla.upgrade` will update the INLA package to the current version, and `inla.update` do the same for backward compatibility. This function is simple wrapper for `update.packages` using the INLA repository.

Havard Rue <hrue@math.ntnu.no>

```
update.packages
```

inla.version	<i>Show the version of the INLA-package</i>
--------------	---

Description

Show the version of the INLA-package

Usage

```
inla.version(what = c("default",
                      "version",
                      "info",
                      "hgid",
                      "rinla",
                      "inla",
                      "date",
                      "bdate"))
```

Arguments

what	What to show version of
------	-------------------------

Value

inla.version either display the current version information using cat with default or info, or return the version number/information for other spesific requests through the call.

Author(s)

Havard Rue <hrue@math.ntnu.no>

Examples

```
## Summary of all
inla.version()
## The building date
inla.version("bdate")
```

Kidney	<i>Kidney infection data</i>
--------	------------------------------

Description

Times of infection from the time to insertion of the catheter for 38 kindey patients using portable dialysis equipment

Usage

```
data(Kidney)
```

Format

A data frame with 76 observations on the following 9 variables.

time a numeric vector. Time to infection from the insertion of catheter

event a numeric vector. 1: time of infection 0: time of censoring

age a numeric vector. Age of the patient at the time of infection

sex a numeric vector. Sex of the patient 0: male 1:female

disease a numeric vector. Type of disease

dis1 a numeric vector. Dummy variable to codify the disease type.

dis2 a numeric vector. Dummy variable to codify the disease type.

dis3 a numeric vector. Dummy variable to codify the disease type.

ID a numeric vector. Patient code.

References

McGilchrist and C.W. Aisbett (1991), Regression with frailty in survival analysis, Biometrics, vol.47, pages 461–166.

D.J. Spiegelhalter and A. Thomas and N.G. Best and W.R. Gilks (1995) BUGS: Bayesian Inference Using Gibbs sampling, Version 0.50., MRC Biostatistics Unit, Cambridge, England.

lattice2node

Functions to define mapping between a lattice and nodes

Description

These functions define mapping in between two-dimensional indices on a lattice and the one-dimensional node representation used in inla.

The mapping from node to lattice follows the default R behaviour (which is column based storage), and `as.vector(A)` and `matrix(a, nrow, ncol)` can be used instead of `inla.matrix2vector` and `inla.vector2matrix`.

Usage

```
inla.lattice2node.mapping(nrow, ncol)
inla.node2lattice.mapping(nrow, ncol)
inla.lattice2node(irow, icol, nrow, ncol)
inla.node2lattice(node, nrow, ncol)
inla.matrix2vector(a.matrix)
inla.vector2matrix(a.vector, nrow, ncol)
```

Arguments

nrow	Number of rows in the lattice.
ncol	Number of columns in the lattice.
irow	Lattice row index, between 1 and nrow
icol	Lattice column index, between 1 and ncol
node	The node index, between 1 and ncol*nrow

<code>a.matrix</code>	is a matrix to be mapped to a vector using internal representation defined by <code>inla.lattice2node</code>
<code>a.vector</code>	is a vector to be mapped into a matrix using the internal representation defined by <code>inla.node2lattice</code>

Value

`inla.lattice2node.mapping` returns the hole mapping as a matrix, and `inla.node2lattice.mapping` returns the hole mapping as `list(irow=..., icol=...)`. `inla.lattice2node` and `inla.node2lattice` provide the mapping for a given set of lattice indices and nodes. `inla.matrix2vector` provide the mapped vector from a matrix, and `inla.vector2matrix` provide the inverse mapped matrix from vector.

Author(s)

Havard Rue <hrue@math.ntnu.no>

See Also

[inla](#)

Examples

```
## write out the mapping using the two alternatives
nrow = 2
ncol = 3
mapping = inla.lattice2node.mapping(nrow,ncol)

for (i in 1:nrow){
  for(j in 1:ncol){
    print(paste("Alt.1: lattice index [", i,",", j,"] corresponds",
                "to node [", mapping[i,j],"]", sep=""))
  }
}

for (i in 1:nrow){
  for(j in 1:ncol){
    print(paste("Alt.2: lattice index [", i,",", j,"] corresponds to node [",
                inla.lattice2node(i,j,nrow,ncol), "]", sep=""))
  }
}

inv.mapping = inla.node2lattice.mapping(nrow,ncol)
for(node in 1:(nrow*ncol))
  print(paste("Alt.1: node [", node, "] corresponds to lattice index [",
              inv.mapping$irow[node], ",",
              inv.mapping$icol[node],"]", sep=""))

for(node in 1:(nrow*ncol))
  print(paste("Alt.2: node [", node, "] corresponds to lattice index [",
              inla.node2lattice(node,nrow,ncol)$irow[1], ",",
              inla.node2lattice(node,nrow,ncol)$icol[1],"]", sep=""))

## apply the mapping from matrix to vector and back
n = nrow*ncol
z = matrix(1:n,nrow,ncol)
```

```
z.vector = inla.matrix2vector(z) # as.vector(z) could also be used
print(mapping)
print(z)
print(z.vector)

## the vector2matrix is the inverse, and should give us the z-matrix
## back. matrix(z.vector, nrow, ncol) could also be used here.
z.matrix = inla.vector2matrix(z.vector, nrow, ncol)
print(z.matrix)
```

Leuk

The Leukemia data

Description

This the Leukemia data from Henderson et al (2003); see source.

Usage

```
data(Leuk)
```

Format

A data frame with 1043 observations on the following 9 variables.

time TODO
cens TODO
xcoord TODO
ycoord TODO
age TODO
sex TODO
wbc TODO
tpi TODO
district TODO

Source

This is the dataset from

Henderson, R. and Shimakura, S. and Gorst, D., 2002, Modeling spatial variation in leukemia survival data, JASA, 97, 460, 965–972.

Examples

```
data(Leuk)
```

```
lines.inla.mesh.segment
```

Draw inla.mesh.segment objects.

Description

Draws a [inla.mesh.segment](#) object with generic or rgl graphics.

Usage

```
## S3 method for class 'inla.mesh.segment'
lines(x, loc = NULL, col = NULL,
      colors = c("black", "blue", "red", "green"),
      add = TRUE, xlim = NULL, ylim = NULL,
      rgl = FALSE, ...)
```

Arguments

x	An inla.mesh.segment object.
loc	Point locations to be used if x\$loc is NULL.
col	Segment color specification.
colors	Colors to cycle through if col is NULL.
add	If TRUE, add to the current plot, otherwise start a new plot.
xlim	X axis limits for a new plot.
ylim	Y axis limits for a new plot.
rgl	If TRUE, use rgl for plotting.
...	Additional parameters, passed on to graphics methods.

Author(s)

Finn Lindgren <finn.lindgren@gmail.com>

See Also

[inla.mesh.segment](#)

link

Link functions in INLA

Description

Define link-functions and its inverse

Usage

```

inla.link.log(x, inverse=FALSE)
inla.link.invlog(x, inverse=FALSE)
inla.link.neglog(x, inverse=FALSE)
inla.link.invneglog(x, inverse=FALSE)
inla.link.logit(x, inverse=FALSE)
inla.link.invlogit(x, inverse=FALSE)
inla.link.probit(x, inverse=FALSE)
inla.link.invprobit(x, inverse=FALSE)
inla.link.cloglog(x, inverse=FALSE)
inla.link.invcloglog(x, inverse=FALSE)
inla.link.loglog(x, inverse=FALSE)
inla.link.invloglog(x, inverse=FALSE)
inla.link.tan(x, inverse=FALSE)
inla.link.invtan(x, inverse=FALSE)
inla.link.cauchit(x, inverse=FALSE)
inla.link.invcauchit(x, inverse=FALSE)
inla.link.identity(x, inverse=FALSE)
inla.link.invidentity(x, inverse=FALSE)
inla.link.invalid(x, inverse=FALSE)
inla.link.invinvalid(x, inverse=FALSE)

```

Arguments

x	The argument. A numeric vector.
inverse	Logical. Use the link (inverse=FALSE) or its inverse (inverse=TRUE)

Value

Return the values of the link-function or its inverse.

