

# Package ‘INLA’

September 29, 2021

**Type** Package

**Title** Full Bayesian Analysis of Latent Gaussian Models using Integrated Nested Laplace Approximations

**Description** Full Bayesian analysis of latent Gaussian models using Integrated Nested Laplace Approximation. It is a front-end to the inla-program.

**Depends** R ( $\geq 3.5$ ),  
Matrix ( $\geq 1.3-0$ ),  
foreach,  
parallel,  
sp ( $\geq 1.4-2$ )

**Suggests** Deriv,  
Ecdat,  
HKprocess,  
MatrixModels,  
Rgraphviz,  
deldir,  
devtools,  
doParallel,  
dplyr,  
evd,  
fields,  
ggplot2,  
graph,  
gridExtra,  
knitr,  
markdown,  
matrixStats,  
mlogit,  
mpoly,  
mvtnorm,  
numDeriv,  
orthopolynom,  
pixmap,  
rgdal,  
rgeos,  
rgl,  
rmarkdown,  
shiny,  
sn,

spdep,  
 splancs,  
 symmoments,  
 testthat,  
 tools

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

**VignetteBuilder** knitr

**BuildVignettes** true

**LazyData** true

**License** GPL (>= 2) + file LICENSE

**RoxygenNote** 7.1.2

**Encoding** UTF-8

**StagedInstall** no

**Collate** 'INLA-package.R'  
 'agaussian.R'  
 'ar.R'  
 'barrier.R'  
 'binary.R'  
 'binary.install.R'  
 'changelog.R'  
 'collect.results.R'  
 'compare.results.R'  
 'coxph.R'  
 'cpo.R'  
 'create.data.file.R'  
 'cut.R'  
 'cygwin.R'  
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 'display.matrix.R'  
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 'expand.dataframe.R'  
 'export-class.R'  
 'f.R'  
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 'group.R'  
 'hyper.R'  
 'hyperpar.R'  
 'idx.R'  
 'iidkd.R'

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'jmarginal.R'  
'jp.R'  
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'lincomb.R'  
'link-functions.R'  
'list-models.R'  
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```

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```

**Roxygen** list(markdown = TRUE)

**Version** 21.09.29-1

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INLA-package

*Integrated Nested Laplace Approximation***Description**

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

**Details**

**Package** INLA

**Version** Currently, this package uses a YY.MM.DD versioning system, and is in heavy development. See <https://github.com/hrue/r-inla/> and <https://www.r-inla.org>

**License** GPL2

See the web-site <https://www.r-inla.org> for further details.

**Author(s)**

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

aggregate.gaussian

*Aggregate Gaussian into an equivalent observation***Description**

Aggreagate Gaussians observed with the same mean and precision, into an eqv triplet, for use with family="agaussian"

**Usage**

```
inla.agaussian(y, s = NULL)
```

**Arguments**

**y** Repeated observations. If y is a matrix, then each row represents repeated observations. if y is a list, then each element of the list is a vector of repeated observations. If y is a vector, then the whole vector represents repeated observations. The optional scaling s, must have the same format as y, ie matrix or vector. NA's in y (and s) are removed and not used or counted. If s is given, then the NA-pattern in y and s must be the same.

**s** Optinonal fixed scaling of the precisions. Must be in the same format as y, and have the same NA-pattern. See the documentation for details.

**Value**

The output is a inla.mdata-object ready for use with family="agaussian". See the example in the documentation.



**Author(s)**

Havard Rue <hrue@r-inla.org>

**Examples**

```
A = matrix(1:25,5,5)
inla.agaussian(A)

A[1,-1] = NA
A[2,-(2:3)] = NA
inla.agaussian(A)
```

---

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, ...)

## S3 method for class 'SpatialPoints'
as.inla.mesh.segment(sp, reverse = FALSE, grp = NULL, is.bnd = TRUE, ...)

## S3 method for class 'SpatialPointsDataFrame'
as.inla.mesh.segment(sp, ...)

## 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 'SpatialPolygons'
as.inla.mesh.segment(sp, join = TRUE, grp = NULL, ...)

## S3 method for class 'SpatialPolygonsDataFrame'
as.inla.mesh.segment(sp, ...)

## S3 method for class 'Polygons'
```

```
as.inla.mesh.segment(sp, join = TRUE, crs = NULL, ...)
```

```
## S3 method for class 'Polygon'
as.inla.mesh.segment(sp, crs = NULL, ...)
```

### Arguments

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

### 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

```
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 ... ~~ |
|--------|--------------------------|

---

## Description

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

## 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

---

|                      |  |
|----------------------|--|
| control.bgev.default | <i>Control variables in control.bgev.default</i> |
|----------------------|--|

---

### Description

Control variables in control.bgev.default for use in inla

### Usage

```
inla.set.control.bgev.default.default(...)
control.bgev.default(beta.ab, q.location, q.mix, q.spread)
```

### Arguments

|            |   |
|------------|---|
| ...        | Possible arguments  |
| q.location | The quantile level for the location parameter               |
| q.spread   | The quantile level for the spread parameter (must be < 0.5) |
| q.mix      | The lower and upper quantile level for the mixing function  |
| beta.ab    | The parameters a and b in the Beta mixing function          |

### Value

The control.bgev-list is set within the corresponding control.family-list as control parameters to the family="bgev". The function control.bgev.default is used to TAB-complete arguments and returns a list of given arguments. The function inla.set.control.bgev.default.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.pardiso.default](#), [control.bgev.default](#), [control.family](#), [control.fixed](#), [control.inla](#), [control.predictor](#), [control.mode](#), [control.hazard](#), [inla](#)

---

|                 |   |
|-----------------|---|
| control.compute | <i>Control variables in control.compute</i> |
|-----------------|---|

---

### Description

Control variables in control.compute for use in inla

### Usage

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

**Arguments**

|                            |  |
|----------------------------|--|
| ...                        | Possible arguments   |
| openmp.strategy            | The computational strategy to use: 'small', 'medium', 'large', 'huge', 'default' and 'pardiso'.  |
| 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  |
| return.marginals.predictor | A boolean variable if the marginals for the linear predictor should be returned (although it is computed). Default FALSE                                     |
| 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 TRUE.  |
| cpo                        | A boolean variable if the cross-validated predictive measures (cpo, pit) should be computed (default FALSE)  |
| po                         | A boolean variable if the predictive ordinate should be computed (default FALSE)   |
| waic                       | A boolean variable if the Watanabe-Akaike information criteria should be computed (default FALSE)  |
| 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 'default', 'taucs', 'band' or 'pardiso' (default inla.getoption("smtp")). smtp='pardiso' implies openmp.strategy='pardiso'. |
| graph                      | A boolean variable if the graph 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.pardiso.default`, `control.bgev.default`, `control.family`, `control.fixed`, `control.inla`, `control.predictor`, `control.mode`, `control.hazard`, `inla`

---

|                |  |
|----------------|--|
| control.expert | <i>Control variables in control.expert</i> |
|----------------|--|

---

### 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)
```

### 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 (default FALSE)               |
| jp                     | An object of class inla.jp defining a joint prior  |

### 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.pardiso.default](#), [control.bgev.default](#), [control.family](#), [control.fixed](#), [control.inla](#), [control.predictor](#), [control.mode](#), [control.hazard](#), [inla](#)

---

|                |  |
|----------------|--|
| control.family | <i>Control variables in control.family</i> |
|----------------|--|

---

### Description

Control variables in control.family for use in inla

### Usage

```
inla.set.control.family.default(...)
control.family(beta.censor.value, cenpoisson.I, control.bgev, control.link, control.mix, dummy, fi
```

**Arguments**

|                   |   |
|-------------------|---|
| ...               | Possible arguments  |
| dummy             | A dummy argument that can be used as a workaround   |
| 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 (default 5.0)  |
| gev.scale.xi      | (Expert option, do not use unless you know what you are doing.) The internal scaling of the shape-parameter for the GEV distribution. (default 0.1)   |
| control.bgev      | See ?control.bgev   |
| cenpoisson.I      | The censoring interval for the censored Poisson   |
| beta.censor.value | The censor value for the Beta-likelihood ( $0 \leq \text{beta.censor.value} < 1/2$ )  |
| 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 ?control.mix  |
| control.link      | See ?control.link   |

**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.pardiso.default](#), [control.bgev.default](#), [control.family](#), [control.fixed](#), [control.inla](#), [control.predictor](#), [control.mode](#), [control.hazard](#), [inla](#)

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|               |   |
|---------------|---|
| control.fixed | <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

|                        |  |
|------------------------|--|
| ...                    | Possible arguments   |
| cdf                    | A list of values to compute the CDF for, for all fixed effects   |
| quantiles              | A list of quantiles to compute for all fixed effects   |
| expand.factor.strategy | The strategy used to expand factors into fixed effects based on their levels. The default strategy is us use the model.matrix-function for which NA's are not allowed (expand.factor.strategy="model.matrix") and levels are possible removed. The alternative option (expand.factor.strategy="inla") use an inla-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 data.frame/list and NOT added as .+factor(x1)+. in the formula only. |
| mean                   | Prior mean for all fixed effects except the intercept. Alternatively, a named list with specific means where name=default applies to unmatched names. For example control.fixed=list(mean=list(a=1,b=2,default=0)) assign 'mean=1' to fixed effect 'a' , 'mean=2' to effect 'b' and 'mean=0' to all others. (default 0.0)  |
| mean.intercept         | Prior mean for the intercept (default 0.0)   |
| prec                   | Default precision for all fixed effects except the intercept. Alternatively, a named list with specific means where name=default applies to unmatched names. For example control.fixed=list(prec=list(a=1,b=2,default=0.01)) assign 'prec=1' to fixed effect 'a' , 'prec=2' to effect 'b' and 'prec=0.01' to all others. (default 0.001)   |
| prec.intercept         | 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)<br>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).  |
| remove.names           | A vector of names of expanded fixed effects to remove from the model-matrix. This is an expert option, and should only be used if you know what you are doing.   |



**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.pardiso.default`, `control.bgev.default`, `control.family`, `control.fixed`, `control.inla`, `control.predictor`, `control.mode`, `control.hazard`, `inla`

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

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**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 'exchangeable', 'exchangeablepos', 'ar1', 'ar', 'rw1', 'rw2', 'besag', or 'iid')   |
| <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>cyclic</code>              | Make the group model cyclic? (Only applies to models 'ar1', 'rw1' and 'rw2')   |
| <code>graph</code>               | The graph specification (Only applies to model 'besag')  |
| <code>scale.model</code>         | Scale the intrinsic model (RW1, RW2, BESAG) so the generalized variance is 1. (Default TRUE)   |
| <code>adjust.for.con.comp</code> | Adjust for connected components when <code>scale.model=TRUE</code> ? (default TRUE)  |
| <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 correlation or precision is assumed to be fixed or random.   |
| <code>prior</code>               | (OBSOLETE!) The name of the prior distribution for the group correlation or precision in the internal scale  |
| <code>param</code>               | (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.pardiso.default`, `control.bgev.default`, `control.family`, `control.fixed`, `control.inla`, `control.predictor`, `control.mode`, `control.hazard`, `inla`

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

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**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', 'rw2' or 'iid'. (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.pardiso.default](#), [control.bgev.default](#), [control.family](#), [control.fixed](#),  
[control.inla](#), [control.predictor](#), [control.mode](#), [control.hazard](#), [inla](#)

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|              |  |
|--------------|--|
| control.inla | <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, adaptive.max, adj
```

**Arguments**

|                     |  |
|---------------------|--|
| ...                 | Possible arguments   |
| strategy            | Character The strategy to use for the approximations; one of 'auto' (default), 'gaussian', 'simplified.laplace', 'laplace' or 'adaptive'   |
| int.strategy        | Character The integration strategy to use; one of 'auto' (default), 'ccd', 'grid', 'eb' (empirical bayes), 'user' or 'user.std'  |
| int.design          | Matrix Matrix of user-defined integration points and weights. Each row consists theta values and the integration weight. (EXPERIMENTAL!)   |
| interpolator        | 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'. |
| fast                | Logical If TRUE, then replace conditional modes in the Laplace approximation with conditional expectation (default TRUE)   |
| linear.correction   | Logical Default TRUE for the 'strategy = laplace' option.  |
| h                   | Numerical The step-length for the gradient calculations for the hyperparameters. Default 0.005.  |
| dz                  | Numerical The step-length in the standardised scale for the integration of the hyperparameters. Default 0.75.  |
| diff.logdens        | Numerical The difference of the log.density for the hyperparameters to stop numerical integration using <code>int.strategy='grid'</code> . Default 6.  |
| print.joint.hyper   | Logical If TRUE, the store also the joint distribution of the hyperparameters (without any costs). Default TRUE.   |
| force.diagonal      | 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', '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.   |
| tolerance.step                     | Numerical The tolerance for the change in root-mean_squre in the inner Newton-like optimisation of the latent field.   |
| 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' 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. Default is 'auto'.) |
| 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 (default 9)  |
| cutoff                             | Numerical The cutoff used in the 'strategy=laplace' approximation. (Smaller value is more accurate and more slow.) (default 1e-4)  |
| 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.   |
| adaptive.max                       | Selecting strategy="adaptive" will chose the default strategy for all fixed effects and model components with length less or equal to adaptive.max, for others, the gaussian strategy will be applied.   |
| huge                               | Logical If TRUE then try to do some of the internal parallisations differently. Hopefully this will be of benefite for 'HUGE' models. (Default FALSE.) [THIS OPTION IS OBSOLETE AND NOT USED!]   |
| step.len                           | Numerical The step-length used to compute numerical derivaties of the log-likelihood   |
| stencil                            | Numerical Number of points in the stencil used to compute the numerical derivaties of the log-likelihood (3, 5, 7 or 9). (default 5)   |
| 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. (default 0.0)  |
| numint.maxfeval        | Numerical Maximum number of function evaluations in the the numerical integration for the hyperparameters. (Default 100000.)  |
| numint.reterr          | 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 stabilise the optimisation but can introduce bias. (Default -Inf)  |
| b.strategy             | Character If cmin is used, either keep the linear term (with b.strategy="keep") or skip the contribution by setting the linear term to zero (b.strategy="skip"). The default value is "skip"  |
| 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.) (default 2.0)   |
| 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). (default .Machine\$integer.max)   |
| 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. (default 1000)  |
| stupid.search.factor   | Numerical Factor ( $\geq 1$ ) to increase the step-length with after each new iteration. (default 1.05)   |
| control.vb             | List of arguments for various VB corrections. enable Logical/Character Use this feature? If "auto" this will be selected automatically. strategy Character What to correct, one of "mean", "more.to.come.later...". verbose Logical Be verbose or not. refinement Integer Number of extra possible refinement iterations. max.correct Numerical Bound the allowed correction (strategy="mean": $ \text{diff.mean}/\text{stdev}  < \text{max.correct}$ ). hyperpar.correct Logical Correct the marginal posterior for the hyperparameters? f.enable.limit The size limit to correct for a f() model component. |
| num.gradient           | Character Set the numerical scheme to compute the gradient, one of "forward" or "central" (default).  |
| num.hessian            | Character Set the numerical scheme to compute the Hessian, one of "forward" or "central" (default).   |
| optimise.strategy      | Character THIS OPTION IS EXPERIMENTAL. Chose the optimiser strategy, one of "plain" or "smart" (default)  |

`use.directions` THIS OPTION IS EXPERIMENTAL. Unless FALSE or NULL, use directions for computing gradient and Hessian, initialised with `use.directions` if a matrix.

`constr.marginal.diagonal` Add stability to  $AQ^T - 1A^T$  by adding a small diagonal term. (default  $\epsilon^{0.5}$ )

`improved.simplified.laplace` If TRUE use an experimental improved variant, otherwise, use the standard one.

`fast` If `stage1only` then try to do all calculations during `stage1` by enabling Gaussian strategy with VB correction enabled.

**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.pardiso.default](#), [control.bgev.default](#), [control.family](#), [control.fixed](#), [control.inla](#), [control.predictor](#), [control.mode](#), [control.hazard](#), [inla](#)

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

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**Description**

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

**Usage**

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

**Arguments**

... Possible arguments

`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.pardiso.default](#), [control.bgev.default](#), [control.family](#), [control.fixed](#), [control.inla](#), [control.predictor](#), [control.mode](#), [control.hazard](#), [inla](#)

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

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## Description

Control variables in control.link for use in inla

## Usage

```
inla.set.control.link.default(...)
control.link(a, fixed, hyper, initial, model, order, param, prior, quantile, 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. |
| hyper    | Definition of the hyperparameter(s) for the link model chosen                             |
| quantile | The quantile for quantile link function   |
| a        | The parameter a in the LOGa link  |
| 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.pardiso.default](#), [control.bgev.default](#), [control.family](#), [control.fixed](#), [control.inla](#), [control.predictor](#), [control.mode](#), [control.hazard](#), [inla](#)

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

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## Description

Control variables in control.mix for use in inla

## Usage

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

## Arguments

|            |  |
|------------|--|
| ...        | Possible arguments   |
| model      | The model for the random effect. Currently, only model='gaussian' 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 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) |
| npoints    | Number of points used to do the numerical integration (default 101)                |
| integrator | The integration scheme to use (default, quadrature, simpson)                       |

## 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.pardiso.default](#), [control.bgev.default](#), [control.family](#), [control.fixed](#), [control.inla](#), [control.predictor](#), [control.mode](#), [control.hazard](#), [inla](#)



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

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### 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 inla(). Use the theta- and x-mode from this run.  |
| theta   | The theta-mode/initial values for theta. This option has preference over result\$mode\$theta.   |
| x       | The x-mode/initial values for x. This option has preference over result\$mode\$x.   |
| 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.pardiso.default](#), [control.bgev.default](#), [control.family](#), [control.fixed](#), [control.inla](#), [control.predictor](#), [control.mode](#), [control.hazard](#), [inla](#)

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|                         |   |
|-------------------------|---|
| control.pardiso.default | <i>Control variables in control.pardiso.default</i> |
|-------------------------|---|

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### Description

Control variables in control.pardiso.default for use in inla

### Usage

```
inla.set.control.pardiso.default.default(...)
control.pardiso.default(debug, nrhs, parallel.reordering, verbose)
```

**Arguments**

|                     |   |
|---------------------|---|
| ...                 | Possible arguments  |
| verbose             | Show detailed output (default FALSE)  |
| debug               | Show internal debug output (default FALSE)  |
| parallel.reordering | Do reordering in parallel (default TRUE)  |
| nrhs                | Number of right-hand sides to solve for in parallel (default depends on the argument num.threads and -1 will not change it) |

**Value**

Extra options controlling the PARDISO library The function `control.pardiso.default` is used to TAB-complete arguments and returns a list of given arguments. The function `inla.set.control.pardiso.default.de` 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.pardiso.default](#), [control.bgev.default](#), [control.family](#), [control.fixed](#), [control.inla](#), [control.predictor](#), [control.mode](#), [control.hazard](#), [inla](#)

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|                                |   |
|--------------------------------|---|
| <code>control.predictor</code> | <i>Control variables in control.predictor</i> |
|--------------------------------|---|

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**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, quan
```

**Arguments**

|           |   |
|-----------|---|
| ...       | Possible arguments  |
| hyper     | Definition of the hyperparameters.  |
| fixed     | (OBSOLETE!) If the precision for the artificial noise is fixed or not (default TRUE)            |
| prior     | (OBSOLETE!) The prior for the artificial noise  |
| param     | (OBSOLETE!) Prior parameters for the artificial noise   |
| initial   | (OBSOLETE!) The value of the log precision of the artificial noise                              |
| compute   | A boolean variable; should the marginals for the linear predictor be computed? (Default FALSE.) |
| cdf       | A list of values to compute the CDF for the linear predictor                                    |
| quantiles | A list of quantiles to compute for the linear predictor   |

|            |  |
|------------|--|
| cross      | 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 extension). (THIS IS AN EXPERIMENTAL OPTION, CHANGES MAY APPEAR.)  |
| A          | The observation matrix (matrix or Matrix::sparseMatrix).   |
| precision  | The precision for $\eta^* - A\eta$ , (default $\exp(15)$ )   |
| link       | Define the family-connection for unobserved observations (NA). link is integer values which defines the family connection; family[link[idx]] unless is.na(link[idx]) for which the identity-link is used. The link-argument only influence the fitted.values in the result-object. If is.null(link) (default) then the identity-link is used for all missing observations. If the length of link 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 link is not used (but must still be a legal value). Setting this variable implies compute=TRUE. |
| vb.correct | Logical Add this model component to the list of variables to be used for the vb corrected Laplace approximation? If NULL use default choice, otherwise correct if TRUE and do not if FALSE (expert option)   |

### 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.pardiso.default](#), [control.bgev.default](#), [control.family](#), [control.fixed](#), [control.inla](#), [control.predictor](#), [control.mode](#), [control.hazard](#), [inla](#)

---

|                 |   |
|-----------------|---|
| control.results | <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

... Possible arguments

return.marginals.random  
A boolean variable; read the marginals for the fterms? (Default TRUE)

return.marginals.predictor  
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.pardiso.default](#), [control.bgev.default](#), [control.family](#), [control.fixed](#), [control.inla](#), [control.predictor](#), [control.results](#), [control.mode](#), [control.hazard](#), [inla](#)

---

|                             |  |
|-----------------------------|--|
| <code>control.update</code> | <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**

|                     |  |
|---------------------|--|
| <code>...</code>    | Possible arguments   |
| <code>result</code> | 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.pardiso.default](#), [control.bgev.default](#), [control.family](#), [control.fixed](#), [control.inla](#), [control.predictor](#), [control.mode](#), [control.hazard](#), [inla](#)

## Description

This function performs group-wise, cross-validators model assessment for an INLA model using so-called node-splitting (Marshall and Spiegelhalter, 2007; Presanis et al, 2013). The user inputs an object of class `inla` (i.e. a result of a call to `inla()`) as well as a variable name (`split.by`) specifying a grouping: Data points that share the same value of `split.by` are in the same group. The function then checks whether each group is an "outlier", or in conflict with the remaining groups, using the methodology described in Ferkingstad et al (2017). The result is a vector containing a p-value for each group, corresponding to a test for each group  $i$ , where the null hypothesis is that group  $i$  is consistent with the other groups except  $i$  (so a small p-value is evidence that the group is an "outlier"). See Ferkingstad et al (2017) for further details.

## Usage

```
inla.cut(result, split.by, mc.cores = NULL, debug=FALSE)
```

## Arguments

|                       |   |
|-----------------------|---|
| <code>result</code>   | An object of class <code>inla</code> , i.e. a result of a call to <code>inla()</code>   |
| <code>split.by</code> | The name of the variable to group by. Data points that have the same value of <code>split.by</code> are in the same group.  |
| <code>mc.cores</code> | The number of cores to use in <code>parallel::mclapply</code> . If <code>is.null(mc.cores)</code> , then check <code>getOption("mc.cores")</code> and <code>inla.getOption("num.threads")</code> in that order. |
| <code>debug</code>    | Print debugging information if TRUE, default is FALSE   |

## Value

A numeric vector of p-values, corresponding to a test for each group  $i$  where the null hypothesis is that group  $i$  is consistent with the other groups except  $i$ . A small p-value for a group indicates that the group is an "outlier" (in conflict with remaining groups).

This function is EXPERIMENTAL!!!

## Author(s)

Egil Ferkingstad <egil.ferkingstad@gmail.com> and Havard Rue <hrue@r-inla.org>

## References

- Ferkingstad, E., Held, L. and Rue, H. (2017). Fast and accurate Bayesian model criticism and conflict diagnostics using R-INLA. arXiv preprint arXiv:1708.03272, available at <http://arxiv.org/abs/1708.03272>. Published in Stat, 6:331-344 (2017).
- Marshall, E. C. and Spiegelhalter, D. J. (2007). Identifying outliers in Bayesian hierarchical models: a simulation-based approach. Bayesian Analysis, 2(2):409-444.
- Presanis, A. M., Ohlssen, D., Spiegelhalter, D. J., De Angelis, D., et al. (2013). Conflict diagnostics in directed acyclic graphs, with applications in Bayesian evidence synthesis. Statistical Science, 28(3):376-397.

## Examples

```
## See http://www.r-inla.org/examples/case-studies/ferkingstad-2017 and Ferkingstad et al (2017).
```

---

|             |                           |
|-------------|---------------------------|
| 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 shows, otherwise the graph-object returned by `inla.read.graph()` is returned.

## Author(s)

Havard Rue <[hrue@r-inla.org](mailto:hrue@r-inla.org)>

## 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**

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

**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)

**Details**

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

**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.

**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 | <i>Extract tagged boundary/internal segments.</i> |
|----------------|---|

---

**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**

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

**Author(s)**

Finn Lindgren <finn.lindgren@gmail.com>

**See Also**

[inla.mesh.segment\(\)](#)



**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.list.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),
args.ar1c = list(Z = NULL, Q.beta = NULL),
args.intslope = list(subject = NULL, strata = NULL, covariates = NULL),
vb.correct = NULL,
locations = NULL,
debug = FALSE)

```

## Arguments

|               |   |
|---------------|---|
| ...           | Name of the covariate and, possibly of the weights vector. NB: order counts!!!!<br>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 and <a href="#">inla.doc</a> for detailed docs.  |
| 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         | Specification 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 or use <code>inla.doc()</code> for detailed info on the family and supported prior distributions.  |
| 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 hyperparamters in the choosen model. If <code>fixed=T</code> the value at which the parameters are fixed is determines through <code>initial</code> . See <code>inla.models()\$latent\$model name'</code> to have info about the choosen 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 <a href="http://www.r-inla.org">!www.r-inla.org</a> 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 choosen model. See <code>inla.models()\$latent\$model name</code> to have info about the choosen 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 choosen model See <code>inla.models()\$latent\$model name</code> to have info about the choosen model.  |
| season.length | Lenght of the seasonal compoment (ONLY if <code>model="seasonal"</code> )  |
| 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 <code>cyclic=T</code> then the sum to 0 constraint is removed. For the correct form of the grah 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 <code>graph</code> . PLEASE CHANGE YOUR CODE. Name of the file containing the graph of the model; see <a href="http://www.r-inla.org/faq">www.r-inla.org/faq</a> .   |
| 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 <div style="text-align: center;"> <math display="block">\text{Prob}(X &lt; x(p))</math> </div>   |
| 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 <div style="text-align: center;"> <math display="block">\text{Prob}(X &lt; x(p)) = p</math> </div>   |
| Cmatrix       | The specification of the precision matrix for the generic, generic3 or z models (up to a scaling constant). <code>Cmatrix</code> 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: $i$ , $j$ and $Q_{ij}$ . In case of the generic3 model, it is a list of such specifications.            |
| rankdef       | A number <b>defining</b> the rank deficiency of the model, with sum-to-zero constraint and possible extra-constraints taken into account. See details.   |
| Z             | The matrix for the z-model   |
| nrow          | Number of rows for 2d-models   |
| ncol          | Number of columns for 2d-models  |
| nu            | Smoothing parameter for the Matern2d-model, possible values are $c(0, 1, 2, 3)$  |

|                     |  |
|---------------------|--|
| bvalue              | TODO   |
| spde.prefix         | TODO   |
| spde2.prefix        | TODO   |
| spde2.transform     | TODO   |
| spde3.prefix        | TODO   |
| spde3.transform     | TODO   |
| mean.linear         | Prior mean for the linear component, only used if model="linear"   |
| prec.linear         | Prior precision for the linear component, only used if model="linear"  |
| compute             | 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. |
| of                  | TODO   |
| precision           | The precision for the artifical noise added when creating a copy of a model and others.  |
| range               | A vector of size two giving the lower and upper range for the scaling parameter beta in the model COPY, CLINEAR, MEC and MEB. If low = high then the identity mapping is used.   |
| adjust.for.con.comp | If TRUE (default), adjust some of the models (currently: besag, bym, bym2 and besag2) if the number of connected components in graph is larger than 1. If FALSE, do nothing.   |
| order               | 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.  |
| scale               | A scaling vector. Its meaning depends on the model.  |
| strata              | Currently not in use   |
| rgeneric            | A object of class <code>inla.rgeneric</code> which defines the model. (EXPERIMENTAL!)  |
| scale.model         | Logical. If TRUE then scale the RW1 and RW2 and BESAG and BYM and BESAG2 and RW2D models so the their (generlized) variance is 1. Default value is <code>inla.getOption("scale.model.default")</code>  |
| args.slm            | Required arguments to the model="slm"; see the documentation for further details.,   |
| args.ar1c           | Required arguments to the model="ar1c"; see the documentation for further details.,  |
| args.intslope       | A list with the subject (factor), strata (factor) and covariates (numeric) for the intslope model; see the documentation for further details.,   |
| vb.correct          | Add this model component to the list of variables to be used for the vb corrected Laplace approximation? If NULL use default choice, otherwise correct if TRUE and do not if FALSE. (expert option),   |
| locations           | A matrix with locations for the model dmatern. This also defines n.  |
| debug               | 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@r-inla.org>

**See Also**

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

---

|     |   |
|-----|---|
| fgn | <i>Return the coefficients in the 3-component AR(1) mixture representing FGN(H)</i> |
|-----|---|

---

**Description**

This function will return the coefficients in the 3-component AR(1) mixture representing FGN(H)

**Usage**

