

Package ‘BayesTools’

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Title Tools for Bayesian Analyses

Version 0.2.17

Description Provides tools for conducting Bayesian analyses and Bayesian model averaging (Kass and Raftery, 1995, <[doi:10.1080/01621459.1995.10476572](https://doi.org/10.1080/01621459.1995.10476572)>, Hoeting et al., 1999, <[doi:10.1214/ss/1009212519](https://doi.org/10.1214/ss/1009212519)>). The package contains functions for creating a wide range of prior distribution objects, mixing posterior samples from 'JAGS' and 'Stan' models, plotting posterior distributions, and etc... The tools for working with prior distribution span from visualization, generating 'JAGS' and 'bridgesampling' syntax to basic functions such as `rng`, `quantile`, and distribution functions.

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URL <https://fbartos.github.io/BayesTools/>

BugReports <https://github.com/FBartos/BayesTools/issues>

License GPL-3

Encoding UTF-8

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RdMacros Rdpack

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R topics documented:

add_column	3
BayesTools	4
BayesTools_ensemble_tables	4
BayesTools_model_tables	7
bridgesampling_object	10
check_input	11
contr.independent	13
contr.meandif	13
contr.orthonormal	14
density.prior	15
ensemble_inference	16
format_BF	17
geom_prior	18
geom_prior_list	19
inclusion_BF	21
interpret	21
is.prior	22
JAGS_add_priors	23
JAGS_bridgesampling	24
JAGS_bridgesampling_posterior	26
JAGS_check_and_list	27
JAGS_check_convergence	28
JAGS_diagnostics	30
JAGS_evaluate_formula	32
JAGS_fit	33
JAGS_formula	35
JAGS_get_inits	37
JAGS_marglik_parameters	37
JAGS_marglik_priors	38
JAGS_to_monitor	39
kitchen_rolls	39
lines.prior	40
lines_prior_list	41
marginal_inference	43
marginal_posterior	44
mean.prior	45
mix_posteriors	46
mpoint	47
parameter_names	48
plot.prior	48
plot_marginal	50
plot_models	52
plot_posterior	53
plot_prior_list	55
point	57
print.BayesTools_table	58

print.prior 58
 prior 59
 prior_factor 61
 prior_functions 63
 prior_functions_methods 64
 prior_informed 65
 prior_informed_medicine_names 67
 prior_PP 68
 prior_spike_and_slab 69
 prior_weightfunction 70
 range.prior 71
 remove_column 72
 Savage_Dickey_BF 73
 sd 73
 sd.prior 74
 transform_factor_samples 75
 transform_meandif_samples 75
 transform_orthonormal_samples 76
 var 76
 var.prior 77
 weightfunctions 78
 weightfunctions_mapping 80

Index **81**

add_column	<i>Adds column to BayesTools table</i>
------------	--

Description

Adds column to a BayesTools table while not breaking formatting, attributes, etc...

Usage

```
add_column(  
  table,  
  column_title,  
  column_values,  
  column_position = NULL,  
  column_type = NULL  
)
```

Arguments

- table BayesTools table
- column_title title of the new column
- column_values values of the new column

column_position	position of the new column (defaults to NULL which appends the column to the end)
column_type	type of values of the new column table (important for formatting, defaults to NULL = the function tries to guess numeric / character based on the column_values but many more specific types are available)

Value

returns an object of 'BayesTools_table' class.

BayesTools	<i>BayesTools</i>
------------	-------------------

Description

BayesTools: Provides tools for conducting Bayesian analyses. The package contains functions for creating a wide range of prior distribution objects, mixing posterior samples from JAGS and Stan models, plotting posterior distributions, and etc... The tools for working with prior distribution span from visualization, generating JAGS and bridgesampling syntax to basic functions such as rng, quantile, and distribution functions.

Author(s)

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See Also

Useful links:

- <https://fbartos.github.io/BayesTools/>
- Report bugs at <https://github.com/FBartos/BayesTools/issues>

BayesTools_ensemble_tables	<i>Create BayesTools ensemble summary tables</i>
----------------------------	--

Description

Creates estimate summaries based on posterior distributions created by [mix_posteriors](#), inference summaries based on inference created by [ensemble_inference](#), or ensemble summary/diagnostics based on a list of [models_inference](#) models (or [marginal_inference](#) in case of [marginal_estimates_table](#)).

Usage

```
ensemble_estimates_table(  
  samples,  
  parameters,  
  probs = c(0.025, 0.95),  
  title = NULL,  
  footnotes = NULL,  
  warnings = NULL,  
  transform_factors = FALSE,  
  transform_orthonormal = FALSE,  
  formula_prefix = TRUE  
)  
  
ensemble_inference_table(  
  inference,  
  parameters,  
  logBF = FALSE,  
  BF01 = FALSE,  
  title = NULL,  
  footnotes = NULL,  
  warnings = NULL  
)  
  
ensemble_summary_table(  
  models,  
  parameters,  
  logBF = FALSE,  
  BF01 = FALSE,  
  title = NULL,  
  footnotes = NULL,  
  warnings = NULL,  
  remove_spike_0 = TRUE,  
  short_name = FALSE  
)  
  
ensemble_diagnostics_table(  
  models,  
  parameters,  
  title = NULL,  
  footnotes = NULL,  
  warnings = NULL,  
  remove_spike_0 = TRUE,  
  short_name = FALSE  
)  
  
ensemble_estimates_empty_table(  
  probs = c(0.025, 0.95),  
  title = NULL,
```

```

    footnotes = NULL,
    warnings = NULL
  )

ensemble_inference_empty_table(title = NULL, footnotes = NULL, warnings = NULL)

ensemble_summary_empty_table(title = NULL, footnotes = NULL, warnings = NULL)

ensemble_diagnostics_empty_table(
  title = NULL,
  footnotes = NULL,
  warnings = NULL
)

marginal_estimates_table(
  samples,
  inference,
  parameters,
  probs = c(0.025, 0.95),
  logBF = FALSE,
  BF01 = FALSE,
  title = NULL,
  footnotes = NULL,
  warnings = NULL,
  formula_prefix = TRUE
)

```

Arguments

<code>samples</code>	posterior samples created by mix_posteriors
<code>parameters</code>	character vector of parameters (or a named list with of character vectors for summary and diagnostics tables) specifying the parameters (and their grouping) for the summary table
<code>probs</code>	quantiles for parameter estimates
<code>title</code>	title to be added to the table
<code>footnotes</code>	footnotes to be added to the table
<code>warnings</code>	warnings to be added to the table
<code>transform_factors</code>	whether factors with orthonormal/meandif prior distribution should be transformed to differences from the grand mean
<code>transform_orthonormal</code>	(to be depreciated) whether factors with orthonormal prior distributions should be transformed to differences from the grand mean
<code>formula_prefix</code>	whether the parameter prefix from formula should be printed. Defaults to TRUE.
<code>inference</code>	model inference created by ensemble_inference
<code>logBF</code>	whether the Bayes factor should be on log scale

BF01	whether the Bayes factor should be inverted
models	list of models_inference model objects, each of which containing a list of priors and inference object, The inference must be a named list with information about the model: model number <code>m_number</code> , marginal likelihood <code>marglik</code> , prior and posterior probability <code>prior_prob</code> and <code>post_prob</code> , inclusion Bayes factor <code>inclusion_BF</code> , and fit summary generated by runjags_estimates_table for the diagnostics table
<code>remove_spike_0</code>	whether prior distributions equal to spike at 0 should be removed from the <code>prior_list</code>
<code>short_name</code>	whether the prior distribution names should be shortened. Defaults to FALSE.

Value

`ensemble_estimates_table` returns a table with the model-averaged estimates, `ensemble_inference_table` returns a table with the prior and posterior probabilities and inclusion Bayes factors, `ensemble_summary_table` returns a table with overview of the models included in the ensemble, and `ensemble_diagnostics_table` returns an overview of the MCMC diagnostics for the models included in the ensemble. All of the tables are objects of class 'BayesTools_table'.

See Also

[ensemble_inference](#) [mix_posteriors](#) [BayesTools_model_tables](#)

BayesTools_model_tables

Create BayesTools model tables

Description

Creates model summary based on a model objects or provides estimates table for a runjags fit.