Note

The inv-functions are redundant, as `inla.link.invlog(x) = inla.link.log(x, inverse=TRUE)` and so on, but they are simpler to use a arguments to other functions.

Author(s)

Havard Rue <hrue@math.ntnu.no>

make.lincomb

Create linear combinations

Description

Create a linear combination or several linear combinations, as input to `inla(..., lincomb = <lincomb>)`

Usage

```

inla.make.lincomb(...)
inla.make.lincombs(...)

```

Arguments

... Arguments; see examples

Value

A structure to be passed on to [inla](#) argument `lincomb`

Author(s)

Havard Rue <hrue@math.ntnu.no>

See Also

TODO

Examples

```
##See the worked out examples and description in the FAQ
##section on {www.r-inla.org}
```

marginal

Functions which operates on marginals

Description

Density, distribution function, quantile function, random generation, hpd-interval, interpolation, expectations, mode and transformations of marginals obtained by `inla` or `inla.hyperpar()`. These functions computes the density (`inla.dmarginal`), the distribution function (`inla.pmarginal`), the quantile function (`inla.qmarginal`), random generation (`inla.rmarginal`), spline smoothing (`inla.smarginal`), computes expected values (`inla.emarginal`), computes the mode (`inla.mmarginal`), transforms the marginal (`inla.tmarginal`), and provide summary statistics (`inla.zmarginal`).

Usage

```
inla.dmarginal(x, marginal, log = FALSE)
inla.pmarginal(q, marginal, normalize = TRUE, len = 1024L)
inla.qmarginal(p, marginal, len = 1024L)
inla.rmarginal(n, marginal)
inla.hpdmarginal(p, marginal, len = 1024L)
inla.smarginal(marginal, log = FALSE, extrapolate = 0.0, keep.type = FALSE, factor=15L)
inla.emarginal(fun, marginal, ...)
inla.mmarginal(marginal)
inla.tmarginal(fun, marginal, n=1024L, h.diff = .Machine$double.eps^(1/3),
               method = c("quantile", "linear"))
inla.zmarginal(marginal, silent = FALSE)
```

Arguments

<code>marginal</code>	A marginal object from either <code>inla</code> or <code>inla.hyperpar()</code> , which is either <code>list(x=c(), y=c())</code> with density values <code>y</code> at locations <code>x</code> , or a <code>matrix(,n,2)</code> for which the density values are the second column and the locations in the first column. The <code>inla.hpdmarginal()</code> -function assumes a unimodal density.
<code>fun</code>	A (vectorised) function like <code>function(x) exp(x)</code> to compute the expectation against, or which define the transformation <code>new = fun(old)</code>
<code>x</code>	Evaluation points
<code>q</code>	Quantiles
<code>p</code>	Probabilities
<code>n</code>	The number of observations. If <code>length(n) > 1</code> , the length is taken to be the number required. For <code>inla.marginal.transform</code> , its the number of points to use in the new density.
<code>h.diff</code>	The step-length for the numerical differeniatio inside <code>inla.marginal.transform</code>
<code>...</code>	Further arguments to be passed to function which expectation is to be computed.
<code>log</code>	Return density or interpolated density in log-scale?
<code>normalize</code>	Renormalise the density after interpolation?
<code>len</code>	Number of locations used to interpolate the distribution function.
<code>keep.type</code>	If FALSE then return a <code>list(x=, y=)</code> , otherwise if TRUE, then return a matrix if the input is a matrix
<code>extrapolate</code>	How much to extrapolate on each side when computing the interpolation. In fraction of the range.
<code>factor</code>	The number of points after interpolation is <code>factor</code> times the original number of points; which is argument <code>n</code> in <code>spline</code>
<code>method</code>	Which method should be used to layout points for where the transformation is computed.
<code>silent</code>	Output the result visually (TRUE) or just through the call.

Value

`inla.smarginal` returns `list(x=c(), y=c())` of interpolated values do extrapolation using the factor given, and the remaining function returns what they say they should do.

Author(s)

Havard Rue <hrue@math.ntnu.no>

See Also

[inla](#), [inla.hyperpar](#)

Examples

```
## a simple linear regression example
n = 10
x = rnorm(n)
sd = 0.1
y = 1+x + rnorm(n,sd=sd)
res = inla(y ~ 1 + x, data = data.frame(x,y),
```

```

control.family=list(initial = log(1/sd^2),fixed=TRUE))

## chose a marginal and compare the with the results computed by the
## inla-program
r = res$summary.fixed["x",]
m = res$marginals.fixed$x

## compute the 95% HPD interval
inla.hpdmarginal(0.95, m)

x = seq(-6, 6, len = 1000)
y = dnorm(x)
inla.hpdmarginal(0.95, list(x=x, y=y))

## compute the the density for exp(r), version 1
r.exp = inla.tmarginal(exp, m)
## or version 2
r.exp = inla.tmarginal(function(x) exp(x), m)

## to plot the marginal, we use the inla.smarginal, which interpolates (in
## log-scale). Compare with some samples.
plot(inla.smarginal(m), type="l")
s = inla.rmarginal(1000, m)
hist(inla.rmarginal(1000, m), add=TRUE, prob=TRUE)
lines(density(s), lty=2)

m1 = inla.emarginal(function(x) x^1, m)
m2 = inla.emarginal(function(x) x^2, m)
stdev = sqrt(m2 - m1^2)
q = inla.qmarginal(c(0.025,0.975), m)

## inla-program results
print(r)

## inla.marginal-results (they shouldn't be perfect!)
print(c(mean=m1, sd=stdev, "0.025quant" = q[1], "0.975quant" = q[2]))
## using the buildt-in function
inla.zmarginal(m)

```

Munich

The Munich rent data

Description

The Munich rent data

Usage

```
data(Munich)
```

Format

A data frame with 2035 observations on the following 17 variables.

rent Net rent per square meter.
 floor.size Size of the flat in square meters.
 year Year of construction of the building in which the flat is located.
 location Location index (in terms of subquarters).
 Gute.Wohnlage Dummy variable for good locations / good neighborhoods.
 Beste.Wohnlage Dummy variable for very good locations / very good neighborhoods.
 Keine.Wvv Dummy for absence of warm water supply.
 Keine.Zh Dummy for absence of central heating system.
 Kein.Badkach Dummy for absence of flagging in the bathroom.
 Besond.Bad Dummy for special features of the bathroom.
 Gehobene.Kueche Dummy for more refined kitchen equipment.
 zim1 Dummy for a flat with 1 room.
 zim2 Dummy for a flat with 2 rooms.
 zim3 Dummy for a flat with 3 rooms.
 zim4 Dummy for a flat with 4 rooms.
 zim5 Dummy for a flat with 5 rooms.
 zim6 Dummy for a flat with 6 rooms.

Source

See Rue and Held (2005), Chapter 4.

References

Rue, H and Held, L. (2005) *Gaussian Markov Random Fields - Theory and Applications* Chapman and Hall

nwEngland

The New England map

Description

This map is used in association to the Leukemia data from Henderson et al (2003); see source.

Usage

data(Leuk)

Format

A SpatialPolygons object.

Source

This map are used to analyse the Leukaemia dataset from
 Henderson, R. and Shimakura, S. and Gorst, D., 2002, Modeling spatial variation in leukemia survival data, JASA, 97, 460, 965–972.