```
inla.fgn(H, K=4L, lag.max = NULL, approx = TRUE)
```

**Arguments**

|         |   |
|---------|---|
| H       | The Hurst coefficient ( $0 < H < 1$ ), or a vector of those   |
| K       | The number of components in representation, must be 3L or 4L  |
| lag.max | Integer. If positive integer, return the coefficients implicitly as the ACF from 0 to lag.max                             |
| approx  | Logical. If lag.max is an positive integer and approx is FALSE, then return the true ACF instead of the approximated one. |

**Value**

`inla.fgn` returns a named matrix. If `is.null(lag.max)`, then first column is H, columns `1+1:K` are lag one correlations (or phi's), and columns `1+K+1:K` are the weights. If `lag.max > 0`, then return the ACFs in columns `2+(0:lag.max)`, for the H in column 1, either the approximated ones or the true ones.

This function is EXPERIMENTAL!!!

**Author(s)**

Havard Rue <hrue@r-inla.org>

**Examples**

```
r = c(inla.fgn(0.7))
r_m = inla.fgn(seq(0.6, 0.8, by=0.01))
```

---

geobugs2inla

*INLA utility functions*


---

**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@r-inla.org>

**See Also**

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

---

|         |                        |
|---------|------------------------|
| Germany | <i>Disease Mapping</i> |
|---------|------------------------|

---

**Description**

Cases of Oral cavity cancer in Germany from 1986-1990

**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 | <i>Construct a neighbour-matrix from a graph</i> |
|--------------|--|

---

**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 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. |
| reordering | A possible reordering. Typical the one obtained from a inla-call, result\$misc\$reordering, or the result of inla.qreordering.                               |
| factor     | A scaling of the inla.graph-object to reduce the size.   |
| max.dim    | Maximum dimension of the inla.graph-object plotted; if missing(factor) and max.dim is set, then factor is computed automatically to give the given max.dim.  |
| ...        | Additional arguments to inla.read.graph()  |

**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@r-inla.org>

**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

---

*Convert indexes*


---

**Description**

Convert indexes given by to 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@r-inla.org>

**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,
  selection = NULL,
  control.compute = list(),
  control.predictor = list(),
  control.family = list(),
```

```

control.inla = list(),
control.fixed = list(),
control.mode = list(),
control.expert = list(),
control.hazard = list(),
control.lincomb = list(),
control.update = list(),
control.pardiso = list(),
only.hyperparam = FALSE,
inla.call = inla.getOption("inla.call"),
inla.arg = inla.getOption("inla.arg"),
num.threads = inla.getOption("num.threads"),
blas.num.threads = inla.getOption("blas.num.threads"),
keep = inla.getOption("keep"),
working.directory = inla.getOption("working.directory"),
silent = inla.getOption("silent"),
inla.mode = c("classic", "twostage", "experimental"),
debug = inla.getOption("debug"),
.parent.frame = parent.frame()
)

```

## Arguments

|           |   |
|-----------|---|
| formula   | <p>A inla formula like <math>y \sim 1 + z + f(\text{ind}, \text{model} = "iid") + f(\text{ind2}, \text{weights}, \text{model} = "ar1")</math>. 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 <a href="#">f</a> for full details and the web site <a href="http://www.r-inla.org">www.r-inla.org</a> for several worked out examples. Each smooth or spatial term specified through <i>f</i> should correspond to separate column of the data frame data. 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.</p> |
| family    | <p>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 alternatives and use <a href="#">inla.doc</a> for detailed docs for individual families.</p>   |
| contrasts | <p>Optional contrasts for the fixed effects; see <code>?lm</code> or <code>?glm</code> for details.</p>   |
| data      | <p>A data frame or list containing the variables in the model. The data frame MUST be provided</p>  |
| quantiles | <p>A vector of quantiles, <math>p(0), p(1), \dots</math> to compute for each posterior marginal. The function returns, for each posterior marginal, the values <math>x(0), x(1), \dots</math> such that</p> $\text{Prob}(X < x(p)) = p$   |
| E         | <p>Known component in the mean for the Poisson likelihoods defined as</p> $E_i \exp(\eta_i)$ <p>where</p> $\eta_i$ <p>is the linear predictor. If not provided it is set to <code>rep(1, n.data)</code>.</p>  |
| offset    | <p>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</p>  |

`offset()` 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 `control.predictor`, then the offset given in this argument is added to `eta*`, the linear predictor related to the observations, as  $\eta^* = A \eta + \text{offset}$ , whereas an offset in the formula is added to `eta`, the linear predictor related to the formula, as  $\eta = \dots + \text{offset.formula}$ . So in this case, the offset defined here and in the formula has a different meaning and usage.

|                                |   |
|--------------------------------|---|
| <code>scale</code>             | Fixed (optional) scale parameters of the precision for Gaussian and Student-T response models. Default value is <code>rep(1, n.data)</code> .   |
| <code>weights</code>           | 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> . WARNING: The normalizing constant for the likelihood is NOT recomputed, so ALL marginals (and the marginal likelihood) must be interpreted with great care. |
| <code>Ntrials</code>           | A vector containing the number of trials for the binomial likelihood and variants, or the number of required successes for the <code>nbinomial2</code> likelihood. Default value is <code>rep(1, n.data)</code> .   |
| <code>strata</code>            | Fixed (optional) strata indicators for <code>tstrata</code> likelihood model.   |
| <code>link.covariates</code>   | A vector or matrix with covariates for link functions   |
| <code>verbose</code>           | Boolean indicating if the <code>inla</code> -program should run in a verbose mode (default FALSE).  |
| <code>lincomb</code>           | Used to define linear combination of nodes in the latent field. The posterior distribution of such linear combination is computed by the <code>inla</code> function. See <a href="http://www.r-inla.org/faq">www.r-inla.org/faq</a> for examples of how to define such linear combinations.   |
| <code>selection</code>         | This is a similar argument to the one in <code>inla.posterior.sample</code> and follow the same format. This argument allows to define a subset of the latent field for which to compute an approximated joint distribution. It will appear in <code>result\$selection</code> . See also <code>?inla.rjmarginall</code> .   |
| <code>control.compute</code>   | See <code>?control.compute</code>   |
| <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.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>control.pardiso</code>   | See <code>?control.pardiso</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, or as 'A:B' defining the number threads in the outer (A) and inner (B) layer for nested parallelism.  |
| <code>blas.num.threads</code>  | The absolute value of <code>blas.num.threads</code> is the maximum number of threads the the openblas/mklblas will use (if available). Value is ignored if $\leq 0$ (then environment variables are used).   |
| <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 an 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>inla.mode</code>         | Run inla in classic-mode, twostage-mode or the new experimental-mode? Not all features are available in the experimental-mode and this mode is really work-in-progress at the moment!!!! Default is to use the mode set by <code>inla.getOption("inla.mode")</code> which is default classic-mode. |
| <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 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 the smooth or spatial effects defined through <code>f()</code> . |
| <code>marginals.random</code>         | 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 $\eta$ 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 $\eta$ 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>selection</code>                  | Provide the approximated joint distribution for the selection  |
| <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] &gt; 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  |
| <code>mlik</code>                       | If <code>mlik=TRUE</code> in <code>control.compute</code> , the log marginal likelihood of the model (using two different estimates), otherwise NULL   |
| <code>neffp</code>                      | 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   |
| <code>mode</code>                       | A list of two elements: <code>mode\$theta</code> is the computed mode of the hyperparameters and <code>mode\$x</code> is the mode of the latent field given the modal value of the hyperparameters.  |
| <code>call</code>                       | The matched call.  |
| <code>formula</code>                    | The formula supplied   |
| <code>nhyper</code>                     | The number of hyperparameters in the model   |
| <code>cpu.used</code>                   | The cpu time used by the <code>inla</code> function  |

**Author(s)**

Havard Rue <hrue@r-inla.org> 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-class | <i>inla estimation object class</i> |
|------------|-------------------------------------|

---

**Description**

The inla class is defined in the INLA package

**See Also**

[inla](#)

---

|                  |  |
|------------------|--|
| inla.ar.pacf2phi | <i>Convert between parameterizations for the AR(p) model</i> |
|------------------|--|

---

**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.phi2acf(phi, lag.max = length(phi))

inla.ar.pacf2acf(pac, lag.max = length(pac))
```

**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@r-inla.org>

**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)))
```

---

|                             |   |
|-----------------------------|---|
| <code>inla.as.sparse</code> | <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, na.rm = FALSE, zeros.rm = FALSE)
```

**Arguments**

|          |  |
|----------|--|
| ...      | The arguments. The matrix or sparse matrix, and the additonal arguments  |
| A        | The matrix   |
| unique   | Logical. If TRUE, then ensure that the internal representation is unique and there are no duplicated entries. (Do not change this unless you know what you are doing.) |
| na.rm    | Replace NA's in the matrix with zeros.   |
| zeros.rm | Remove zeros in the matrix.  |

**Value**

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

**Author(s)**

Havard Rue <hrue@r-inla.org>

**Examples**

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

---

`inla.as.wkt_tree.wkt`    *Internal WKT handling*

---

**Description**

Conversion between WKT and a tree representation

**Usage**

```
inla.as.wkt_tree.wkt(x, ...)

inla.as.wkt.wkt_tree(x, pretty = FALSE, ...)

inla.wkt_tree_get_item(x, item, duplicate = 1)

inla.wkt_tree_set_item(x, item_tree, duplicate = 1)
```

**Arguments**

|                        |   |
|------------------------|---|
| <code>x</code>         | A WKT2 string, or a <code>wkt_tree</code> list structure  |
| <code>...</code>       | Unused  |
| <code>item</code>      | character vector with item labels identifying a parameter item entry.   |
| <code>duplicate</code> | For items that have more than one match, <code>duplicate</code> indicates the index number of the desired version. Default: 1 |
| <code>item_tree</code> | An item tree identifying a parameter item entry   |



---

|              |  |
|--------------|--|
| inla.barrier | <i>Functions for defining the Barrier models</i> |
|--------------|--|

---

**Description**

Functions for defining Barrier models as an inla rgeneric model

**Usage**

```
inla.barrier.pcmatern(mesh, barrier.triangles, prior.range,
                     prior.sigma, range.fraction=0.2)
inla.barrier.polygon(mesh, barrier.triangles, Omega=NULL)
inla.barrier.q(fem, ranges, sigma=1)
inla.barrier.fem(mesh, barrier.triangles, Omega=NULL)
```

**Arguments**

|                   |  |
|-------------------|--|
| mesh              | The mesh to build the model on, from inla.mesh.2d  |
| barrier.triangles | The numerical ids of the triangles that make up the barrier area   |
| prior.range       | 2 parameters (range0, Prange) for the prior spatial range. If Prange is NA, then range0 is used as a fixed range value (not tested).             |
| prior.sigma       | 2 parameters (sig0, Psig) for the prior marginal standard deviation sigma. If Psig is NA, then sig0 is used as a fixed sigma value (not tested). |
| range.fraction    | The length of the spatial range inside the barrier area, as a fraction of the range parameter.   |
| Omega             | Advanced option for creating a set of permeable barriers (not documented)  |

**Details**

This model is described in the ArXiv preprint arXiv:1608.03787. For examples, see <https://haakonbakka.bitbucket.io/btopic107.html>.

**Value**

inla.barrier.pcmatern gives the (rgeneric) model object for fitting the model in INLA, inla.barrier.polygon gives the polygon around the barrier (mainly for plotting), inla.barrier.q is an internal method producing the Q matrix from a result of inla.barrier.fem, inla.barrier.fem is an internal method producing the Finite Element matrices.

**Author(s)**

Haakon Bakka <bakka@r-inla.org>

**See Also**

inla.spde2.pcmatern

---

inla.barrier.pcmatern *Functions for defining the Barrier models*


---

## Description

Functions for defining Barrier models as an inla rgeneric model

## Usage

```
inla.barrier.pcmatern(
  mesh,
  barrier.triangles,
  prior.range,
  prior.sigma,
  range.fraction = 0.2
)

inla.barrier.polygon(mesh, barrier.triangles, Omega = NULL)

inla.barrier.q(fem, ranges, sigma = 1, envir = NULL)

inla.barrier.fem(mesh, barrier.triangles, Omega = NULL)
```

## Arguments

|                   |   |
|-------------------|---|
| mesh              | The mesh to build the model on, from inla.mesh.2d   |
| barrier.triangles | The numerical ids of the triangles that make up the barrier area  |
| prior.range       | 2 parameters (range0,Prange) for the prior spatial range. If Prange is NA, then range0 is used as a fixed range value (not tested).             |
| prior.sigma       | 2 parameters (sig0,Psig) for the prior marginal standard deviation sigma. If Psig is NA, then sig0 is used as a fixed sigma value (not tested). |
| range.fraction    | The length of the spatial range inside the barrier area, as a fraction of the range parameter.  |
| Omega             | Advanced option for creating a set of permeable barriers (not documented)   |
| fem               | represents the Barrier model or the Different Terrains (DT) model, by containing all the needed matrices to solve the SPDE                      |
| ranges, sigma     | the hyperparameters that determine Q  |
| envir             | the environment used for caching (with optimize=TRUE), if any   |

## Details

This model is described in the ArXiv preprint arXiv:1608.03787. For examples, see <https://haakonbakkagit.github.io/btopic128.html>

- inla.barrier.pcmatern This function creates the model component used in inla(...)
- inla.barrier.polygon This function constructs SpatialPolygons for the different subdomains (areas)

- `inla.barrier.q`: This function computes a specific precision matrix
- `inla.barrier.fem`: This function computes the Finite Element matrices that are needed to compute the precision matrix  $Q$  later

### Value

- `inla.barrier.pcmatern` gives the (rgeneric) model object for fitting the model in INLA
- `inla.barrier.polygon` gives the polygon around the barrier (mainly for plotting)
- `inla.barrier.q` is an internal method producing the  $Q$  matrix from a result of `inla.barrier.fem`,
- `inla.barrier.fem` is an internal method producing the Finite Element matrices.

### Author(s)

Haakon Bakka <bakka@r-inla.org>

### See Also

`inla.spde2.pcmatern`

---

|                                  |  |
|----------------------------------|--|
| <code>inla.binary.install</code> | <i>Install alternative binary builds</i> |
|----------------------------------|--|

---

### Description

Install alternative binary builds.

### Usage

```
inla.binary.install(os = c("CentOS Linux-6", "CentOS Linux-7", "CentOS Linux-8",
                           "CentOS Stream-8", "Fedora-33", "Fedora-34", "Manjaro Linux",
                           "Ubuntu-16.04", "Ubuntu-18.04", "Ubuntu-20.04"),
                    verbose = TRUE, md5.check = TRUE)
```

### Arguments

|                        |   |
|------------------------|---|
| <code>os</code>        | If <code>os</code> is given, install binary build for this <code>os</code> . If <code>os</code> is not given, chose <code>os</code> interactively among available builds. |
| <code>verbose</code>   | Logical. Verbose output if TRUE   |
| <code>md5.check</code> | Logical. If TRUE, stop if md5-checksum-file is not present or md5-checksum fail. If FALSE, ignore md5-checksum check.   |

### Details

Install a new binary for `os` unless `missing(os)`, for which the `os` is chosen interactively among the available builds.

### Value

Return TRUE if installation was successful and FALSE if not.

**Author(s)**

Havard Rue <hrue@r-inla.org>

**Examples**

```
## Not run:
  inla.binary.install()
  inla.binary.install(os = "CentOS Linux-7")

## End(Not run)
```

---

|                |                       |
|----------------|-----------------------|
| 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@r-inla.org>

**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,
  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                                       |
| 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@r-inla.org>

**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(), tag="", debug=FALSE)
inla.rbind.data.frames(...)
```

## Arguments

|                |  |
|----------------|--|
| formula        | The formula for the coxph model where the reponse 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> .  |
| tag            | An optional tag added to the names of the new variables created (to make them unique when combined with several calls of <code>inla.coxph</code> . Note that <code>E..coxph</code> is not included, as its usually merged into one vector over different expansions. |
| debug          | Print debug-information  |
| ...            | Data.frames to be <code>rbind</code> -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 `rbinded` data.frames padded with NAs. There is a better implementation in `dplyr::bind_rows`, which is used if package `dplyr` is installed.

## Author(s)

Havard Rue <hrue@r-inla.org>

## 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..coxph)

```

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,
         mc.cores = NULL,
         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.  |
| mc.cores | The number of cores to use in parallel::mclapply. If is.null(mc.cores), then check getOption("mc.cores") and inla.getOption("num.threads") in that order. |

|                |  |
|----------------|--|
| 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@r-inla.org>

**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 = NULL,
  doCheckCRSArgs = TRUE,
  args = NULL,
  oblique = NULL,
  SRS_string = NULL,
  ...
)

inla.wkt_predef()
```



**Arguments**

|                             |  |
|-----------------------------|--|
| <code>projargs</code>       | 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; run <code>names(inla.wkt_predef())</code> for valid predefined projections. |
| <code>doCheckCRSArgs</code> | 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.  |
| <code>args</code>           | 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> .           |
| <code>oblique</code>        | 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.                             |
| <code>SRS_string</code>     | a WKT2 string defining the coordinate system; see <code>sp::CRS</code> . This takes precedence over <code>projargs</code> .  |
| <code>...</code>            | 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

`inla.wkt_predef` returns a WKT2 string defining a projection

`inla.wkt_predef` returns a WKT2 string defining a projection

**Author(s)**

Finn Lindgren <finn.lindgren@gmail.com>

**See Also**

[sp::CRS\(\)](#), [crs\\_wkt\(\)](#), [inla.sp\\_get\\_crs\(\)](#) [plot.CRS\(\)](#), [inla.identical.CRS\(\)](#)

**Examples**

```
if (require(rgdal)) {
  crs1 <- inla.CRS("longlat_globe")
  crs2 <- inla.CRS("lambert_globe")
  crs3 <- inla.CRS("mollweide_norm")
  crs4 <- inla.CRS("hammer_globe")
  crs5 <- inla.CRS("sphere")
  crs6 <- inla.CRS("globe")
}
## Not run:
names(inla.wkt_predef())

## End(Not run)

## Not run:
names(inla.wkt_predef())

## End(Not run)
```

---

inla.CRSargs

*Show expanded CRS arguments*


---

**Description**

Wrapper for `sp::CRS` and `inla.CRS` objects to extract the coordinate reference system argument string. Should no longer be used with PROJ6/rgdal3; see [inla.crs\\_get\\_wkt\(\)](#)

**Usage**

```
inla.CRSargs(x, ...)

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

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

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

inla.as.CRS.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.   |

**Details**

- `inla.as.CRSargs.list`: CRS proj4 string for name=value pair list
- `inla.as.list.CRSargs`: List of name=value pairs from CRS proj4 string

**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](mailto:finn.lindgren@gmail.com)

**See Also**

[rgdal::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@r-inla.org>

---

|               |                                |
|---------------|--------------------------------|
| 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.1d'
inla.diameter(x, ...)

## 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, ...)
```

**Arguments**

|          |   |
|----------|---|
| x        | A point set as an $n \times d$ matrix, or an <code>inla.mesh</code> related object.   |
| ...      | Additional parameters passed on to other methods.   |
| 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). |

**Details**

- `inla.diameter.default` Calculate upper bound for the diameter of a point set, by encapsulating in a circular domain.

**Value**

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

**Author(s)**

Finn Lindgren [finn.lindgren@gmail.com](mailto: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, section, verbose=FALSE)
```

**Arguments**

|         |   |
|---------|---|
| what    | What to view documentation about; name of latent model, name of prior, etc. (A regular expression.)                             |
| section | An optional section, like <code>names(inla.models())</code> , 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@r-inla.org>

**See Also**

`www.r-inla.org`

**Examples**

```
## Not run: inla.doc("rw2")
## Not run: inla.doc("gaussian", section = "prior")
```

---

inla.extract.el

---

*Extract elements by matching name from container objects.*


---

**Description**

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

**Usage**

```

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

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

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

## S3 method for class 'list'
inla.extract.el(M, match, ...)

```

**Arguments**

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

**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 $\gamma$ 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 tex 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.get.inlaEnv | <i>Return the internal environment used by INLA</i> |
|------------------|---|

---

**Description**

A function which return the internal environment used by INLA

**Usage**

```
inla.get.inlaEnv()
```

**Value**

This function returns the internal environment used by INLA to keep internal variables.

**Author(s)**

Havard Rue <hrue@r-inla.org>

---

|            |                                    |
|------------|------------------------------------|
| 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@r-inla.org>

**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.has\_PROJ6

*PROJ6 detection*


---

**Description**

Detect whether PROJ6 is available for INLA

**Usage**

```
inla.has_PROJ6()

inla.not_for_PROJ6(fun)

inla.not_for_PROJ4(fun)

inla.fallback_PROJ6(fun)

inla.requires_PROJ6(fun)
```

**Arguments**

`fun`                      The name of the calling function

**Details**

`inla.has_PROJ6` is called to check if PROJ6&GDAL3 are available.

**Value**

For `inla.has_PROJ6`, logical; TRUE if PROJ6 is available, FALSE otherwise

**Functions**

- `inla.not_for_PROJ6`: Called to warn about using old PROJ4 features even though PROJ6 is available
- `inla.not_for_PROJ4`: Called to give an error when calling methods that are only available for PROJ6
- `inla.fallback_PROJ6`: Called to warn about falling back to using old PROJ4 methods when a PROJ6 method hasn't been implemented
- `inla.requires_PROJ6`: Called to give an error when PROJ6 is required but not available

**Examples**

```
inla.has_PROJ6()
```

---

|                            |   |
|----------------------------|---|
| <code>inla.hyperpar</code> | <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 = 15,
  h = NULL,
  restart = FALSE,
  quantiles = NULL,
  keep = FALSE)
```

**Arguments**

|                                  |   |
|----------------------------------|---|
| <code>result</code>              | An object of class <code>inla</code> , ie a result of a call to <code>inla()</code>   |
| <code>skip.configurations</code> | A boolean variable; skip configurations if the values at the main axis are too small. (Default TRUE)  |
| <code>verbose</code>             | Boolean indicating whether the <code>inla</code> program should run in a verbose mode.  |
| <code>dz</code>                  | Step length in the standardized scale used in the construction of the grid, default 0.75.   |
| <code>diff.logdens</code>        | The difference of the log.density for the hyperparameters to stop numerical integration using <code>int.strategy='grid'</code> . Default 15 |

|                        |   |
|------------------------|---|
| <code>h</code>         | The step-length for the gradient calculations for the hyperparameters. Default 0.01.  |
| <code>restart</code>   | A boolean defining wheather the optimizer should start again to ind the mode or if it should use the mode contained in the object |
| <code>quantiles</code> | A vector of quantiles, to compute for each posterior marginal.  |
| <code>keep</code>      | 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@r-inla.org>

**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 inla-object, f.ex the output from an inla-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@r-inla.org>

**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](mailto: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.iidkd.sample | <i>Provide samples from the iidkd component (experimental)</i> |
|-------------------|--|

---

### Description

This function provide samples of the iidkd component using more interpretable parameters

### Usage

```
inla.iidkd.sample(n = 10^4, result, name, return.cov = FALSE)
```

### Arguments

|            |  |
|------------|--|
| n          | Integer Number of samples to use   |
| result     | inla-object An object of class inla, ie a result of a call to inla()                                 |
| name       | Character The name of the iidkd component  |
| return.cov | Logical Return samples of the covariance matrix instead of stdev/correlation matrix described below? |

### Value

A list of sampled matrices, with (default) correlations on the off-diagonal and standard-deviations on the diagonal

### Author(s)

Havard Rue <hrue@r-inla.org>

### See Also

inla.doc("iidkd")

---

|               |                                     |
|---------------|-------------------------------------|
| inla.knmodels | <i>Spacetime interaction models</i> |
|---------------|-------------------------------------|

---

### Description

It implements the models in Knorr-Held, L. (2000) with three different constraint approaches: sum-to-zero, contrast or diagonal add.

## Usage

```
inla.knmodels(
  formula,
  data,
  progress=FALSE,
  control.st=list(
    t=NULL,
    s=NULL,
    st=NULL,
    graph=NULL,
    type=c(paste(1:4), paste0(2:4, 'c'), paste0(2:4, 'd')),
    diagonal=1e-5,
    ...)
)
```

## Arguments

|                         |   |
|-------------------------|---|
| <code>formula</code>    | The formula specifying the other model components, without the spacetime interaction term. The spacetime interaction term will be added accordingly to the specification in the <code>control.st</code> argument. See <code>inla</code>   |
| <code>progress</code>   | If it is to be shown the model fitting progress. Useful if more than one interaction type is being fitted.  |
| <code>control.st</code> | <p>Named list of arguments to control the spacetime interaction. It should contain:</p> <p><b>time</b> to be used as the index set for the main temporal effect which will be considered for the constraints when it is the case.</p> <p><b>space</b> to be used as the index set for the main spatial effect which will be considered for the constraints when it is the case.</p> <p><b>spacetime</b> to be the index set for the spacetime interaction effect.</p> <p><b>graph</b> to be the graph for the spatial neighbor structure to be used in a <code>f</code> term for the main spatial random effect term or for building the spacetime interaction model.</p> <p><b>type</b> to specify the spacetime interaction type. 1 to 4 corresponds to the four interaction types in Knorr-Held, L. (2000) with all the needed sum-to-zero constraints. 2c, 3c and 4c are the contrast version considering the first time or space constrained to be equal to zero. 2d, 3d and 4d are the corresponding versions when considering the diagonal add approach.</p> <p><b>diagonal</b> to be the value to be added to the diagonal when using the diagonal add approach.</p> <p><b>timeref</b> to specify the time point to be the reference time in the contrast parametrization.</p> <p><b>spaceref</b> to specify the area to be the reference for the contrast parametrization.</p> <p>... where additional arguments can be passed to <code>f</code> function. Specification of the hyperparameter, fixed or random, initial value, prior and its parameters for the spacetime interaction. See <code>?inla.models</code> and look for <code>generic0</code>. By default we scale it and use the PC-prior to set the prior using the <code>pc.prec</code> prior with <code>param = c(0.5, 0.5)</code>. See documentation with <code>?inla.doc("pc.prec")</code>.</p> <p>...</p> <p>Arguments to be passed to the <code>inla</code> function.</p> |

**Value**

inla.knmodels returns an object of class "inla". or a list of objects of this class if it is asked to compute more than one interaction type at once. Note: when the model type is 2c, 3c, 4c, 2d, 3d or 4d, it also includes linear combinations summary.

**Author(s)**

Elias T. Krainski

**See Also**

[inla.knmodels.sample](#) to sample from

**Examples**

```
### define space domain as a grid
grid <- SpatialGrid(GridTopology(c(0,0), c(1, 1), c(4, 5)))
(n <- nrow(xy <- coordinates(grid)))

### build a spatial neighborhood list
jj <- lapply(1:n, function(i)
  which(sqrt((xy[i,1]-xy[,1])^2 + (xy[i,2]-xy[,2])^2)==1))

### build the spatial adjacency matrix
graph <- sparseMatrix(rep(1:n, sapply(jj, length)),
  unlist(jj), x=1, dims=c(n, n))

### some random data at 10 time point
dat <- inla.knmodels.sample(graph, m=10, tau.t=2, tau.s=2, tau.st=3)
str(dat)
sapply(dat$x, summary)

nd <- length(dat$x$eta)
dat$e <- runif(nd, 0.9, 1.1)*rgamma(n, 40, 2)
dat$y <- rpois(nd, dat$e*exp(dat$x$eta-3))
summary(dat$y)

### fit the type 4 considering three different approaches
tgraph <- sparseMatrix(i=c(2:10, 1:9), j=c(1:9, 2:10), x=1)
res <- inla.knmodels(y ~ f(time, model='bym2', graph=tgraph) +
  f(space, model='bym2', graph=graph),
  data=dat, family='poisson', E=dat$E, progress=TRUE,
  control.st=list(time=time, space=space,
    spacetime=spacetime, graph=graph, type=c(4, '4c', '4d')),
  control.compute=list(dic=TRUE, waic=TRUE, cpo=TRUE))
sapply(res, function(x)
  c(dic=x$dic$dic, waic=x$waic$waic, cpo=-sum(log(x$cpo$cpo))))
```

---

inla.knmodels.sample    *Spacetime interaction models sampler function*

---

**Description**

It implements the sampling method for the models in Knorr-Held, L. (2000) considering the algorithm 3.1 in Rue & Held (2005) book.