Usage

```
model_summary_table(
  model,
  model_description = NULL,
  title = NULL,
  footnotes = NULL,
  warnings = NULL,
  remove_spike_0 = TRUE,
  short_name = FALSE,
  formula_prefix = TRUE,
  remove_parameters = NULL
)

runjags_estimates_table(
```

```
    fit,
    transformations = NULL,
    title = NULL,
    footnotes = NULL,
    warnings = NULL,
    conditional = FALSE,
    remove_spike_0 = TRUE,
    transform_factors = FALSE,
    transform_orthonormal = FALSE,
    formula_prefix = TRUE,
    remove_inclusion = FALSE,
    remove_parameters = NULL
  )

runjags_inference_table(
  fit,
  title = NULL,
  footnotes = NULL,
  warnings = NULL,
  formula_prefix = TRUE
)

JAGS_estimates_table(
  fit,
  transformations = NULL,
  title = NULL,
  footnotes = NULL,
  warnings = NULL,
  conditional = FALSE,
  remove_spike_0 = TRUE,
  transform_factors = FALSE,
  transform_orthonormal = FALSE,
  formula_prefix = TRUE,
  remove_inclusion = FALSE,
  remove_parameters = NULL
)

JAGS_inference_table(
  fit,
  title = NULL,
  footnotes = NULL,
  warnings = NULL,
  formula_prefix = TRUE
)

JAGS_summary_table(
  model,
  model_description = NULL,
```



```

    title = NULL,
    footnotes = NULL,
    warnings = NULL,
    remove_spike_0 = TRUE,
    short_name = FALSE,
    formula_prefix = TRUE,
    remove_parameters = NULL
)

model_summary_empty_table(
  model_description = NULL,
  title = NULL,
  footnotes = NULL,
  warnings = NULL
)

runjags_estimates_empty_table(title = NULL, footnotes = NULL, warnings = NULL)
runjags_inference_empty_table(title = NULL, footnotes = NULL, warnings = NULL)
JAGS_estimates_empty_table(title = NULL, footnotes = NULL, warnings = NULL)
JAGS_inference_empty_table(title = NULL, footnotes = NULL, warnings = NULL)

stan_estimates_table(
  fit,
  transformations = NULL,
  title = NULL,
  footnotes = NULL,
  warnings = NULL
)

```

Arguments

<code>model</code>	model object containing a list of priors and inference object, The inference must be a named list with information about the model: model number <code>m_number</code> , marginal likelihood <code>marglik</code> , prior and posterior probability <code>prior_prob</code> and <code>post_prob</code> , and model inclusion Bayes factor <code>inclusion_BF</code>
<code>model_description</code>	named list with additional description to be added to the table
<code>title</code>	title to be added to the table
<code>footnotes</code>	footnotes to be added to the table
<code>warnings</code>	warnings to be added to the table
<code>remove_spike_0</code>	whether prior distributions equal to spike at 0 should be removed from the <code>prior_list</code>
<code>short_name</code>	whether the prior distribution names should be shortened. Defaults to FALSE.
<code>formula_prefix</code>	whether the parameter prefix from formula should be printed. Defaults to TRUE.

remove_parameters	parameters to be removed from the summary. Defaults to NULL, i.e., including all parameters.
fit	runjags model fit
transformations	named list of transformations to be applied to specific parameters
conditional	summarizes estimates conditional on being included in the model for spike and slab priors. Defaults to FALSE.
transform_factors	whether factors with orthonormal/meandif prior distribution should be transformed to differences from the grand mean
transform_orthonormal	(to be depreciated) whether factors with orthonormal prior distributions should be transformed to differences from the grand mean
remove_inclusion	whether estimates of the inclusion probabilities should be excluded from the summary table. Defaults to FALSE.

Value

model_summary_table returns a table with overview of the fitted model, runjags_estimates_table returns a table with MCMC estimates, and runjags_estimates_empty_table returns an empty estimates table. All of the tables are objects of class 'BayesTools_table'.

See Also

[BayesTools_ensemble_tables](#)

bridgesampling_object *Create a 'bridgesampling' object*

Description

prepares a 'bridgesampling' object with a given log marginal likelihood.

Usage

```
bridgesampling_object(logml = -Inf)
```

Arguments

logml log marginal likelihood. Defaults to -Inf.

Value

JAGS_bridgesampling returns an object of class 'bridge'.

check_input	<i>Check input</i>
-------------	--------------------

Description

A set of convenience functions for checking objects/arguments to a function passed by a user.

Usage

```
check_bool(  
  x,  
  name,  
  check_length = 1,  
  allow_NULL = FALSE,  
  allow_NA = TRUE,  
  call = ""  
)  
  
check_char(  
  x,  
  name,  
  check_length = 1,  
  allow_values = NULL,  
  allow_NULL = FALSE,  
  allow_NA = TRUE,  
  call = ""  
)  
  
check_real(  
  x,  
  name,  
  lower = -Inf,  
  upper = Inf,  
  allow_bound = TRUE,  
  check_length = 1,  
  allow_NULL = FALSE,  
  allow_NA = TRUE,  
  call = ""  
)  
  
check_int(  
  x,  
  name,  
  lower = -Inf,  
  upper = Inf,  
  allow_bound = TRUE,  
  check_length = 1,
```

```

    allow_NULL = FALSE,
    allow_NA = TRUE,
    call = ""
)

check_list(
  x,
  name,
  check_length = 0,
  check_names = NULL,
  all_objects = FALSE,
  allow_other = FALSE,
  allow_NULL = FALSE,
  call = ""
)

```

Arguments

x	object to be checked
name	name of the object that will be print in the error message.
check_length	length of the object to be checked. Defaults to 1. Set to 0 in order to not check object length.
allow_NULL	whether the object can be NULL. If so, no checks are executed.
allow_NA	whether the object can contain NA or NaN values.
call	string to be placed as a prefix to the error call.
allow_values	names of values allowed in a character vector. Defaults to NULL (do not check).
lower	lower bound of allowed values. Defaults to -Inf (do not check).
upper	upper bound of allowed values. Defaults to Inf (do not check).
allow_bound	whether the values at the boundary are allowed. Defaults to TRUE.
check_names	names of entries allowed in a list. Defaults to NULL (do not check).
all_objects	whether all entries in check_names must be present. Defaults to FALSE.
allow_other	whether additional entries then the specified in check_names might be present

Value

returns NULL, called for the input check.

Examples

```

# check whether the object is logical
check_bool(TRUE, name = "input")

# will throw an error on any other type
## Not run:
  check_bool("TRUE", name = "input")

## End(Not run)

```

contr.independent *Independent contrast matrix*

Description

Return a matrix of independent contrasts – a level for each term.

Usage

```
contr.independent(n, contrasts = TRUE)
```

Arguments

n a vector of levels for a factor, or the number of levels
contrasts logical indicating whether contrasts should be computed

Value

A matrix with n rows and k columns, with k = n if contrasts = TRUE and k = n if contrasts = FALSE.

References

There are no references for Rd macro \insertAllCites on this help page.

Examples

```
contr.independent(c(1, 2))  
contr.independent(c(1, 2, 3))
```

contr.meandif *Mean difference contrast matrix*

Description

Return a matrix of mean difference contrasts. This is an adjustment to the `contr.orthonormal` that ascertains that the prior distributions on difference between the grand mean and factor level are identical independent of the number of factor levels (which does not hold for the orthonormal contrast). Furthermore, the contrast is re-scaled so the specified prior distribution exactly corresponds to the prior distribution on difference between each factor level and the grand mean – this is approximately twice the scale of `contr.orthonormal`.

Usage

```
contr.meandif(n, contrasts = TRUE)
```

Arguments

n a vector of levels for a factor, or the number of levels
contrasts logical indicating whether contrasts should be computed

Value

A matrix with n rows and k columns, with $k = n - 1$ if contrasts = TRUE and $k = n$ if contrasts = FALSE.

References

There are no references for Rd macro `\insertAllCites` on this help page.