Examples

```
data(Leuk)
plot(nwEngland)
```

Oral	~~ data name/kind ... ~~
------	--------------------------

Description

~~ A concise (1-5 lines) description of the dataset. ~~

Usage

```
data(Oral)
```

Format

A data frame with 544 observations on the following 3 variables.

region a numeric vector

E a numeric vector

Y a numeric vector

References

Rue, H and Held, L. (2005) *Gaussian Markov Random Fields - Theory and Applications* Chapman and Hall

param2.matern.orig	<i>Parameter settings for inla.spde2.matern models.</i>
--------------------	---

Description

Construct parameter settings for inla.spde2.matern models.

Usage

```
param2.matern.orig(mesh, alpha = 2,
  B.tau = matrix(c(0, 1, 0), 1, 3),
  B.kappa = matrix(c(0, 0, 1), 1, 3),
  prior.variance.nominal = 1,
  prior.range.nominal = NULL,
  prior.tau = NULL,
  prior.kappa = NULL,
  theta.prior.mean = NULL,
  theta.prior.prec = 0.1)
```

Arguments

mesh	The mesh to build the model on, as an inla.mesh object.
alpha	Fractional operator order, $0 < \alpha \leq 2$ supported. ($\nu = \alpha - d/2$)
B.tau	Matrix with specification of log-linear model for τ .
B.kappa	Matrix with specification of log-linear model for κ .
prior.variance.nominal	Nominal prior mean for the field variance
prior.range.nominal	Nominal prior mean for the spatial range
prior.tau	Prior mean for tau (overrides prior.variance.nominal)
prior.kappa	Prior mean for kappa (overrides prior.range.nominal)
theta.prior.mean	(overrides prior.*)
theta.prior.prec	Scalar, vector or matrix, specifying the joint prior precision for <i>theta</i> .

Author(s)

Finn Lindgren <finn.lindgren@gmail.com>

See Also

[inla.spde2.matern](#)

pc.ar

Utility functions for the PC prior for a an AR(p) model

Description

Functions to evaluate and sample from the PC prior for an AR(p) model

Usage

```
inla.pc.ar.rpacf(n=1, p, lambda = 1)
inla.pc.ar.dpacf(pac, lambda = 1, log = TRUE)
```

Arguments

p	The order of the AR-model
pac	A vector of partial autocorrelation coefficients
n	Number of observations
lambda	The rate parameter in the prior
log	Logical. Return the density in natural or log-scale.

Value

inla.pc.ar.rpac generate samples from the prior, returning a matrix where each row is a sample of theta. inla.pc.ar.dpac evaluates the density of pac. Use inla.ar.pacf2phi, inla.ar.phi2pacf, inla.ar.pacf2acf and inla.ar.acf2pacf to convert between various parameterisations.

Author(s)

Havard Rue <hrue@math.ntnu.no>

pc.cor0

Utility functions for the PC prior for correlation in AR(1)

Description

Functions to evaluate, sample, compute quantiles and percentiles of the PC prior for the correlation in the Gaussian AR(1) model where the base-model is zero correlation.

Usage

```
inla.pc.rcor0(n, u, alpha, lambda)
inla.pc.dcor0(cor, u, alpha, lambda, log = FALSE)
inla.pc.qcor0(p, u, alpha, lambda)
inla.pc.pcor0(q, u, alpha, lambda)
```

Arguments

n	Number of observations
u	The upper limit (see Details)
alpha	The probability going above the upper limit (see Details)
lambda	The rate parameter (see Details)
cor	Vector of correlations
log	Logical. Return the density in natural or log-scale.
p	Vector of probabilities
q	Vector of quantiles

Details

The statement $\text{Prob}(|\text{cor}| > u) = \alpha$ is used to determine lambda unless lambda is given. Either lambda must be given, or u AND alpha. The density is symmetric around zero.

Value

inla.pc.dcor0 gives the density, inla.pc.pcor0 gives the distribution function, inla.pc.qcor0 gives the quantile function, and inla.pc.rcor0 generates random deviates.

Author(s)

Havard Rue <hrue@math.ntnu.no>

See Also

`inla.doc("pc.rho0")`

Examples

```
cor = inla.pc.rcor0(100, lambda = 1)
d = inla.pc.dcor0(cor, lambda = 1)
cor = inla.pc.qcor0(c(0.3, 0.7), u = 0.5, alpha=0.01)
inla.pc.pcor0(cor, u = 0.5, alpha=0.01)
```

<code>pc.cor1</code>	<i>Utility functions for the PC prior for correlation in AR(1)</i>
----------------------	--

Description

Functions to evaluate, sample, compute quantiles and percentiles of the PC prior for the correlation in the Gaussian AR(1) model where the base-model is correlation one.

Usage

```
inla.pc.rcor1(n, u, alpha, lambda)
inla.pc.dcor1(cor, u, alpha, lambda, log = FALSE)
inla.pc.qcor1(p, u, alpha, lambda)
inla.pc.pcor1(q, u, alpha, lambda)
```

Arguments

<code>n</code>	Number of observations
<code>u</code>	The upper limit (see Details)
<code>alpha</code>	The probability going above the upper limit (see Details)
<code>lambda</code>	The rate parameter (see Details)
<code>cor</code>	Vector of correlations
<code>log</code>	Logical. Return the density in natural or log-scale.
<code>p</code>	Vector of probabilities
<code>q</code>	Vector of quantiles

Details

The statement $\text{Prob}(\text{cor} > u) = \alpha$ is used to determine `lambda` unless `lambda` is given. Either `lambda` must be given, or `u` AND `alpha`.

Value

`inla.pc.dcor1` gives the density, `inla.pc.pcor1` gives the distribution function, `inla.pc.qcor1` gives the quantile function, and `inla.pc.rcor1` generates random deviates.

Author(s)

Havard Rue <hrue@math.ntnu.no>

See Also

inla.doc("pc.rho1")

Examples

```
cor = inla.pc.rcor1(100, lambda = 1)
d = inla.pc.dcor1(cor, lambda = 1)
cor = inla.pc.qcor1(c(0.3, 0.7), u = 0.5, alpha=0.75)
inla.pc.pcor1(cor, u = 0.5, alpha=0.75)
```

pc.cormat

Utility functions for the PC prior for a correlation matrix

Description

Functions to evaluate and sample from the PC prior for a correlation matrix.

Usage

```
inla.pc.cormat.dim2p(dim)
inla.pc.cormat.p2dim(p)
inla.pc.cormat.theta2R(theta)
inla.pc.cormat.R2theta(R)
inla.pc.cormat.r2R(r)
inla.pc.cormat.R2r(R)
inla.pc.cormat.r2theta(r)
inla.pc.cormat.theta2r(theta)
inla.pc.cormat.permute(R)
inla.pc.cormat.rtheta(n=1, p, lambda = 1)
inla.pc.cormat.dtheta(theta, lambda = 1, log = FALSE)
```

Arguments

dim	The dimension of theta, the parameterisation of the correlation matrix
p	The dimension the correlation matrix
theta	A vector of parameters for the correlation matrix
r	The off diagonal elements of a correlation matrix
R	A correlation matrix
n	Number of observations
lambda	The rate parameter in the prior
log	Logical. Return the density in natural or log-scale.

Details

The parameterisation of a correlation matrix of dimension p has dim parameters: θ which are in the interval $-\pi$ to π . The alternative parameterisation is through the off-diagonal elements r of the correlation matrix R . The functions `inla.pc.cormat.<A>2` convert between parameterisations $\langle A \rangle$ to parameterisations $\langle B \rangle$, where both $\langle A \rangle$ and $\langle B \rangle$ are one of θ , r and R , and p and dim .