**Usage**

```
inla.knmodels.sample(
  graph,
  m,
  type=4,
  intercept=0,
  tau.t=1,
  phi.t=0.7,
  tau.s=1,
  phi.s=0.7,
  tau.st=1,
  ev.t=NULL,
  ev.s=NULL)
```

**Arguments**

|           |  |
|-----------|--|
| graph     |  |
| m         | Time dimension.  |
| type      | Integer from 1 to 4 to identify one of the four interaction type.        |
| intercept | A constant to be added to the linear predictor                           |
| tau.t     | Precision parameter for the main temporal effect.                        |
| phi.t     | Mixing parameter in the bym2 model assumed for the main temporal effect. |
| tau.s     | Precision parameter for the main spatial effect.                         |
| phi.s     | Mixing parameter in the bym2 model assumed for the main spatial effect.  |
| tau.st    | Precision parameter for the spacetime effect.                            |
| ev.t      | Eigenvalues and eigenvectors of the temporal precision matrix structure. |
| ev.s      | Eigenvalues and eigenvectors of the spatial precision matrix structure.  |

**Value**

A list with the following elements

|           |   |
|-----------|---|
| time      | The time index for each observation, with length equals $m \times n$ .      |
| space     | The spatial index for each observation, with length equals $m \times n$ .   |
| spacetime | The spacetime index for each observation, with length equals $m \times n$ . |
| x         | A list with the following elements  |
| t.iid     | The unstructured main temporal effect part.                                 |
| t.str     | The structured main temporal effect part.                                   |
| t         | The main temporal effect with length equals $2m$ .                          |
| s.iid     | The unstructured main spatial effect part.                                  |
| s.str     | The structured main spatial effect part.                                    |
| s         | The main spatial effect with length equals $2n$ .                           |
| st        | The spacetime interaction effect with length equals $m \times n$ .          |
| eta       | The linear predictor with length equals $n \times m$ .                      |



**Author(s)**

Elias T. Krainski

**See Also**

[inla.knmodels](#) for model fitting

---

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 <a href="#">ks.test</a> , 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.list.models | <i>List available model components, likelihoods, priors, etc</i> |
|------------------|--|

---

**Description**

List available model components, likelihoods, priors, etc. To read specific documentation for the individual elements, use [inla.doc](#).

**Usage**

```
inla.list.models(section = names(inla.models()), ...)
```

**Arguments**

|         |   |
|---------|---|
| section | The section(s) to list, missing section will list all sections. <code>names(inla.models())</code> lists available sections. |
| ...     | Additional argument to cat  |

**Details**

The list is cat'ed with ... arguments.

This function is EXPERIMENTAL.

**Value**

Nothing is returned

**Author(s)**

Havard Rue

**Examples**

```
## Not run:
inla.list.models("likelihood")
inla.list.models(c("prior", "group"))
inla.list.models(file=file("everything.txt"))

#Show detailed doc for a specific prior/likelihood/latent model
inla.doc("binomial")

## 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@r-inla.org>

---

|                 |   |
|-----------------|---|
| 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, ...)
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`

**Note**

It is often required to set `Y=inla.mdata(...)` and then define the formula as `Y~...`, especially when used with `inla.stack`.

**Author(s)**

Havard Rue

**See Also**

[inla](#)

---

inla.merge

---

*Merge a mixture of inla-objects*


---

**Description**

Merge a mixture of inla-objects

**Usage**

```
## S3 method for class 'inla'
merge(x, y, ..., prob = rep(1, length(loos)),
      mc.cores = NULL, verbose = FALSE)
inla.merge(loos, prob = rep(1, length(loos)), verbose = FALSE)
```

**Arguments**

|                       |   |
|-----------------------|---|
| <code>x</code>        | An inla-object to be merged   |
| <code>y</code>        | An inla-object to be merged   |
| <code>...</code>      | Additional inla-objects to be merged  |
| <code>loos</code>     | List of inla-objects to be merged   |
| <code>prob</code>     | The mixture of (possibly unnormalized) probabilities  |
| <code>mc.cores</code> | The number of cores to use in <code>parallel::mclapply</code> . If <code>is.null(mc.cores)</code> , then check <code>getOption("mc.cores")</code> and <code>inla.getOption("num.threads")</code> in that order. |
| <code>verbose</code>  | Turn on verbose-output or not   |

## Details

The function `merge.inla` implements method `merge` for `inla`-objects. `merge.inla` is a wrapper for the function `inla.merge`. The interface is slightly different, `merge.inla` is more tailored for interactive use, whereas `inla.merge` is better in general code.

`inla.merge` is intended for merging a mixture of `inla`-objects, each run with the same formula and settings, except for a set of hyperparameters that are fixed to different values. Using this function, we can then integrate over these hyperparameters using (unnormalized) integration weights `prob`. The main objects to be merged, are the summary statistics and marginal densities (like for hyperparameters, fixed, random, etc). Not all entries in the object can be merged, and by default these are inherited from the first object in the list, while some are just set to `NULL`. Those objects that are merged, will be listed if run with option `verbose=TRUE`.

Note that merging hyperparameter in the user-scale is prone to discretization error in general, so it is more stable to convert the marginal of the hyperparameter from the merged internal scale to the user-scale. (This is not done by this function.)

## Value

A merged `inla`-object.

## Author(s)

Havard Rue <hrue@r-inla.org>

## Examples

```
set.seed(123)
n = 100
y = rnorm(n)
y[1:10] = NA
x = rnorm(n)
z1 = runif(n)
z2 = runif(n)*n
idx = 1:n
idx2 = 1:n
lc1 = inla.make.lincomb(idx = c(1, 2, 3))
names(lc1) = "lc1"
lc2 = inla.make.lincomb(idx = c(0, 1, 2, 3))
names(lc2) = "lc2"
lc3 = inla.make.lincomb(idx = c(0, 0, 1, 2, 3))
names(lc3) = "lc3"
lc = c(lc1, lc2, lc3)
rr = list()
for (logprec in c(0, 1, 2))
  rr[[length(rr)+1]] = inla(y ~ 1 + x + f(idx, z1) + f(idx2, z2),
    lincomb = lc,
    control.family = list(hyper = list(prec = list(initial = logprec))),
    control.predictor = list(compute = TRUE, link = 1),
    data = data.frame(y, x, idx, idx2, z1, z2))
r = inla.merge(rr, prob = seq_along(rr), verbose=TRUE)
summary(r)
```

---

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,
  ...
)

inla.mesh.1d.fem(mesh)
```

### 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', 'cyclic')</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.  |
| <code>mesh</code>         | An <code>inla.mesh.1d</code> object   |

### Author(s)

Finn Lindgren <finn.lindgren@gmail.com>

---

inla.mesh.1d.bary

*Mapping matrix for 1D meshes*


---

### Description

Calculates barycentric coordinates and weight matrices for `inla.mesh.1d()` objects.

**Usage**

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

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

**Arguments**

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

**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 = NULL,
  min.angle = NULL,
  cutoff = 1e-12,
  max.n.strict = NULL,
  max.n = NULL,
  plot.delay = NULL,
  crs = NULL
)
```



**Arguments**

|                           |  |
|---------------------------|--|
| <code>loc</code>          | Matrix of point locations to be used as initial triangulation nodes. Can alternatively be a <code>SpatialPoints</code> or <code>SpatialPointsDataFrame</code> object.  |
| <code>loc.domain</code>   | Matrix of point locations used to determine the domain extent. Can alternatively be a <code>SpatialPoints</code> or <code>SpatialPointsDataFrame</code> object.  |
| <code>offset</code>       | The automatic extension distance. One or two values, for an inner and an optional outer extension. If negative, interpreted as a factor relative to the approximate data diameter (default=-0.10???)   |
| <code>n</code>            | The number of initial nodes in the automatic extensions (default=16)   |
| <code>boundary</code>     | A list of one or two <code>inla.mesh.segment()</code> objects describing domain boundaries.  |
| <code>interior</code>     | An <code>inla.mesh.segment()</code> object describing desired interior edges.  |
| <code>max.edge</code>     | The largest allowed triangle edge length. One or two values.   |
| <code>min.angle</code>    | The smallest allowed triangle angle. One or two values. (Default=21)   |
| <code>cutoff</code>       | The minimum allowed distance between points. Point at most as far apart as this are replaced by a single vertex prior to the mesh refinement step.   |
| <code>max.n.strict</code> | The maximum number of vertices allowed, overriding <code>min.angle</code> and <code>max.edge</code> (default=-1, meaning no limit). One or two values, where the second value gives the number of additional vertices allowed for the extension.   |
| <code>max.n</code>        | The maximum number of vertices allowed, overriding <code>max.edge</code> only (default=-1, meaning no limit). One or two values, where the second value gives the number of additional vertices allowed for the extension.   |
| <code>plot.delay</code>   | On Linux (and Mac if appropriate X11 libraries are installed), specifying a non-negative numeric value activates a rudimentary plotting system in the underlying <code>fmesh</code> program, showing the triangulation algorithm at work, with waiting time factor <code>plot.delay</code> between each step.<br><br>On all systems, specifying any negative value activates displaying the result after each step of the multi-step domain extension algorithm. |
| <code>crs</code>          | An optional CRS or <code>inla.CRS</code> object  |

**Value**

An `inla.mesh` object.

**Author(s)**

Finn Lindgren <finn.lindgren@gmail.com>

**See Also**

`inla.mesh.create()`, `inla.delaunay()`, `inla.nonconvex.hull()`

**Examples**

```
loc <- matrix(runif(10 * 2), 10, 2)

if (require("splancs")) {
  boundary <- list(
    inla.nonconvex.hull(loc, 0.1, 0.15),
```

```

      inla.nonconvex.hull(loc, 0.2, 0.2)
    )
    offset <- NULL
  } else {
    boundary <- NULL
    offset <- c(0.1, 0.2)
  }
  mesh <- inla.mesh.2d(loc, boundary = boundary, offset = offset, max.edge = c(0.05, 0.1))

  plot(mesh)

```

---

inla.mesh.assessment    *Interactive mesh building and diagnostics*

---

### Description

Assess the finite element approximation errors in a mesh for interactive R sessions. More detailed assessment tools are in [meshbuilder\(\)](#).

### Usage

```
inla.mesh.assessment(mesh, spatial.range, alpha = 2, dims = c(500, 500))
```

### Author(s)

Finn Lindgren <finn.lindgren@gmail.com>

### See Also

inla.mesh.2d, inla.mesh.create, meshbuilder

### Examples

```

bnd <- inla.mesh.segment(cbind(
  c(0, 10, 10, 0, 0),
  c(0, 0, 10, 10, 0)
), bnd = TRUE)
mesh <- inla.mesh.2d(boundary = bnd, max.edge = 1)
out <- inla.mesh.assessment(mesh, spatial.range = 3, alpha = 2)

```

---

inla.mesh.assessment    *Interactive mesh building and diagnostics*

---

### Description

Assess the finite element approximation errors in a mesh for interactive R sessions. More detailed assessment tools are in [meshbuilder](#).

### Usage

```
inla.mesh.assessment(mesh)
```

**Author(s)**

Finn Lindgren <finn.lindgren@gmail.com>

**See Also**

inla.mesh.2d, inla.mesh.create, meshbuilder

**Examples**

```
bnd <- inla.mesh.segment(cbind(c(0, 10, 10, 0, 0),
                               c(0, 0, 10, 10, 0)), bnd = TRUE)
mesh <- inla.mesh.2d(boundary = bnd, max.edge = 1)
out <- inla.mesh.assessment(mesh, spatial.range = 3, alpha = 2)
```

---

|                 |                                      |
|-----------------|--------------------------------------|
| 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 <code>n</code> must be a scalar, and for planar 2d meshes a 2-vector). For spherical harmonics, <code>n</code> is the maximal harmonic order.                |
| degree         | Degree of B-spline polynomials. See <a href="#">inla.mesh.1d()</a> .   |
| 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 <a href="#">inla.mesh.1d()</a> for more information.                              |
| free.clamped | If TRUE and boundary is "free", 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 NULL, 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.components    *Compute connected mesh subsets*

---

**Description**

Compute subsets of vertices and triangles in an inla.mesh object that are connected by edges.

**Usage**

```
inla.mesh.components(mesh)
```

**Value**

A list with elements `vertex` and `triangle`, vectors of integer labels for which connected component they belong, and `info`, a data.frame with columns

|                        |  |
|------------------------|--|
| <code>component</code> | Connected component integer label.   |
| <code>nV</code>        | The number of vertices in the component.   |
| <code>nT</code>        | The number of triangles in the component.  |
| <code>area</code>      | The surface area associated with the component. Component labels are not comparable across different meshes, but some ordering stability is guaranteed by initiating each component from the lowest numbered triangle whenever a new component is initiated. |

**Author(s)**

Finn Lindgren <finn.lindgren@gmail.com>

**See Also**

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

## Examples

```
# Construct two simple meshes:
loc <- matrix(c(0, 1, 0, 1), 2, 2)
mesh1 <- inla.mesh.2d(loc = loc, max.edge = 0.1)
bnd <- inla.nonconvex.hull(loc, 0.3)
mesh2 <- inla.mesh.2d(boundary = bnd, max.edge = 0.1)

# Compute connectivity information:
conn1 <- inla.mesh.components(mesh1)
conn2 <- inla.mesh.components(mesh2)
# One component, simply connected mesh
conn1$info
# Two disconnected components
conn2$info

# Extract the subset mesh for the largest component:
# (Note: some information is lost, such as fixed segments,
# and boundary edge labels.)
maxi <- conn2$info$component[which.max(conn2$info$area)]
mesh3 <- inla.mesh.create(
  loc = mesh2$loc,
  tv = mesh2$graph$tv[conn2$triangle == maxi, , drop = FALSE]
)
```

---

inla.mesh.components    *Compute connected mesh subsets*

---

## Description

Compute subsets of vertices and triangles in an `inla.mesh` object that are connected by edges.

## Usage

```
inla.mesh.components(mesh)
```

## Value

A list with elements `vertex` and `triangle`, vectors of integer labels for which connected component they belong, and `info`, a `data.frame` with columns

|                        |  |
|------------------------|--|
| <code>component</code> | Connected component integer label.   |
| <code>nV</code>        | The number of vertices in the component.   |
| <code>nT</code>        | The number of triangles in the component.  |
| <code>area</code>      | The surface area associated with the component. Component labels are not comparable across different meshes, but some ordering stability is guaranteed by initiating each component from the lowest numbered triangle whenever a new component is initiated. |

## Author(s)

Finn Lindgren <finn.lindgren@gmail.com>

**See Also**

inla.mesh.2d, inla.mesh.create

**Examples**

```
# Construct two simple meshes:
loc <- matrix(c(0,1,0,1), 2, 2)
mesh1 <- inla.mesh.2d(loc = loc, max.edge=0.1)
bnd <- inla.nonconvex.hull(loc, 0.3)
mesh2 <- inla.mesh.2d(boundary = bnd, max.edge=0.1)

# Compute connectivity information:
conn1 <- inla.mesh.components(mesh1)
conn2 <- inla.mesh.components(mesh2)
# One component, simply connected mesh
conn1$info
# Two disconnected components
conn2$info

# Extract the subset mesh for the largest component:
# (Note: some information is lost, such as fixed segments,
# and boundary edge labels.)
maxi <- conn2$info$component[which.max(conn2$info$area)]
mesh3 <- inla.mesh.create(loc = mesh2$loc,
                        tv = mesh2$graph$tv[conn2$triangle == maxi,,drop=FALSE])
```

---

inla.mesh.create

*Low level function for high-quality triangulations*


---

**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 <code>SpatialPoints</code> or <code>SpatialPointsDataFrame</code> object.  |
| tv           | A triangle-vertex index matrix, specifying an existing triangulation.  |
| boundary     | A list of <code>inla.mesh.segment</code> objects, generated by <code>inla.mesh.segment()</code> , specifying boundary constraint segments.   |
| interior     | A list of <code>inla.mesh.segment</code> objects, generated by <code>inla.mesh.segment()</code> , specifying interior constraint segments.   |
| extend       | logical or list specifying whether to extend the data region, with parameters<br><b>list("n")</b> the number of edges in the extended boundary (default=8)<br><b>list("offset")</b> the extension distance. If negative, interpreted as a factor relative to the approximate data diameter (default=-0.10)<br>Setting to FALSE is only useful in combination lattice or boundary.  |
| refine       | logical or list specifying whether to refine the triangulation, with parameters<br><b>list("min.angle")</b> the minimum allowed interior angle in any triangle. The algorithm is guaranteed to converge for min.angle at most 21 (default=21)<br><b>list("max.edge")</b> 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)<br><b>list("max.n.strict")</b> the maximum number of vertices allowed, overriding min.angle and max.edge (default=-1, meaning no limit)<br><b>list("max.n")</b> the maximum number of vertices allowed, overriding max.edge only (default=-1, meaning no limit) |
| lattice      | An <code>inla.mesh.lattice</code> object, generated by <code>inla.mesh.lattice()</code> , specifying points on a regular lattice.  |
| globe        | Subdivision resolution for a semi-regular spherical triangulation with equidistant points along equidistant latitude bands.  |
| cutoff       | The minimum allowed distance between points. Point at most as far apart as this are replaced by a single vertex prior to the mesh refinement step.   |
| plot.delay   | On Linux (and Mac if appropriate X11 libraries are installed), specifying a numeric value activates a rudimentary plotting system in the underlying <code>fmesh</code> program, showing the triangulation algorithm at work.   |
| data.dir     | Where to store the <code>fmesh</code> data files. Defaults to <code>tempdir()</code> if <code>keep</code> is FALSE, otherwise <code>"inla.mesh.data"</code> .  |
| keep         | TRUE if the data files should be kept in <code>data.dir</code> or deleted afterwards. Defaults to true if <code>data.dir</code> is specified, otherwise false. Warning: If <code>keep</code> is false, <code>data.dir</code> and its contents will be deleted (unless set to <code>tempdir()</code> ).   |
| timings      | If TRUE, obtain timings for the mesh construction.   |
| quality.spec | List of vectors of per vertex max.edge target specification for each location in loc, boundary/interior (segm), and lattice. Only used if refining the mesh.   |
| crs          | An optional CRS or <code>inla.CRS</code> object  |
| ...          | Optional parameters passed on to <code>inla.mesh.create</code> .   |



**Details**

`inla.mesh.create` generates triangular meshes on subsets of  $R^2$  and  $S^2$ . Use the higher level wrapper function `inla.mesh.2d()` for greater control over mesh resolution and coarser domain extensions.

`inla.delaunay` is a wrapper function for obtaining the convex hull of a point set and calling `inla.mesh.create` to generate the classical Delaunay tringulation.

**Value**

An `inla.mesh` object.

**Author(s)**

Finn Lindgren <finn.lindgren@gmail.com>

**See Also**

`inla.mesh.2d()`, `inla.mesh.1d()`, `inla.mesh.segment()`, `inla.mesh.lattice()`, `inla.mesh.query()`

**Examples**

```
loc <- matrix(runif(10 * 2), 10, 2)

mesh <- inla.delaunay(loc)
plot(mesh)

mesh <- inla.mesh.create(loc,
  interior = inla.mesh.segment(idx = 1:2),
  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

*Directional derivative matrices for functions on meshes.*


---

**Description**

Calculates directional derivative matrices for functions on `inla.mesh()` objects.

**Usage**

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

**Arguments**

|      |  |
|------|--|
| mesh | An <code>inla.mesh()</code> 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**

```
inla.mesh.fem(mesh, order = 2)
```

**Arguments**

|       |  |
|-------|--|
| mesh  | An <code>inla.mesh()</code> or <code>inla.mesh.1d()</code> object. |
| order | The model order.   |

**Value**

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

|    |  |
|----|--|
| c0 | $c0[i,j] = \langle \text{psi}_i, 1 \rangle$                                      |
| c1 | $c1[i,j] = \langle \text{psi}_i, \text{psi}_j \rangle$                           |
| g1 | $g1[i,j] = \langle \text{grad } \text{psi}_i, \text{grad } \text{psi}_j \rangle$ |
| g2 | $g2 = g1 * c0^{-1} * g1$   |
| gk | $gk = g1 * (c0^{-1} * g1)^{(k-1)}$ , up to and including $k=\text{order}$        |

**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

|                    |   |
|--------------------|---|
| <code>x</code>     | vector or grid matrix of x-values                           |
| <code>y</code>     | vector of grid matrix of y-values                           |
| <code>z</code>     | if x is a matrix, a grid matrix of z-values                 |
| <code>dims</code>  | the size of the grid, length 2 vector                       |
| <code>units</code> | One of <code>c("default", "longlat", "longsinlat")</code> . |
| <code>crs</code>   | An optional CRS or <code>inla.CRS</code> object             |

## Value

An `inla.mesh.lattice` object.

## Author(s)

Finn Lindgren <finn.lindgren@gmail.com>

## See Also

`inla.mesh()`

## Examples

```
lattice <- inla.mesh.lattice(seq(0, 1, length.out = 17), seq(0, 1, length.out = 10))

## Use the lattice "as-is", without refinement:
mesh <- inla.mesh.create(lattice = lattice, boundary = lattice$segm)
mesh <- inla.mesh.create(lattice = lattice, extend = FALSE)
plot(mesh)

## Refine the triangulation, with limits on triangle angles and edges:
mesh <- inla.mesh.create(
  lattice = lattice,
```

```

    refine = list(max.edge = 0.08),
    extend = FALSE
  )
plot(mesh)

## Add an extension around the lattice, but maintain the lattice edges:
mesh <- inla.mesh.create(
  lattice = lattice,
  refine = list(max.edge = 0.08),
  interior = lattice$segm
)
plot(mesh)

## Only add extension:
mesh <- inla.mesh.create(lattice = lattice, refine = list(max.edge = 0.08))
plot(mesh)

```

---

|                   |   |
|-------------------|---|
| inla.mesh.map.lim | <i>Coordinate mappings for inla.mesh projections.</i> |
|-------------------|---|

---

## Description

Calculates coordinate mappings for inla.mesh projections.

## Usage

```

inla.mesh.map.lim(
  loc = NULL,
  projection = c("default", "longlat", "longsinlat", "mollweide")
)

inla.mesh.map(
  loc,
  projection = c("default", "longlat", "longsinlat", "mollweide"),
  inverse = TRUE
)

```

## 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.

**Functions**

- `inla.mesh.map.lim`: Projection extent limit calculations

**Author(s)**

Finn Lindgren <finn.lindgren@gmail.com>

**See Also**

[inla.mesh.project\(\)](#)

---

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

---

**Description**

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

**Usage**

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

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

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

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

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, ...)
```

**Arguments**

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

**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      *High-quality triangulations*


---

**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"> <li>• tt.neighbours Compute neighbour triangles for triangles; list of vectors: list(triangles, orders)</li> <li>• vt.neighbours Compute neighbour triangles for vertices; list of vectors: list(vertices, orders)</li> </ul> |

**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> Constructs inla.mesh.segment objects that can be used to specify boundary and interior constraint edges in calls to <a href="#">inla.mesh()</a> . |
|-------------------|--|

---

## Description

Constraint segments for inla.mesh

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

## Usage

```
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

|     |  |
|-----|--|
| ... | Additional parameters. When joining segments, a list of inla.mesh.segment objects.   |
| loc | Matrix of point locations.   |
| idx | Segment index sequence vector or index pair matrix. The indices refer to the rows of loc. If loc==NULL, the indices will be interpreted as indices into the point specification supplied to <a href="#">inla.mesh.create()</a> . If is.bnd==TRUE, defaults to linking all the points in loc, as c(1:nrow(loc), 1L), otherwise 1:nrow(loc). |



|                          |  |
|--------------------------|--|
| grp                      | Vector of group labels for each segment. Set to NULL to let the labels be chosen automatically in a call to <a href="#">inla.mesh.create()</a> . |
| is.bnd                   | TRUE if the segments are boundary segments, otherwise FALSE.   |
| crs                      | An optional CRS or <code>inla.CRS</code> object  |
| grp.default              | When joining segments, use this group label for segments that have <code>grp=NULL</code> .   |
| x, y, z, nlevels, levels | Parameters specifying a set of surface contours, with syntax described in <a href="#">contour()</a> .  |
| 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 <a href="#">inla.simplify.curve()</a> .  |

**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:** `doc = ‘Gaussian random effects in dim=1’`

`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: doc = 'Classical measurement error model'
    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 = '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: doc = 'Berkson measurement error model'
  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 = '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: doc = 'Random walk of order 1'
  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: doc = ‘Random walk of order 2’**

```
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: doc = ‘Exact solution to the random walk of order 2’**

```
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:** doc = 'Seasonal model for time series'

```

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:** doc = 'The Besag area model (CAR-model)'

```

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: doc = 'The shared Besag model'
    constr = 'TRUE'
    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: doc = 'The BYM-model (Besag-York-Mollier model)'
    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: doc = 'The BYM-model with the PC priors'**

```

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:** doc = ‘A proper version of the Besag model’

```

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:** doc = ‘An alternative proper version of the Besag model’

```

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:** doc = 'Fractional Gaussian noise model'

```

constr = 'FALSE'
nrow.ncol = 'FALSE'
augmented = 'TRUE'
aug.factor = '5'
aug.constr = '1'
n.div.by = 'NULL'
n.required = 'FALSE'
set.default.values = 'TRUE'
order.default = '4'
order.defined = '3 4'
pdf = 'fgn'

```

**Model 'fgn2'.** Number of hyperparameters are 2.

```

Hyperparameter 'theta1' hyperid = '13111'
  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 = '13112'
    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: doc = 'Fractional Gaussian noise model (alt 2)'
    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 = '4'
    order.defined = '3 4'
    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:** doc = 'Auto-regressive model of order 1 (AR(1))'

```

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 'ar1c'.** Number of hyperparameters are 2.

**Hyperparameter 'theta1' hyperid = '14101'**

```

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 = '14102'**

```

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

```

**Properties:** doc = 'Auto-regressive model of order 1 w/covariates'

```

constr = 'FALSE'
nrow.ncol = 'FALSE'
augmented = 'FALSE'
aug.factor = '1'
aug.constr = 'NULL'
n.div.by = 'NULL'
n.required = 'FALSE'
set.default.values = 'TRUE'
status = 'experimental'
pdf = 'ar1c'

```

**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: doc = 'Auto-regressive model of order p (AR(p))'
    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 = '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: doc = 'The Ornstein-Uhlenbeck process'
    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 'intslope'.** Number of hyperparameters are 13.