Examples

```
contr.meandif(c(1, 2))  
contr.meandif(c(1, 2, 3))
```

`contr.orthonormal` *Orthornomal contrast matrix*

Description

Return a matrix of orthornomal contrasts. Code is based on `stanova::contr.bayes` and corresponding to description by Rouder et al. (2012)

Usage

```
contr.orthonormal(n, contrasts = TRUE)
```

Arguments

n a vector of levels for a factor, or the number of levels
contrasts logical indicating whether contrasts should be computed

Value

A matrix with n rows and k columns, with $k = n - 1$ if contrasts = TRUE and $k = n$ if contrasts = FALSE.

References

Rouder JN, Morey RD, Speckman PL, Province JM (2012). "Default Bayes factors for ANOVA designs." *Journal of Mathematical Psychology*, **56**(5), 356–374. doi:10.1016/j.jmp.2012.08.001.

Examples

```
contr.orthonormal(c(1, 2))
contr.orthonormal(c(1, 2, 3))
```

density.prior	<i>Prior density</i>
---------------	----------------------

Description

Computes density of a prior distribution across a range of values.

Usage

```
## S3 method for class 'prior'
density(
  x,
  x_seq = NULL,
  x_range = NULL,
  x_range_quant = NULL,
  n_points = 1000,
  n_samples = 10000,
  force_samples = FALSE,
  individual = FALSE,
  transformation = NULL,
  transformation_arguments = NULL,
  transformation_settings = FALSE,
  truncate_end = TRUE,
  ...
)
```

Arguments

x	a prior
x_seq	sequence of x coordinates
x_range	vector of length two with lower and upper range for the support (used if x_seq is unspecified)
x_range_quant	quantile used for automatically obtaining x_range if both x_range and x_seq are unspecified. Defaults to 0.005 for all but Cauchy, Student-t, Gamma, and Inverse-gamma distributions that use 0.010.
n_points	number of equally spaced points in the x_range if x_seq is unspecified
n_samples	number of samples from the prior distribution if the density cannot be obtained analytically (or if samples are forced with force_samples = TRUE)
force_samples	should prior be sampled instead of obtaining analytic solution whenever possible
individual	should individual densities be returned (e.g., in case of weightfunction)

transformation transformation to be applied to the prior distribution. Either a character specifying one of the prepared transformations:

- lin** linear transformation in form of $a + b \cdot x$
- tanh** also known as Fisher's z transformation
- exp** exponential transformation

, or a list containing the transformation function `fun`, inverse transformation function `inv`, and the Jacobian of the transformation `jac`. See examples for details.

transformation_arguments a list with named arguments for the transformation

transformation_settings boolean indicating whether the settings the `x_seq` or `x_range` was specified on the transformed support

truncate_end whether the density should be set to zero in for the endpoints of truncated distributions

... additional arguments

Value

`density.prior` returns an object of class 'density'.

See Also

[prior\(\)](#)

ensemble_inference *Compute posterior probabilities and inclusion Bayes factors*

Description

Computes prior probabilities, posterior probabilities, and inclusion Bayes factors based either on (1) a list of models, vector of parameters, and a list of indicators the models represent the null or alternative hypothesis for each parameter, (2) on prior model odds, marginal likelihoods, and indicator whether the models represent the null or alternative hypothesis, or (3) list of models for each model.

Usage

```
compute_inference(prior_weights, margliks, is_null = NULL, conditional = FALSE)
```

```
ensemble_inference(model_list, parameters, is_null_list, conditional = FALSE)
```

```
models_inference(model_list)
```


Arguments

prior_weights	vector of prior model odds
margliks	vector of marginal likelihoods
is_null	logical vector of indicators specifying whether the model corresponds to the null or alternative hypothesis (or an integer vector indexing models corresponding to the null hypothesis)
conditional	whether prior and posterior model probabilities should be returned only for the conditional model. Defaults to FALSE
model_list	list of models, each of which contains marginal likelihood estimated with bridge sampling marglik and prior model odds prior_weights
parameters	vector of parameters names for which inference should be drawn
is_null_list	list with entries for each parameter carrying either logical vector of indicators specifying whether the model corresponds to the null or alternative hypothesis (or an integer vector indexing models corresponding to the null hypothesis)

Value

compute_inference returns a named list of prior probabilities, posterior probabilities, and Bayes factors, ppoint gives the distribution function, ensemble_inference gives a list of named lists of inferences for each parameter, and models_inference returns a list of models, each expanded by the inference list.

See Also

[mix_posteriors](#) [BayesTools_ensemble_tables](#)

format_BF	<i>Format Bayes factor</i>
-----------	----------------------------

Description

Formats Bayes factor

Usage

```
format_BF(BF, logBF = FALSE, BF01 = FALSE, inclusion = FALSE)
```

Arguments

BF	Bayes factor(s)
logBF	log(BF)
BF01	1/BF
inclusion	whether the Bayes factor is an inclusion BF (for naming purposes)

Value

format_BF returns a formatted Bayes factor.

geom_prior

*Add prior object to a ggplot***Description**

Add prior object to a ggplot

Usage

```
geom_prior(
  x,
  xlim = NULL,
  x_seq = NULL,
  x_range_quant = NULL,
  n_points = 1000,
  n_samples = 10000,
  force_samples = FALSE,
  transformation = NULL,
  transformation_arguments = NULL,
  transformation_settings = FALSE,
  show_parameter = if (individual) 1 else NULL,
  individual = FALSE,
  rescale_x = FALSE,
  scale_y2 = 1,
  ...
)
```

Arguments

x	a prior
xlim	plotting range of the prior
x_seq	sequence of x coordinates
x_range_quant	quantile used for automatically obtaining x_range if both x_range and x_seq are unspecified. Defaults to 0.005 for all but Cauchy, Student-t, Gamma, and Inverse-gamme distributions that use 0.010.
n_points	number of equally spaced points in the x_range if x_seq is unspecified
n_samples	number of samples from the prior distribution if the density cannot be obtained analytically (or if samples are forced with force_samples = TRUE)
force_samples	should prior be sampled instead of obtaining analytic solution whenever possible
transformation	transformation to be applied to the prior distribution. Either a character specifying one of the prepared transformations: lin linear transformation in form of $a + b \cdot x$ tanh also known as Fisher's z transformation exp exponential transformation

	, or a list containing the transformation function <code>fun</code> , inverse transformation function <code>inv</code> , and the Jacobian of the transformation <code>jac</code> . See examples for details.
<code>transformation_arguments</code>	a list with named arguments for the transformation
<code>transformation_settings</code>	boolean indicating whether the settings <code>x_seq</code> or <code>x_range</code> was specified on the transformed support
<code>show_parameter</code>	which parameter should be returned in case of multiple parameters per prior. Useful when priors for the omega parameter are plotted and <code>individual = TRUE</code> .
<code>individual</code>	should individual densities be returned (e.g., in case of <code>weightfunction</code>)
<code>rescale_x</code>	allows to rescale x-axis in case a <code>weightfunction</code> is plotted.
<code>scale_y2</code>	scaling factor for a secondary axis
<code>...</code>	additional arguments

Value

`geom_prior_list` returns an object of class 'ggplot'.

See Also

[plot.prior\(\)](#) [lines.prior\(\)](#)

<code>geom_prior_list</code>	<i>Add list of prior objects to a plot</i>
------------------------------	--

Description

Add list of prior objects to a plot

Usage

```
geom_prior_list(
  prior_list,
  xlim = NULL,
  x_seq = NULL,
  x_range_quant = NULL,
  n_points = 500,
  n_samples = 10000,
  force_samples = FALSE,
  transformation = NULL,
  transformation_arguments = NULL,
  transformation_settings = FALSE,
  rescale_x = FALSE,
  scale_y2 = NULL,
  prior_list_mu = NULL,
  ...
)
```

Arguments

prior_list	list of prior distributions
xlim	x plotting range
x_seq	sequence of x coordinates
x_range_quant	quantile used for automatically obtaining x_range if both x_range and x_seq are unspecified. Defaults to 0.005 for all but Cauchy, Student-t, Gamma, and Inverse-gamme distributions that use 0.010.
n_points	number of equally spaced points in the x_range if x_seq is unspecified
n_samples	number of samples from the prior distribution if the density cannot be obtained analytically (or if samples are forced with force_samples = TRUE)
force_samples	should prior be sampled instead of obtaining analytic solution whenever possible
transformation	transformation to be applied to the prior distribution. Either a character specifying one of the prepared transformations: lin linear transformation in form of $a + b*x$ tanh also known as Fisher's z transformation exp exponential transformation , or a list containing the transformation function fun, inverse transformation function inv, and the Jacobian of the transformation jac. See examples for details.
transformation_arguments	a list with named arguments for the transformation
transformation_settings	boolean indicating whether the settings the x_seq or x_range was specified on the transformed support
rescale_x	allows to rescale x-axis in case a weightfunction is plotted.
scale_y2	scaling factor for a secondary axis
prior_list_mu	list of priors for the mu parameter required when plotting PET-PEESE
...	additional arguments

Value

geom_prior_list returns an object of class 'ggplot'.