Value

`inla.pc.cormat.rtheta` generate samples from the prior, returning a matrix where each row is a sample of θ . `inla.pc.cormat.dtheta` evaluates the density of θ . `inla.pc.cormat.permute` randomly permutes a correlation matrix, which is useful if an exchangeable sample of a correlation matrix is required.

Author(s)

Havard Rue <hrue@math.ntnu.no>

Examples

```
p = 4
print(paste("theta has length", inla.pc.cormat.p2dim(p)))
theta = inla.pc.cormat.rtheta(n=1, p=4, lambda = 1)
print("sample theta:")
print(theta)
print(paste("log.dens", inla.pc.cormat.dtheta(theta, log=TRUE)))
print("r:")
r = inla.pc.cormat.theta2r(theta)
print(r)
print("A sample from the non-exchangable prior, R:")
R = inla.pc.cormat.r2R(r)
print(R)
print("A sample from the exchangeable prior, R:")
R = inla.pc.cormat.permute(R)
print(R)
```

pc.ddof

PC-prior for dof in a standarized Student-t

Description

A function to evaluate the PC-prior for the degrees of freedom in a standarized Student-t distribution

Usage

```
inla.pc.ddof(dof, lambda, u, alpha, log=FALSE)
```

Arguments

dof	Degrees of freedom
log	Logical. Return the density or the log-density
lambda	The optional value of lambda, instead of defining it implicitly through u and alpha
u	The upper value of dof used to elicitate lambda, $\text{Prob}(\text{dof} < u) = \alpha$
alpha	The probability alpha used to elicitate lambda

Details

These functions implements the PC-prior for the dof in a standardized Student-t distribution (ie. with unit variance and $\text{dof} > 2$). Either lambda, or u AND alpha must be given. Due the internal tabulation, dof must be larger than 2.0025.

Value

`inla.pc.ddof` returns the prior density for given dof.

Author(s)

Havard Rue <hrue@math.ntnu.no>

pc.multvar

Multivariate PC priors

Description

Functions to evaluate and simulate from multivariate PC priors: The simplex and sphere case

Usage

```
inla.pc.multvar.h.default(x, inverse = FALSE, derivative = FALSE)
inla.pc.multvar.simplex.r(n = NULL, lambda = 1, h = inla.pc.multvar.h.default, b = NULL)
inla.pc.multvar.simplex.d(x = NULL, lambda = 1, log = FALSE, h = inla.pc.multvar.h.default, b = NULL)
inla.pc.multvar.sphere.r(n = NULL, lambda = 1, h = inla.pc.multvar.h.default, H = NULL)
inla.pc.multvar.sphere.d(x = NULL, lambda = 1, log = FALSE, h = inla.pc.multvar.h.default, H = NULL)
```

Arguments

x	Samples to evaluate. If input is a matrix then each row is a sample. If input is a vector then this is the sample.
inverse	Compute the inverse of the h()-function.
derivative	Compute the derivative of the h()-function. (derivative of the inverse function is not used).
n	Number of samples to generate.
lambda	The lambda-parameter in the PC-prior.
log	Evaluate the density in log-scale or ordinary scale.

h	The h()-function, defaults to <code>inla.pc.multivar.h.default</code> . See that code for an example of how to write a user-specific function.
b	The b-vector (gradient) in the expression for the simplex option, $d(\mathbf{x}) = \mathbf{h}(\mathbf{b}^T \mathbf{x})$
H	The H(essian)-matrix in the expression for the sphere option, $d(\mathbf{x}) = \mathbf{h}(1/2 * \mathbf{x}^T \mathbf{H} \mathbf{x})$. If H is a vector, then it is interpreted as the diagonal of a (sparse) diagonal matrix.

Details

These functions implements multivariate PC-priors of the simplex and sphere type.

Value

`inla.pc.multivar.simplex.r` generate samples from the simplex case, and `inla.pc.multivar.simplex.d` evaluate the density. `inla.pc.multivar.sphere.r` generate samples from the sphere case, and `inla.pc.multivar.sphere.d` evaluate the density. `inla.pc.multivar.h.default` implements the default h()-function and illustrate how to code your own spesific one, if needed.

Author(s)

Havard Rue <hrue@math.ntnu.no>

pc.prec

Utility functions for the PC prior for the precision

Description

Functions to evaluate, sample, compute quantiles and percentiles of the PC prior for the precision in the Gaussian distribution.

Usage

```
inla.pc.rprec(n, u, alpha, lambda)
inla.pc.dprec(prec, u, alpha, lambda, log = FALSE)
inla.pc.qprec(p, u, alpha, lambda)
inla.pc.pprec(q, u, alpha, lambda)
```

Arguments

n	Number of observations
u	The upper limit (see Details)
alpha	The probability going above the upper limit (see Details)
lambda	The rate parameter (see Details)
prec	Vector of precisions
log	Logical. Return the density in natural or log-scale.
p	Vector of probabilities
q	Vector of quantiles

Details

The statement $\text{Prob}(1/\sqrt{\text{prec}} > u) = \alpha$ is used to determine λ unless λ is given. Either λ must be given, or u AND α .

Value

`inla.pc.dprec` gives the density, `inla.pc.pprec` gives the distribution function, `inla.pc.qprec` gives the quantile function, and `inla.pc.rprec` generates random deviates.

Author(s)

Havard Rue <hrue@math.ntnu.no>

See Also

`inla.doc("pc.prec")`

Examples

```
prec = inla.pc.rprec(100, lambda = 1)
d = inla.pc.dprec(prec, lambda = 1)
prec = inla.pc.qprec(0.5, u = 1, alpha=0.01)
inla.pc.pprec(prec, u = 1, alpha=0.01)
```

plot.inla

Default INLA plotting

Description

Takes an `inla` object produced by `inla` and plots the results

Usage

```
## S3 method for class 'inla'
plot(x,
      plot.fixed.effects = TRUE,
      plot.lincomb = TRUE,
      plot.random.effects = TRUE,
      plot.hyperparameters = TRUE,
      plot.predictor = TRUE,
      plot.q = TRUE,
      plot.cpo = TRUE,
      plot.prior = FALSE,
      single = FALSE,
      postscript = FALSE,
      pdf = FALSE,
      prefix = "inla.plots/figure-",
      intern = FALSE,
      debug = FALSE,
      ...)
```

Arguments

<code>x</code>	A fitted inla object produced by <code>inla</code>
<code>plot.fixed.effects</code>	Boolean indicating if posterior marginals for the fixed effects in the model should be plotted
<code>plot.lincomb</code>	Boolean indicating if posterior marginals for the linear combinations should be plotted
<code>plot.random.effects</code>	Boolean indicating if posterior mean and quantiles for the random effects in the model should be plotted
<code>plot.hyperparameters</code>	Boolean indicating if posterior marginals for the hyperparameters in the model should be plotted
<code>plot.predictor</code>	Boolean indicating if posterior mean and quantiles for the linear predictor in the model should be plotted
<code>plot.q</code>	Boolean indicating if precision matrix should be displayed
<code>plot.cpo</code>	Boolean indicating if CPO/PIT values should be plotted
<code>plot.prior</code>	Plot also the prior density for the hyperparameters
<code>single</code>	Boolean indicating if there should be more than one plot per page (FALSE) or just one (TRUE)
<code>postscript</code>	Boolean indicating if postscript files should be produced instead
<code>pdf</code>	Boolean indicating if PDF files should be produced instead
<code>prefix</code>	The prefix for the created files. Additional numbering and suffix is added.
<code>intern</code>	Plot also the hyperparameters in its internal scale.
<code>debug</code>	Write some debug information
<code>...</code>	Additional arguments to <code>postscript()</code> , <code>pdf()</code> or <code>dev.new()</code> .

Value

The return value is a list of the files created (if any).