**Hyperparameter 'theta1' hyperid = '16101'**

```

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 = '16102'**

```

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 = '16103'**

```

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'

```

**Hyperparameter 'theta4' hyperid = '16104'**

```

name = 'gamma1'
short.name = 'g1'
initial = '1'
fixed = 'TRUE'
prior = 'normal'
param = '1 36'
to.theta = 'function(x) x'
from.theta = 'function(x) x'

```

**Hyperparameter 'theta5' hyperid = '16105'**

```

name = 'gamma2'
short.name = 'g2'
initial = '1'

```



```

    fixed = 'TRUE'
    prior = 'normal'
    param = '1 36'
    to.theta = 'function(x) x'
    from.theta = 'function(x) x'
Hyperparameter 'theta6' hyperid = '16106'
    name = 'gamma3'
    short.name = 'g3'
    initial = '1'
    fixed = 'TRUE'
    prior = 'normal'
    param = '1 36'
    to.theta = 'function(x) x'
    from.theta = 'function(x) x'
Hyperparameter 'theta7' hyperid = '16107'
    name = 'gamma4'
    short.name = 'g4'
    initial = '1'
    fixed = 'TRUE'
    prior = 'normal'
    param = '1 36'
    to.theta = 'function(x) x'
    from.theta = 'function(x) x'
Hyperparameter 'theta8' hyperid = '16108'
    name = 'gamma5'
    short.name = 'g5'
    initial = '1'
    fixed = 'TRUE'
    prior = 'normal'
    param = '1 36'
    to.theta = 'function(x) x'
    from.theta = 'function(x) x'
Hyperparameter 'theta9' hyperid = '16109'
    name = 'gamma6'
    short.name = 'g6'
    initial = '1'
    fixed = 'TRUE'
    prior = 'normal'
    param = '1 36'
    to.theta = 'function(x) x'
    from.theta = 'function(x) x'
Hyperparameter 'theta10' hyperid = '16110'
    name = 'gamma7'
    short.name = 'g7'
    initial = '1'

```

```

    fixed = 'TRUE'
    prior = 'normal'
    param = '1 36'
    to.theta = 'function(x) x'
    from.theta = 'function(x) x'
Hyperparameter 'theta11' hyperid = '16111'
    name = 'gamma8'
    short.name = 'g8'
    initial = '1'
    fixed = 'TRUE'
    prior = 'normal'
    param = '1 36'
    to.theta = 'function(x) x'
    from.theta = 'function(x) x'
Hyperparameter 'theta12' hyperid = '16112'
    name = 'gamma9'
    short.name = 'g9'
    initial = '1'
    fixed = 'TRUE'
    prior = 'normal'
    param = '1 36'
    to.theta = 'function(x) x'
    from.theta = 'function(x) x'
Hyperparameter 'theta13' hyperid = '16113'
    name = 'gamma10'
    short.name = 'g10'
    initial = '1'
    fixed = 'TRUE'
    prior = 'normal'
    param = '1 36'
    to.theta = 'function(x) x'
    from.theta = 'function(x) x'
Properties: doc = 'Intecept-slope model with Wishart-prior'
    constr = 'FALSE'
    nrow.ncol = 'FALSE'
    augmented = 'FALSE'
    aug.factor = '1'
    aug.constr = 'NULL'
    n.div.by = 'NULL'
    n.required = 'FALSE'
    set.default.values = 'TRUE'
    status = 'experimental'
    pdf = 'intslope'
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: doc = 'A generic model'
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: doc = 'A generic model (type 0)'
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: doc = 'A generic model (type 1)'
    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: doc = 'A generic model (type 2)'
    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: doc = 'A generic model (type 3)'
    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: doc = 'A SPDE model'
    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: doc = 'A SPDE2 model'
    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: doc = 'A SPDE3 model'
    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:** doc = 'Gaussian random effect in dim=1 with Wishart prior'

```

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: doc = ‘Gaussian random effect in dim=2 with Wishart prior’
  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: doc = 'Gaussian random effect in dim=3 with Wishart prior'
    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: doc = 'Gaussian random effect in dim=4 with Wishart prior'
  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: doc = 'Gaussian random effect in dim=5 with Wishart prior'
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 'iidkd'. Number of hyperparameters are 55.
Hyperparameter 'theta1' hyperid = '29101'
  name = 'theta1'
  short.name = 'theta1'
  initial = '1048576'
  fixed = 'FALSE'
  prior = 'wishartkd'
  param = '100 1048576 1048576 1048576 1048576 1048576 1048576 1048576
    1048576 1048576 1048576 1048576 1048576 1048576 1048576 1048576
    1048576 1048576 1048576 1048576 1048576 1048576 1048576 1048576
    1048576 1048576 1048576 1048576 1048576 1048576 1048576 1048576
    1048576 1048576 1048576 1048576 1048576 1048576 1048576 1048576
    1048576 1048576 1048576'
  to.theta = 'function(x) x'
  from.theta = 'function(x) x'
Hyperparameter 'theta2' hyperid = '29102'
  name = 'theta2'
  short.name = 'theta2'
  initial = '1048576'
  fixed = 'FALSE'
  prior = 'none'
  param = ''
  to.theta = 'function(x) x'
  from.theta = 'function(x) x'
Hyperparameter 'theta3' hyperid = '29103'
  name = 'theta3'
  short.name = 'theta3'
  initial = '1048576'
  fixed = 'FALSE'

```

```

    prior = 'none'
    param = ''
    to.theta = 'function(x) x'
    from.theta = 'function(x) x'
Hyperparameter 'theta4' hyperid = '29104'
    name = 'theta4'
    short.name = 'theta4'
    initial = '1048576'
    fixed = 'FALSE'
    prior = 'none'
    param = ''
    to.theta = 'function(x) x'
    from.theta = 'function(x) x'
Hyperparameter 'theta5' hyperid = '29105'
    name = 'theta5'
    short.name = 'theta5'
    initial = '1048576'
    fixed = 'FALSE'
    prior = 'none'
    param = ''
    to.theta = 'function(x) x'
    from.theta = 'function(x) x'
Hyperparameter 'theta6' hyperid = '29106'
    name = 'theta6'
    short.name = 'theta6'
    initial = '1048576'
    fixed = 'FALSE'
    prior = 'none'
    param = ''
    to.theta = 'function(x) x'
    from.theta = 'function(x) x'
Hyperparameter 'theta7' hyperid = '29107'
    name = 'theta7'
    short.name = 'theta7'
    initial = '1048576'
    fixed = 'FALSE'
    prior = 'none'
    param = ''
    to.theta = 'function(x) x'
    from.theta = 'function(x) x'
Hyperparameter 'theta8' hyperid = '29108'
    name = 'theta8'
    short.name = 'theta8'
    initial = '1048576'
    fixed = 'FALSE'

```

```

    prior = 'none'
    param = ''
    to.theta = 'function(x) x'
    from.theta = 'function(x) x'
Hyperparameter 'theta9' hyperid = '29109'
    name = 'theta9'
    short.name = 'theta9'
    initial = '1048576'
    fixed = 'FALSE'
    prior = 'none'
    param = ''
    to.theta = 'function(x) x'
    from.theta = 'function(x) x'
Hyperparameter 'theta10' hyperid = '29110'
    name = 'theta10'
    short.name = 'theta10'
    initial = '1048576'
    fixed = 'FALSE'
    prior = 'none'
    param = ''
    to.theta = 'function(x) x'
    from.theta = 'function(x) x'
Hyperparameter 'theta11' hyperid = '29111'
    name = 'theta11'
    short.name = 'theta11'
    initial = '1048576'
    fixed = 'FALSE'
    prior = 'none'
    param = ''
    to.theta = 'function(x) x'
    from.theta = 'function(x) x'
Hyperparameter 'theta12' hyperid = '29112'
    name = 'theta12'
    short.name = 'theta12'
    initial = '1048576'
    fixed = 'FALSE'
    prior = 'none'
    param = ''
    to.theta = 'function(x) x'
    from.theta = 'function(x) x'
Hyperparameter 'theta13' hyperid = '29113'
    name = 'theta13'
    short.name = 'theta13'
    initial = '1048576'
    fixed = 'FALSE'

```

```

    prior = 'none'
    param = ''
    to.theta = 'function(x) x'
    from.theta = 'function(x) x'
Hyperparameter 'theta14' hyperid = '29114'
    name = 'theta14'
    short.name = 'theta14'
    initial = '1048576'
    fixed = 'FALSE'
    prior = 'none'
    param = ''
    to.theta = 'function(x) x'
    from.theta = 'function(x) x'
Hyperparameter 'theta15' hyperid = '29115'
    name = 'theta15'
    short.name = 'theta15'
    initial = '1048576'
    fixed = 'FALSE'
    prior = 'none'
    param = ''
    to.theta = 'function(x) x'
    from.theta = 'function(x) x'
Hyperparameter 'theta16' hyperid = '29116'
    name = 'theta16'
    short.name = 'theta16'
    initial = '1048576'
    fixed = 'FALSE'
    prior = 'none'
    param = ''
    to.theta = 'function(x) x'
    from.theta = 'function(x) x'
Hyperparameter 'theta17' hyperid = '29117'
    name = 'theta17'
    short.name = 'theta17'
    initial = '1048576'
    fixed = 'FALSE'
    prior = 'none'
    param = ''
    to.theta = 'function(x) x'
    from.theta = 'function(x) x'
Hyperparameter 'theta18' hyperid = '29118'
    name = 'theta18'
    short.name = 'theta18'
    initial = '1048576'
    fixed = 'FALSE'

```

```

    prior = 'none'
    param = ''
    to.theta = 'function(x) x'
    from.theta = 'function(x) x'
Hyperparameter 'theta19' hyperid = '29119'
    name = 'theta19'
    short.name = 'theta19'
    initial = '1048576'
    fixed = 'FALSE'
    prior = 'none'
    param = ''
    to.theta = 'function(x) x'
    from.theta = 'function(x) x'
Hyperparameter 'theta20' hyperid = '29120'
    name = 'theta20'
    short.name = 'theta20'
    initial = '1048576'
    fixed = 'FALSE'
    prior = 'none'
    param = ''
    to.theta = 'function(x) x'
    from.theta = 'function(x) x'
Hyperparameter 'theta21' hyperid = '29121'
    name = 'theta21'
    short.name = 'theta21'
    initial = '1048576'
    fixed = 'FALSE'
    prior = 'none'
    param = ''
    to.theta = 'function(x) x'
    from.theta = 'function(x) x'
Hyperparameter 'theta22' hyperid = '29122'
    name = 'theta22'
    short.name = 'theta22'
    initial = '1048576'
    fixed = 'FALSE'
    prior = 'none'
    param = ''
    to.theta = 'function(x) x'
    from.theta = 'function(x) x'
Hyperparameter 'theta23' hyperid = '29123'
    name = 'theta23'
    short.name = 'theta23'
    initial = '1048576'
    fixed = 'FALSE'

```

```

    prior = 'none'
    param = ''
    to.theta = 'function(x) x'
    from.theta = 'function(x) x'
Hyperparameter 'theta24' hyperid = '29124'
    name = 'theta24'
    short.name = 'theta24'
    initial = '1048576'
    fixed = 'FALSE'
    prior = 'none'
    param = ''
    to.theta = 'function(x) x'
    from.theta = 'function(x) x'
Hyperparameter 'theta25' hyperid = '29125'
    name = 'theta25'
    short.name = 'theta25'
    initial = '1048576'
    fixed = 'FALSE'
    prior = 'none'
    param = ''
    to.theta = 'function(x) x'
    from.theta = 'function(x) x'
Hyperparameter 'theta26' hyperid = '29126'
    name = 'theta26'
    short.name = 'theta26'
    initial = '1048576'
    fixed = 'FALSE'
    prior = 'none'
    param = ''
    to.theta = 'function(x) x'
    from.theta = 'function(x) x'
Hyperparameter 'theta27' hyperid = '29127'
    name = 'theta27'
    short.name = 'theta27'
    initial = '1048576'
    fixed = 'FALSE'
    prior = 'none'
    param = ''
    to.theta = 'function(x) x'
    from.theta = 'function(x) x'
Hyperparameter 'theta28' hyperid = '29128'
    name = 'theta28'
    short.name = 'theta28'
    initial = '1048576'
    fixed = 'FALSE'

```

```

    prior = 'none'
    param = ''
    to.theta = 'function(x) x'
    from.theta = 'function(x) x'
Hyperparameter 'theta29' hyperid = '29129'
    name = 'theta29'
    short.name = 'theta29'
    initial = '1048576'
    fixed = 'FALSE'
    prior = 'none'
    param = ''
    to.theta = 'function(x) x'
    from.theta = 'function(x) x'
Hyperparameter 'theta30' hyperid = '29130'
    name = 'theta30'
    short.name = 'theta30'
    initial = '1048576'
    fixed = 'FALSE'
    prior = 'none'
    param = ''
    to.theta = 'function(x) x'
    from.theta = 'function(x) x'
Hyperparameter 'theta31' hyperid = '29131'
    name = 'theta31'
    short.name = 'theta31'
    initial = '1048576'
    fixed = 'FALSE'
    prior = 'none'
    param = ''
    to.theta = 'function(x) x'
    from.theta = 'function(x) x'
Hyperparameter 'theta32' hyperid = '29132'
    name = 'theta32'
    short.name = 'theta32'
    initial = '1048576'
    fixed = 'FALSE'
    prior = 'none'
    param = ''
    to.theta = 'function(x) x'
    from.theta = 'function(x) x'
Hyperparameter 'theta33' hyperid = '29133'
    name = 'theta33'
    short.name = 'theta33'
    initial = '1048576'
    fixed = 'FALSE'

```

```

    prior = 'none'
    param = ''
    to.theta = 'function(x) x'
    from.theta = 'function(x) x'
Hyperparameter 'theta34' hyperid = '29134'
    name = 'theta34'
    short.name = 'theta34'
    initial = '1048576'
    fixed = 'FALSE'
    prior = 'none'
    param = ''
    to.theta = 'function(x) x'
    from.theta = 'function(x) x'
Hyperparameter 'theta35' hyperid = '29135'
    name = 'theta35'
    short.name = 'theta35'
    initial = '1048576'
    fixed = 'FALSE'
    prior = 'none'
    param = ''
    to.theta = 'function(x) x'
    from.theta = 'function(x) x'
Hyperparameter 'theta36' hyperid = '29136'
    name = 'theta36'
    short.name = 'theta36'
    initial = '1048576'
    fixed = 'FALSE'
    prior = 'none'
    param = ''
    to.theta = 'function(x) x'
    from.theta = 'function(x) x'
Hyperparameter 'theta37' hyperid = '29137'
    name = 'theta37'
    short.name = 'theta37'
    initial = '1048576'
    fixed = 'FALSE'
    prior = 'none'
    param = ''
    to.theta = 'function(x) x'
    from.theta = 'function(x) x'
Hyperparameter 'theta38' hyperid = '29138'
    name = 'theta38'
    short.name = 'theta38'
    initial = '1048576'
    fixed = 'FALSE'

```



```

    prior = 'none'
    param = ''
    to.theta = 'function(x) x'
    from.theta = 'function(x) x'
Hyperparameter 'theta39' hyperid = '29139'
    name = 'theta39'
    short.name = 'theta39'
    initial = '1048576'
    fixed = 'FALSE'
    prior = 'none'
    param = ''
    to.theta = 'function(x) x'
    from.theta = 'function(x) x'
Hyperparameter 'theta40' hyperid = '29140'
    name = 'theta40'
    short.name = 'theta40'
    initial = '1048576'
    fixed = 'FALSE'
    prior = 'none'
    param = ''
    to.theta = 'function(x) x'
    from.theta = 'function(x) x'
Hyperparameter 'theta41' hyperid = '29141'
    name = 'theta41'
    short.name = 'theta41'
    initial = '1048576'
    fixed = 'FALSE'
    prior = 'none'
    param = ''
    to.theta = 'function(x) x'
    from.theta = 'function(x) x'
Hyperparameter 'theta42' hyperid = '29142'
    name = 'theta42'
    short.name = 'theta42'
    initial = '1048576'
    fixed = 'FALSE'
    prior = 'none'
    param = ''
    to.theta = 'function(x) x'
    from.theta = 'function(x) x'
Hyperparameter 'theta43' hyperid = '29143'
    name = 'theta43'
    short.name = 'theta43'
    initial = '1048576'
    fixed = 'FALSE'

```

```

    prior = 'none'
    param = ''
    to.theta = 'function(x) x'
    from.theta = 'function(x) x'
Hyperparameter 'theta44' hyperid = '29144'
    name = 'theta44'
    short.name = 'theta44'
    initial = '1048576'
    fixed = 'FALSE'
    prior = 'none'
    param = ''
    to.theta = 'function(x) x'
    from.theta = 'function(x) x'
Hyperparameter 'theta45' hyperid = '29145'
    name = 'theta45'
    short.name = 'theta45'
    initial = '1048576'
    fixed = 'FALSE'
    prior = 'none'
    param = ''
    to.theta = 'function(x) x'
    from.theta = 'function(x) x'
Hyperparameter 'theta46' hyperid = '29146'
    name = 'theta46'
    short.name = 'theta46'
    initial = '1048576'
    fixed = 'FALSE'
    prior = 'none'
    param = ''
    to.theta = 'function(x) x'
    from.theta = 'function(x) x'
Hyperparameter 'theta47' hyperid = '29147'
    name = 'theta47'
    short.name = 'theta47'
    initial = '1048576'
    fixed = 'FALSE'
    prior = 'none'
    param = ''
    to.theta = 'function(x) x'
    from.theta = 'function(x) x'
Hyperparameter 'theta48' hyperid = '29148'
    name = 'theta48'
    short.name = 'theta48'
    initial = '1048576'
    fixed = 'FALSE'

```

```

    prior = 'none'
    param = ''
    to.theta = 'function(x) x'
    from.theta = 'function(x) x'
Hyperparameter 'theta49' hyperid = '29149'
    name = 'theta49'
    short.name = 'theta49'
    initial = '1048576'
    fixed = 'FALSE'
    prior = 'none'
    param = ''
    to.theta = 'function(x) x'
    from.theta = 'function(x) x'
Hyperparameter 'theta50' hyperid = '29150'
    name = 'theta50'
    short.name = 'theta50'
    initial = '1048576'
    fixed = 'FALSE'
    prior = 'none'
    param = ''
    to.theta = 'function(x) x'
    from.theta = 'function(x) x'
Hyperparameter 'theta51' hyperid = '29151'
    name = 'theta51'
    short.name = 'theta51'
    initial = '1048576'
    fixed = 'FALSE'
    prior = 'none'
    param = ''
    to.theta = 'function(x) x'
    from.theta = 'function(x) x'
Hyperparameter 'theta52' hyperid = '29152'
    name = 'theta52'
    short.name = 'theta52'
    initial = '1048576'
    fixed = 'FALSE'
    prior = 'none'
    param = ''
    to.theta = 'function(x) x'
    from.theta = 'function(x) x'
Hyperparameter 'theta53' hyperid = '29153'
    name = 'theta53'
    short.name = 'theta53'
    initial = '1048576'
    fixed = 'FALSE'

```

```

    prior = 'none'
    param = ''
    to.theta = 'function(x) x'
    from.theta = 'function(x) x'
Hyperparameter 'theta54' hyperid = '29154'
    name = 'theta54'
    short.name = 'theta54'
    initial = '1048576'
    fixed = 'FALSE'
    prior = 'none'
    param = ''
    to.theta = 'function(x) x'
    from.theta = 'function(x) x'
Hyperparameter 'theta55' hyperid = '29155'
    name = 'theta55'
    short.name = 'theta55'
    initial = '1048576'
    fixed = 'FALSE'
    prior = 'none'
    param = ''
    to.theta = 'function(x) x'
    from.theta = 'function(x) x'
Properties: doc = 'Gaussian random effect in dim=k with Wishart prior'
    constr = 'FALSE'
    nrow.ncol = 'FALSE'
    augmented = 'TRUE'
    aug.factor = '1'
    aug.constr = '1 2 3 4 5 6 7 8 9 10'
    n.div.by = '-1'
    n.required = 'TRUE'
    set.default.values = 'TRUE'
    status = 'experimental'
    pdf = 'iidkd'
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: doc = '(This model is obsolete)'
    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: doc = 'The z-model in a classical mixed model formulation'
    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: doc = 'Thin-plate spline model'**

```
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: doc = 'Thin-plate spline with iid noise'**

```
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: doc = 'Spatial lag model'**

```

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: doc = 'Matern covariance function on a regular grid'
    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 'dmatern'. Number of hyperparameters are 3.
Hyperparameter 'theta1' hyperid = '35101'
    name = 'log precision'
    short.name = 'prec'
    initial = '3'
    fixed = 'FALSE'
    prior = 'pc.prec'
    param = '1 0.01'
    to.theta = 'function(x) log(x)'
    from.theta = 'function(x) exp(x)'
Hyperparameter 'theta2' hyperid = '35102'
    name = 'log range'
    short.name = 'range'
    initial = '0'
    fixed = 'FALSE'
    prior = 'pc.range'
    param = '1 0.5'
    to.theta = 'function(x) log(x)'
    from.theta = 'function(x) exp(x)'
Hyperparameter 'theta3' hyperid = '35103'
    name = 'log nu'
    short.name = 'nu'
    initial = '-0.693147180559945'
    fixed = 'TRUE'

```



```

    prior = 'loggamma'
    param = '0.5 1'
    to.theta = 'function(x) log(x)'
    from.theta = 'function(x) exp(x)'
Properties: doc = 'Dense Matern field'
    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 = 'dmatern'
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) {} if (all(is.infinite(c(low, high)) || low == high) {} return(x) else if (all(is.finite(c(low, high)))) {} stopifnot(low < high) return(log(-(low - x) / (high - x))) else if (is.finite(low) && is.infinite(high) && high > low) {} return(log(x - low)) else {} stop("Condition not yet implemented") '
        from.theta = 'function(x, REPLACE.ME.low, REPLACE.ME.high) {} if (all(is.infinite(c(low, high)) || low == high) {} return(x) else if (all(is.finite(c(low, high)))) {} stopifnot(low < high) return(low + exp(x) / (1 + exp(x)) * (high - low)) else if (is.finite(low) && is.infinite(high) && high > low) {} return(low + exp(x)) else {} stop("Condition not yet implemented") '
    Properties: doc = 'Create a copy of a model component'
        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) {} if (all(is.infinite(c(low,high)) || low == high) {} stopifnot(low < high) return(x) else if (all(is.finite(c(low,high))) {} stopifnot(low < high) return(log(-(low-x) / (high-x))) else if (is.finite(low) && is.infinite(high) && high > low) {} return(log(x-low)) else {} stop("Condition not yet implemented")'
from.theta = 'function(x,REPLACE.ME.low,REPLACE.ME.high) {} if (all(is.infinite(c(low,high)) || low == high) {} stopifnot(low < high) return(x) else if (all(is.finite(c(low,high))) {} stopifnot(low < high) return(low + exp(x) / (1 + exp(x)) * (high-low)) else if (is.finite(low) && is.infinite(high) && high > low) {} return(low + exp(x)) else {} stop("Condition not yet implemented")'

```

**Properties:** **doc** = 'Constrained linear effect'

```

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: doc = 'Sigmoidal effect of a covariate'
    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 'revsign'. 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: doc = 'Reverse sigmoidal effect of a covariate'
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:** **doc** = 'A nonlinear model of a covariate'

```

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:** doc = 'A nonlinear model of a covariate'

```

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: doc =** ‘Exchangeable correlations’

**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: doc =** ‘Exchangeable positive correlations’

**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: doc =** ‘AR(1) correlations’

**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:** `doc = 'AR(p) correlations'`

**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:** `doc = 'Random walk of order 1'`

**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:** `doc = 'Random walk of order 2'`

**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:** `doc = 'Besag model'`

**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:** `doc = 'Independent model'`

**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 = ‘pc.prec’`

`param = ‘1 0.01’`

`initial = ‘0’`

`fixed = ‘FALSE’`

`to.theta = ‘function(x) log(x)’`

`from.theta = ‘function(x) exp(x)’`

**Properties:** `doc = ‘Gaussian mixture’`

**Model ‘loggamma’.** Number of hyperparameters are 1.

**Hyperparameter ‘theta’** `hyperid = ‘47101’`

`name = ‘log precision’`

`short.name = ‘prec’`

`prior = ‘pc.mgamma’`

`param = ‘4.8’`

`initial = ‘4’`

`fixed = ‘FALSE’`

`to.theta = ‘function(x) log(x)’`

`from.theta = ‘function(x) exp(x)’`

**Properties:** `doc = ‘LogGamma mixture’`

**Model ‘mloggamma’.** Number of hyperparameters are 1.

**Hyperparameter ‘theta’** `hyperid = ‘47201’`

`name = ‘log precision’`

`short.name = ‘prec’`

`prior = ‘pc.mgamma’`

`param = ‘4.8’`

`initial = ‘4’`

`fixed = ‘FALSE’`

`to.theta = ‘function(x) log(x)’`

`from.theta = ‘function(x) exp(x)’`

**Properties:** `doc = ‘Minus-LogGamma mixture’`

**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 ‘inverse’.** Number of hyperparameters are 0.

**Model ‘log’.** Number of hyperparameters are 0.

**Model ‘loga’.** 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 ‘quantile’.** Number of hyperparameters are 0.

**Model ‘pquantile’.** 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: doc =** ‘Logit link with sensitivity and specificity’

**status =** ‘disabled’

**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: doc =** ‘Log-link with an offset’

**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: doc = 'Logit-link with an offset'
    status = 'experimental'
    pdf = 'logitoffset'
Model 'robit'. Number of hyperparameters are 1.
    Hyperparameter 'theta' hyperid = '49021'
        name = 'log degrees of freedom'
        short.name = 'dof'
        initial = '1.6094379124341'
        fixed = 'TRUE'
        prior = 'pc.dof'
        param = '50 0.5'
        to.theta = 'function(x) log(x - 2)'
        from.theta = 'function(x) 2 + exp(x)'
Properties: doc = 'Robit link'
    status = 'experimental'
    pdf = 'robit'
Model 'sn'. Number of hyperparameters are 2.
    Hyperparameter 'theta1' hyperid = '49031'
        name = 'skewness'
        short.name = 'skew'
        initial = '0.00123456789'
        fixed = 'FALSE'
        prior = 'pc.sn'
        param = '10'
        to.theta = 'function(x, skew.max = 0.988) log((1 + x / skew.max) / (1 - x / skew.max))'
        from.theta = 'function(x, skew.max = 0.988) skew.max * (2 * exp(x) / (1 + exp(x)) - 1)'
    Hyperparameter 'theta2' hyperid = '49032'
        name = 'intercept'
        short.name = 'intercept'
        initial = '0'
        fixed = 'FALSE'
        prior = 'linksnintercept'
        param = '0 0'
        to.theta = 'function(x) log(x / (1 - x))'
        from.theta = 'function(x) exp(x) / (1 + exp(x))'
Properties: doc = 'Skew-normal link'
    pdf = 'linksn'
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: doc = 'A test1-link function (experimental)'
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:** doc = ‘A special1-link function (experimental)’  
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:** doc = ‘A special2-link function (experimental)’  
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 = ‘13.8155105579643’
fixed = ‘TRUE’
prior = ‘loggamma’
param = ‘1 1e-05’
to.theta = ‘function(x) log(x)’
from.theta = ‘function(x) exp(x)’

```

**Properties:** doc = ‘(do not use)’

**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: doc = ‘A random walk of order 1 for the log-hazard’**

**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: doc = ‘A random walk of order 2 for the log-hazard’**

**Model ‘iid’.** Number of hyperparameters are 1.

**Hyperparameter ‘theta’ hyperid = ‘55501’**

```
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: doc = ‘An iid model for the log-hazard’**

**Section ‘likelihood’.** Valid models in this section are:

**Model ‘poisson’.** Number of hyperparameters are 0.

**Model ‘xpoisson’.** Number of hyperparameters are 0.

**Model ‘cenpoisson’.** Number of hyperparameters are 0.

**Model ‘cenpoisson2’.** 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: doc = 'The generalized Poisson likelihood'
    survival = 'FALSE'
    discrete = 'TRUE'
    link = 'default log logoffset'
    pdf = 'gpoisson'
    status = 'experimental'
Model 'poisson.special1'. Number of hyperparameters are 1.
Hyperparameter 'theta' hyperid = '56100'
    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: doc = 'The Poisson.special1 likelihood'
    survival = 'FALSE'
    discrete = 'TRUE'
    link = 'default log'
    pdf = 'poisson-special'
Model 'binomial'. Number of hyperparameters are 0.
Model 'xbinomial'. Number of hyperparameters are 0.
Model 'pom'. Number of hyperparameters are 10.
Hyperparameter 'theta1' hyperid = '57101'
    name = 'theta1'
    short.name = 'theta1'
    initial = 'NA'
    fixed = 'FALSE'
    prior = 'dirichlet'
    param = '3'
    to.theta = 'function(x) x'
    from.theta = 'function(x) x'

```

**Hyperparameter ‘theta2’ hyperid = ‘57102’**

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

**Hyperparameter ‘theta3’ hyperid = ‘57103’**

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

**Hyperparameter ‘theta4’ hyperid = ‘57104’**

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

**Hyperparameter ‘theta5’ hyperid = ‘57105’**

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

**Hyperparameter ‘theta6’ hyperid = ‘57106’**

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

**Hyperparameter ‘theta7’ hyperid = ‘57107’**

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

**Hyperparameter ‘theta8’ hyperid = ‘57108’**

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

**Hyperparameter ‘theta9’ hyperid = ‘57109’**

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

**Hyperparameter ‘theta10’ hyperid = ‘57110’**

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

**Properties: doc = ‘Likelihood for the proportional odds model’**

```
status = ‘experimental’
survival = ‘FALSE’
discrete = ‘TRUE’
link = ‘default identity’
pdf = ‘pom’
```

**Model ‘bgev’.** Number of hyperparameters are 12.

**Hyperparameter ‘theta1’ hyperid = ‘57201’**

```
name = ‘spread’
```

```

    short.name = 'sd'
    initial = '0'
    fixed = 'FALSE'
    prior = 'loggamma'
    param = '1 3'
    to.theta = 'function(x) log(x)'
    from.theta = 'function(x) exp(x)'
Hyperparameter 'theta2' hyperid = '57202'
    name = 'tail'
    short.name = 'xi'
    initial = '-4'
    fixed = 'FALSE'
    prior = 'pc.gevtail'
    param = '7 0 0.5'
    to.theta = 'function(x, interval = c(REPLACE.ME.low, REPLACE.ME.high)) log(-(interval[1]
    -x) / (interval[2] -x))'
    from.theta = 'function(x, interval = c(REPLACE.ME.low, REPLACE.ME.high))
    interval[1] + (interval[2] -interval[1]) * exp(x) / (1.0 + exp(x))'
Hyperparameter 'theta3' hyperid = '57203'
    name = 'betal'
    short.name = 'betal'
    initial = 'NA'
    fixed = 'FALSE'
    prior = 'normal'
    param = '0 300'
    to.theta = 'function(x) x'
    from.theta = 'function(x) x'
Hyperparameter 'theta4' hyperid = '57204'
    name = 'beta2'
    short.name = 'beta2'
    initial = 'NA'
    fixed = 'FALSE'
    prior = 'normal'
    param = '0 300'
    to.theta = 'function(x) x'
    from.theta = 'function(x) x'
Hyperparameter 'theta5' hyperid = '57205'
    name = 'beta3'
    short.name = 'beta3'
    initial = 'NA'
    fixed = 'FALSE'
    prior = 'normal'
    param = '0 300'
    to.theta = 'function(x) x'
    from.theta = 'function(x) x'
Hyperparameter 'theta6' hyperid = '57206'

```

```

    name = 'beta4'
    short.name = 'beta4'
    initial = 'NA'
    fixed = 'FALSE'
    prior = 'normal'
    param = '0 300'
    to.theta = 'function(x) x'
    from.theta = 'function(x) x'
Hyperparameter 'theta7' hyperid = '57207'
    name = 'beta5'
    short.name = 'beta5'
    initial = 'NA'
    fixed = 'FALSE'
    prior = 'normal'
    param = '0 300'
    to.theta = 'function(x) x'
    from.theta = 'function(x) x'
Hyperparameter 'theta8' hyperid = '57208'
    name = 'beta6'
    short.name = 'beta6'
    initial = 'NA'
    fixed = 'FALSE'
    prior = 'normal'
    param = '0 300'
    to.theta = 'function(x) x'
    from.theta = 'function(x) x'
Hyperparameter 'theta9' hyperid = '57209'
    name = 'beta7'
    short.name = 'beta7'
    initial = 'NA'
    fixed = 'FALSE'
    prior = 'normal'
    param = '0 300'
    to.theta = 'function(x) x'
    from.theta = 'function(x) x'
Hyperparameter 'theta10' hyperid = '57210'
    name = 'beta8'
    short.name = 'beta8'
    initial = 'NA'
    fixed = 'FALSE'
    prior = 'normal'
    param = '0 300'
    to.theta = 'function(x) x'
    from.theta = 'function(x) x'
Hyperparameter 'theta11' hyperid = '57211'