See Also

[plot_prior_list\(\)](#) [lines_prior_list\(\)](#)

inclusion_BF	<i>Compute inclusion Bayes factors</i>
--------------	--

Description

Computes inclusion Bayes factors based on prior model probabilities, posterior model probabilities (or marginal likelihoods), and indicator whether the models represent the null or alternative hypothesis.

Usage

```
inclusion_BF(prior_probs, post_probs, margliks, is_null)
```

Arguments

prior_probs	vector of prior model probabilities
post_probs	vector of posterior model probabilities
margliks	vector of marginal likelihoods.
is_null	logical vector of indicators whether the model corresponds to the null or alternative hypothesis (or an integer vector indexing models corresponding to the null hypothesis)

Details

Supplying margliks as the input is preferred since it is better at dealing with under/overflow (posterior probabilities are very close to either 0 or 1). In case that both the post_probs and margliks are supplied, the results are based on margliks.

Value

inclusion_BF returns a Bayes factor.

interpret	<i>Interpret ensemble inference and estimates</i>
-----------	---

Description

Provides textual summary for posterior distributions created by [mix_posteriors](#) and ensemble inference created by [ensemble_inference](#).

Usage

```
interpret(inference, samples, specification, method)
```

Arguments

inference	model inference created by ensemble_inference
samples	posterior samples created by mix_posteriors
specification	list of lists specifying the generated text. Each inner list carries: (1) inference specifying the name of in the inference entry and optionally inference_name as a name to use in the text and inference_BF_name as a symbol to be used instead of the default "BF", (2) samples specifying the name of in the samples entry and optionally samples_name as a name to use in the text, samples_units as a unit text to be appended after the estimate, and samples_conditional specifying whether the estimate is conditional or model-averaged.
method	character specifying name of the method to be appended at the beginning of each sentence.

Value

interpret returns character.

See Also

[ensemble_inference](#) [mix_posteriors](#) [BayesTools_model_tables](#) [BayesTools_ensemble_tables](#)

is.prior

Reports whether x is a a prior object

Description

Reports whether x is a a prior object. Note that point priors inherit the prior.simple property

Usage

is.prior(x)

is.prior.point(x)

is.prior.none(x)

is.prior.simple(x)

is.prior.discrete(x)

is.prior.vector(x)

is.prior.PET(x)

is.prior.PEERE(x)

```
is.prior.weightfunction(x)
is.prior.factor(x)
is.prior.orthonormal(x)
is.prior.treatment(x)
is.prior.independent(x)
is.prior.spike_and_slab(x)
is.prior.meandif(x)
```

Arguments

x an object of test

Value

returns a boolean indicating whether the test object is a prior (of specific type).

Examples

```
# create some prior distributions
p0 <- prior(distribution = "point", parameters = list(location = 0))
p1 <- prior_PET(distribution = "normal", parameters = list(mean = 0, sd = 1))

is.prior(p0)
is.prior.simple(p0)
is.prior.point(p0)
is.prior.PET(p0)

is.prior(p1)
is.prior.simple(p1)
is.prior.point(p1)
is.prior.PET(p1)
```

JAGS_add_priors	<i>Add 'JAGS' prior</i>
-----------------	-------------------------

Description

Adds priors to a 'JAGS' syntax.

Usage

```
JAGS_add_priors(syntax, prior_list)
```

Arguments

syntax	JAGS model syntax
prior_list	named list of prior distribution (names correspond to the parameter names)

Value

JAGS_add_priors returns a JAGS syntax.

JAGS_bridgesampling *Compute marginal likelihood of a 'JAGS' model*

Description

A wrapper around [bridge_sampler](#) that automatically computes likelihood part dependent on the prior distribution and prepares parameter samples. `log_posterior` must specify a function that takes two arguments - a named list of samples from the prior distributions and the data, and returns log likelihood of the model part.

Usage

```
JAGS_bridgesampling(
  fit,
  log_posterior,
  data = NULL,
  prior_list = NULL,
  formula_list = NULL,
  formula_data_list = NULL,
  formula_prior_list = NULL,
  add_parameters = NULL,
  add_bounds = NULL,
  maxiter = 10000,
  silent = TRUE,
  ...
)
```

Arguments

fit	model fitted with either runjags posterior samples obtained with rjags-package
log_posterior	function that takes a named list of samples, the data, and additional list of parameters passed as <code>...</code> as input and returns the log of the unnormalized posterior density of the model part
data	list containing data to fit the model (not including data for the formulas)
prior_list	named list of prior distribution (names correspond to the parameter names) of parameters not specified within the <code>formula_list</code>
formula_list	named list of formulas to be added to the model (names correspond to the parameter name created by each of the formula)

<code>formula_data_list</code>	named list of data frames containing data for each formula (names of the lists correspond to the parameter name created by each of the formula)
<code>formula_prior_list</code>	named list of named lists of prior distributions (names of the lists correspond to the parameter name created by each of the formula and the names of the prior distribution correspond to the parameter names) of parameters specified within the formula
<code>add_parameters</code>	vector of additional parameter names that should be used in bridgesampling but were not specified in the <code>prior_list</code>
<code>add_bounds</code>	list with two name vectors ("lb" and "up") containing lower and upper bounds of the additional parameters that were not specified in the <code>prior_list</code>
<code>maxiter</code>	maximum number of iterations for the <code>bridge_sampler</code>
<code>silent</code>	whether the progress should be printed, defaults to TRUE
<code>...</code>	additional argument to the <code>bridge_sampler</code> and <code>log_posterior</code> function

Value

JAGS_bridgesampling returns an object of class 'bridge'.

Examples

```
## Not run:
# simulate data
set.seed(1)
data <- list(
  x = rnorm(10),
  N = 10
)
data$x

# define priors
priors_list <- list(mu = prior("normal", list(0, 1)))

# define likelihood for the data
model_syntax <-
  "model{
    for(i in 1:N){
      x[i] ~ dnorm(mu, 1)
    }
  }"

# fit the models
fit <- JAGS_fit(model_syntax, data, priors_list)

# define log posterior for bridge sampling
log_posterior <- function(parameters, data){
  sum(dnorm(data$x, parameters$mu, 1, log = TRUE))
}
```

```
# get marginal likelihoods
marglik <- JAGS_bridgesampling(fit, log_posterior, data, priors_list)

## End(Not run)
```

JAGS_bridgesampling_posterior

Prepare 'JAGS' posterior for 'bridgesampling'

Description

prepares posterior distribution for 'bridgesampling' by removing unnecessary parameters and attaching lower and upper bounds of parameters based on a list of prior distributions.

Usage

```
JAGS_bridgesampling_posterior(
  posterior,
  prior_list,
  add_parameters = NULL,
  add_bounds = NULL
)
```

Arguments

posterior	matrix of mcmc samples from the posterior distribution
prior_list	named list of prior distribution (names correspond to the parameter names) of parameters not specified within the formula_list
add_parameters	vector of additional parameter names that should be used in bridgesampling but were not specified in the prior_list
add_bounds	list with two name vectors ("lb" and "up") containing lower and upper bounds of the additional parameters that were not specified in the prior_list

Value

JAGS_bridgesampling_posterior returns a matrix of posterior samples with 'lb' and 'ub' attributes carrying the lower and upper boundaries.