Author(s)

Havard Rue <hrue@math.ntnu.no>

See Also

[inla](#)

Examples

```
## Not run:
result = inla(...)
plot(result)
plot(result, single=TRUE)
plot(result, single=TRUE, pdf=TRUE, paper = "a4")

## End(Not run)
```

plot.inla.CRS	<i>Plot CRS and inla.CRS objects</i>
---------------	--------------------------------------

Description

Plot the outline of a CRS or inla.CRS projection, with optional graticules (transformed parallels and meridians) and Tissot indicatrices.

Usage

```
## S3 method for class 'inla.CRS'
plot(x,
      xlim = NULL, ylim = NULL,
      outline = TRUE,
      graticule = c(15, 15, 45),
      tissot = c(30, 30, 30),
      asp = 1, add = FALSE,
      eps=0.05, ...)
## S3 method for class 'CRS'
plot(x,
      xlim = NULL, ylim = NULL,
      outline = TRUE,
      graticule = c(15, 15, 45),
      tissot = c(30, 30, 30),
      asp = 1, add = FALSE,
      eps=0.05, ...)
```

Arguments

x	A CRS or inla.CRS object.
xlim	Optional x-axis limits.
ylim	Optional y-axis limits.
outline	Logical, if TRUE, draw the outline of the projection.
graticule	Vector of length at most 3, to plot meridians with spacing graticule[1] degrees and parallels with spacing graticule[2] degrees. graticule[3] optionally specifies the spacing above and below the first and last parallel. When graticule[1]==0 no meridians are drawn, and when graticule[2]==0 no parallels are drawn. Use graticule=NULL to skip drawing a graticule.
tissot	Vector of length at most 3, to plot Tissot's indicatrices with spacing tissot[1] degrees and parallels with spacing tissot[2] degrees. tissot[3] specifies a scaling factor. Use tissot=NULL to skip drawing a Tissot's indicatrices.
asp	The aspect ratio for the plot, default 1.
add	If TRUE, add the projection plot to an existing plot.
eps	Clipping tolerance for rudimentary boundary clipping
...	Additional arguments passed on to the internal calls to plot and lines.

Author(s)

Finn Lindgren <finn.lindgren@gmail.com>

See Also[inla.CRS](#)**Examples**

```

if (require(rgdal)) {
  oblique <- c(0,45,45,0)
  par(mfrow=c(4,2))
  for (projtype in c("longlat", "lambert", "mollweide", "hammer")) {
    plot(inla.CRS(projtype), main=projtype)
    plot(inla.CRS(projtype, oblique=oblique), main=paste("oblique", projtype))
  }
  par(mfrow=c(1,1))
}

```

plot.inla.mesh

*Draw a triangulation mesh object***Description**

Plots an [inla.mesh](#) object using either standard graphics or with `rgl`.

Usage

```

## S3 method for class 'inla.mesh'
plot(x,
      col = "white",
      t.sub = 1:nrow(mesh$graph$tv),
      add = FALSE,
      lwd = 1,
      xlim = range(mesh$loc[, 1]),
      ylim = range(mesh$loc[, 2]),
      main = NULL,
      rgl = FALSE,
      size = 2,
      draw.vertices = FALSE,
      vertex.color = "black",
      draw.edges = TRUE,
      edge.color = rgb(0.3, 0.3, 0.3),
      draw.segments = draw.edges, ...)

```

Arguments

<code>x</code>	An inla.mesh object.
<code>col</code>	Color specification. A single named color, a vector of scalar values, or a matrix of RGB values. Requires <code>rgl=TRUE</code> .
<code>t.sub</code>	Optional triangle index subset to be drawn.
<code>add</code>	If <code>TRUE</code> , adds to the current plot instead of starting a new one.
<code>lwd</code>	Line width for triangle edges.
<code>xlim</code>	X-axis limits.

ylim	Y-axis limits.
main	The main plot title. If not specified, a default title is generated based on the mesh type.
rgl	When TRUE, generates an rgl plot instead of a generic graphics plot. Allows 3D plotting and color surface plotting.
size	Size of vertex points in rgl plotting. See rgl.material.
draw.vertices	If TRUE, draw triangle vertices.
vertex.color	Color specification for all vertices.
draw.edges	If TRUE, draw triangle edges.
edge.color	Color specification for all edges.
draw.segments	If TRUE, draw boundary and interior constraint edges more prominently.
...	Further graphics parameters, interpreted by the respective plotting systems.

Author(s)

Finn Lindgren <finn.lindgren@gmail.com>

See Also

[plot.inla.trimesh](#)

Examples

```
mesh = inla.mesh.create(globe=10)
plot(mesh)

if (require(rgl)) {
  plot(mesh, rgl=TRUE, col=mesh$loc[,1])
}
```

plot.inla.trimesh	<i>Low level triangulation mesh plotting</i>
-------------------	--

Description

Plots a triangulation mesh using rgl.

Usage

```
## S3 method for class 'inla.trimesh'
plot(x, S,
      color = NULL, color.axis = NULL,
      color.n = 512, color.palette = cm.colors, color.truncate = FALSE,
      alpha = NULL, lwd = 1, specular = "black",
      draw.vertices = TRUE,
      draw.edges = TRUE, edge.color = rgb(0.3, 0.3, 0.3),
      ...)
```

Arguments

<code>x</code>	A 3-column triangle-to-vertex index map matrix.
<code>S</code>	A 3-column vertex coordinate matrix.
<code>color</code>	Color specification. A single named color, a vector of scalar values, or a matrix of RGB values.
<code>color.axis</code>	The min/max limit values for the color mapping.
<code>color.n</code>	The number of colors to use in the color palette.
<code>color.palette</code>	A color palette function.
<code>color.truncate</code>	If TRUE, truncate the colors at the color axis limits.
<code>alpha</code>	Transparency/opaqueness values. See <code>rgl.material</code> .
<code>lwd</code>	Line width for edges. See <code>rgl.material</code> .
<code>specular</code>	Specular color. See <code>rgl.material</code> .
<code>draw.vertices</code>	If TRUE, draw triangle vertices.
<code>draw.edges</code>	If TRUE, draw triangle edges.
<code>edge.color</code>	Edge color specification.
<code>...</code>	Additional parameters passed to and from other methods.

Author(s)

Finn Lindgren <finn.lindgren@gmail.com>

See Also

[plot.inla.mesh](#)

PRborder

The PRborder data

Description

A data matrix with Longitude and Latitude coordinates for the boundary of Parana State.

Usage

```
data(PRborder)
```

Format

Longtiude The Longtiude coordinate

Latitude The Latitude coordinate

See Also

PRprec

print.inla	<i>Print a INLA fit</i>
------------	-------------------------

Description

Print a INLA fit

Usage

```
## S3 method for class 'inla'
print(x,...)
```

Arguments

x	An inla-object (output from an inla -call).
...	other arguments.

Details

None

Value

None

Author(s)

Havard Rue

See Also

[inla](#)

Examples

```
## None
```

PRprec	<i>The PRprec data</i>
--------	------------------------

Description

A data frame with daily rainfall in the Parana State.