```

```

name = 'beta9'
short.name = 'beta9'
initial = 'NA'
fixed = 'FALSE'
prior = 'normal'
param = '0 300'
to.theta = 'function(x) x'
from.theta = 'function(x) x'

```

**Hyperparameter 'theta12' hyperid = '57212'**

```

name = 'beta10'
short.name = 'beta'
initial = 'NA'
fixed = 'FALSE'
prior = 'normal'
param = '0 300'
to.theta = 'function(x) x'
from.theta = 'function(x) x'

```

**Properties:** doc = 'The blended Generalized Extreme Value likelihood'

```

status = 'experimental'
survival = 'FALSE'
discrete = 'FALSE'
link = 'default identity log'
pdf = 'bgev'

```

**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:** doc = 'The Gamma likelihood'

```

survival = 'FALSE'
discrete = 'FALSE'
link = 'default log quantile'
pdf = 'gamma'

```

**Model 'gammasurv'.** Number of hyperparameters are 1.

**Hyperparameter 'theta' hyperid = '58101'**

```

name = 'precision parameter'
short.name = 'prec'
initial = '0'
fixed = 'FALSE'
prior = 'loggamma'

```

```

    param = '1 0.01'
    to.theta = 'function(x) log(x)'
    from.theta = 'function(x) exp(x)'
Properties: doc = 'The Gamma likelihood (survival)'
    survival = 'TRUE'
    discrete = 'FALSE'
    status = 'experimental'
    link = 'default log'
    pdf = 'gammasurv'
Model 'gammajw'. Number of hyperparameters are 0.
Model 'gammajwsurv'. Number of hyperparameters are 0.
Model 'gammacount'. Number of hyperparameters are 1.
    Hyperparameter 'theta' hyperid = '59001'
        name = 'log alpha'
        short.name = 'alpha'
        initial = '0'
        fixed = 'FALSE'
        prior = 'pc.gammacount'
        param = '3'
        to.theta = 'function(x) log(x)'
        from.theta = 'function(x) exp(x)'
    Properties: doc = 'A Gamma generalisation of the Poisson likelihood'
        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 = '1'
        fixed = 'FALSE'
        prior = 'loggamma'
        param = '1 0.1'
        to.theta = 'function(x,sc = 0.1) log(x) / sc'
        from.theta = 'function(x,sc = 0.1) exp(sc * x)'
    Properties: doc = 'A quantile version of the Kumar likelihood'
        survival = 'FALSE'
        discrete = 'FALSE'
        link = 'default logit loga cauchit'
        pdf = 'qkumar'
Model 'qloglogistic'. Number of hyperparameters are 1.
    Hyperparameter 'theta' hyperid = '60011'
        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: doc = 'A quantile loglogistic likelihood'
survival = 'FALSE'
discrete = 'FALSE'
link = 'default log neglog'
pdf = 'qloglogistic'

```

**Model 'qloglogisticsurv'**. Number of hyperparameters are 1.

```

Hyperparameter 'theta' hyperid = '60021'
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: doc = 'A quantile loglogistic likelihood (survival)'
survival = 'TRUE'
discrete = 'FALSE'
link = 'default log neglog'
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: doc = 'The Beta likelihood'
survival = 'FALSE'
discrete = 'FALSE'
link = 'default logit loga 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: doc = 'The Beta-Binomial likelihood'
survival = 'FALSE'
discrete = 'TRUE'
link = 'default logit loga cauchit probit cloglog loglog robit sn'
pdf = 'betabinomial'

```

**Model 'betabinomialna'.** Number of hyperparameters are 1.

```

Hyperparameter 'theta' hyperid = '62101'
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: doc = 'The Beta-Binomial Normal approximation likelihood'
survival = 'FALSE'
discrete = 'TRUE'
link = 'default logit loga cauchit probit cloglog loglog robit sn'
pdf = 'betabinomialna'

```

**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 = 'pc.mgamma'
param = '7'
to.theta = 'function(x) log(x)'
from.theta = 'function(x) exp(x)'
Properties: doc = 'The negBinomial likelihood'
survival = 'FALSE'
discrete = 'TRUE'
link = 'default log logoffset quantile'
pdf = 'nbinomial'

```

**Model 'nbinomial2'.** Number of hyperparameters are 0.

**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: doc = ‘The simplex likelihood’**

```
survival = ‘FALSE’
discrete = ‘FALSE’
link = ‘default logit loga cauchit probit cloglog loglog’
pdf = ‘simplex’
```

**Model ‘gaussian’.** Number of hyperparameters are 2.

**Hyperparameter ‘theta1’ 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)’
```

**Hyperparameter ‘theta2’ hyperid = ‘65002’**

```
name = ‘log precision offset’
short.name = ‘precoffset’
initial = ‘72.0873067782343’
fixed = ‘TRUE’
prior = ‘none’
param = ‘’
to.theta = ‘function(x) log(x)’
from.theta = ‘function(x) exp(x)’
```

**Properties: doc = ‘The Gaussian likelihood’**

```
survival = ‘FALSE’
discrete = ‘FALSE’
link = ‘default identity logit loga cauchit log logoffset’
pdf = ‘gaussian’
```

**Model ‘agaussian’.** 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: doc = 'The aggregated Gaussian likelihood'
    status = 'experimental'
    survival = 'FALSE'
    discrete = 'FALSE'
    link = 'default identity logit loga cauchit log logoffset'
    pdf = 'agaussian'
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: doc = 'The circular Gaussian likelihood'
        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: doc = 'The wrapped Cauchy likelihood'
        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: doc = '(experimental)'
    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: doc = '(experimental)'
    survival = 'FALSE'
    discrete = 'FALSE'
    link = 'default logit loga'
    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: doc = '(experimental)'
```

```
survival = 'FALSE'
```

```
discrete = 'FALSE'
```

```
link = 'default identity'
```

```
pdf = 'loggammafrailty'
```

```
status = 'experimental'
```

**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: doc = 'The Logistic likelihood'
```

```
survival = 'FALSE'
```

```
discrete = 'FALSE'
```

```
link = 'default identity'
```

```
pdf = 'logistic'
```

**Model 'sn'.** Number of hyperparameters are 2.

```
Hyperparameter 'theta1' hyperid = '74001'
```

```
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 = '74002'
```

```
name = 'logit skew'
```

```
short.name = 'skew'
```

```

initial = '0.00123456789'
fixed = 'FALSE'
prior = 'pc.sn'
param = '10'
to.theta = 'function(x,skew.max = 0.988) log((1 + x / skew.max) / (1 -x / skew.max))'
from.theta = 'function(x,skew.max = 0.988) skew.max * (2 * exp(x) / (1 + exp(x))
  -1)'

```

```

Properties: doc = 'The Skew-Normal likelihood'
status = 'experimental'
survival = 'FALSE'
discrete = 'FALSE'
link = 'default identity'
pdf = 'sn'

```

**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 = 'tail parameter'
  short.name = 'tail'
  initial = '0'
  fixed = 'FALSE'
  prior = 'gaussian'
  param = '0 25'
  to.theta = 'function(x) x'
  from.theta = 'function(x) x'

```

```

Properties: doc = 'The Generalized Extreme Value likelihood'
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 = '0'
  fixed = 'FALSE'
  prior = 'loggamma'

```

```

    param = '1 5e-05'
    to.theta = 'function(x) log(x)'
    from.theta = 'function(x) exp(x)'
Properties: doc = 'The log-Normal likelihood'
    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 = '0'
        fixed = 'FALSE'
        prior = 'loggamma'
        param = '1 5e-05'
        to.theta = 'function(x) log(x)'
        from.theta = 'function(x) exp(x)'
    Properties: doc = 'The log-Normal likelihood (survival)'
        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 = '-2'
        fixed = 'FALSE'
        prior = 'pc.alphaw'
        param = '5'
        to.theta = 'function(x,sc = 0.1) log(x) / sc'
        from.theta = 'function(x,sc = 0.1) exp(sc * x)'
    Properties: doc = 'The Weibull likelihood'
        survival = 'FALSE'
        discrete = 'FALSE'
        link = 'default log neglog quantile'
        pdf = 'weibull'
Model 'weibullsurv'. Number of hyperparameters are 1.
    Hyperparameter 'theta' hyperid = '79101'
        name = 'log alpha'
        short.name = 'alpha'

```

```

initial = '-2'
fixed = 'FALSE'
prior = 'pc.alphaw'
param = '5'
to.theta = 'function(x,sc = 0.1) log(x) / sc'
from.theta = 'function(x,sc = 0.1) exp(sc * x)'

```

**Properties:** **doc** = 'The Weibull likelihood (survival)'

```

survival = 'TRUE'
discrete = 'FALSE'
link = 'default log neglog quantile'
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:** **doc** = 'The loglogistic likelihood'

```

survival = 'FALSE'
discrete = 'FALSE'
link = 'default log neglog'
pdf = 'loglogistic'

```

**Model 'loglogisticsurv'.** Number of hyperparameters are 1.

**Hyperparameter 'theta' hyperid = '80011'**

```

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:** **doc** = 'The loglogistic likelihood (survival)'

```

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 = '0.1'
fixed = 'FALSE'
prior = 'pc.alphaw'
param = '5'
to.theta = 'function(x,sc = 0.1) log(x) / sc'
from.theta = 'function(x,sc = 0.1) exp(sc * 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: doc = 'The Weibull-cure likelihood (survival)'
  survival = 'TRUE'
  discrete = 'FALSE'
  link = 'default log neglog'
  pdf = 'weibullcure'

```

**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: doc = 'The Gaussian stochvol likelihood'
  survival = 'FALSE'
  discrete = 'FALSE'
  link = 'default log'
  pdf = 'stochvolgaussian'

```

**Model 'stochvolsn'.** Number of hyperparameters are 2.

```

Hyperparameter 'theta1' hyperid = '82101'
  name = 'logit skew'
  short.name = 'skew'
  initial = '0.00123456789'
  fixed = 'FALSE'
  prior = 'pc.sn'
  param = '10'
  to.theta = 'function(x,skew.max = 0.988) log((1 + x / skew.max) / (1 - x / skew.max))'
  from.theta = 'function(x,skew.max = 0.988) skew.max * (2 * exp(x) / (1 + exp(x)) - 1)'

```

**Hyperparameter ‘theta2’ hyperid = ‘82102’**

```
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: doc = ‘The SkewNormal stochvol likelihood’**

```
status = 'experimental'
survival = 'FALSE'
discrete = 'FALSE'
link = 'default log'
pdf = 'stochvolnsn'
```

**Model ‘stochvolt’.** Number of hyperparameters are 1.

**Hyperparameter ‘theta’ hyperid = ‘83001’**

```
name = 'log degrees of freedom'
short.name = 'dof'
initial = '4'
fixed = 'FALSE'
prior = 'pc.dof'
param = '15 0.5'
to.theta = 'function(x) log(x - 2)'
from.theta = 'function(x) 2 + exp(x)'
```

**Properties: doc = ‘The Student-t stochvol likelihood’**

```
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: doc = 'The Normal inverse Gaussian stochastic likelihood'
    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: doc = 'Zero-inflated Poisson, type 0'
        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: doc = 'Zero-inflated Poisson, type 1'
        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: doc = 'Zero-inflated Poisson, type 2'
    survival = 'FALSE'
    discrete = 'FALSE'
    link = 'default log'
    pdf = 'zeroinflated'
Model 'zeroinflatedcenpoisson0'. Number of hyperparameters are 1.
Hyperparameter 'theta' hyperid = '87101'
    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: doc = 'Zero-inflated censored Poisson, type 0'
    status = 'experimental'
    survival = 'FALSE'
    discrete = 'FALSE'
    link = 'default log'
    pdf = 'zeroinflated'
Model 'zeroinflatedcenpoisson1'. Number of hyperparameters are 1.
Hyperparameter 'theta' hyperid = '87201'
    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: doc = 'Zero-inflated censored Poisson, type 1'
    status = 'experimental'
    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: doc = 'Zero-inflated Beta-Binomial, type 0'
    survival = 'FALSE'
    discrete = 'TRUE'
    link = 'default logit loga cauchit probit cloglog loglog robit sn'
    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: doc = 'Zero-inflated Beta-Binomial, type 1'
    survival = 'FALSE'
    discrete = 'TRUE'
    link = 'default logit loga cauchit probit cloglog loglog robit sn'
    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:** doc = ‘Zero-inflated Binomial, type 0’  
 survival = ‘FALSE’  
 discrete = ‘FALSE’  
 link = ‘default logit loga cauchit probit cloglog loglog robit sn’  
 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:** doc = ‘Zero-inflated Binomial, type 1’  
 survival = ‘FALSE’  
 discrete = ‘FALSE’  
 link = ‘default logit loga cauchit probit cloglog loglog robit sn’  
 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:** doc = ‘Zero-inflated Binomial, type 2’  
 survival = ‘FALSE’  
 discrete = ‘FALSE’  
 link = ‘default logit loga cauchit probit cloglog loglog robit sn’  
 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:** doc = ‘Zero and N inflated binomial, type 2’

```
survival = ‘FALSE’
discrete = ‘FALSE’
link = ‘default logit loga cauchit probit cloglog loglog robit sn’
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:** doc = ‘Zero and N inflated binomial, type 3’

```
status = ‘experimental’
survival = ‘FALSE’
```

```

discrete = 'FALSE'
link = 'default logit loga cauchit probit cloglog loglog robit sn'
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: doc = 'Zero inflated Beta-Binomial, type 2'**

```

survival = 'FALSE'
discrete = 'FALSE'
link = 'default logit loga cauchit probit cloglog loglog robit sn'
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 = 'pc.mgamma'
param = '7'
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: doc = 'Zero inflated negBinomial, type 0'
    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 = 'pc.mgamma'
    param = '7'
    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: doc = 'Zero inflated negBinomial, type 1'
    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 = 'pc.mgamma'
    param = '7'
    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: doc = 'Zero inflated negBinomial, type 1, strata 2'
    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 = 'pc.mgamma'
param = '7'
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 = 'pc.mgamma'
param = '7'
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 = 'pc.mgamma'
param = '7'
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 = 'pc.mgamma'
param = '7'
```

```

    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 = 'pc.mgamma'
    param = '7'
    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 = 'pc.mgamma'
    param = '7'
    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 = 'pc.mgamma'
    param = '7'
    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 = 'pc.mgamma'
    param = '7'
    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 = 'pc.mgamma'
    param = '7'

```

```

    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 = 'pc.mgamma'
    param = '7'
    to.theta = 'function(x) log(x)'
    from.theta = 'function(x) exp(x)'
Properties: doc = 'Zero inflated negBinomial, type 1, strata 3'
    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 = 'pc.mgamma'
    param = '7'
    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: doc = 'Zero inflated negBinomial, type 2'
    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 = 'pc.dof'
    param = '15 0.5'
    to.theta = 'function(x) log(x -2)'
    from.theta = 'function(x) 2 + exp(x)'
Properties: doc = 'Student-t likelihood'
    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 = 'pc.dof'
    param = '15 0.5'
    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: doc = 'A stratified version of the Student-t likelihood'
    survival = 'FALSE'
    discrete = 'FALSE'
    link = 'default identity'
    pdf = 'tstrata'
Model 'nmix'. Number of hyperparameters are 15.
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’

```

**Hyperparameter ‘theta6’ hyperid = ‘101106’**

```

name = ‘beta6’
short.name = ‘beta6’
initial = ‘0’
fixed = ‘FALSE’
prior = ‘normal’
param = ‘0 1’
to.theta = ‘function(x) x’
from.theta = ‘function(x) x’

```

**Hyperparameter ‘theta7’ hyperid = ‘101107’**

```
name = ‘beta7’  
short.name = ‘beta7’  
initial = ‘0’  
fixed = ‘FALSE’  
prior = ‘normal’  
param = ‘0 1’  
to.theta = ‘function(x) x’  
from.theta = ‘function(x) x’
```

**Hyperparameter ‘theta8’ hyperid = ‘101108’**

```
name = ‘beta8’  
short.name = ‘beta8’  
initial = ‘0’  
fixed = ‘FALSE’  
prior = ‘normal’  
param = ‘0 1’  
to.theta = ‘function(x) x’  
from.theta = ‘function(x) x’
```

**Hyperparameter ‘theta9’ hyperid = ‘101109’**

```
name = ‘beta9’  
short.name = ‘beta9’  
initial = ‘0’  
fixed = ‘FALSE’  
prior = ‘normal’  
param = ‘0 1’  
to.theta = ‘function(x) x’  
from.theta = ‘function(x) x’
```

**Hyperparameter ‘theta10’ hyperid = ‘101110’**

```
name = ‘beta10’  
short.name = ‘beta10’  
initial = ‘0’  
fixed = ‘FALSE’  
prior = ‘normal’  
param = ‘0 1’  
to.theta = ‘function(x) x’  
from.theta = ‘function(x) x’
```

**Hyperparameter ‘theta11’ hyperid = ‘101111’**

```
name = ‘beta11’  
short.name = ‘beta11’  
initial = ‘0’  
fixed = ‘FALSE’  
prior = ‘normal’  
param = ‘0 1’  
to.theta = ‘function(x) x’  
from.theta = ‘function(x) x’
```

**Hyperparameter ‘theta12’ hyperid = ‘101112’**

```
name = ‘beta12’
short.name = ‘beta12’
initial = ‘0’
fixed = ‘FALSE’
prior = ‘normal’
param = ‘0 1’
to.theta = ‘function(x) x’
from.theta = ‘function(x) x’
```

**Hyperparameter ‘theta13’ hyperid = ‘101113’**

```
name = ‘beta13’
short.name = ‘beta13’
initial = ‘0’
fixed = ‘FALSE’
prior = ‘normal’
param = ‘0 1’
to.theta = ‘function(x) x’
from.theta = ‘function(x) x’
```

**Hyperparameter ‘theta14’ hyperid = ‘101114’**

```
name = ‘beta14’
short.name = ‘beta14’
initial = ‘0’
fixed = ‘FALSE’
prior = ‘normal’
param = ‘0 1’
to.theta = ‘function(x) x’
from.theta = ‘function(x) x’
```

**Hyperparameter ‘theta15’ hyperid = ‘101115’**

```
name = ‘beta15’
short.name = ‘beta15’
initial = ‘0’
fixed = ‘FALSE’
prior = ‘normal’
param = ‘0 1’
to.theta = ‘function(x) x’
from.theta = ‘function(x) x’
```

**Properties: doc = ‘Binomial-Poisson mixture’**

```
status = ‘experimental’
survival = ‘FALSE’
discrete = ‘TRUE’
link = ‘default logit loga probit’
pdf = ‘nmix’
```

**Model ‘nmixnb’.** Number of hyperparameters are 16.

**Hyperparameter ‘theta1’ hyperid = ‘101121’**

```
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 = '101122'
    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 = '101123'
    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 = '101124'
    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 = '101125'
    name = 'beta5'
    short.name = 'beta5'
    initial = '0'
    fixed = 'FALSE'
    prior = 'normal'
    param = '0 1'
    to.theta = 'function(x) x'
    from.theta = 'function(x) x'
Hyperparameter 'theta6' hyperid = '101126'
    name = 'beta6'

```

```

    short.name = 'beta6'
    initial = '0'
    fixed = 'FALSE'
    prior = 'normal'
    param = '0 1'
    to.theta = 'function(x) x'
    from.theta = 'function(x) x'
Hyperparameter 'theta7' hyperid = '101127'
    name = 'beta7'
    short.name = 'beta7'
    initial = '0'
    fixed = 'FALSE'
    prior = 'normal'
    param = '0 1'
    to.theta = 'function(x) x'
    from.theta = 'function(x) x'
Hyperparameter 'theta8' hyperid = '101128'
    name = 'beta8'
    short.name = 'beta8'
    initial = '0'
    fixed = 'FALSE'
    prior = 'normal'
    param = '0 1'
    to.theta = 'function(x) x'
    from.theta = 'function(x) x'
Hyperparameter 'theta9' hyperid = '101129'
    name = 'beta9'
    short.name = 'beta9'
    initial = '0'
    fixed = 'FALSE'
    prior = 'normal'
    param = '0 1'
    to.theta = 'function(x) x'
    from.theta = 'function(x) x'
Hyperparameter 'theta10' hyperid = '101130'
    name = 'beta10'
    short.name = 'beta10'
    initial = '0'
    fixed = 'FALSE'
    prior = 'normal'
    param = '0 1'
    to.theta = 'function(x) x'
    from.theta = 'function(x) x'
Hyperparameter 'theta11' hyperid = '101131'
    name = 'beta11'

```

```

    short.name = 'beta11'
    initial = '0'
    fixed = 'FALSE'
    prior = 'normal'
    param = '0 1'
    to.theta = 'function(x) x'
    from.theta = 'function(x) x'
Hyperparameter 'theta12' hyperid = '101132'
    name = 'beta12'
    short.name = 'beta12'
    initial = '0'
    fixed = 'FALSE'
    prior = 'normal'
    param = '0 1'
    to.theta = 'function(x) x'
    from.theta = 'function(x) x'
Hyperparameter 'theta13' hyperid = '101133'
    name = 'beta13'
    short.name = 'beta13'
    initial = '0'
    fixed = 'FALSE'
    prior = 'normal'
    param = '0 1'
    to.theta = 'function(x) x'
    from.theta = 'function(x) x'
Hyperparameter 'theta14' hyperid = '101134'
    name = 'beta14'
    short.name = 'beta14'
    initial = '0'
    fixed = 'FALSE'
    prior = 'normal'
    param = '0 1'
    to.theta = 'function(x) x'
    from.theta = 'function(x) x'
Hyperparameter 'theta15' hyperid = '101135'
    name = 'beta15'
    short.name = 'beta15'
    initial = '0'
    fixed = 'FALSE'
    prior = 'normal'
    param = '0 1'
    to.theta = 'function(x) x'
    from.theta = 'function(x) x'
Hyperparameter 'theta16' hyperid = '101136'
    name = 'overdispersion'

```

```

short.name = 'overdispersion'
initial = '0'
fixed = 'FALSE'
prior = 'pc.gamma'
param = '7'
to.theta = 'function(x) log(x)'
from.theta = 'function(x) exp(x)'

```

```

Properties: doc = 'NegBinomial-Poisson mixture'
status = 'experimental'
survival = 'FALSE'
discrete = 'TRUE'
link = 'default logit loga probit'
pdf = 'nmixnb'

```

**Model 'gp'.** Number of hyperparameters are 1.

**Hyperparameter 'theta' hyperid = '101201'**

```

name = 'tail'
short.name = 'xi'
initial = '-4'
fixed = 'FALSE'
prior = 'pc.gevtail'
param = '7 0 0.5'
to.theta = 'function(x,interval = c(REPLACE.ME.low,REPLACE.ME.high)) log(-(interval[1]
  -x) / (interval[2] -x))'
from.theta = 'function(x,interval = c(REPLACE.ME.low,REPLACE.ME.high))
  interval[1] + (interval[2] -interval[1]) * exp(x) / (1.0 + exp(x))'

```

```

Properties: doc = 'Generalized Pareto likelihood'
status = 'experimental'
survival = 'FALSE'
discrete = 'TRUE'
link = 'default quantile'
pdf = 'genPareto'

```

**Model 'dgp'.** Number of hyperparameters are 1.

**Hyperparameter 'theta' hyperid = '101201'**

```

name = 'tail'
short.name = 'xi'
initial = '2'
fixed = 'FALSE'
prior = 'pc.gevtail'
param = '7 0 0.5'
to.theta = 'function(x,interval = c(REPLACE.ME.low,REPLACE.ME.high)) log(-(interval[1]
  -x) / (interval[2] -x))'
from.theta = 'function(x,interval = c(REPLACE.ME.low,REPLACE.ME.high))
  interval[1] + (interval[2] -interval[1]) * exp(x) / (1.0 + exp(x))'

```

```

Properties: doc = 'Discrete generalized Pareto likelihood'
status = 'experimental'
survival = 'FALSE'

```



```

discrete = 'TRUE'
link = 'default quantile'
pdf = 'dgp'

```

**Model 'logperiodogram'.** Number of hyperparameters are 0.

**Model 'tweedie'.** Number of hyperparameters are 2.

```

Hyperparameter 'theta1' hyperid = '102101'
  name = 'p'
  short.name = 'p'
  initial = '0'
  fixed = 'FALSE'
  prior = 'normal'
  param = '0 10'
  to.theta = 'function(x,interval = c(1.0,2.0)) log(-(interval[1] -x) / (interval[2]
    -x))'
  from.theta = 'function(x,interval = c(1.0,2.0)) interval[1] + (interval[2]
    -interval[1]) * exp(x) / (1.0 + exp(x))'
Hyperparameter 'theta2' hyperid = '102201'
  name = 'dispersion'
  short.name = 'phi'
  initial = '0'
  fixed = 'FALSE'
  prior = 'loggamma'
  param = '1 0.1'
  to.theta = 'function(x) log(x)'
  from.theta = 'function(x) exp(x)'
Properties: doc = 'Tweedie distribution'
  status = 'experimental'
  survival = 'FALSE'
  discrete = 'FALSE'
  link = 'default log'
  pdf = 'tweedie'

```

**Model 'fmri'.** Number of hyperparameters are 2.

```

Hyperparameter 'theta1' hyperid = '103101'
  name = 'precision'
  short.name = 'prec'
  initial = '0'
  fixed = 'FALSE'
  prior = 'loggamma'
  param = '10 10'
  to.theta = 'function(x) log(x)'
  from.theta = 'function(x) exp(x)'
Hyperparameter 'theta2' hyperid = '103202'
  name = 'dof'
  short.name = 'df'
  initial = '4'
  fixed = 'TRUE'

```

```

    prior = 'normal'
    param = '0 1'
    to.theta = 'function(x) x'
    from.theta = 'function(x) x'
Properties: doc = 'fmri distribution (special nc-chi)'
    status = 'experimental'
    survival = 'FALSE'
    discrete = 'FALSE'
    link = 'default log'
    pdf = 'fmri'
Model 'fmrisurv'. Number of hyperparameters are 2.
    Hyperparameter 'theta1' hyperid = '104101'
        name = 'precision'
        short.name = 'prec'
        initial = '0'
        fixed = 'FALSE'
        prior = 'loggamma'
        param = '10 10'
        to.theta = 'function(x) log(x)'
        from.theta = 'function(x) exp(x)'
    Hyperparameter 'theta2' hyperid = '104201'
        name = 'dof'
        short.name = 'df'
        initial = '4'
        fixed = 'TRUE'
        prior = 'normal'
        param = '0 1'
        to.theta = 'function(x) x'
        from.theta = 'function(x) x'
    Properties: doc = 'fmri distribution (special nc-chi)'
        status = 'experimental'
        survival = 'TRUE'
        discrete = 'FALSE'
        link = 'default log'
        pdf = 'fmri'
Model 'gompertz'. Number of hyperparameters are 1.
    Hyperparameter 'theta' hyperid = '105101'
        name = 'shape'
        short.name = 'alpha'
        initial = '-20'
        fixed = 'FALSE'
        prior = 'normal'
        param = '-20 0.01'
        to.theta = 'function(x,sc = 0.1) log(x) / sc'
        from.theta = 'function(x,sc = 0.1) exp(sc * x)'

```

**Properties:** `doc = 'gompertz distribution'`

`status = 'experimental'`

`survival = 'FALSE'`

`discrete = 'FALSE'`

`link = 'default log neglog'`

`pdf = 'gompertz'`

**Model 'gompertzsurv'.** Number of hyperparameters are 1.

**Hyperparameter 'theta' hyperid = '106101'**

`name = 'shape'`

`short.name = 'alpha'`

`initial = '-20'`

`fixed = 'FALSE'`

`prior = 'normal'`

`param = '-20 0.01'`

`to.theta = 'function(x,sc = 0.1) log(x) / sc'`

`from.theta = 'function(x,sc = 0.1) exp(sc * x)'`

**Properties:** `doc = 'gompertz distribution'`

`status = 'experimental'`

`survival = 'TRUE'`

`discrete = 'FALSE'`

`link = 'default log neglog'`

`pdf = 'gompertz'`

**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 'linksnintercept'.** 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 'gamma'.** 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.alphaw'.** Number of parameters in the prior = 1

**Model 'pc.ar'.** Number of parameters in the prior = 1

**Model 'dirichlet'.** 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.sn’.** Number of parameters in the prior = 1  
**Model ‘pc.gamma’.** Number of parameters in the prior = 1  
**Model ‘pc.mgamma’.** Number of parameters in the prior = 1  
**Model ‘pc.gammacount’.** Number of parameters in the prior = 1  
**Model ‘pc.gevtail’.** Number of parameters in the prior = 3  
**Model ‘pc’.** Number of parameters in the prior = 2  
**Model ‘ref.ar’.** Number of parameters in the prior = 0  
**Model ‘pom’.** Number of parameters in the prior = 0  
**Model ‘jeffreystdf’.** Number of parameters in the prior = 0  
**Model ‘wishartkd’.** Number of parameters in the prior = 56  
**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:** `doc = ‘(experimental)’`

`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.nmix.lambda.fitted

*Estimate posterior distributions of fitted lambda values*

---

## Description

For use with 'nmix' and 'nmixnb' models. This function takes the information contained in an object returned by `inla()` and uses the contents to create fitted lambda values using the linear predictor for `log(lambda)`, the input covariate values, and samples from the posteriors of the model hyperparameters. Fitted values from the linear predictor are exponentiated, by default, before being returned.