JAGS_check_and_list *Check and list 'JAGS' fitting settings*

Description

Checks and lists settings for the [JAGS_fit](#) function.

Usage

```
JAGS_check_and_list_fit_settings(
  chains,
  adapt,
  burnin,
  sample,
  thin,
  autofit,
  parallel,
  cores,
  silent,
  seed,
  check_mins = list(chains = 1, adapt = 50, burnin = 50, sample = 100, thin = 1),
  call = ""
)

JAGS_check_and_list_autofit_settings(
  autofit_control,
  skip_sample_extend = FALSE,
  call = ""
)
```

Arguments

chains	number of chains to be run, defaults to 4
adapt	number of samples used for adapting the MCMC chains, defaults to 500
burnin	number of burnin iterations of the MCMC chains, defaults to 1000
sample	number of sampling iterations of the MCMC chains, defaults to 4000
thin	thinning interval for the MCMC samples, defaults to 1
autofit	whether the models should be refitted until convergence criteria specified in autofit_control. Defaults to FALSE.
parallel	whether the chains should be run in parallel FALSE
cores	number of cores used for multithreading if parallel = TRUE, defaults to chains
silent	whether the function should proceed silently, defaults to TRUE
seed	seed for random number generation

check_mins	named list of minimal values for which should some input be checked. Defaults to: chains 1 adapt 50 burnin 50 sample 100 thin 1
call	string to be placed as a prefix to the error call.
autofit_control	a list of arguments controlling the autofit function. Possible options are: max_Rhat maximum R-hat error for the autofit function. Defaults to 1.05. min_ESS minimum effective sample size. Defaults to 500. max_error maximum MCMC error. Defaults to 1.01. max_SD_error maximum MCMC error as the proportion of standard deviation of the parameters. Defaults to 0.05. max_time list specifying the time <code>time</code> and units <code>units</code> after which the automatic fitting function is stopped. The units arguments need to correspond to units passed to <code>difftime</code> function. sample_extend number of samples between each convergence check. Defaults to 1000. restarts number of times new initial values should be generated in case the model fails to initialize. Defaults to 10.
skip_sample_extend	whether <code>sample_extend</code> is allowed to be NULL and skipped in the check

Value

`JAGS_check_and_list_fit_settings` invisibly returns a list of checked fit settings. `JAGS_check_and_list_autofit_set` invisibly returns a list of checked autofit settings. parameter names.

JAGS_check_convergence

Assess convergence of a runjags model

Description

Checks whether the supplied `runjags-package` model satisfied convergence criteria.

Usage

```
JAGS_check_convergence(
  fit,
  prior_list,
  max_Rhat = 1.05,
```

```

    min_ESS = 500,
    max_error = 0.01,
    max_SD_error = 0.05
  )

```

Arguments

<code>fit</code>	a runjags model
<code>prior_list</code>	named list of prior distribution (names correspond to the parameter names)
<code>max_Rhat</code>	maximum R-hat error for the autofit function. Defaults to 1.05.
<code>min_ESS</code>	minimum effective sample size. Defaults to 500.
<code>max_error</code>	maximum MCMC error. Defaults to 1.01.
<code>max_SD_error</code>	maximum MCMC error as the proportion of standard deviation of the parameters. Defaults to 0.05.

Value

JAGS_check_convergence returns a boolean indicating whether the model converged or not, with an attribute 'errors' carrying the failed convergence checks (if any).

See Also

[JAGS_fit\(\)](#)

Examples

```

## Not run:
# simulate data
set.seed(1)
data <- list(
  x = rnorm(10),
  N = 10
)
data$x

# define priors
priors_list <- list(mu = prior("normal", list(0, 1)))

# define likelihood for the data
model_syntax <-
  "model{
    for(i in 1:N){
      x[i] ~ dnorm(mu, 1)
    }
  }"

# fit the models
fit <- JAGS_fit(model_syntax, data, priors_list)
JAGS_check_convergence(fit, priors_list)

## End(Not run)

```

JAGS_diagnostics *Plot diagnostics of a 'JAGS' model*

Description

Creates density plots, trace plots, and autocorrelation plots for a given parameter of a JAGS model.

Usage

```
JAGS_diagnostics(  
  fit,  
  parameter,  
  type,  
  plot_type = "base",  
  xlim = NULL,  
  ylim = NULL,  
  lags = 30,  
  n_points = 1000,  
  transformations = NULL,  
  transform_factors = FALSE,  
  transform_orthonormal = FALSE,  
  short_name = FALSE,  
  parameter_names = FALSE,  
  formula_prefix = TRUE,  
  ...  
)
```

```
JAGS_diagnostics_density(  
  fit,  
  parameter,  
  plot_type = "base",  
  xlim = NULL,  
  n_points = 1000,  
  transformations = NULL,  
  transform_factors = FALSE,  
  transform_orthonormal = FALSE,  
  short_name = FALSE,  
  parameter_names = FALSE,  
  formula_prefix = TRUE,  
  ...  
)
```

```
JAGS_diagnostics_trace(  
  fit,  
  parameter,  
  plot_type = "base",  
  ylim = NULL,
```

```

    transformations = NULL,
    transform_factors = FALSE,
    transform_orthonormal = FALSE,
    short_name = FALSE,
    parameter_names = FALSE,
    formula_prefix = TRUE,
    ...
)

JAGS_diagnostics_autocorrelation(
  fit,
  parameter,
  plot_type = "base",
  lags = 30,
  transformations = NULL,
  transform_factors = FALSE,
  transform_orthonormal = FALSE,
  short_name = FALSE,
  parameter_names = FALSE,
  formula_prefix = TRUE,
  ...
)

```

Arguments

<code>fit</code>	a JAGS model fitted via <code>JAGS_fit()</code>
<code>parameter</code>	parameter to be plotted
<code>type</code>	what type of model diagnostic should be plotted. The available options are "density", "trace", and "autocorrelation"
<code>plot_type</code>	whether to use a base plot "base" or ggplot2 "ggplot" for plotting.
<code>xlim</code>	x plotting range
<code>ylim</code>	y plotting range
<code>lags</code>	number of lags to be shown for the autocorrelation plot. Defaults to 30.
<code>n_points</code>	number of equally spaced points in the <code>x_range</code> if <code>x_seq</code> is unspecified
<code>transformations</code>	named list of transformations to be applied to specific parameters
<code>transform_factors</code>	whether factors with orthonormal/meandif prior distribution should be transformed to differences from the grand mean
<code>transform_orthonormal</code>	(to be depreciated) whether factors with orthonormal prior distributions should be transformed to differences from the grand mean
<code>short_name</code>	whether prior distribution names should be shorted
<code>parameter_names</code>	whether parameter names should be printed
<code>formula_prefix</code>	whether the parameter prefix from formula should be printed. Defaults to TRUE.
<code>...</code>	additional arguments

Value

diagnostics returns either NULL if plot_type = "base" or an object/list of objects (depending on the number of parameters to be plotted) of class 'ggplot2' if plot_type = "ggplot2".

See Also

[JAGS_fit\(\)](#) [JAGS_check_convergence\(\)](#)

JAGS_evaluate_formula *Evaluate JAGS formula using posterior samples*

Description

Evaluates a JAGS formula on a posterior distribution obtained from a fitted model.

Usage

```
JAGS_evaluate_formula(fit, formula, parameter, data, prior_list)
```

Arguments

fit	model fitted with either runjags posterior samples obtained with rjags-package
formula	formula specifying the right hand side of the assignment (the left hand side is ignored)
parameter	name of the parameter created with the formula
data	data.frame containing predictors included in the formula
prior_list	named list of prior distribution of parameters specified within the formula

Value

JAGS_evaluate_formula returns a matrix of the evaluated posterior samples on the supplied data.

See Also

[JAGS_fit\(\)](#) [JAGS_formula\(\)](#)

JAGS_fit

Fits a 'JAGS' model

Description

A wrapper around [run.jags](#) that simplifies fitting 'JAGS' models with usage with pre-specified model part of the 'JAGS' syntax, data and list of prior distributions.