Usage

```
data(PRprec)
```

Format

A data frame TODO

Altitude TODO

Latitude TODO

Longitude TODO

d0101 Daily rainfall at day "mmdd"

d0102 Daily rainfall at day "mmdd"

d0103 Daily rainfall at day "mmdd"

d0104 Daily rainfall at day "mmdd"

d0105 Daily rainfall at day "mmdd"

d0106 Daily rainfall at day "mmdd"

d0107 Daily rainfall at day "mmdd"

d0108 Daily rainfall at day "mmdd"

d0109 Daily rainfall at day "mmdd"

d0110 Daily rainfall at day "mmdd"

d0111 Daily rainfall at day "mmdd"

d0112 Daily rainfall at day "mmdd"

d0113 Daily rainfall at day "mmdd"

d0114 Daily rainfall at day "mmdd"

d0115 Daily rainfall at day "mmdd"

d0116 Daily rainfall at day "mmdd"

d0117 Daily rainfall at day "mmdd"

d0118 Daily rainfall at day "mmdd"

d0119 Daily rainfall at day "mmdd"

d0120 Daily rainfall at day "mmdd"

d0121 Daily rainfall at day "mmdd"

d0122 Daily rainfall at day "mmdd"

d0123 Daily rainfall at day "mmdd"

d0124 Daily rainfall at day "mmdd"

d0125 Daily rainfall at day "mmdd"

d0126 Daily rainfall at day "mmdd"

d0127 Daily rainfall at day "mmdd"

d0128 Daily rainfall at day "mmdd"

d0129 Daily rainfall at day "mmdd"

d0130 Daily rainfall at day "mmdd"

d0131 Daily rainfall at day "mmdd"

d0201 Daily rainfall at day "mmdd"

d0202 Daily rainfall at day "mmdd"

d0203 Daily rainfall at day "mmdd"

d0204 Daily rainfall at day "mmdd"

d0205 Daily rainfall at day "mmdd"
d0206 Daily rainfall at day "mmdd"
d0207 Daily rainfall at day "mmdd"
d0208 Daily rainfall at day "mmdd"
d0209 Daily rainfall at day "mmdd"
d0210 Daily rainfall at day "mmdd"
d0211 Daily rainfall at day "mmdd"
d0212 Daily rainfall at day "mmdd"
d0213 Daily rainfall at day "mmdd"
d0214 Daily rainfall at day "mmdd"
d0215 Daily rainfall at day "mmdd"
d0216 Daily rainfall at day "mmdd"
d0217 Daily rainfall at day "mmdd"
d0218 Daily rainfall at day "mmdd"
d0219 Daily rainfall at day "mmdd"
d0220 Daily rainfall at day "mmdd"
d0221 Daily rainfall at day "mmdd"
d0222 Daily rainfall at day "mmdd"
d0223 Daily rainfall at day "mmdd"
d0224 Daily rainfall at day "mmdd"
d0225 Daily rainfall at day "mmdd"
d0226 Daily rainfall at day "mmdd"
d0227 Daily rainfall at day "mmdd"
d0228 Daily rainfall at day "mmdd"
d0301 Daily rainfall at day "mmdd"
d0302 Daily rainfall at day "mmdd"
d0303 Daily rainfall at day "mmdd"
d0304 Daily rainfall at day "mmdd"
d0305 Daily rainfall at day "mmdd"
d0306 Daily rainfall at day "mmdd"
d0307 Daily rainfall at day "mmdd"
d0308 Daily rainfall at day "mmdd"
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d1123 Daily rainfall at day "mmdd"
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See Also

PRborder

qinv

Computes (parts of) the inverse of a SPD sparse matrix

Description

This routine use the GMRFLib implementation which compute parts of the inverse of a SPD sparse matrix. The diagonal and values for the neighbours in the inverse, are provided.

Usage

```
inla.qinv(Q, constr, reordering = inla.reorderings())
```

Arguments

Q	A SPD matrix, either as a (dense) matrix or sparseMatrix.
constr	Optional linear constraints; see ?INLA::f and argument extraconstr
reordering	The type of reordering algorithm to be used; either one of the names listed in inla.reorderings() or the output from inla.qreordering(Q). The default is "auto" which try several reordering algorithm and use the best one for this particular matrix.

Value

inla.qinv returns a sparseMatrix of type dgTMatrix with the diagonal and values for the neighbours in the inverse. Note that the full inverse is NOT provided!

Author(s)

Havard Rue <hrue@math.ntnu.no>

Examples

```
## dense matrix example
n = 10
A = matrix(runif(n^2), n, n)
Q = A %*% t(A)
print(mean(abs(inla.qinv(Q) - solve(Q))))

## sparse matrix example
rho = 0.9
Q = toeplitz(c(1+rho^2, -rho, rep(0, n-3), -rho)) / (1-rho^2)
Q = inla.as.dgTMatrix(Q)
Q.inv = inla.qinv(Q)

## compute the marginal variances as a vector from a precision matrix
marginal.variances = diag(inla.qinv(Q))

## read the sparse matrix from a file in the 'i, j, value' format
filename = INLA::inla.tempfile()
write(t(cbind(Q@i+1L, Q@j+1L, Q@x)), ncol=3, file=filename)
Qinv = inla.qinv(filename)
unlink(filename)
```

qreordering

*Compute the reordering using the GMRFLib implementation***Description**

This function compute the reordering (or find the best reordering) using the GMRFLib implementation

Usage

```
inla.qreordering(graph, reordering)
```

Arguments

graph	A (inla-)graph object, a filename containing the graph or a matrix/Matrix defining it.
reordering	The type of reordering algorithm to be used; either one of the names listed in <code>inla.reorderings()</code> . The default is "auto" which try several reordering algorithm and use the best one for this particular matrix.

Value

`inla.qreordering` returns a list with the name of the reordering algorithm used or found, the reordering code for the reordering algorithm, the actual reordering and its inverse.

Author(s)

Havard Rue <hrue@math.ntnu.no>

Examples

```
g = system.file("demodata/germany.graph", package="INLA")
r = inla.qreordering(g)
m = inla.graph2matrix(g)
r = inla.qreordering(m)
m.file = INLA::inla.write.fmesher.file(m)
r = inla.qreordering(m.file)
unlink(m.file)
```

qsample

Generate samples from a GMRF using the GMRFLib implementation

Description

This function generate samples from a GMRF using the GMRFLib implementation

Usage

```
inla.qsample(
  n = 1L,
  Q,
  b,
  mu,
  sample,
  constr,
  reordering = inla.reorderings(),
  seed = 0L,
  logdens = ifelse(missing(sample), FALSE, TRUE),
  compute.mean = ifelse(missing(sample), FALSE, TRUE))
```

Arguments

n	Number of samples. Only used if <code>missing(sample)</code>
Q	The precision matrix or a filename containing it.
b	The linear term
mu	The mu term
sample	A matrix of optional samples where each column is a sample. If set, then evaluate the log-density for each sample only.
constr	Optional linear constraints; see <code>?INLA::f</code> and argument <code>extraconstr</code>
reordering	The type of reordering algorithm to be used; either one of the names listed in <code>inla.reorderings()</code> or the output from <code>inla.qreordering(Q)</code> . The default is "auto" which try several reordering algorithm and use the best one for this particular matrix.
seed	Control the RNG. If <code>seed=0L</code> then GMRFLib will set the seed intelligently/at 'random'. If <code>seed < 0L</code> then the saved state of the RNG will be reused if possible, otherwise, GMRFLib will set the seed intelligently/at 'random'. If <code>seed > 0L</code> then this value is used as the seed for the RNG.

logdens	If TRUE, compute also the log-density of each sample. Note that the output format then change.
compute.mean	If TRUE, compute also the (constrained) mean. Note that the output format then change.

Value

The log-density has form $-1/2(x-\mu)^T Q (x-\mu) + b^T x$

If logdens is FALSE, then `inla.qsample` returns the samples in a matrix, where each column is a sample. If logdens or compute.mean is TRUE, then a list with names `sample`, `logdens` and `mean` is returned. The samples are stored in the matrix `sample` where each column is a sample, and the log densities of each sample are stored as the vector `logdens`. The mean (include corrections for the constraints, if any) is store in the vector `mean`.