## Usage

```
inla.nmix.lambda.fitted(result, sample.size = 1000,
                        return.posteriors = FALSE, scale = "exp")
```

## Arguments

- |                               |  |
|-------------------------------|--|
| <code>result</code>           | The output object from a call to <code>inla()</code> , where the family argument has been set to 'nmix' or 'nmixnb'. For the function to work, the call to <code>inla()</code> should also include the argument <code>control.compute=list(config = TRUE)</code> . |
| <code>sample.size</code>      | The size of the sample from the posteriors of the model hyperparameters. This sample size ends up being the size of the estimated posterior for a fitted lambda value. Default is 1000. Larger values are recommended.   |
| <code>return.posterior</code> | A logical value for whether or not to return the full estimated posteriors for each fitted value (TRUE), or just a summary of the posteriors (FALSE). Default is FALSE.  |
| <code>scale</code>            | A character string, where the default string, "exp", causes values from the linear predictor to be exponentiated before being returned. The string, "log", causes values to be returned on the <code>log(lambda)</code> scale.                                     |

**Value**

`fitted.summary` A data frame with summaries of estimated posteriors of fitted lambda values. The number of rows equals the number of rows in the data used to create the 'nmix' or 'nmixnb' model. There are six columns of summary statistics for each estimated posterior. Columns include an index, `mean.lambda`, `sd.lambda`, `quant025.lambda`, `median.lambda`, `quant975.lambda`, and `mode.lambda`.

`fitted.posterior`s A data frame containing samples that comprise the full estimated posteriors of fitted values. The number of rows equals the number of rows in the data used to create the 'nmix' or 'nmixnb' model. The number of columns equals one plus the number of samples specified by the `sample.size` argument.

**Note**

This function is experimental.

**Author(s)**

Tim Meehan <tmeehan@audubon.org>

**References**

See documentation for families "nmix" and "nmixnb": `inla.doc("nmix")`

**Examples**

```
## an example analysis of an N-mixture model using simulated data
## set parameters
n <- 75                                # number of study sites
nrep.max <- 5                          # number of surveys per site
b0 <- 0.5                              # lambda intercept, expected abundance
b1 <- 2.0                              # effect of x1 on lambda
a0 <- 1.0                              # p intercept, detection probability
a2 <- 0.5                              # effect of x2 on p
size <- 3.0                            # size of theta
overdispersion <- 1 / size             # for negative binomial distribution

## make empty vectors and matrix
x1 <- c(); x2 <- c()
lambdas <- c(); Ns <- c()
y <- matrix(NA, n, nrep.max)

## fill vectors and matrix
for(i in 1:n) {
  x1.i <- runif(1) - 0.5
  lambda <- exp(b0 + b1 * x1.i)
  N <- rnbinom(1, mu = lambda, size = size)
  x2.i <- runif(1) - 0.5
  eta <- a0 + a2 * x2.i
  p <- exp(eta) / (exp(eta) + 1)
  nr <- sample(1:nrep.max, 1)
  y[i, 1:nr] <- rbinom(nr, size = N, prob = p)
  x1 <- c(x1, x1.i); x2 <- c(x2, x2.i)
  lambdas <- c(lambdas, lambda); Ns <- c(Ns, N)
}
```

```
## bundle counts, lambda intercept, and lambda covariates
Y <- inla.mdata(y, 1, x1)

## run inla and summarize output
result <- inla(Y ~ 1 + x2,
  data = list(Y=Y, x2=x2),
  family = "nmixnb",
  control.fixed = list(mean = 0, mean.intercept = 0, prec = 0.01,
    prec.intercept = 0.01),
  control.family = list(hyper = list(theta1 = list(param = c(0, 0.01)),
    theta2 = list(param = c(0, 0.01)),
    theta3 = list(prior = "flat",
      param = numeric()))),
  control.compute=list(config = TRUE)) # important argument
summary(result)

## get and evaluate fitted values
lam.fits <- inla.nmix.lambda.fitted(result, 5000)$fitted.summary
plot(lam.fits$median.lambda, lambdas)
round(sum(lam.fits$median.lambda, 0); sum(Ns))
```

---

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 SpatialPoints or SpatialPointsDataFrame 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 concave=convex.  |
| 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 <a href="#">inla.simplify.curve()</a> 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 | <i>Set and get global options for INLA</i> |
|-------------|--|

---

**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 | <p>The option to get. If option = NULL then inla.getOption then inla.getOption will return a named list of current values, otherwise, option must be one of</p> <p>inla.call: The path to the inla-program.</p> <p>inla.arg: Additional arguments to inla.call</p> <p>fmesh.call: The path to the fmesher-program</p> <p>fmesh.arg: Additional arguments to fmesher.call</p> <p>num.threads: Character string with the number of threads to use as A:B</p> <p>blas.num.threads: Number of threads to use for openblas and mklblas (see inla for details)</p> <p>smtp: Sparse matrix library to use, one of band, taucs (default) or pardiso</p> <p>mkl: Use binaries buildt with Intel MKL? (If possible)</p> <p>vecLib: This option applies to Mac only. If TRUE and mkl=FALSE, link with vecLib BLAS and LAPACK libs (if available)</p> <p>vecLibPath: This option applies to Mac only. Path to vecLib-libraries. If empty, use default.</p> <p>pardiso.license: The full path to the PARDISO license file</p> <p>keep: Keep temporary files?</p> <p>working.directory: The name of the working directory.</p> <p>silent: Run the inla-program in a silent mode?</p> <p>debug : Run the inla-program in a debug mode?</p> <p>cygwin : The home of the Cygwin installation (default "C:/cygwin") [Remote computing for Windows only]</p> <p>ssh.auth.sock: The ssh bind-adress (value of \$SSH_AUTH_SOCK int the Cygwin-shell). [Remote computing for Windows only]</p> <p>show.warning.graph.file : Give a warning for using the obsolete argument graph.file instead of graph</p> <p>scale.model.default : The default value of argument scale.model which optionally scale intrinsic models to have generalized unit average variance</p> <p>short.summary : Use a less verbose output for summary. Useful for Markdown documents.</p> <p>inla.timeout : The timeout limit, in whole seconds, for calls to the inla binary. Default is 0, meaning no timeout limit. Set to a positive integer to terminate</p> |

inla calls if they run to long. Fractional seconds are rounded up to the nearest integer. This feature is EXPERIMENTAL and might change at a later stage.

fmesher.timeout : The timeout limit, in whole seconds, for calls to the fmesher binary. Default is 0, meaning no timeout limit. Set to a positive integer to terminate fmesher calls that may enter infinite loops due to special geometry regularity. Fractional seconds are rounded up to the nearest integer.

inla.mode : Which mode to use in INLA? Default is "classic". Other options are (USE AT YOUR OWN RISK, THIS IS WORK IN PROGRESS!!!) options are "twostage" and "experimental".

### Author(s)

Havard Rue <hrue@r-inla.org>

### Examples

```
## set number of threads
inla.setOption("num.threads", "4:1")
## alternative format
inla.setOption(num.threads="4:1")
## check it
inla.getOption("num.threads")
```

---

|                   |  |
|-------------------|--|
| inla.over_sp_mesh | <i>Check which mesh triangles are inside a polygon</i> |
|-------------------|--|

---

### Description

Wrapper for the `sp::over()` method to find triangle centroids or vertices inside sp polygon objects

### Usage

```
inla.over_sp_mesh(x, y, type = c("centroid", "vertex"), ignore.CRS = FALSE)
```

### Arguments

|            |  |
|------------|--|
| x          | geometry (typically a <code>sp::SpatialPolygons()</code> object) for the queries                     |
| y          | an <code>inla.mesh()</code> object   |
| type       | the query type; either 'centroid' (default, for triangle centroids), or 'vertex' (for mesh vertices) |
| ignore.CRS | logical; whether to ignore the coordinate system information in x and y (default FALSE)              |

### Value

A vector of triangle indices (when type is 'centroid') or vertex indices (when type is 'vertex')

### Author(s)

Haakon Bakka, <bakka@r-inla.org>, and Finn Lindgren <finn.lindgren@gmail.com>

**Examples**

```
# Create a polygon and a mesh
obj <- sp::SpatialPolygons(list(Polygons(list(Polygon(rbind(
  c(0, 0),
  c(50, 0),
  c(50, 50),
  c(0, 50)
))),
ID = 1
)),
proj4string = inla.CRS("longlat_globe")
)
mesh <- inla.mesh.create(globe = 2, crs = inla.CRS("sphere"))

## 3 vertices found in the polygon
inla.over_sp_mesh(obj, mesh, type = "vertex")

## 3 triangles found in the polygon
inla.over_sp_mesh(obj, mesh)

## Multiple transformations can lead to slightly different results due to edge cases
## 4 triangles found in the polygon
inla.over_sp_mesh(obj, inla.spTransform(mesh, CRSobj = inla.CRS("mollweide_norm")), ignore.CRS = FALSE)

## Ignoring mismatching coordinate systems is rarely useful
## 20 triangles "found in" the polygon
inla.over_sp_mesh(obj, inla.spTransform(mesh, CRSobj = inla.CRS("mollweide_norm")), ignore.CRS = TRUE)
```

---

inla.pardiso

---

*PARDISO support in R-INLA*


---

**Description**

Describe and check the PARDISO support in R-INLA

**Usage**

```
inla.pardiso()
inla.pardiso.check()
```

**Details**

`inla.pardiso()` describes the PARDISO support in R-INLA, how to get the license key and enable it in the R-INLA package. `inla.pardiso.check()` check if the PARDISO support is working.

**Author(s)**

Havard Rue <hrue@r-inla.org>

---

|                  |                          |
|------------------|--------------------------|
| inla.priors.used | <i>Print priors used</i> |
|------------------|--------------------------|

---

**Description**

Print the priors used for the hyperparameters

**Usage**

```
inla.priors.used(result, digits=6L)
```

**Arguments**

|        |  |
|--------|--|
| result | An inla-object, typically the output from an inla()-call |
| digits | The digits argument to the function format()             |

**Details**

This function provides a more human-friendly output of `result$all.hyper` of all the priors used for the hyperparameters. Since not all information about the model is encoded in this object, more hyperparameters than actually used, may be printed. In particular, `group.theta1` is printed even though the argument `group` in `f()` is not used. Similarly for `spde`-models, but the user should know that, for example, only the two first ones are actually used. Hopefully, this issue will be fixed in the future.

**Author(s)**

Havard Rue <hrue@r-inla.org>

**Examples**

```
r = inla(y ~ 1 + x, data = data.frame(y = 1:10, x = rep(1:5, 2)))
inla.priors.used(r)
```

---

|            |                               |
|------------|-------------------------------|
| inla.prune | <i>Prune the INLA-package</i> |
|------------|-------------------------------|

---

**Description**

Prune the INLA-package by deleting binary files not supported by the running OS

**Usage**

```
inla.prune(ask = TRUE)
```

**Arguments**

|     |  |
|-----|--|
| ask | Logical. If TRUE, then ask for user confirmation before deleting. If FALSE, then delete without user confirmation. |
|-----|--|

**Value**

No value is returned.

**Author(s)**

Havard Rue <hrue@r-inla.org>

---

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**

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

**Examples**

```
inla.reorderings()
```

---

|            |                          |
|------------|--------------------------|
| inla.rerun | <i>Rerun an analysis</i> |
|------------|--------------------------|

---

**Description**

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

**Usage**

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

**Arguments**

|                     |   |
|---------------------|---|
| <code>object</code> | An inla-object, ie the output from an inla-call                                     |
| <code>plain</code>  | 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 <a href="#">inla.spde.make.A()</a> . |
| n.repl  | The maximum replicate index, in the sense used in <a href="#">inla.spde.make.A()</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, and functions thereof, from an approximated posterior of a fitted model</i> |
|-------------|--|

---

**Description**

This function generate samples, and functions of those, from an approximated posterior of a fitted model (an inla-object)

**Usage**

```
inla.posterior.sample(n = 1L, result, selection = list(),
                     intern = FALSE,
                     use.improved.mean = TRUE, skew.corr = TRUE,
                     add.names = TRUE, seed = 0L, num.threads = NULL,
                     parallel.configs = TRUE, verbose=FALSE)
inla.posterior.sample.eval(fun, samples, return.matrix = TRUE, ...)
```

**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> .   |
| selection | Select what part of the sample to return. By default, the whole sample is returned. selection is a named list with the name of the components of the sample, and what indices of them to return. Names include APredictor, Predictor, (Intercept), and otherwise names in the formula. The values of the list, is interpreted as indices. If they are negative, they are interpreted as 'not', a zero is interpreted as 'all', and positive indices are interpreted as 'only'. The names of elements of each samples refer to the indices in the full sample. |



|                                |  |
|--------------------------------|--|
| <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>use.improved.mean</code> | Logical. If TRUE then use the marginal mean values when constructing samples. If FALSE then use the mean in the Gaussian approximations.   |
| <code>skew.corr</code>         | Logical. If TRUE then correct samples for skewness, if FALSE, do not correct samples for skewness (ie use the Gaussian).   |
| <code>add.names</code>         | Logical. If TRUE then add name for each elements of each sample. If FALSE, only add name for the first sample. (This save space.)  |
| <code>seed</code>              | See the same argument in <code>?inla.qsample</code> for further information. In order to produce reproducible results, you ALSO need to make sure the RNG in R is in the same state, see example below. When seed is non-zero, <code>num.threads</code> is forced to "1:1" and <code>parallel.configs</code> is set to FALSE, since parallel sampling would not produce a reproducible sequence of pseudo-random numbers.  |
| <code>num.threads</code>       | The number of threads to use in the format 'A:B' defining the number threads in the outer (A) and inner (B) layer for nested parallelism. A '0' will be replaced intelligently. <code>seed!=0</code> requires serial computations.   |
| <code>parallel.configs</code>  | Logical. If TRUE and not on Windows, then try to run each configuration in parallel (not Windows) using A threads (see <code>num.threads</code> ), where each of them is using B:0 threads.  |
| <code>verbose</code>           | Logical. Run in verbose mode or not.   |
| <code>fun</code>               | The function to evaluate for each sample. Upon entry, the variable names defined in the model are defined as the value of the sample. The list of names are defined in <code>result\$misc\$configs\$contents</code> where <code>result</code> is an <code>inla</code> -object. This includes predefined names for the linear predictor ( <code>Predictor</code> and <code>APredictor</code> ), and the intercept ( <code>(Intercept)</code> or <code>Intercept</code> ). The hyperparameters are defined as <code>theta</code> , no matter if they are in the internal scale or not. The function <code>fun</code> can also return a vector. To simplify usage, <code>fun</code> can also be a vector character's. In this case <code>fun</code> it is interpreted as (strict) variable names, and a function is created that return these variables: if argument <code>fun</code> equals <code>c("Intercept", "a[1:2]")</code> , then this is equivalent to <code>pass function() return(c(get('Intercept'), get('a[1:2]')))</code> . |
| <code>samples</code>           | <code>samples</code> is the output from <code>inla.posterior.sample()</code>   |
| <code>return.matrix</code>     | Logical. If TRUE, then return the samples of <code>fun</code> as matrix, otherwise, as a list.   |
| <code>...</code>               | Additional arguments to <code>fun</code>   |

## Details

The hyperparameters are sampled from the configurations used to do the numerical integration, hence if you want a higher resolution, you need to change the `int.stratey` variable and friends. The latent field is sampled from the Gaussian approximation conditioned on the hyperparameters, but with a correction for the mean (default), and optional (and by default) corrected for the estimated skewness.

The `log.density` report is only correct when there is no constraints. With constraints, it correct the Gaussian part of the sample for the constraints.

After the sample is (optional) skewness corrected, the `log.density` is not exact for correcting for constraints, but the error is very small in most cases.

**Value**

`inla.posterior.sample` returns 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`. `inla.posterior.sample.eval` return a list or a matrix of fun applied to each sample.

**Author(s)**

Havard Rue <hrue@r-inla.org> and Cristian Chiuchiole <cristian.chiuchiole@kaust.edu.sa>

**Examples**

```
r = inla(y ~ 1 ,data = data.frame(y=rnorm(1)), control.compute = list(config=TRUE))
samples = inla.posterior.sample(2,r)

## reproducible results:
inla.seed = as.integer(runif(1)*.Machine$integer.max)
set.seed(12345)
x = inla.posterior.sample(10, r, seed = inla.seed, num.threads="1:1")
set.seed(12345)
xx = inla.posterior.sample(10, r, seed = inla.seed, num.threads="1.1")
all.equal(x, xx)

set.seed(1234)
n = 25
xx = rnorm(n)
yy = rev(xx)
z = runif(n)
y = rnorm(n)
r = inla(y ~ 1 + z + f(xx) + f(yy, copy="xx"),
        data = data.frame(y, z, xx, yy),
        control.compute = list(config=TRUE),
        family = "gaussian")
r.samples = inla.posterior.sample(10, r)

fun = function(...) {
  mean(xx) - mean(yy)
}
f1 = inla.posterior.sample.eval(fun, r.samples)

fun = function(...) {
  c(exp(Intercept), exp(Intercept + z))
}
f2 = inla.posterior.sample.eval(fun, r.samples)

fun = function(...) {
  return (theta[1]/(theta[1] + theta[2]))
}
f3 = inla.posterior.sample.eval(fun, r.samples)

## Predicting nz new observations, and
## comparing the estimated one with the true one
set.seed(1234)
n = 100
alpha = beta = s = 1
z = rnorm(n)
```

```

y = alpha + beta * z + rnorm(n, sd = s)
r = inla(y ~ 1 + z,
        data = data.frame(y, z),
        control.compute = list(config=TRUE),
        family = "gaussian")
r.samples = inla.posterior.sample(10^3, r)

## just return samples of the intercept
intercepts = inla.posterior.sample.eval("Intercept", r.samples)

nz = 3
znew = rnorm(nz)
fun = function(zz = NA) {
  ## theta[1] is the precision
  return (Intercept + z * zz +
          rnorm(length(zz), sd = sqrt(1/theta[1])))
}
par(mfrow=c(1, nz))
f1 = inla.posterior.sample.eval(fun, r.samples, zz = znew)
for(i in 1:nz) {
  hist(f1[i, ], n = 100, prob = TRUE)
  m = alpha + beta * znew[i]
  xx = seq(m-4*s, m+4*s, by = s/100)
  lines(xx, dnorm(xx, mean=m, sd = s), lwd=2)
}

##
## Be aware that using non-clean variable names might be a little tricky
##
n <- 100
X <- matrix(rnorm(n^2), n, 2)
x <- X[, 1]
xx <- X[, 2]
xxx <- x*xx

y <- 1 + 2*x + 3*xx + 4*xxx + rnorm(n, sd = 0.01)

r <- inla(y ~ X[, 1]*X[, 2],
        data = list(y = y, X = X),
        control.compute = list(config = TRUE))
print(round(dig = 4, r$summary.fixed[, "mean"]))

sam <- inla.posterior.sample(100, r)
sam.extract <- inla.posterior.sample.eval(
  (function(...) {
    beta.1 <- get("X[, 1]")
    beta.2 <- get("X[, 2]")
    beta.12 <- get("X[, 1]:X[, 2]")
    return(c(Intercept, beta.1, beta.2, beta.12))
  }), sam)
print(round(dig = 4, rowMeans(sam.extract)))

## a simpler form can also be used here, and in the examples below
sam.extract <- inla.posterior.sample.eval(
  c("Intercept", "X[, 1]", "X[, 2]", "X[, 1]:X[, 2]"), sam)
print(round(dig = 4, rowMeans(sam.extract)))

```

```

r <- inla(y ~ x + xx + xxx,
        data = list(y = y, x = x, xx = xx, xxx = xxx),
        control.compute = list(config = TRUE))

sam <- inla.posterior.sample(100, r)
sam.extract <- inla.posterior.sample.eval(
  (function(...) {
    return(c(Intercept, x, xx, xxx))
  }), sam)
print(round(dig = 4, rowMeans(sam.extract)))

sam.extract <- inla.posterior.sample.eval(c("Intercept", "x", "xx", "xxx"), sam)
print(round(dig = 4, rowMeans(sam.extract)))

r <- inla(y ~ x*xx,
        data = list(y = y, x = x, xx = xx),
        control.compute = list(config = TRUE))

sam <- inla.posterior.sample(100, r)
sam.extract <- inla.posterior.sample.eval(
  (function(...) {
    return(c(Intercept, x, xx, get("x:xx")))
  }), sam)
print(round(dig = 4, rowMeans(sam.extract)))

sam.extract <- inla.posterior.sample.eval(c("Intercept", "x", "xx", "x:xx"), sam)
print(round(dig = 4, rowMeans(sam.extract)))

```

---

|                     |  |
|---------------------|--|
| 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

---

*Observation/prediction matrices for mesh models.*


---

**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 <a href="#">inla.mesh()</a> or <a href="#">inla.mesh.1d()</a> object specifying a function basis on a mesh domain. Alternatively, an <code>inla.spde</code> object that includes a mesh (e.g. from <a href="#">inla.spde2.matern()</a> ).  |
| loc   | Observation/prediction coordinates. <code>mesh</code> and <code>loc</code> defines a matrix <code>A.loc</code> of mapping weights between basis function weights and field values. If <code>loc</code> is <code>NULL</code> , <code>A.loc</code> is defined as <code>Diagonal(n.spde, 1)</code> . |
| index | For each observation/prediction value, an index into <code>loc</code> . Default is <code>seq_len(nrow(A.loc))</code> .  |

|               |   |
|---------------|---|
| 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 <a href="#">inla.mesh.1d()</a> 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 <a href="#">inla.spde.make.block.A()</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 <a href="#">inla.spde.make.block.A()</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"><li>• 'none': Straight sum, no rescaling.</li><li>• 'count': Divide by the number of entries in the block.</li><li>• 'weights': Divide by the sum of the weight values within each block.</li><li>• 'sum': Divide by the resulting row sums.</li></ul> |

## 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 | <i>Precision matrices for SPDE models Calculates the precision matrix for given parameter values based on an inla.spde model object.</i> |
|---------------------|--|

---

## Description

Precision matrices for SPDE models

Calculates the precision matrix for given parameter values based on an inla.spde model object.

## Usage

```

inla.spde.precision(...)

inla.spde1.precision(spde, ...)

## S3 method for class 'inla.spde1'
inla.spde.precision(spde, ...)

inla.spde2.precision(
  spde,
  theta = NULL,
  phi0 = inla.spde2.theta2phi0(spde, theta),
  phi1 = inla.spde2.theta2phi1(spde, theta),
  phi2 = inla.spde2.theta2phi2(spde, theta),
  ...
)

## 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),
  ...
)

```

**Arguments**

|       |   |
|-------|---|
| ...   | Additional parameters passed on to other methods.           |
| spde  | An inla.spde object.  |
| theta | The parameter vector.                                       |
| phi0  | Internal parameter for a generic model. Expert option only. |
| phi1  | Internal parameter for a generic model. Expert option only. |
| phi2  | Internal parameter for a generic model. Expert option only. |

**Value**

A sparse precision matrix.

**Author(s)**

Finn Lindgren <finn.lindgren@gmail.com>

**See Also**

[inla.spde.models\(\)](#), [inla.spde2.generic\(\)](#), [inla.spde2.theta2phi0\(\)](#), [inla.spde2.theta2phi1\(\)](#), [inla.spde2.theta2phi2\(\)](#)

---

|                  |  |
|------------------|--|
| inla.spde.result | <i>SPDE result extraction from INLA estimation results</i> |
|------------------|--|

---

**Description**

Extract field and parameter values and distributions for an inla.spde SPDE effect from an inla result object.

**Usage**

```
inla.spde.result(...)

inla.spde1.result(inla, name, spde, do.transform = TRUE, ...)

## S3 method for class 'inla.spde1'
inla.spde.result(inla, name, spde, do.transform = TRUE, ...)

inla.spde2.result(inla, name, spde, do.transform = TRUE, ...)

## S3 method for class 'inla.spde2'
inla.spde.result(inla, name, spde, do.transform = TRUE, ...)
```

**Arguments**

|                           |  |
|---------------------------|--|
| <code>...</code>          | Further arguments passed to and from other methods.  |
| <code>inla</code>         | An <code>inla</code> object obtained from a call to <code>inla()</code>  |
| <code>name</code>         | A character string with the name of the SPDE effect in the <code>inla</code> formula.  |
| <code>spde</code>         | The <code>inla.spde</code> object used for the effect in the <code>inla</code> formula. (Note: this could have been stored in the <code>inla</code> output, but isn't.) Usually the result of a call to <code>inla.spde2.matern()</code> . |
| <code>do.transform</code> | If TRUE, also calculate marginals transformed to user-scale. Setting to FALSE is useful for large non-stationary models, as transforming many marginal densities is time-consuming.  |

**Value**

For `inla.spde2` models, a list, where the nominal range and variance are defined as the values that would have been obtained with a stationary model and no boundary effects:

|   |  |
|---|--|
| <code>marginals.kappa</code>                | Marginal densities for kappa   |
| <code>marginals.log.kappa</code>            | Marginal densities for log(kappa)                                      |
| <code>marginals.log.range.nominal</code>    | Marginal densities for log(range)                                      |
| <code>marginals.log.tau</code>              | Marginal densities for log(tau)  |
| <code>marginals.log.variance.nominal</code> | Marginal densities for log(variance)                                   |
| <code>marginals.range.nominal</code>        | Marginal densities for range   |
| <code>marginals.tau</code>                  | Marginal densities for tau   |
| <code>marginals.theta</code>                | Marginal densities for the theta parameters                            |
| <code>marginals.values</code>               | Marginal densities for the field values                                |
| <code>marginals.variance.nominal</code>     | Marginal densities for variance  |
| <code>summary.hyperpar</code>               | The SPDE related part of the <code>inla.hyperpar</code> output summary |
| <code>summary.log.kappa</code>              | Summary statistics for log(kappa)                                      |
| <code>summary.log.range.nominal</code>      | Summary statistics for log(range)                                      |
| <code>summary.log.tau</code>                | Summary statistics for log(tau)  |
| <code>summary.log.variance.nominal</code>   | Summary statistics for log(kappa)                                      |
| <code>summary.theta</code>                  | Summary statistics for the theta parameters                            |
| <code>summary.values</code>                 | 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$n, n.repl = 2)
spatial.A <- inla.spde.make.A(mesh, loc,
  index = rep(1:nrow(loc), 2),
  repl = rep(1:2, each = nrow(loc))
)
## Toy example with no spatial correlation (range=zero)
y <- 10 + rnorm(100 * 2)
stack <- inla.stack(
  data = list(y = y),
  A = list(spatial.A),
  effects = list(c(index, list(intercept = 1))),
  tag = "tag"
)
data <- inla.stack.data(stack, spde = spde)
formula <- y ~ -1 + intercept + f(spatial,
  model = spde,
  replicate = spatial.repl
)
result <- inla(formula,
  family = "gaussian", data = data,
  control.predictor = list(A = inla.stack.A(stack))
)
spde.result <- inla.spde.result(result, "spatial", spde)
plot(spde.result$marginals.range.nominal[[1]], type = "l")
```

---

inla.spde.sample

---

*Sample from SPDE models*


---

**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**

|           |   |
|-----------|---|
| ...       | Parameters passed on to other methods.    |
| precision | A precision matrix.                       |
| seed      | The seed for the pseudo-random generator. |
| spde      | An inla.spde object.                      |

**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**

```
inla.spde1.create(
  mesh,
  model = c("matern", "imatern", "matern.osc"),
  param = NULL,
  ...
)

inla.spde1.matern(mesh, ...)

inla.spde1.imatern(mesh, ...)

inla.spde1.matern.osc(mesh, ...)
```

**Arguments**

|       |   |
|-------|---|
| mesh  | The mesh to build the model on, as an <a href="#">inla.mesh()</a> 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.spde1.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))),
  ...
)

```

## Arguments

|    |  |
|----|--|
| M0 | The symmetric M0 matrix.               |
| M1 | The square M1 matrix.                  |
| M2 | The symmetric M2 matrix.               |
| B0 | Basis definition matrix for $\phi_0$ . |



|               |  |
|---------------|--|
| B1            | Basis definition matrix for $\phi_2$ .   |
| B2            | Basis definition matrix for $\phi_2$ .   |
| theta.mu      | Prior expectation for the $\theta$ vector  |
| theta.Q       | Prior precision for the $\theta$ vector  |
| transform     | Transformation link for $\phi_2$ . Valid settings are "logit", "log", and "identity" |
| theta.initial | Initial value for the $\theta$ vector. Default theta.mu                              |
| fixed         | Logical vector. For every TRUE value, treat the corresponding theta value as known.  |
| theta.fixed   | Vector holding the values of fixed theta values. Default =theta.initial[fixed]       |
| BLC           | Basis definition matrix for linear combinations of theta.                            |
| ...           | Additional parameters, currently unused.   |
| spde          | An inla.sdpe2 object.  |
| theta         | parameter values to be mapped.   |

**Value**

For inla.spde2.generic, an [inla.spde2\(\)](#) object.

For inla.spde2.theta2phi0/1/2, a vector of  $\phi$  values.