Usage

```
JAGS_fit(
  model_syntax,
  data = NULL,
  prior_list = NULL,
  formula_list = NULL,
  formula_data_list = NULL,
  formula_prior_list = NULL,
  chains = 4,
  adapt = 500,
  burnin = 1000,
  sample = 4000,
  thin = 1,
  autofit = FALSE,
  autofit_control = list(max_Rhat = 1.05, min_ESS = 500, max_error = 0.01, max_SD_error =
    0.05, max_time = list(time = 60, unit = "mins"), sample_extend = 1000, restarts = 10),
  parallel = FALSE,
  cores = chains,
  silent = TRUE,
  seed = NULL,
  add_parameters = NULL,
  required_packages = NULL
)

JAGS_extend(
  fit,
  autofit_control = list(max_Rhat = 1.05, min_ESS = 500, max_error = 0.01, max_SD_error =
    0.05, max_time = list(time = 60, unit = "mins"), sample_extend = 1000, restarts = 10),
  parallel = FALSE,
  cores = NULL,
  silent = TRUE,
  seed = NULL
)
```

Arguments

model_syntax	jags syntax for the model part
data	list containing data to fit the model (not including data for the formulas)

prior_list	named list of prior distribution (names correspond to the parameter names) of parameters not specified within the formula_list
formula_list	named list of formulas to be added to the model (names correspond to the parameter name created by each of the formula)
formula_data_list	named list of data frames containing data for each formula (names of the lists correspond to the parameter name created by each of the formula)
formula_prior_list	named list of named lists of prior distributions (names of the lists correspond to the parameter name created by each of the formula and the names of the prior distribution correspond to the parameter names) of parameters specified within the formula
chains	number of chains to be run, defaults to 4
adapt	number of samples used for adapting the MCMC chains, defaults to 500
burnin	number of burnin iterations of the MCMC chains, defaults to 1000
sample	number of sampling iterations of the MCMC chains, defaults to 4000
thin	thinning interval for the MCMC samples, defaults to 1
autofit	whether the models should be refitted until convergence criteria specified in autofit_control. Defaults to FALSE.
autofit_control	a list of arguments controlling the autofit function. Possible options are: max_Rhat maximum R-hat error for the autofit function. Defaults to 1.05. min_ESS minimum effective sample size. Defaults to 500. max_error maximum MCMC error. Defaults to 1.01. max_SD_error maximum MCMC error as the proportion of standard deviation of the parameters. Defaults to 0.05. max_time list specifying the time <code>time</code> and units after which the automatic fitting function is stopped. The units arguments need to correspond to units passed to <code>difftime</code> function. sample_extend number of samples between each convergence check. Defaults to 1000. restarts number of times new initial values should be generated in case the model fails to initialize. Defaults to 10.
parallel	whether the chains should be run in parallel FALSE
cores	number of cores used for multithreading if <code>parallel = TRUE</code> , defaults to <code>chains</code>
silent	whether the function should proceed silently, defaults to TRUE
seed	seed for random number generation
add_parameters	vector of additional parameter names that should be used monitored but were not specified in the <code>prior_list</code>
required_packages	character vector specifying list of packages containing JAGS models required for sampling (in case that the function is run in parallel or in detached R session). Defaults to NULL.
fit	a 'BayesTools_fit' object (created by <code>JAGS_fit()</code> function) to be extended

Value

JAGS_fit returns an object of class 'runjags' and 'BayesTools_fit'.

See Also

[JAGS_check_convergence\(\)](#)

Examples

```
## Not run:
# simulate data
set.seed(1)
data <- list(
  x = rnorm(10),
  N = 10
)
data$x

# define priors
priors_list <- list(mu = prior("normal", list(0, 1)))

# define likelihood for the data
model_syntax <-
  "model{
    for(i in 1:N){
      x[i] ~ dnorm(mu, 1)
    }
  }"

# fit the models
fit <- JAGS_fit(model_syntax, data, priors_list)

## End(Not run)
```

JAGS_formula

Create JAGS formula syntax and data object

Description

Creates a JAGS formula syntax, prepares data input, and returns modified prior list for further processing in the JAGS_fit function

Usage

```
JAGS_formula(formula, parameter, data, prior_list)
```

Arguments

formula	formula specifying the right hand side of the assignment (the left hand side is ignored)
parameter	name of the parameter to be created with the formula
data	data.frame containing predictors included in the formula
prior_list	named list of prior distribution of parameters specified within the formula

Value

JAGS_formula returns a list containing the formula JAGS syntax, JAGS data object, and modified prior_list.

See Also

[JAGS_fit\(\)](#)

Examples

```
# simulate data
set.seed(1)
df <- data.frame(
  y      = rnorm(60),
  x_cont = rnorm(60),
  x_bin  = rbinom(60, 1, .5),
  x_fac3 = factor(rep(c("A", "B", "C"), 20), levels = c("A", "B", "C")),
  x_fac4 = factor(rep(c("A", "B", "C", "D"), 15), levels = c("A", "B", "C", "D"))
)

# specify priors
prior_list <- list(
  "intercept" = prior("normal", list(0, 1)),
  "x_cont"    = prior("normal", list(0, .5)),
  "x_fac3"    = prior_factor("normal", list(0, 1), contrast = "treatment"),
  "x_fac4"    = prior_factor("mnormal", list(0, 1), contrast = "orthonormal"),
  "x_fac3:x_fac4" = prior_factor("mnormal", list(0, .5), contrast = "orthonormal")
)

# create the formula object
formula <- JAGS_formula(
  formula = ~ x_cont + x_fac3 * x_fac4,
  parameter = "mu", data = df, prior_list = prior_list)

```

JAGS_get_inits	<i>Create initial values for 'JAGS' model</i>
----------------	---

Description

Creates initial values for priors in a 'JAGS' model.

Usage

```
JAGS_get_inits(prior_list, chains, seed)
```

Arguments

prior_list	named list of prior distribution (names correspond to the parameter names)
chains	number of chains
seed	seed for random number generation

Value

JAGS_add_priors returns a list of JAGS initial values.

JAGS_marglik_parameters	<i>Extract parameters for 'JAGS' priors</i>
-------------------------	---

Description

Extracts transformed parameters from the prior part of a 'JAGS' model inside of a 'bridgesampling' function (returns them as a named list)

Usage

```
JAGS_marglik_parameters(samples, prior_list)
```

```
JAGS_marglik_parameters_formula(  
  samples,  
  formula_data_list,  
  formula_prior_list,  
  prior_list_parameters  
)
```

Arguments

<code>samples</code>	samples provided by <code>bridgesampling</code> function
<code>prior_list</code>	named list of prior distribution (names correspond to the parameter names) of parameters not specified within the <code>formula_list</code>
<code>formula_data_list</code>	named list of data frames containing data for each formula (names of the lists correspond to the parameter name created by each of the formula)
<code>formula_prior_list</code>	named list of named lists of prior distributions (names of the lists correspond to the parameter name created by each of the formula and the names of the prior distribution correspond to the parameter names) of parameters specified within the formula
<code>prior_list_parameters</code>	named list of prior distributions on model parameters (not specified within the formula but that might scale the formula parameters)

Value

`JAGS_marglik_parameters` returns a named list of (transformed) posterior samples.

`JAGS_marglik_priors` *Compute marginal likelihood for 'JAGS' priors*

Description

Computes marginal likelihood for the prior part of a 'JAGS' model within 'bridgesampling' function

Usage

```
JAGS_marglik_priors(samples, prior_list)
```

```
JAGS_marglik_priors_formula(samples, formula_prior_list)
```

Arguments

<code>samples</code>	samples provided by <code>bridgesampling</code> function
<code>prior_list</code>	named list of prior distribution (names correspond to the parameter names) of parameters not specified within the <code>formula_list</code>
<code>formula_prior_list</code>	named list of named lists of prior distributions (names of the lists correspond to the parameter name created by each of the formula and the names of the prior distribution correspond to the parameter names) of parameters specified within the formula

Value

JAGS_marglik_priors returns a numeric value of likelihood evaluated at the current posterior sample.