Author(s)

Havard Rue <hrue@math.ntnu.no>

Examples

```
g = system.file("demodata/germany.graph", package="INLA")
Q = inla.graph2matrix(g)
diag(Q) = dim(Q)[1L]
x = inla.qsample(10, Q)
## Not run: matplot(x)
x = inla.qsample(10, Q, logdens=TRUE)
## Not run: matplot(x$sample)

n = 3
Q = diag(n)
ns = 2

## sample and evaluate a sample
x = inla.qsample(n, Q=Q, logdens=TRUE)
xx = inla.qsample(Q=Q, sample = x$sample)
print(x$logdens - xx$logdens)

## the use of a constraint
constr = list(A = matrix(rep(1, n), 1, n), e = 0)
x = inla.qsample(n, Q=Q, constr=constr)
print(constr$A %*% x)

## control the RNG
x = inla.qsample(n, Q=Q, seed = 123)
## restart from same seed, only sample 1
xx = inla.qsample(n=1, Q=Q, seed = 123)
## continue from the save state, sample the remaining 2
xxx = inla.qsample(n=n-1, Q=Q, seed = -1)
## should be 0
print(x - cbind(xx, xxx))
```

qsolve

*Solves linear SPD systems***Description**

This routine use the GMRFLib implementation to solve linear systems with a SPD matrix.

Usage

```
inla.qsolve(Q, B, reordering, method = c("solve", "forward", "backward"))
```

Arguments

Q	A SPD matrix, either as a (dense) matrix, sparse-matrix or a filename containing the matrix (in the fmasher-format).
B	The right hand side matrix, either as a (dense) matrix, sparse-matrix or a file-name containing the matrix (in the fmasher-format). (Must be a matrix or sparse-matrix even if ncol(B) is 1.)
reordering	The type of reordering algorithm to be used; either one of the names listed in <code>inla.reorderings()</code> or the output from <code>inla.qreordering(Q)</code> . The default is "auto" which try several reordering algorithm and use the best one for this particular matrix.
method	The system to solve, one of "solve", "forward" or "backward". Let $Q = L L^T$, where L is lower triangular (the Cholesky triangle), then method="solve" solves $L L^T X = B$ or equivalently $Q X = B$, method="forward" solves $L X = B$, and method="backward" solves $L^T X = B$.

Value

`inla.qsolve` returns a matrix X, which is the solution of $Q X = B$, $L X = B$ or $L^T X = B$ depending on the value of method.

Author(s)

Havard Rue <hrue@math.ntnu.no>

Examples

```
n = 10
QQ = matrix(runif(n^2), n, n)
Q = inla.as.dgTMatrix(QQ %%% t(QQ))
B = matrix(runif(n^2-n), n, n-1)

X = inla.qsolve(Q, B, method = "solve")
print(paste("err", sum(abs( Q %%% X - B))))

L = t(chol(Q))
X = inla.qsolve(Q, B, method = "forward")
print(paste("err", sum(abs( L %%% X - B))))

X = inla.qsolve(Q, B, method = "backward")
```

```

print(paste("err", sum(abs( t(L) %*% X - B))))

Q.file = INLA::inla.write.fmesher.file(Q)
B.file = INLA::inla.write.fmesher.file(B)
X = inla.qsolve(Q.file, B.file, method = "backward")
print(paste("err", sum(abs( t(L) %*% X - B))))
unlink(Q.file)
unlink(B.file)

```

read.graph

*Read and write a graph-object***Description**

Reads a graph-object to a file and write graph-object to file

Usage

```

inla.read.graph(..., size.only = FALSE)
inla.write.graph(graph, filename = "graph.dat", mode = c("binary", "ascii"), ...)

## S3 method for class 'inla.graph'
summary(object, ...)
## S3 method for class 'inla.graph'
plot(x, y, ...)
## S3 method for class 'inla.graph.summary'
print(x, ...)

```

Arguments

filename	The filename of the graph.
graph	An inla.graph-object, a (sparse) symmetric matrix, a filename containing the graph, or a list or collection of characters and/or numbers defining the graph.
mode	The mode of the file; ascii-file or a (gzip-compressed) binary. Default value depends on the inla.option internal.binary.mode which is default TRUE; see inla.setOption.
object	An inla.graph-object
x	An inla.graph-object
y	Not used
size.only	Only read the size of the graph
...	Additional arguments. In inla.read.graph, then it is the graph definition (object, character, filename), plus extra arguments. In inla.write.graph it is extra arguments to inla.read.graph.

Value

The output of inla.read.graph, is an inla.graph object, with elements

n	is the size of the graph
nnbs	is a vector with the number of neighbours

nbs	is a list-list with the neighbours
cc	list with connected component information (this entry can be auto-generated; see below) <ul style="list-style-type: none"> • idis a vector with the connected component id for each node (starting from 1) • nis the number of connected components • nodesis a list-list of nodes belonging to each connected component

The connected component information, can be generated from the rest of the graph-structure, using `graph = inla.add.graph.cc(graph)` if you manually construct the `inla.graph`-object. Methods implemented for `inla.graph` are `summary` and `plot`. The method `plot` require the libraries `Rgraphviz` and `graph` from the Bioconductor-project, see <https://www.bioconductor.org>.

Author(s)

Havard Rue <hrue@math.ntnu.no>

See Also

[inla.spy](#)

Examples

```
## a graph on a file
cat("3 1 1 2 2 1 1 3 0\n", file="g.dat")
g = inla.read.graph("g.dat")
## writing an inla.graph-object to file
g.file = inla.write.graph(g, mode="binary")
## re-reading it from that file
gg = inla.read.graph(g.file)
summary(g)
plot(g)
inla.spy(g)
## when defining the graph directly in the call, we can use a mix of character and numbers
g = inla.read.graph(c(3, 1, "1 2 2 1 1 3", 0))
inla.spy(c(3, 1, "1 2 2 1 1 3 0"))
inla.spy(c(3, 1, "1 2 2 1 1 3 0"), reordering=3:1)
inla.write.graph(c(3, 1, "1 2 2 1 1 3 0"))
```

rgeneric.define

rgeneric models

Description

A framework for defining latent models in R

Usage

```

inla.rgeneric.define(model = NULL, debug = FALSE, R.init = NULL, ...)
inla.rgeneric.iid.model(
  cmd = c("graph", "Q", "mu", "initial", "log.norm.const", "log.prior", "quit"),
  theta = NULL, args = NULL)
inla.rgeneric.ar1.model(
  cmd = c("graph", "Q", "mu", "initial", "log.norm.const", "log.prior", "quit"),
  theta = NULL, args = NULL)
inla.rgeneric.wrapper(
  cmd = c("graph", "Q", "mu", "initial", "log.norm.const", "log.prior", "quit"),
  model, theta = NULL)

```

Arguments

model	The definition of the model; see <code>inla.rgeneric.ar1.model</code>
cmd	An allowed request
theta	Values of theta
debug	Logical. Turn on/off debugging
R.init	An R-file to be loaded or sourced, when the R-engine starts. See <code>inla.load</code>
args	A list. A list of further args
...	Further args
debug	Logical. Enable debug output

Value

This allows a latent model to be defined in R. See `inla.rgeneric.ar1.model` and `inla.rgeneric.iid.model` and the documentation for worked out examples of how to define latent models in this way. This will be somewhat slow and is intended for special cases and prototyping. The function `inla.rgeneric.wrapper` is for internal use only.

Author(s)

Havard Rue <hrue@math.ntnu.no>

Salm

Extra-Poisson variation in dose-response study

Description

Breslow (1984) analyses some mutagenicity assay data (shown below) on salmonella in which three plates have been processed at each dose i of quinoline and the number of revertant colonies of TA98 Salmonella measured

Usage

```
data(Salm)
```

Format

A data frame with 18 observations on the following 3 variables.

y number of salmonella bacteria
 dose dose of quinoline (mg per plate)
 rand indicator

Source

WinBUGS/OpenBUGS manual Examples VOL.I

Examples

```
data(Salm)
```

scale.model

Scale an intrinsic GMRF model

Description

This function scales an intrinsic GMRF model so the geometric mean of the marginal variances is one

Usage

```
inla.scale.model(Q, constr = NULL, eps = sqrt(.Machine$double.eps))
```

Arguments

Q	A SPD matrix, either as a (dense) matrix or sparseMatrix
constr	Linear constraints spanning the null-space of Q; see ?INLA::f and argument extraconstr
eps	A small constant added to the diagonal of Q if constr

Value

inla.scale.model returns a sparseMatrix of type dgTMatrix scaled so the geometric mean of the marginal variances (of the possible non-singular part of Q) is one, for each connected component of the matrix.