**Author(s)**

Finn Lindgren <finn.lindgren@gmail.com>

**See Also**

[inla.spde2.models\(\)](#), [inla.spde2.matern\(\)](#)

---

|                   |  |
|-------------------|--|
| inla.spde2.matern | <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,
...
)

inla.spde2.theta2phi0(spde, theta)

inla.spde2.theta2phi1(spde, theta)

inla.spde2.theta2phi2(spde, theta)

```

### Arguments

|                        |  |
|------------------------|--|
| mesh                   | The mesh to build the model on, as an <code>inla.mesh()</code> or <code>inla.mesh.1d()</code> 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 $\tau$ .   |
| B.kappa                | Matrix with specification of log-linear model for $\kappa$ .   |
| 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, <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). |
| ...                    | 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  $\alpha$ , 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  $B_0^\tau$ ,  $B_k^\tau$ ,  $B_0^\kappa$ , and  $B_k^\kappa$  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.

## Functions

- `inla.spde2.theta2phi0`: Convert from theta vector to phi0 values in the internal `spde2` model representation
- `inla.spde2.theta2phi1`: Convert from theta vector to phi1 values in the internal `spde2` model representation
- `inla.spde2.theta2phi2`: Convert from theta vector to phi2 values in the internal `spde2` model representation

## 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 <code>inla.mesh()</code> 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 <code>inla.spde2.matern</code> 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 | <i>Matern SPDE model object with PC prior for INLA</i> |
|---------------------|--|

---

**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**

|                 |   |
|-----------------|---|
| mesh            | The mesh to build the model on, as an <a href="#">inla.mesh()</a> or <a href="#">inla.mesh.1d()</a> object. |
| alpha           | Fractional operator order, $0 < \alpha \leq 2$ supported, for $\nu = \alpha - d/2 > 0$ .                    |
| param           | Further model parameters. Not currently used.   |
| constr          | If TRUE, apply an integrate-to-zero constraint. Default FALSE.  |
| extraconstr.int | 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). |
| <code>prior.range</code>       | A length 2 vector, with ( <code>range0</code> , <code>Prange</code> ) specifying that $P(\rho < \rho_0) = p_\rho$ , where $\rho$ is the spatial range of the random field. If <code>Prange</code> is NA, then <code>range0</code> is used as a fixed range value.  |
| <code>prior.sigma</code>       | A length 2 vector, with ( <code>sigma0</code> , <code>Psigma</code> ) specifying that $P(\sigma > \sigma_0) = p_\sigma$ , where $\sigma$ is the marginal standard deviation of the field. If <code>Psigma</code> is NA, then <code>sigma0</code> is used as a fixed range value.   |

## Details

This method constructs a Matern SPDE model, with spatial range  $\rho$  and standard deviation parameter  $\sigma$ . 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  $\tau$  is proportional to  $1/\sigma$ .

Stationary models are supported for  $0 < \alpha \leq 2$ , with spectral approximation methods used for non-integer  $\alpha$ , 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,  $\rho$ , and the marginal standard deviation,  $\sigma$ , 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  $\lambda_\rho$  and  $\lambda_\sigma$  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 ( $\rho_0$  and  $p_\rho$ ) and the upper tail quantile and probability for the standard deviation ( $\sigma_0$  and  $p_\sigma$ ).

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))
```

---

|                  |   |
|------------------|---|
| inla.spTransform | <i>Wrapper method for sp::spTransform</i> |
|------------------|---|

---

## 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 'SpatialPointsDataFrame'
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>...</code>  | Potential additional arguments  |
| <code>crs0</code> | The source <code>sp::CRS</code> or <code>inla.CRS</code> object         |

|             |   |
|-------------|---|
| crs1        | The target <code>sp::CRS</code> or <code>inla.CRS</code> object   |
| passthrough | default <code>FALSE</code> . Setting to <code>TRUE</code> allows objects with no CRS information to be passed through without transformation. |
| CRSobj      | The target <code>sp::CRS</code> or <code>inla.CRS</code> object   |

### Details

`inla.spTransform.default` Low level transformation of raw coordinates.

### Value

The object is returned with its coordinates transformed

### Author(s)

Finn Lindgren [finn.lindgren@gmail.com](mailto: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)
}
```

---

|                              |                                |
|------------------------------|--------------------------------|
| <code>inla.sp_get_crs</code> | <i>Extract CRS information</i> |
|------------------------------|--------------------------------|

---

### Description

Wrapper for `CRS(proj4args)` (PROJ4) and `CRS(wkt)` for `sp::Spatial` objects.

This function is a convenience method to workaround PROJ4/PROJ6 differences, and the lack of a crs extraction method for `Spatial` objects.

### Usage

```
inla.sp_get_crs(x)
```

### Arguments

`x` A `sp::Spatial` object

**Value**

A CRS object, or NULL if no valid CRS identified

**Author(s)**

Finn Lindgren <finn.lindgren@gmail.com>

**Examples**

```
## Not run:
if (interactive()) {
  s <- sp::SpatialPoints(matrix(1:6, 3, 2), proj4string = inla.CRS("sphere"))
  inla.sp_get_crs(s)
}

## End(Not run)
```

---

|                  |                               |
|------------------|-------------------------------|
| 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@r-inla.org>

**Examples**

```
##See the FAQ entry on this issue on r-inla.org.
```

---

inla.stack.remove.unused

*Data stacking for advanced INLA models*


---

## Description

Functions for combining data, effects and observation matrices into `inla.stack` objects, and extracting information from such objects.

## Usage

```
inla.stack.remove.unused(stack)

inla.stack.compress(stack, remove.unused = TRUE)

inla.stack(..., compress = TRUE, remove.unused = TRUE)

inla.stack.sum(
  data,
  A,
  effects,
  tag = "",
  compress = TRUE,
  remove.unused = TRUE
)

inla.stack.join(..., compress = TRUE, remove.unused = TRUE)

inla.stack.index(stack, tag)

inla.stack.LHS(stack)

inla.stack.RHS(stack)

inla.stack.data(stack, ...)

inla.stack.A(stack)
```

## Arguments

|                            |   |
|----------------------------|---|
| <code>stack</code>         | A <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>remove.unused</code> | If <code>TRUE</code> , compress the model by removing rows of effects corresponding to all-zero columns in the A matrix (and removing those columns).   |
| <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. |
| <code>compress</code>      | If <code>TRUE</code> , compress the model by removing duplicated rows of effects, replacing the corresponding A-matrix columns with a single column containing the sum.   |

|         |  |
|---------|--|
| data    | A list or codedata.frame of named data vectors. Scalars are expanded to match the number of rows in the A matrices, or any non-scalar data vectors. An error is given if the input is inconsistent.  |
| A       | A list of observation matrices. Scalars are expanded to diagonal matrices matching the effect vector lengths. An error is given if the input is inconsistent or ambiguous.   |
| effects | A collection of effects/predictors. Each list element corresponds to an observation matrix, and must either be a single vector, a list of vectors, or a data.frame. Single-element effect vectors are expanded to vectors matching the number of columns in the corresponding A matrix. An error is given if the input is inconsistent or ambiguous. |
| tag     | A string specifying a tag for later identification.  |

### Details

For models with a single effects collection, the outer list container for A and effects may be omitted.

Component size definitions:

- $n_l$  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

$$\tilde{A} = \text{cbind}(A^1, \dots, A^{n_l})$$

and

$$\tilde{x}^k = \text{rbind}(x^{k,1}, \dots, x^{k,n_l})$$

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  $i = 1, \dots, n_i$

**Functions**

- `inla.stack.remove.unused`: Remove unused entries from an existing stack
- `inla.stack.compress`: Compress an existing stack by removing duplicates
- `inla.stack.sum`: Create data stack as a sum of predictors
- `inla.stack.join`: Join two or more data stacks
- `inla.stack.index`: Extract tagged indices
- `inla.stack.LHS`: Extract data associated with the "left hand side" of the model (e.g. the data itself, `Ntrials`, `link`, `E`)
- `inla.stack.RHS`: Extract data associated with the "right hand side" of the model (all the covariates/predictors)
- `inla.stack.data`: Extract data for an `inla` call, and optionally join with other variables
- `inla.stack.A`: Extract the "A matrix" for `control.predictor`

**Functions**

- `inla.stack.remove.unused`: Remove unused entries from an existing stack
- `inla.stack.compress`: Compress an existing stack by removing duplicates
- `inla.stack`: Shorthand for `inla.stack.join` and `inla.stack.sum`
- `inla.stack.sum`: Create data stack as a sum of predictors
- `inla.stack.join`: Join two or more data stacks
- `inla.stack.index`: Extract tagged indices
- `inla.stack.LHS`: Extract data associated with the "left hand side" of the model (e.g. the data itself, `Ntrials`, `link`, `E`)
- `inla.stack.RHS`: Extract data associated with the "right hand side" of the model (all the covariates/predictors)
- `inla.stack.data`: Extract data for an `inla` call, and optionally join with other variables
- `inla.stack.A`: Extract the "A matrix" for `control.predictor`

**See Also**

[`inla.spde.make.A\(\)`](#), [`inla.spde.make.index\(\)`](#)

**Examples**

```
n <- 200
loc <- matrix(runif(n * 2), n, 2)
mesh <- inla.mesh.2d(
  loc.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.pcmatern(mesh,
  prior.range = c(0.01, 0.01),
  prior.sigma = c(10, 0.01)
)

covar <- rnorm(n)
field <- inla.qsample(n = 1, Q = inla.spde.precision(spde, theta = log(c(0.5, 1))))[, 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$loc)
stack.obs <-
  inla.stack(
    data = list(y = y),
    A = list(A.obs, 1),
    effects = list(c(
      list(Intercept = 1),
      inla.spde.make.index("spatial", spde$n.spde)
    ),
    covar = covar
  ),
  tag = "obs"
)
stack.pred <-
  inla.stack(
    data = list(y = NA),
    A = list(A.pred),
    effects = list(c(
      list(Intercept = 1),
      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
  )
)

plot(y, result1$summary.fitted.values[inla.stack.index(stack.obs, "obs")$data, "mean"],
  main = "Observations vs posterior predicted values at the data locations"
)

result2 <- inla(formula,
  data = inla.stack.data(stack, spde = spde),
  family = "gaussian",
  control.predictor = list(
    A = inla.stack.A(stack),
    compute = TRUE
  )
)

field.pred <- inla.mesh.project(
  proj.pred,
  result2$summary.fitted.values[inla.stack.index(stack, "pred")$data, "mean"]
)
field.pred.sd <- inla.mesh.project(
  proj.pred,

```

```

    result2$summary.fitted.values[inla.stack.index(stack, "pred")$data, "sd"]
  )

  plot(field, field.pred, main = "True vs predicted field")
  abline(0, 1)
  image(inla.mesh.project(mesh,
    field = field,
    dims = c(200, 200)
  ),
  main = "True field"
  )
  image(inla.mesh.project(mesh,
    field = field.pred,
    dims = c(200, 200)
  ),
  main = "Posterior field mean"
  )
  image(inla.mesh.project(mesh,
    field = field.pred.sd,
    dims = c(200, 200)
  ),
  main = "Prediction standard deviation"
  )
  plot(field, (field.pred - field) / 1,
    main = "True field vs standardised prediction residuals"
  )

```

---

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.

## Usage

```

inla.surv(time, event, time2, truncation, subject = NULL, .special = NULL)
## S3 method for class 'inla.surv'
plot(x, y, ...)
## S3 method for class 'inla.surv'
print(x, ...)
is.inla.surv(object)
as.inla.surv(object, ...)

```

## Arguments

|       |  |
|-------|--|
| time  | For right censored data, this is the follow up time. For interval data, this is the starting time for the interval. For in-interval event, this is the observed time (in the interval) for the event. For left censored data, this the censoring time. |
| event | The status indicator, 1=observed event, 0=right censored event, 2=left censored event, 3=interval censored event, and 4=observed event in an interval (left, right).   |
| time2 | Ending time for the interval censored data or an in-interval event.  |





---

|              |                                 |
|--------------|---------------------------------|
| inla.upgrade | <i>Upgrade the INLA-package</i> |
|--------------|---------------------------------|

---

**Description**

Functions to upgrade the INLA-package to the current version.

**Usage**

```
inla.upgrade(lib = NULL, testing=FALSE, ask = TRUE)
inla.update(lib = NULL, testing=FALSE, ask = TRUE)
```

**Arguments**

|         |  |
|---------|--|
| lib     | Location to install the library.                           |
| testing | If TRUE, then look for a test-version if the INLA-package. |
| ask     | same argument as in update.packages                        |

**Value**

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.

**Author(s)**

Havard Rue <hrue@r-inla.org>

**See Also**

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", "date"))
```

**Arguments**

|      |                         |
|------|-------------------------|
| what | What to show version of |
|------|-------------------------|

**Value**

inla.version display the current version information using cat with default or info, or return other specific requests through the call.

**Author(s)**

Havard Rue <hrue@r-inla.org>

**Examples**

```
## Summary of all
inla.version()
## The building date
inla.version("date")
```

---

|                     |                         |
|---------------------|-------------------------|
| inla.wkt_is_geocent | <i>Handling CRS/WKT</i> |
|---------------------|-------------------------|

---

**Description**

Get and set CRS object or WKT string properties.

**Usage**

```
inla.wkt_is_geocent(wkt)

inla.crs_is_geocent(crs)

inla.wkt_get_ellipsoid_radius(wkt)

inla.crs_get_ellipsoid_radius(crs)

inla.wkt_set_ellipsoid_radius(wkt, radius)

inla.crs_set_ellipsoid_radius(crs, radius)

inla.wkt_unit_params()

inla.wkt_get_lengthunit(wkt)

inla.wkt_set_lengthunit(wkt, unit, params = NULL)

inla.crs_get_wkt(crs)

inla.crs_get_lengthunit(crs)

inla.crs_set_lengthunit(crs, unit, params = NULL)
```

**Arguments**

|      |   |
|------|---|
| wkt  | A WKT2 character string   |
| crs  | A <code>sp::CRS</code> or <code>inla.CRS</code> object  |
| unit | character, name of a unit. Supported names are "metre", "kilometre", and the aliases "meter", "m", "International metre", "kilometer", and "km", as defined by <code>inla.wkt_unit_params</code> or the <code>params</code> argument. (For legacy PROJ4 use, only "m" and "km" are supported) |

params            Length unit definitions, in the list format produced by `inla.wkt_unit_params()`,  
Default: NULL, which invokes `inla.wkt_unit_params()`

### Value

For `inla.wkt_unit_params`, a list of named unit definitions

For `inla.wkt_get_lengthunit`, a list of length units used in the wkt string, excluding the ellipsoid radius unit.

For `inla.wkt_set_lengthunit`, a WKT2 string with altered length units. Note that the length unit for the ellipsoid radius is unchanged.

For `inla.crs_get_wkt`, WKT2 string.

For `inla.crs_get_lengthunit`, a list of length units used in the wkt string, excluding the ellipsoid radius unit. (For legacy PROJ4 code, the raw units from the proj4string are returned, if present.)

For `inla.crs_set_lengthunit`, a `sp::CRS` object with altered length units. Note that the length unit for the ellipsoid radius is unchanged.

For `inla.wkt_unit_params`, a list of named unit definitions

For `inla.wkt_get_lengthunit`, a list of length units used in the wkt string, excluding the ellipsoid radius unit.

For `inla.wkt_set_lengthunit`, a WKT2 string with altered length units. Note that the length unit for the ellipsoid radius is unchanged.

For `inla.crs_get_wkt`, WKT2 string.

For `inla.crs_get_lengthunit`, a list of length units used in the wkt string, excluding the ellipsoid radius unit. (For legacy PROJ4 code, the raw units from the proj4string are returned, if present.)

For `inla.crs_set_lengthunit`, a `sp::CRS` object with altered length units. Note that the length unit for the ellipsoid radius is unchanged.

### Author(s)

Finn Lindgren <finn.lindgren@gmail.com>

Finn Lindgren <finn.lindgren@gmail.com>

### See Also

[inla.sp\\_get\\_crs\(\)](#)

[inla.sp\\_get\\_crs\(\)](#)

### Examples

```
## Not run:
if (inla.has_PROJ6()) {
  c1 <- inla.CRS("globe")
  inla.crs_get_lengthunit(c1)
  c2 <- inla.crs_set_lengthunit(c1, "km")
  inla.crs_get_lengthunit(c2)
}

## End(Not run)

## Not run:
if (inla.has_PROJ6()) {
```

```

c1 <- inla.CRS("globe")
inla.crs_get_lengthunit(c1)
c2 <- inla.crs_set_lengthunit(c1, "km")
inla.crs_get_lengthunit(c2)
}

## End(Not run)

```

joint.marginal

*Sample, transform and evaluate from a joint marginal approximation***Description**

Sample, transform and evaluate from from a joint marginal approximation as returned using argument selection in inla.

**Usage**

```

inla.rjmarginal(n, jmarginal, constr)
inla.rjmarginal.eval(fun, samples, ...)
inla.tjmarginal(jmarginal, A)
inla.1djmarginal(jmarginal)

```

**Arguments**

|           |  |
|-----------|--|
| n         | The number of samples  |
| jmarginal | A marginal object given either by a inla object or result\$selection   |
| constr    | Optional linear constraints; see ?INLA::f and argument extraconstr   |
| fun       | A function which is evaluated for each sample, similar to inla.posterior.sample.eval: please see the documentation for this functions for details. |
| samples   | The samples, as in the form of the output from inla.rjmarginal   |
| A         | A matrix used for the linear combination   |

**Value**

THESE FUNCTIONS ARE EXPERIMENTAL FOR THE MOMENT (JULY 2020)

inla.rjmarginal returns a list with the samples in samples (matrix) and the corresponding log-densities in log.density (vector). Each column in samples contains one sample.

inla.rjmarginal.eval returns a matrix, where each row is the (vector) function evaluated at each sample.

inla.tjmarginal returns a inla.jmarginal-object of the linear combination defined by the matrix A.

inla.1djmarginal return the marginal densities from a joint approximation.

**Author(s)**

Cristian Chiuchiole and Havard Rue <hrue@r-inla.org>

**See Also**[inla](#)**Examples**

```

n = 10
x = 1+rnorm(n)
xx = 3 + rnorm(n)
y = 1 + x + xx + rnorm(n)
selection = list(xx=1, Predictor = 3:4, x=1)
r = inla(y ~ 1 + x + xx,
        data = data.frame(y, x, xx),
        selection = selection)
ns = 100
xx = inla.rjmarginal(ns, r)

print(cbind(mean = r$selection$mean, sample.mean = rowMeans(xx$samples)))
print("cov matrix")
print(round(r$selection$cov.matrix, dig=3))
print("sample cov matrix")
print(round(cov(t(xx$samples)), dig=3))

skew = function(z) mean((z-mean(z))^3)/var(z)^1.5
print(round(cbind(skew = r$selection$skewness,
                 sample.skew = apply(xx$sample, 1, skew)), dig=3))

## illustrating the eval function
n = 10
x = rnorm(n)
eta = 1 + x
y = eta + rnorm(n, sd=0.1)
selection = list(x = 1, Predictor = c(1, 2, 4, 5), '(Intercept)' = 1)
r = inla(y ~ 1 + x,
        data = data.frame(y, x),
        selection = selection)
xx = inla.rjmarginal(100, r)
xx.eval = inla.rjmarginal.eval(function() c(x, Predictor, Intercept), xx)
print(cbind(xx$samples[, 1]))
print(cbind(xx.eval[, 1]))

constr <- list(A = matrix(1, ncol = n, nrow = 1), e = 1)
x <- inla.rjmarginal(10, r, constr = constr)

A <- matrix(rnorm(n^2), n, n)
b <- inla.tjmarginal(r, A)
b.marg <- inla.1djmarginal(b)

```

jp.define

*Joint-prior models***Description**

A framework for defining joint priors in R

**Usage**

```
inla.jp.define(jp = NULL, ...)
```

**Arguments**

**jp** The `jp`-function which returns the joint log-prior as a function of argument `theta`. There is an optional second argument that is a vector of `theta`-names. If second argument is not present, argument `.theta.desc` will be added.

**...** Named list of variables that defines the environment of `jp`

**Value**

This allows joint priors to be defined in R.  
This function is for internal use only.

**Author(s)**

Havard Rue <hrue@r-inla.org>

---

Kidney

*Kidney infection data*

---

**Description**

Times of infection from the time to insertion of the catheter for 38 kindey patients using portable dialysis equipment

**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, Cambridre, 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**

|                       |  |
|-----------------------|--|
| <code>nrow</code>     | Number of rows in the lattice.   |
| <code>ncol</code>     | Number of columns in the lattice.  |
| <code>irow</code>     | Lattice row index, between 1 and <code>nrow</code>   |
| <code>icol</code>     | Lattice column index, between 1 and <code>ncol</code>  |
| <code>node</code>     | The node index, between 1 and <code>ncol*nrow</code>   |
| <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@r-inla.org>

**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)
```

## Description

This the Leukemia data from Henderson et al (2003); see source.

## 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**

|                     |   |
|---------------------|---|
| <code>x</code>      | An <code>inla.mesh.segment()</code> object.                   |
| <code>loc</code>    | Point locations to be used if <code>x\$loc</code> is NULL.    |
| <code>col</code>    | Segment color specification.                                  |
| <code>colors</code> | Colors to cycle through if <code>col</code> is NULL.          |
| <code>add</code>    | If TRUE, add to the current plot, otherwise start a new plot. |
| <code>xlim</code>   | X axis limits for a new plot.                                 |
| <code>ylim</code>   | Y axis limits for a new plot.                                 |
| <code>rgl</code>    | If TRUE, use <code>rgl</code> for plotting.                   |
| <code>...</code>    | 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.inverse(x, inverse=FALSE)
inla.link.invinverse(x, inverse=FALSE)
```

```

inla.link.robit(x, df=7, inverse=FALSE)
inla.link.invrobit(x, df=7, inverse=FALSE)
inla.link.sn(x, intercept=0.5, skew=0, a=0, inverse=FALSE)
inla.link.invsn(x, intercept=0.5, skew=0, a=0, inverse=FALSE)
inla.link.invalid(x, inverse=FALSE)
inla.link.ininvalid(x, inverse=FALSE)
inla.link.invqpoisson(x, inverse = FALSE, quantile = 0.5)

```

### Arguments

|           |  |
|-----------|--|
| x         | The argument. A numeric vector.  |
| df        | The degrees of freedom for the Student-t                                 |
| inverse   | Logical. Use the link (inverse=FALSE) or its inverse (inverse=TRUE)      |
| intercept | The quantile level for the intercept in the Skew-Normal link             |
| skew      | The skewness in the Skew-Normal. Not both of skew and a can be given.    |
| a         | The a-parameter in the Skew-Normal. Not both of skew and a can be given. |
| quantile  | The quantile level for quantile links                                    |

### 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 as arguments to other functions.

### Author(s)

Havard Rue <hrue@r-inla.org>

---

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@r-inla.org>

**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 = 2048L)
inla.qmarginal(p, marginal, len = 2048L)
inla.rmarginal(n, marginal)
inla.hpdmarginal(p, marginal, len = 2048L)
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=2048L, h.diff = .Machine[["double.eps"]]^(1.0/3.0),
               method = c("quantile", "linear"))
inla.zmarginal(marginal, silent = FALSE)
```

**Arguments**

|          |  |
|----------|--|
| marginal | 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. |
| fun      | 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>  |
| x        | Evaluation points  |
| q        | Quantiles  |
| p        | Probabilities  |

|             |  |
|-------------|--|
| n           | The number of observations. If <code>length(n) &gt; 1</code> , the length is taken to be the number required.                      |
| h.diff      | The step-length for the numerical differentiation inside <code>inla.tmarginal</code>   |
| ...         | Further arguments to be passed to function which expectation is to be computed.  |
| log         | Return density or interpolated density in log-scale?   |
| normalize   | Renormalise the density after interpolation?   |
| len         | Number of locations used to interpolate the distribution function.   |
| keep.type   | If FALSE then return a <code>list(x=,y=)</code> , otherwise if TRUE, then return a matrix if the input is a matrix                 |
| extrapolate | How much to extrapolate on each side when computing the interpolation. In fraction of the range.                                   |
| factor      | The number of points after interpolation is factor times the original number of points; which is argument n in <code>spline</code> |
| method      | Which method should be used to layout points for where the transformation is computed.   |
| silent      | Output the result visually (TRUE) or just through the call.  |

### Value

`inla.smarginal` returns `list=c(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@r-inla.org>

### 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^2L),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, m)
m2 = inla.emarginal(function(x) x^2L, m)
stdev = sqrt(m2 - m1^2L)
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[2L]))
## using the buildt-in function
inla.zmarginal(m)

```

---

meshbuilder

---

*Interactive mesh building and diagnostics*


---

## Description

Interactively design and build a triangle mesh for use with SPDE models, and assess the finite element approximation errors. The R code needed to recreate the mesh outside the interactive Shiny app is also generated. Spatial objects can be imported from the global workspace.

## Usage

```
meshbuilder()
```

## Author(s)

Finn Lindgren <finn.lindgren@gmail.com>

## See Also

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

## Examples

```

## Not run:
meshbuilder()

## End(Not run)

```

Munich

*The Munich rent data***Description**

The Munich rent data

**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.

### 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. ~~

### 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      *Parameter settings for inla.spde2.matern models.*

---

## 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

|                                     |  |
|-------------------------------------|--|
| <code>mesh</code>                   | The mesh to build the model on, as an <code>inla.mesh()</code> object.             |
| <code>alpha</code>                  | Fractional operator order, $0 < \alpha \leq 2$ supported. ( $\nu = \alpha - d/2$ ) |
| <code>B.tau</code>                  | Matrix with specification of log-linear model for $\tau$ .                         |
| <code>B.kappa</code>                | Matrix with specification of log-linear model for $\kappa$ .                       |
| <code>prior.variance.nominal</code> | Nominal prior mean for the field variance  |
| <code>prior.range.nominal</code>    | Nominal prior mean for the spatial range   |
| <code>prior.tau</code>              | Prior mean for tau (overrides <code>prior.variance.nominal</code> )                |
| <code>prior.kappa</code>            | Prior mean for kappa (overrides <code>prior.range.nominal</code> )                 |
| <code>theta.prior.mean</code>       | (overrides <code>prior.*</code> )  |
| <code>theta.prior.prec</code>       | 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.alphaw | <i>Utility functions for the PC prior for the alpha parameter in the Weibull likelihood</i> |
|-----------|---|

---

## Description

Functions to evaluate, sample, compute quantiles and percentiles of the PC prior for the alpha parameter in the Weibull likelihood

## Usage

```
inla.pc.ralphaw(n, lambda = 5)
inla.pc.dalphaw(alpha, lambda = 5, log = FALSE)
inla.pc.qalphaw(p, lambda = 5)
inla.pc.palphaw(q, lambda = 5)
```

## Arguments

|        |  |
|--------|--|
| n      | Number of observations                               |
| lambda | The rate parameter in the PC-prior                   |
| alpha  | Vector of evaluation points, where $\alpha > 0$ .    |
| log    | Logical. Return the density in natural or log-scale. |
| p      | Vector of probabilities                              |
| q      | Vector of quantiles                                  |

## Details

This gives the PC prior for the alpha parameter for the Weibull likelihood, where  $\alpha=1$  is the base model.

## Value

inla.pc.dalphaw gives the density, inla.pc.palphaw gives the distribution function, inla.pc.qalphaw gives the quantile function, and inla.pc.ralphaw generates random deviates.