JAGS_to_monitor	<i>Create list of monitored parameters for 'JAGS' model</i>
-----------------	---

Description

Creates a vector of parameter names to be monitored in a 'JAGS' model.

Usage

```
JAGS_to_monitor(prior_list)
```

Arguments

prior_list named list of prior distribution (names correspond to the parameter names)

Value

JAGS_to_monitor returns a character vector of parameter names.

kitchen_rolls	<i>Kitchen Rolls data from Wagenmakers et al. (2015) replication study.</i>
---------------	---

Description

The data set contains mean NEO PI-R scores for two groups of students. Each of them filled a personality questionnaire while rotating a kitchen roll either clock or counter-clock wise. See Wagenmakers et al. (2015) for more details about the replication study and the <https://osf.io/uszvx/> for the original data.

Usage

```
kitchen_rolls
```

Format

A data.frame with 2 columns and 102 observations.

Value

a data.frame.

References

Wagenmakers E, Beek TF, Rotteveel M, Gierholz A, Matzke D, Steingroever H, Ly A, Verhagen J, Selker R, Sasiadek A, others (2015). “Turning the hands of time again: a purely confirmatory replication study and a Bayesian analysis.” *Frontiers in Psychology*, **6**, 1–6. doi:10.3389/fpsyg.2015.00494.

lines.prior	<i>Add prior object to a plot</i>
-------------	-----------------------------------

Description

Add prior object to a plot

Usage

```
## S3 method for class 'prior'
lines(
  x,
  xlim = NULL,
  x_seq = NULL,
  x_range_quant = NULL,
  n_points = 1000,
  n_samples = 10000,
  force_samples = FALSE,
  transformation = NULL,
  transformation_arguments = NULL,
  transformation_settings = FALSE,
  show_parameter = if (individual) 1 else NULL,
  individual = FALSE,
  rescale_x = FALSE,
  scale_y2 = 1,
  ...
)
```

Arguments

x	a prior
xlim	plotting range of the prior
x_seq	sequence of x coordinates
x_range_quant	quantile used for automatically obtaining x_range if both x_range and x_seq are unspecified. Defaults to 0.005 for all but Cauchy, Student-t, Gamma, and Inverse-gamme distributions that use 0.010.
n_points	number of equally spaced points in the x_range if x_seq is unspecified
n_samples	number of samples from the prior distribution if the density cannot be obtained analytically (or if samples are forced with force_samples = TRUE)

force_samples	should prior be sampled instead of obtaining analytic solution whenever possible
transformation	transformation to be applied to the prior distribution. Either a character specifying one of the prepared transformations: lin linear transformation in form of $a + b \cdot x$ tanh also known as Fisher's z transformation exp exponential transformation , or a list containing the transformation function <code>fun</code> , inverse transformation function <code>inv</code> , and the Jacobian of the transformation <code>jac</code> . See examples for details.
transformation_arguments	a list with named arguments for the transformation
transformation_settings	boolean indicating whether the settings the <code>x_seq</code> or <code>x_range</code> was specified on the transformed support
show_parameter	which parameter should be returned in case of multiple parameters per prior. Useful when priors for the omega parameter are plotted and <code>individual = TRUE</code> .
individual	should individual densities be returned (e.g., in case of weightfunction)
rescale_x	allows to rescale x-axis in case a weightfunction is plotted.
scale_y2	scaling factor for a secondary axis
...	additional arguments

Value

`lines.prior` returns `NULL`.

See Also

[plot.prior\(\)](#) [geom_prior\(\)](#)

<code>lines_prior_list</code>	<i>Add list of prior objects to a plot</i>
-------------------------------	--

Description

Add list of prior objects to a plot

Usage

```
lines_prior_list(
  prior_list,
  xlim = NULL,
  x_seq = NULL,
  x_range_quant = NULL,
  n_points = 500,
```

```

n_samples = 10000,
force_samples = FALSE,
transformation = NULL,
transformation_arguments = NULL,
transformation_settings = FALSE,
rescale_x = FALSE,
scale_y2 = NULL,
prior_list_mu = NULL,
...
)

```

Arguments

prior_list	list of prior distributions
xlim	x plotting range
x_seq	sequence of x coordinates
x_range_quant	quantile used for automatically obtaining x_range if both x_range and x_seq are unspecified. Defaults to 0.005 for all but Cauchy, Student-t, Gamma, and Inverse-gamme distributions that use 0.010.
n_points	number of equally spaced points in the x_range if x_seq is unspecified
n_samples	number of samples from the prior distribution if the density cannot be obtained analytically (or if samples are forced with force_samples = TRUE)
force_samples	should prior be sampled instead of obtaining analytic solution whenever possible
transformation	transformation to be applied to the prior distribution. Either a character specifying one of the prepared transformations: lin linear transformation in form of $a + b \cdot x$ tanh also known as Fisher's z transformation exp exponential transformation , or a list containing the transformation function fun, inverse transformation function inv, and the Jacobian of the transformation jac. See examples for details.
transformation_arguments	a list with named arguments for the transformation
transformation_settings	boolean indicating whether the settings the x_seq or x_range was specified on the transformed support
rescale_x	allows to rescale x-axis in case a weightfunction is plotted.
scale_y2	scaling factor for a secondary axis
prior_list_mu	list of priors for the mu parameter required when plotting PET-PEESE
...	additional arguments

Value

lines_prior_list returns NULL.

See Also

[plot_prior_list\(\)](#) [geom_prior_list\(\)](#)

marginal_inference	<i>Model-average marginal posterior distributions and marginal Bayes factors</i>
--------------------	--

Description

Creates marginal model-averaged and conditional posterior distributions based on a list of models, vector of parameters, formula, and a list of indicators of the null or alternative hypothesis models for each parameter. Computes inclusion Bayes factors for each marginal estimate via a Savage-Dickey density approximation.

Usage

```
marginal_inference(
  model_list,
  marginal_parameters,
  parameters,
  is_null_list,
  formula,
  null_hypothesis = 0,
  normal_approximation = FALSE,
  n_samples = 10000,
  seed = NULL,
  silent = FALSE
)
```

Arguments

model_list	list of models, each of which contains marginal likelihood estimated with bridge sampling <code>marglik</code> and prior model odds <code>prior_weights</code>
marginal_parameters	parameters for which the the marginal summary should be created
parameters	all parameters included in the <code>model_list</code> that are relevant for the formula (all of which need to have specification of <code>is_null_list</code>)
is_null_list	list with entries for each parameter carrying either logical vector of indicators specifying whether the model corresponds to the null or alternative hypothesis (or an integer vector indexing models corresponding to the null hypothesis)
formula	model formula (needs to be specified if parameter was part of a formula)
null_hypothesis	point null hypothesis to test. Defaults to 0
normal_approximation	whether the height of prior and posterior density should be approximated via a normal distribution (rather than kernel density). Defaults to FALSE.

n_samples	number of samples to be drawn for the model-averaged posterior distribution
seed	seed for random number generation
silent	whether warnings should be returned silently. Defaults to FALSE

Value

mix_posteriors returns a named list of mixed posterior distributions (either a vector of matrix).

See Also

[ensemble_inference](#) [mix_posteriors](#) [BayesTools_ensemble_tables](#)

marginal_posterior	<i>Model-average marginal posterior distributions</i>
--------------------	---

Description

Creates marginal model-averages posterior distributions for a given parameter based on model-averaged posterior samples and parameter name (and formula with at specification).