Author(s)

Havard Rue <hrue@math.ntnu.no>

Examples

```
## Q is singular
data(Germany)
g = system.file("demodata/germany.graph", package="INLA")
Q = -inla.graph2matrix(g)
diag(Q) = 0
diag(Q) = -rowSums(Q)
n = dim(Q)[1]
Q.scaled = inla.scale.model(Q, constr = list(A = matrix(1, 1, n), e=0))
print(diag(INLA::inla.ginv(Q.scaled)))

## Q is singular with 3 connected components
g = inla.read.graph("6 1 2 2 3 2 2 1 3 3 2 1 2 4 1 5 5 1 4 6 0")
print(paste("Number of connected components", g$cc$n))
Q = -inla.graph2matrix(g)
diag(Q) = 0
diag(Q) = -rowSums(Q)
n = dim(Q)[1]
Q.scaled = inla.scale.model(Q, constr = list(A = matrix(1, 1, n), e=0))
print(diag(INLA::inla.ginv(Q.scaled)))

## Q is non-singular with 3 connected components. no constraints needed
diag(Q) = diag(Q) + 1
Q.scaled = inla.scale.model(Q)
print(diag(INLA::inla.ginv(Q.scaled)))
```

Scotland

*Conditional Autoregressive (CAR) model for disease mapping***Description**

The rate of lip cancer in 56 counties in Scotland is recorder. The data set includes the observed and expected cases (based on the population and its age and sex distribution in the country), a covariate measuring the percentage of the population engaged in agriculture, fishing or forestry and the "position" of each county expressed as a list of adjacent counties

Usage

```
data(Scotland)
```

Format

A data frame with 56 observations on the following 4 variables.

Counts The number of lip cancer registered

E The expected number of lip cancer

X The percentage of the population engaged in agriculture, fishing or forestry

Region The county

Source

OpenBUGS Example manual, GeoBUGS

References

Clayton and Kaldor (1987) and Breslow and Clayton (1993)

Examples

```
data(Scotland)
```

Seeds	<i>Factorial design</i>
-------	-------------------------

Description

Proportion of seeds that germinated on each of 21 plates arranged according to a 2 by 2 factorial layout by seed and type of root extract

Usage

```
data(Seeds)
```

Format

A data frame with 21 observations on the following 5 variables.

r number of germinated seeds per plate

n number of total seeds per plate

x1 seed type

x2 root extracted

plate indicator for the plate

Source

WinBUGS/OpenBUGS Manual Example, Vol. I

Examples

```
data(Seeds)
```

SPDEtoy

toy simulated data set for the SPDE tutorial

Description

Simulated data set on 200 location points. The simulation process is made at the introduction of the SPDE tutorial.

Usage

```
data(SPDEtoy)
```

Format

A data frame with 200 observations on the following 3 variables.

s1 First element of the coordinates
s2 Second element of the coordinates
y data simulated at the locations

Source

SPDE tutorial

Examples

```
data(SPDEtoy)
```

summary.inla

Summary for a INLA fit

Description

Takes a fitted inla or surv.inla object produced by inla or surv.inla and produces a summary from it.

Usage

```
## S3 method for class 'inla'
summary(object, ..., digits = 4L, include.lincomb = TRUE)
## S3 method for class 'summary.inla'
print(x, ...)
```

Arguments

object	a fitted inla object as produced by inla.
x	a summary.inla object produced by summary.inla
digits	Integer Number of digits
include.lincomb	Logcial Include the summary for the the linear combinations or not
...	other arguments.

Details

Posterior mean and standard deviation (together with quantiles or cdf) are printed for the fixed effects in the model.

For the random effects the function `summary()` prints the posterior mean and standard deviations for the hyperparameters

Value

`summary.inla` returns an object of call `summaryinla`, a list with components:

<code>call</code>	the component from object.
<code>fixed</code>	the component from object.
<code>random</code>	the component from object.
<code>neffp</code>	the component from object.
<code>linear.predictor</code>	
	the component from object.
<code>lincomb</code>	the component from object.
<code>lincomb.derived</code>	
	the component from object.
<code>family</code>	the component from object.

Author(s)

Sara Martino and Havard Rue

See Also

[inla](#)

summary.inla.mesh	<i>Summarizing triangular mesh objects</i>
-------------------	--

Description

Construct and print `inla.mesh` object summaries

Usage

```
## S3 method for class 'inla.mesh'
summary(object, verbose = FALSE, ...)

## S3 method for class 'summary.inla.mesh'
print(x, ...)
```

Arguments

<code>object</code>	an object of class "inla.mesh", usually a result of a call to inla.mesh.create or inla.mesh.2d .
<code>x</code>	an object of class "summary.inla.mesh", usually a result of a call to summary.inla.mesh .
<code>verbose</code>	If TRUE, produce a more detailed output.
<code>...</code>	further arguments passed to or from other methods.

Author(s)

Finn Lindgren <finn.lindgren@gmail.com>

Surg

Surgical: Institutional ranking

Description

This example considers mortality rates in 12 hospitals performing cardiac surgery in babies

Usage

```
data(Surg)
```

Format

A data frame with 12 observations on the following 3 variables.

n Number of deaths

r Total number of cases

hospital a factor with levels A B C D E F G H I J K L

Source

WinBUGS/OpenBUGS Manual Examples Vol. I

Examples

```
data(Surg)
```

SurvSim

Survival data

Description

Simulated data set for Weibull survival model

Usage

```
data(SurvSim)
```

Format

A data frame with 100 observations on the following 3 variables.

y a numeric vector of survival times

cens a numeric vector of event indicator (0=censored 1=failure)

x a numeric vector of covariate

Tokyo

*Binomial time series***Description**

Recorded days of rain above 1 mm in Tokyo for 2 years, 1983:84

Usage

```
data(Tokyo)
```

Format

A data frame with 366 observations on the following 3 variables.

y number of days with rain

n total number of days

time day of the year

Source

<http://www.math.ntnu.no/~hrue/GMRF-book/tokyo.rainfall.data.dat>

References

Rue, H and Held, L. (2005) *Gaussian Markov Random Fields - Theory and Applications* Chapman and Hall

Examples

```
data(Tokyo)
```

Zambia

*Semiparametric regression***Description**

Undernutrition of children in each region of Zambia is measured through a score computed on the basis of some anthropometric measures. The data set contains also other information about each child.

Usage

```
data(Zambia)
```

Format

A data frame with 4847 observations on the following 10 variables.

hazstd standardised Z score of stunting

bmi body mass index of the mother

agc age of the child in months

district district where the child lives

rcw mother employment status with categories "working" (1) and "not working" (-1)

edu1 mother's education status with categories "complete primary but incomplete secondary " (edu1=1), "complete secondary or higher" (edu2=1) and "no education or incomplete primary" (edu1=edu2=-1)

edu2 see above

tpr locality of the domicile with categories "urban" (1) and "rural" (-1)

sex gender of the child with categories "male" (1) and "female" (-1)

edu DO NOT KNOW; check source

Source

BayesX Manual <http://www.stat.uni-muenchen.de/~bayesx/bayesx.html>

Examples

```
data(Zambia)
```

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