## Author(s)

Havard Rue <hrue@r-inla.org>

## See Also

inla.doc("pc.alphaw")

## Examples

```
x = inla.pc.ralphaw(100, lambda = 5)
d = inla.pc.dalphaw(x, lambda = 5)
x = inla.pc.qalphaw(0.5, lambda = 5)
inla.pc.palphaw(x, lambda = 5)
```

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.dpacf 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@r-inla.org>

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@r-inla.org>

**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)
```

---

pc.cor1

---

*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 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**

|        |   |
|--------|---|
| 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  $\alpha$ .

**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@r-inla.org>

**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 of 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  $\text{dim}$  parameters:  $\theta$  which are in the interval  $-\pi$  to  $\pi$ . The alternative parameterisation is through the off-diagonal elements  $r$  of the correlation matrix  $R$ . The functions `inla.pc.cormat.<A>2<B>` convert between parameterisations  $\langle A \rangle$  to parameterisations  $\langle B \rangle$ , where both  $\langle A \rangle$  and  $\langle B \rangle$  are one of  $\theta$ ,  $r$  and  $R$ , and  $p$  and  $\text{dim}$ .

**Value**

`inla.pc.cormat.rtheta` generate samples from the prior, returning a matrix where each row is a sample of  $\theta$ . `inla.pc.cormat.dtheta` evaluates the density of  $\theta$ . `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@r-inla.org>

**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 exchangable 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 standarized 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@r-inla.org>



pc.gamma

*Utility functions for the PC prior for  $\text{Gamma}(1/a, 1/a)$* **Description**

Functions to evaluate, sample, compute quantiles and percentiles of the PC prior for  $\text{Gamma}(1/a, 1/a)$

**Usage**

```
inla.pc.rgamma(n, lambda = 1)
inla.pc.dgamma(x, lambda = 1, log = FALSE)
inla.pc.qgamma(p, lambda = 1)
inla.pc.pgamma(q, lambda = 1)
```

**Arguments**

|        |  |
|--------|--|
| n      | Number of observations                               |
| lambda | The rate parameter (see Details)                     |
| x      | Evaluation points                                    |
| log    | Logical. Return the density in natural or log-scale. |
| p      | Vector of probabilities                              |
| q      | Vector of quantiles                                  |

**Details**

This gives the PC prior for the  $\text{Gamma}(1/a, 1/a)$  case, where  $a=0$  is the base model.

**Value**

inla.pc.dgamma gives the density, inla.pc.pgamma gives the distribution function, inla.pc.qgamma gives the quantile function, and inla.pc.rgamma generates random deviates.

**Author(s)**

Havard Rue <hrue@r-inla.org>

**See Also**

inla.doc("pc.gamma")

**Examples**

```
x = inla.pc.rgamma(100, lambda = 1)
d = inla.pc.dgamma(x, lambda = 1)
x = inla.pc.qgamma(0.5, lambda = 1)
inla.pc.pgamma(x, lambda = 1)
```

pc.gammacount

*Utility functions for the PC prior for the gammacount likelihood***Description**

Functions to evaluate, sample, compute quantiles and percentiles of the PC prior for the gammacount likelihood

**Usage**

```
inla.pc.rgammacount(n, lambda = 1)
inla.pc.dgammacount(x, lambda = 1, log = FALSE)
inla.pc.qgammacount(p, lambda = 1)
inla.pc.pgammacount(q, lambda = 1)
```

**Arguments**

|        |  |
|--------|--|
| n      | Number of observations                               |
| lambda | The rate parameter (see Details)                     |
| x      | Evaluation points                                    |
| log    | Logical. Return the density in natural or log-scale. |
| p      | Vector of probabilities                              |
| q      | Vector of quantiles                                  |

**Details**

This gives the PC prior for the gammacount likelihood, which is the PC prior for a in  $\text{Gamma}(a, 1)$  where  $\text{Gamma}(1, 1)$  is the base model.

**Value**

inla.pc.dgammacount gives the density, inla.pc.pgammacount gives the distribution function, inla.pc.qgammacount gives the quantile function, and inla.pc.rgammacount generates random deviates.

**Author(s)**

Havard Rue <hrue@r-inla.org>

**See Also**

inla.doc("pc.gammacount")

**Examples**

```
x = inla.pc.rgammacount(100, lambda = 1)
d = inla.pc.dgammacount(x, lambda = 1)
x = inla.pc.qgammacount(0.5, lambda = 1)
inla.pc.pgammacount(x, lambda = 1)
```

---

|            |  |
|------------|--|
| pc.gevtail | <i>Utility functions for the PC prior for the tail parameter in the GEV likelihood</i> |
|------------|--|

---

### Description

Functions to evaluate, sample, compute quantiles and percentiles of the PC prior for the tail parameter in the GEV likelihood

### Usage

```
inla.pc.rgevtail(n, lambda = 7)
inla.pc.dgevtail(xi, lambda = 7, log = FALSE)
inla.pc.qgevtail(p, lambda = 7)
inla.pc.pgevtail(q, lambda = 7)
```

### Arguments

|        |  |
|--------|--|
| n      | Number of observations                               |
| lambda | The rate parameter in the PC-prior                   |
| xi     | Vector of evaluation points, where $1 > xi > 0$ .    |
| log    | Logical. Return the density in natural or log-scale. |
| p      | Vector of probabilities                              |
| q      | Vector of quantiles                                  |

### Details

This gives the PC prior for the tail parameter for the GEV likelihood, where  $xi=0$  is the base model.

### Value

inla.pc.dgevtail gives the density, inla.pc.pgevtail gives the distribution function, inla.pc.qgevtail gives the quantile function, and inla.pc.rgevtail generates random deviates.

### Author(s)

Havard Rue <hrue@r-inla.org>

### See Also

inla.doc("pc.gevtail")

### Examples

```
xi = inla.pc.rgevtail(100, lambda = 7)
d = inla.pc.dgevtail(xi, lambda = 7)
xi = inla.pc.qgevtail(0.5, lambda = 7)
inla.pc.pgevtail(xi, lambda = 7)
```

---

|            |                               |
|------------|-------------------------------|
| pc.multvar | <i>Multivariate PC priors</i> |
|------------|-------------------------------|

---

**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.multvar.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.multvar.simplex.r` generate samples from the simplex case, and `inla.pc.multvar.simplex.d` evaluate the density. `inla.pc.multvar.sphere.r` generate samples from the sphere case, and `inla.pc.multvar.sphere.d` evaluate the density. `inla.pc.multvar.h.default` implements the default h()-function and illustrate how to code your own specific one, if needed.

**Author(s)**

Havard Rue <hrue@r-inla.org>

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 lambda unless lambda is given. Either lambda must be given, or u AND alpha.

**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@r-inla.org>

**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)
```

---

|       |   |
|-------|---|
| pc.sn | <i>Utility functions for the PC prior for skewness in the skew-normal linkfunction and likelihood</i> |
|-------|---|

---

## Description

Functions to evaluate, sample, compute quantiles and percentiles of the PC prior for the skewness in the skew-normal link-function and likelihood

## Usage

```
inla.pc.rsn(n, lambda = 40)
inla.pc.dsn(skew, lambda = 40, log = FALSE)
inla.pc.qsn(p, lambda = 40)
inla.pc.psn(q, lambda = 40)
```

## Arguments

|        |  |
|--------|--|
| n      | number of observations                               |
| lambda | the rate parameter in the PC prior                   |
| skew   | vector of evaluation points                          |
| log    | logical. return the density in natural or log-scale. |
| p      | vector of probabilities                              |
| q      | vector of quantiles                                  |

## Details

Defines the PC prior for the skewness for the skew-normal linkfunction and likelihood, where skew=0 is the base model. The skewness range from -0.99527... to 0.99527.... ca.

## Value

inla.pc.dsn gives the density, inla.pc.psn gives the distribution function, inla.pc.qsn gives the quantile function, and inla.pc.rsn generates random deviates.

## Author(s)

havard rue <hrue@r-inla.org>

## See Also

inla.doc("pc.sn")

## Examples

```
x = inla.pc.rsn(100, lambda = 40)
d = inla.pc.dsn(x, lambda = 40)
x = inla.pc.qsn(0.5, lambda = 40)
inla.pc.psn(x, lambda = 40)
```

---

|           |                              |
|-----------|------------------------------|
| plot.inla | <i>Default INLA plotting</i> |
|-----------|------------------------------|

---

## 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,
      cex = 1.75,
      ...)
```

## Arguments

|                      |  |
|----------------------|--|
| x                    | A fitted inla object produced by inla  |
| plot.fixed.effects   | Boolean indicating if posterior marginals for the fixed effects in the model should be plotted             |
| plot.lincomb         | Boolean indicating if posterior marginals for the linear combinations should be plotted                    |
| plot.random.effects  | Boolean indicating if posterior mean and quantiles for the random effects in the model should be plotted   |
| plot.hyperparameters | Boolean indicating if posterior marginals for the hyperparameters in the model should be plotted           |
| plot.predictor       | Boolean indicating if posterior mean and quantiles for the linear predictor in the model should be plotted |
| plot.q               | Boolean indicating if precision matrix should be displayed   |
| plot.cpo             | Boolean indicating if CPO/PIT values should be plotted   |
| plot.prior           | Plot also the prior density for the hyperparameters  |

|            |   |
|------------|---|
| single     | Boolean indicating if there should be more than one plot per page (FALSE) or just one (TRUE)              |
| postscript | Boolean indicating if postscript files should be produced instead   |
| pdf        | Boolean indicating if PDF files should be produced instead  |
| prefix     | The prefix for the created files. Additional numbering and suffix is added.                               |
| intern     | Plot also the hyperparameters in its internal scale.  |
| debug      | Write some debug information  |
| cex        | The cex parameter in par(). If set to NULL or 0, then default values will be used for graphics parameters |
| ...        | Additional arguments to postscript(), pdf() or dev.new().   |

**Value**

The return value is a list of the files created (if any).

**Author(s)**

Havard Rue <hrue@r-inla.org>

**See Also**

[inla](#)

**Examples**

```
## Not run:
result = inla(...)
plot(result)
plot(result, single = TRUE, plot.prior = TRUE)
plot(result, single = TRUE, pdf = TRUE, paper = "a4")

## End(Not run)
```

---

plot.inla.CRS

*Plot CRS and inla.CRS objects*

---

**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 <a href="#">inla.CRS()</a> 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](mailto:finn.lindgren@gmail.com)

### See Also

[inla.CRS\(\)](#)

## Examples

```
if (require(rgdal)) {
  oblique <- c(0, 45, 45, 0)
  for (projtype in c("longlat", "lambert", "mollweide", "hammer")) {
    plot(inla.CRS(projtype), main = projtype)
    plot(inla.CRS(projtype, oblique = oblique), main = paste("oblique", projtype))
  }
}
```

---

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 <code>inla.mesh()</code> 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.  |
| <code>ylim</code>  | 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.

### 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, digits = 3L, ...)
```

**Arguments**

|        |   |
|--------|---|
| x      | An inla-object (output from an <a href="#">inla</a> -call). |
| digits | Number of digits to print                                   |
| ...    | 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.

**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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**d0319** Daily rainfall at day "mmdd"  
**d0320** Daily rainfall at day "mmdd"  
**d0321** Daily rainfall at day "mmdd"  
**d0322** Daily rainfall at day "mmdd"  
**d0323** Daily rainfall at day "mmdd"  
**d0324** Daily rainfall at day "mmdd"  
**d0325** Daily rainfall at day "mmdd"  
**d0326** Daily rainfall at day "mmdd"  
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**d0328** Daily rainfall at day "mmdd"  
**d0329** Daily rainfall at day "mmdd"  
**d0330** Daily rainfall at day "mmdd"  
**d0331** Daily rainfall at day "mmdd"  
**d0401** Daily rainfall at day "mmdd"  
**d0402** Daily rainfall at day "mmdd"  
**d0403** Daily rainfall at day "mmdd"  
**d0404** Daily rainfall at day "mmdd"  
**d0405** Daily rainfall at day "mmdd"  
**d0406** Daily rainfall at day "mmdd"  
**d0407** Daily rainfall at day "mmdd"  
**d0408** Daily rainfall at day "mmdd"  
**d0409** Daily rainfall at day "mmdd"  
**d0410** Daily rainfall at day "mmdd"  
**d0411** Daily rainfall at day "mmdd"  
**d0412** Daily rainfall at day "mmdd"  
**d0413** Daily rainfall at day "mmdd"  
**d0414** Daily rainfall at day "mmdd"  
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**d0416** Daily rainfall at day "mmdd"  
**d0417** Daily rainfall at day "mmdd"  
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**d0424** Daily rainfall at day "mmdd"  
**d0425** Daily rainfall at day "mmdd"



**d0426** Daily rainfall at day "mmdd"  
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**d0501** Daily rainfall at day "mmdd"  
**d0502** Daily rainfall at day "mmdd"  
**d0503** Daily rainfall at day "mmdd"  
**d0504** Daily rainfall at day "mmdd"  
**d0505** Daily rainfall at day "mmdd"  
**d0506** Daily rainfall at day "mmdd"  
**d0507** Daily rainfall at day "mmdd"  
**d0508** Daily rainfall at day "mmdd"  
**d0509** Daily rainfall at day "mmdd"  
**d0510** Daily rainfall at day "mmdd"  
**d0511** Daily rainfall at day "mmdd"  
**d0512** Daily rainfall at day "mmdd"  
**d0513** Daily rainfall at day "mmdd"  
**d0514** Daily rainfall at day "mmdd"  
**d0515** Daily rainfall at day "mmdd"  
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**d0525** Daily rainfall at day "mmdd"  
**d0526** Daily rainfall at day "mmdd"  
**d0527** Daily rainfall at day "mmdd"  
**d0528** Daily rainfall at day "mmdd"  
**d0529** Daily rainfall at day "mmdd"  
**d0530** Daily rainfall at day "mmdd"  
**d0531** Daily rainfall at day "mmdd"  
**d0601** Daily rainfall at day "mmdd"  
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**d0605** Daily rainfall at day "mmdd"  
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**d0623** Daily rainfall at day "mmdd"  
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**d0625** Daily rainfall at day "mmdd"  
**d0626** Daily rainfall at day "mmdd"  
**d0627** Daily rainfall at day "mmdd"  
**d0628** Daily rainfall at day "mmdd"  
**d0629** Daily rainfall at day "mmdd"  
**d0630** Daily rainfall at day "mmdd"  
**d0701** Daily rainfall at day "mmdd"  
**d0702** Daily rainfall at day "mmdd"  
**d0703** Daily rainfall at day "mmdd"  
**d0704** Daily rainfall at day "mmdd"  
**d0705** Daily rainfall at day "mmdd"  
**d0706** Daily rainfall at day "mmdd"  
**d0707** Daily rainfall at day "mmdd"  
**d0708** Daily rainfall at day "mmdd"  
**d0709** Daily rainfall at day "mmdd"  
**d0710** Daily rainfall at day "mmdd"  
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**d0721** Daily rainfall at day "mmdd"  
**d0722** Daily rainfall at day "mmdd"  
**d0723** Daily rainfall at day "mmdd"  
**d0724** Daily rainfall at day "mmdd"  
**d0725** Daily rainfall at day "mmdd"  
**d0726** Daily rainfall at day "mmdd"  
**d0727** Daily rainfall at day "mmdd"  
**d0728** Daily rainfall at day "mmdd"  
**d0729** Daily rainfall at day "mmdd"  
**d0730** Daily rainfall at day "mmdd"  
**d0731** Daily rainfall at day "mmdd"  
**d0801** Daily rainfall at day "mmdd"  
**d0802** Daily rainfall at day "mmdd"  
**d0803** Daily rainfall at day "mmdd"  
**d0804** Daily rainfall at day "mmdd"  
**d0805** Daily rainfall at day "mmdd"  
**d0806** Daily rainfall at day "mmdd"  
**d0807** Daily rainfall at day "mmdd"  
**d0808** Daily rainfall at day "mmdd"  
**d0809** Daily rainfall at day "mmdd"  
**d0810** Daily rainfall at day "mmdd"  
**d0811** Daily rainfall at day "mmdd"  
**d0812** Daily rainfall at day "mmdd"  
**d0813** Daily rainfall at day "mmdd"  
**d0814** Daily rainfall at day "mmdd"  
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**d0824** Daily rainfall at day "mmdd"  
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**d0826** Daily rainfall at day "mmdd"  
**d0827** Daily rainfall at day "mmdd"  
**d0828** Daily rainfall at day "mmdd"  
**d0829** Daily rainfall at day "mmdd"  
**d0830** Daily rainfall at day "mmdd"  
**d0831** Daily rainfall at day "mmdd"  
**d0901** Daily rainfall at day "mmdd"  
**d0902** Daily rainfall at day "mmdd"  
**d0903** Daily rainfall at day "mmdd"  
**d0904** Daily rainfall at day "mmdd"  
**d0905** Daily rainfall at day "mmdd"  
**d0906** Daily rainfall at day "mmdd"  
**d0907** Daily rainfall at day "mmdd"  
**d0908** Daily rainfall at day "mmdd"  
**d0909** Daily rainfall at day "mmdd"  
**d0910** Daily rainfall at day "mmdd"  
**d0911** Daily rainfall at day "mmdd"  
**d0912** Daily rainfall at day "mmdd"  
**d0913** Daily rainfall at day "mmdd"  
**d0914** Daily rainfall at day "mmdd"  
**d0915** Daily rainfall at day "mmdd"  
**d0916** Daily rainfall at day "mmdd"  
**d0917** Daily rainfall at day "mmdd"  
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**d0921** Daily rainfall at day "mmdd"  
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**d0923** Daily rainfall at day "mmdd"  
**d0924** Daily rainfall at day "mmdd"  
**d0925** Daily rainfall at day "mmdd"  
**d0926** Daily rainfall at day "mmdd"  
**d0927** Daily rainfall at day "mmdd"  
**d0928** Daily rainfall at day "mmdd"  
**d0929** Daily rainfall at day "mmdd"  
**d0930** Daily rainfall at day "mmdd"  
**d1001** Daily rainfall at day "mmdd"  
**d1002** Daily rainfall at day "mmdd"

**d1003** Daily rainfall at day "mmdd"  
**d1004** Daily rainfall at day "mmdd"  
**d1005** Daily rainfall at day "mmdd"  
**d1006** Daily rainfall at day "mmdd"  
**d1007** Daily rainfall at day "mmdd"  
**d1008** Daily rainfall at day "mmdd"  
**d1009** Daily rainfall at day "mmdd"  
**d1010** Daily rainfall at day "mmdd"  
**d1011** Daily rainfall at day "mmdd"  
**d1012** Daily rainfall at day "mmdd"  
**d1013** Daily rainfall at day "mmdd"  
**d1014** Daily rainfall at day "mmdd"  
**d1015** Daily rainfall at day "mmdd"  
**d1016** Daily rainfall at day "mmdd"  
**d1017** Daily rainfall at day "mmdd"  
**d1018** Daily rainfall at day "mmdd"  
**d1019** Daily rainfall at day "mmdd"  
**d1020** Daily rainfall at day "mmdd"  
**d1021** Daily rainfall at day "mmdd"  
**d1022** Daily rainfall at day "mmdd"  
**d1023** Daily rainfall at day "mmdd"  
**d1024** Daily rainfall at day "mmdd"  
**d1025** Daily rainfall at day "mmdd"  
**d1026** Daily rainfall at day "mmdd"  
**d1027** Daily rainfall at day "mmdd"  
**d1028** Daily rainfall at day "mmdd"  
**d1029** Daily rainfall at day "mmdd"  
**d1030** Daily rainfall at day "mmdd"  
**d1031** Daily rainfall at day "mmdd"  
**d1101** Daily rainfall at day "mmdd"  
**d1102** Daily rainfall at day "mmdd"  
**d1103** Daily rainfall at day "mmdd"  
**d1104** Daily rainfall at day "mmdd"  
**d1105** Daily rainfall at day "mmdd"  
**d1106** Daily rainfall at day "mmdd"  
**d1107** Daily rainfall at day "mmdd"  
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**d1109** Daily rainfall at day "mmdd"  
**d1110** Daily rainfall at day "mmdd"  
**d1111** Daily rainfall at day "mmdd"

**d1112** Daily rainfall at day "mmdd"  
**d1113** Daily rainfall at day "mmdd"  
**d1114** Daily rainfall at day "mmdd"  
**d1115** Daily rainfall at day "mmdd"  
**d1116** Daily rainfall at day "mmdd"  
**d1117** Daily rainfall at day "mmdd"  
**d1118** Daily rainfall at day "mmdd"  
**d1119** Daily rainfall at day "mmdd"  
**d1120** Daily rainfall at day "mmdd"  
**d1121** Daily rainfall at day "mmdd"  
**d1122** Daily rainfall at day "mmdd"  
**d1123** Daily rainfall at day "mmdd"  
**d1124** Daily rainfall at day "mmdd"  
**d1125** Daily rainfall at day "mmdd"  
**d1126** Daily rainfall at day "mmdd"  
**d1127** Daily rainfall at day "mmdd"  
**d1128** Daily rainfall at day "mmdd"  
**d1129** Daily rainfall at day "mmdd"  
**d1130** Daily rainfall at day "mmdd"  
**d1201** Daily rainfall at day "mmdd"  
**d1202** Daily rainfall at day "mmdd"  
**d1203** Daily rainfall at day "mmdd"  
**d1204** Daily rainfall at day "mmdd"  
**d1205** Daily rainfall at day "mmdd"  
**d1206** Daily rainfall at day "mmdd"  
**d1207** Daily rainfall at day "mmdd"  
**d1208** Daily rainfall at day "mmdd"  
**d1209** Daily rainfall at day "mmdd"  
**d1210** Daily rainfall at day "mmdd"  
**d1211** Daily rainfall at day "mmdd"  
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**d1227** Daily rainfall at day "mmdd"  
**d1228** Daily rainfall at day "mmdd"  
**d1229** Daily rainfall at day "mmdd"  
**d1230** Daily rainfall at day "mmdd"  
**d1231** Daily rainfall at day "mmdd"

### 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::inla.reorderings(), num.threads = NULL)
```

### 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 for TAUCS; 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. |
| num.threads | Maximum number of threads the inla-program will use, or as 'A:B' defining the number threads in the outer (A) and inner (B) layer for nested parallelism.   |

### 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@r-inla.org>

**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 = 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 = inla.reorderings())
```

**Arguments**

|            |  |
|------------|--|
| graph      | A (inla-)graph object  |
| reordering | The name of the 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@r-inla.org>



**Examples**

```
g = system.file("demodata/germany.graph", package="INLA")
r = inla.qreordering(g)
m = inla.graph2matrix(g)
r = inla.qreordering(m)
```

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::inla.reorderings(),
  seed = 0L,
  logdens = ifelse(missing(sample), FALSE, TRUE),
  compute.mean = ifelse(missing(sample), FALSE, TRUE),
  num.threads = if (seed == 0L) "0:0" else NULL,
  selection = NULL, verbose = FALSE)
```

**Arguments**

|            |   |
|------------|---|
| n          | Number of samples. Only used if missing(sample)   |
| 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 ?INLA::f and argument extraconstr  |
| reordering | The type of reordering algorithm to be used for TAUCS; 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.   |
| seed       | Control the RNG. If seed=0L then GMRFLib will set the seed intelligently/at 'random', and this is and should be the default behaviour. If seed < 0L then the saved state of the RNG will be reused if possible, otherwise, GMRFLib will set the seed intelligently/at 'random'. If seed > 0L then this value is used as the seed for the RNG. |

PLEASE NOTE1: If seed!=0 then the computations will run in serial mode, over-riding whatever is set in num. threads (a warning might be issued).

PLEASE NOTE2: If the PARDISO sparse matrix library is used, continuity of the samples with respect to small changes in the precision matrix, can be expected but is not guaranteed. If this feature is required, please use the TAUCS sparse matrix library.

|              |  |
|--------------|--|
| 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.   |
| num.threads  | Maximum number of threads the inla-program will use, or as 'A:B' defining the number threads in the outer (A) and inner (B) layer for nested parallelism. seed!=0 requires serial computations.                  |
| selection    | A vector of indices of each sample to return. NULL means return the whole sample. (Note that the log-density returned, is for the whole sample.) The use of selection cannot be combined with the use of sample. |
| verbose      | Logical. Run in verbose mode or not.   |

### 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@r-inla.org>

### 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 (require serial mode)
x = inla.qsample(n, Q=Q, seed = 123, num.threads="1:1")
## restart from same seed, only sample 1
xx = inla.qsample(n=1, Q=Q, seed = 123, num.threads="1:1")
## continue from the save state, sample the remaining 2
xxx = inla.qsample(n=n-1, Q=Q, seed = -1, num.threads="1:1")
## 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 = inla.reorderings(), method = c("solve", "forward", "backward"))
```

## Arguments

|            |   |
|------------|---|
| Q          | A SPD matrix, either as a (dense) matrix or sparse-matrix.  |
| B          | The right hand side matrix, either as a (dense) matrix or sparse-matrix.  |
| reordering | The type of reordering algorithm to be used for TAUCS; 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 (using the TAUCS library).            |
| 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 <code>method="solve"</code> solves $L L^T X = B$ or equivalently $Q X = B$ , <code>method="forward"</code> solves $L X = B$ , and <code>method="backward"</code> 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@r-inla.org>

**Examples**

```

n = 10
nb <- n-1
QQ = matrix(rnorm(n^2), n, n)
QQ <- QQ %*% t(QQ)

Q = inla.as.sparse(QQ)
B = matrix(rnorm(n*nb), n, nb)

X = inla.qsolve(Q, B, method = "solve")
XX = inla.qsolve(Q, B, method = "solve", reordering = inla.qreordering(Q))
print(paste("err solve1", sum(abs( Q %*% X - B))))
print(paste("err solve2", sum(abs( Q %*% XX - B))))

## the forward and backward solve is tricky, as after permutation and with Q=LL', then L is
## lower triangular, but L in the original ordering is not lower triangular. if the rhs is iid
## noise, this is not important. to control the reordering, then the 'taucs' library must be
## used.
inla.setOption(smtp = 'taucs')

## case 1. use the matrix as is, no reordering
r <- "identity"
L = t(chol(Q))
X = inla.qsolve(Q, B, method = "forward", reordering = r)
XX = inla.qsolve(Q, B, method = "backward", reordering = r)
print(paste("err forward ", sum(abs(L %*% X - B))))
print(paste("err backward", sum(abs(t(L) %*% XX - B))))

## case 2. use a reordering from the library
r <- inla.qreordering(Q)
im <- r$ireordering
m <- r$reordering
print(cbind(idx = 1:n, m, im) )
Qr <- Q[im, im]
L = t(chol(Qr))[m, m]

X = inla.qsolve(Q, B, method = "forward", reordering = r)
XX = inla.qsolve(Q, B, method = "backward", reordering = r)
print(paste("err forward ", sum(abs( L %*% X - B))))
print(paste("err backward", sum(abs( t(L) %*% XX - B))))

```

read.graph

*Read and write a graph-object***Description**

Construct a graph-object from a file or a matrix; 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, a list or collection of characters and/or numbers defining the graph, or a neighbours list with class nb (see <code>spdep::card</code> and <code>spdep::poly2nb</code> for details of nb and an example a function returning an nb object |
| mode      | The mode of the file; ascii-file or a (gzip-compressed) binary.   |
| 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 <code>inla.read.graph</code> , then it is the graph definition (object, matrix, character, filename), plus extra arguments. In <code>inla.write.graph</code> it is extra arguments to <code>inla.read.graph</code> .   |

### 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 <ul style="list-style-type: none"> <li>• <code>idis</code> is a vector with the connected component id for each node (starting from 1)</li> <li>• <code>nis</code> is the number of connected components</li> <li>• <code>nodesis</code> is a list-list of nodes belonging to each connected component</li> </ul> |

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@r-inla.org](mailto:hrue@r-inla.org)>

### See Also

[inla.spy](#)

## Examples

```
## a graph from 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)
##
Not run:
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"))

## building a graph from adjacency matrix
adjacent = matrix(0, nrow = 4, ncol = 4)
adjacent[1,4] = adjacent[4,1] = 1
adjacent[2,4] = adjacent[4,2] = 1
adjacent[2,3] = adjacent[3,2] = 1
adjacent[3,4] = adjacent[4,3] = 1
g = inla.read.graph(adjacent)
plot(g)
summary(g)
End(Not run)
```

---

rgeneric.define

*rgeneric models*


---

## Description

A framework for defining latent models in R

## Usage

```
inla.rgeneric.define(model = NULL, debug = FALSE, compile = TRUE, optimize = FALSE, ...)
inla.rgeneric.iid.model(
  cmd = c("graph", "Q", "mu", "initial", "log.norm.const", "log.prior", "quit"),
  theta = NULL)
inla.rgeneric.ar1.model(
  cmd = c("graph", "Q", "mu", "initial", "log.norm.const", "log.prior", "quit"),
  theta = NULL)
inla.rgeneric.ar1.model.opt(
  cmd = c("graph", "Q", "mu", "initial", "log.norm.const", "log.prior", "quit"),
  theta = NULL)
inla.rgeneric.wrapper(
  cmd = c("graph", "Q", "mu", "initial", "log.norm.const", "log.prior", "quit"),
  model, theta = NULL)
```

```
inla.rgeneric.q(
  rmodel,
  cmd = c("graph", "Q", "mu", "initial", "log.norm.const", "log.prior", "quit"),
  theta = NULL)
```

### Arguments

|                       |   |
|-----------------------|---|
| <code>model</code>    | The definition of the model; see <code>inla.rgeneric.ar1.model</code>   |
| <code>rmodel</code>   | The rgeneric model-object, the output of <code>inla.rgeneric.define</code>  |
| <code>debug</code>    | Logical. Turn on/off debugging  |
| <code>compile</code>  | Logical. Compile the definition of the model or not.  |
| <code>optimize</code> | Logical. With this option TRUE, then model pass only the values of Q and not the whole matrix. Please see the vignette for details and <code>inla.rgeneric.ar1.model.opt</code> for an example. |
| <code>cmd</code>      | An allowed request  |
| <code>theta</code>    | Values of theta   |
| <code>...</code>      | Named list of variables that defines the environment of model   |
| <code>debug</code>    | 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@r-inla.org>

---

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

### 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@r-inla.org>

**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(MASS::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(MASS::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(MASS::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

**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

*Factorial design*


---

**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

**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.

**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 = 3L, include.lincomb = TRUE, ...)
## S3 method for class 'summary.inla'
print(x, digits = 3L, ...)
```

**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 | Logical 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

If the option short.summary is set to TRUE using inla.setOption, then a less verbose summary variant will be used, which might be more suitable for Markdown documents.

**Value**

summary.inla returns an object of class summary.inla, a list of components to print.

**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**

- object            an object of class "inla.mesh", usually a result of a call to [inla.mesh.create\(\)](#) or [inla.mesh.2d\(\)](#).
- verbose          If TRUE, produce a more detailed output.
- ...              further arguments passed to or from other methods.
- x                an object of class "summary.inla.mesh", usually a result of a call to [summary.inla.mesh\(\)](#).

**Author(s)**

Finn Lindgren <finn.lindgren@gmail.com>

---

|      |  |
|------|--|
| Surg | <i>Surgical: Institutional ranking</i> |
|------|--|

---

**Description**

This example considers mortality rates in 12 hospitals performing cardiac surgery in babies

**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

**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

**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.

**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

**age** 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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