Usage

```
marginal_posterior(
  samples,
  parameter,
  formula = NULL,
  at = NULL,
  prior_samples = FALSE,
  use_formula = TRUE,
  transformation = NULL,
  transformation_arguments = NULL,
  transformation_settings = FALSE,
  n_samples = 10000,
  ...
)
```

Arguments

samples	model-averaged posterior samples created by mix_posteriors()
parameter	parameter of interest
formula	model formula (needs to be specified if parameter was part of a formula)
at	named list with predictor levels of the formula for which marginalization should be performed. If a predictor level is missing, 0 is used for continuous predictors, the baseline factor level is used for factors with contrast = "treatment" prior distributions, and the parameter is completely omitted for factors with contrast = "meandif",

prior_samples whether marginal prior distributions should be generated contrast = "orthonormal", and contrast = "independent" levels
use_formula whether the parameter should be evaluated as a part of supplied formula
transformation transformation to be applied to the prior distribution. Either a character specifying one of the prepared transformations:
lin linear transformation in form of $a + b \cdot x$
tanh also known as Fisher's z transformation
exp exponential transformation
, or a list containing the transformation function `fun`, inverse transformation function `inv`, and the Jacobian of the transformation `jac`. See examples for details.
transformation_arguments a list with named arguments for the transformation
transformation_settings boolean indicating whether the settings the `x_seq` or `x_range` was specified on the transformed support
n_samples number of samples to be drawn for the model-averaged posterior distribution
... additional arguments

Value

`marginal_posterior` returns a named list of mixed marginal posterior distributions (either a vector of matrix). #'

mean.prior	<i>Prior mean</i>
------------	-------------------

Description

Computes mean of a prior distribution. (In case of orthonormal prior distributions for factors, the mean of for the deviations from intercept is returned.)

Usage

```
## S3 method for class 'prior'
mean(x, ...)
```

Arguments

x a prior
... unused

Value

a mean of an object of class 'prior'.

See Also[prior\(\)](#)**Examples**

```
# create a standard normal prior distribution
p1 <- prior(distribution = "normal", parameters = list(mean = 1, sd = 1))

# compute mean of the prior distribution
mean(p1)
```

`mix_posteriors`*Model-average posterior distributions*

Description

Model-averages posterior distributions based on a list of models, vector of parameters, and a list of indicators of the null or alternative hypothesis models for each parameter.

Usage

```
mix_posteriors(
  model_list,
  parameters,
  is_null_list,
  conditional = FALSE,
  seed = NULL,
  n_samples = 10000
)
```

Arguments

<code>model_list</code>	list of models, each of which contains marginal likelihood estimated with bridge sampling <code>marglik</code> and prior model odds <code>prior_weights</code>
<code>parameters</code>	vector of parameters names for which inference should be drawn
<code>is_null_list</code>	list with entries for each parameter carrying either logical vector of indicators specifying whether the model corresponds to the null or alternative hypothesis (or an integer vector indexing models corresponding to the null hypothesis)
<code>conditional</code>	whether prior and posterior model probabilities should be returned only for the conditional model. Defaults to <code>FALSE</code>
<code>seed</code>	integer specifying seed for sampling posteriors for model averaging. Defaults to <code>NULL</code> .
<code>n_samples</code>	number of samples to be drawn for the model-averaged posterior distribution

Value

mix_posteriors returns a named list of mixed posterior distributions (either a vector of matrix).

See Also

[ensemble_inference](#) [BayesTools_ensemble_tables](#)

mpoint *Multivariate point mass distribution*

Description

Density, distribution function, quantile function and random generation for multivariate point distribution.

Usage

```
dmpoint(x, location, log = FALSE)
```

```
rmpoint(n, location)
```

```
ppoint(q, location, lower.tail = TRUE, log.p = FALSE)
```

```
qmpoint(p, location, lower.tail = TRUE, log.p = FALSE)
```

Arguments

x, q	vector or matrix of quantiles.
location	vector of locations corresponding to the location of individual points. Alternatively, a matrix with rows corresponding to the location of individual samples and columns correspond to the location of individual points.
log, log.p	logical; if TRUE, probabilities p are given as log(p).
n	number of observations.
lower.tail	logical; if TRUE (default), probabilities are $P[X \leq x]$, otherwise, $P[X \geq x]$.
p	vector of probabilities.

Value

dpoint gives the density, ppoint gives the distribution function, qpoint gives the quantile function, and rpoint generates random deviates.

Examples

```
# draw samples from a multivariate point distribution
rmpoint(10, location = c(0, 1))
```

parameter_names	<i>Clean parameter names from JAGS</i>
-----------------	--

Description

Removes additional formatting from parameter names outputted from JAGS.

Usage

```
format_parameter_names(
  parameters,
  formula_parameters = NULL,
  formula_prefix = TRUE
)

JAGS_parameter_names(parameters, formula_parameter = NULL)
```

Arguments

parameters a vector of parameter names
 formula_parameters
 a vector of formula parameter prefix names
 formula_prefix whether the formula_parameters names should be kept. Defaults to TRUE.
 formula_parameter
 a formula parameter prefix name

Value

A character vector with reformatted parameter names.

Examples

```
format_parameter_names(c("mu_x_cont", "mu_x_fac3t", "mu_x_fac3t__xX__x_cont"),
  formula_parameters = "mu")
```

plot.prior	<i>Plots a prior object</i>
------------	-----------------------------

Description

Plots a prior object

Usage

```
## S3 method for class 'prior'
plot(
  x,
  plot_type = "base",
  x_seq = NULL,
  xlim = NULL,
  x_range_quant = NULL,
  n_points = 1000,
  n_samples = 10000,
  force_samples = FALSE,
  transformation = NULL,
  transformation_arguments = NULL,
  transformation_settings = FALSE,
  show_figures = if (individual) -1 else NULL,
  individual = FALSE,
  rescale_x = FALSE,
  par_name = NULL,
  ...
)
```

Arguments

<code>x</code>	a prior
<code>plot_type</code>	whether to use a base plot "base" or ggplot2 "ggplot" for plotting.
<code>x_seq</code>	sequence of x coordinates
<code>xlim</code>	x plotting range
<code>x_range_quant</code>	quantile used for automatically obtaining <code>x_range</code> if both <code>x_range</code> and <code>x_seq</code> are unspecified. Defaults to 0.005 for all but Cauchy, Student-t, Gamma, and Inverse-gamma distributions that use 0.010.
<code>n_points</code>	number of equally spaced points in the <code>x_range</code> if <code>x_seq</code> is unspecified
<code>n_samples</code>	number of samples from the prior distribution if the density cannot be obtained analytically (or if samples are forced with <code>force_samples = TRUE</code>)
<code>force_samples</code>	should prior be sampled instead of obtaining analytic solution whenever possible
<code>transformation</code>	transformation to be applied to the prior distribution. Either a character specifying one of the prepared transformations: lin linear transformation in form of $a + b \cdot x$ tanh also known as Fisher's z transformation exp exponential transformation , or a list containing the transformation function <code>fun</code> , inverse transformation function <code>inv</code> , and the Jacobian of the transformation <code>jac</code> . See examples for details.
<code>transformation_arguments</code>	a list with named arguments for the transformation

transformation_settings	boolean indicating whether the settings the x_seq or x_range was specified on the transformed support
show_figures	which figures should be returned in case of multiple plots are generated. Useful when priors for the omega parameter are plotted and individual = TRUE.
individual	should individual densities be returned (e.g., in case of weightfunction)
rescale_x	allows to rescale x-axis in case a weightfunction is plotted.
par_name	a type of parameter for which the prior is specified. Only relevant if the prior corresponds to a mu parameter that needs to be transformed.
...	additional arguments

Value

plot.prior returns either NULL or an object of class 'ggplot' if plot_type is plot_type = "ggplot".

See Also

[prior\(\)](#) [lines.prior\(\)](#) [geom_prior\(\)](#)

Examples

```
# create some prior distributions
p0 <- prior(distribution = "point", parameters = list(location = 0))
p1 <- prior(distribution = "normal", parameters = list(mean = 0, sd = 1))
p2 <- prior(distribution = "normal", parameters = list(mean = 0, sd = 1), truncation = list(0, Inf))

# a default plot
plot(p0)

# manipulate line thickness and color, change the parameter name
plot(p1, lwd = 2, col = "blue", par_name = bquote(mu))

# use ggplot
plot(p2, plot_type = "ggplot")

# utilize the ggplot prior geom
plot(p2, plot_type = "ggplot", xlim = c(-2, 2)) + geom_prior(p1, col = "red", lty = 2)

# apply transformation
plot(p1, transformation = "exp")
```

plot_marginal

Plot samples from the marginal posterior distributions

Description

Plot samples from the marginal posterior distributions

Usage

```
plot_marginal(
  samples,
  parameter,
  plot_type = "base",
  prior = FALSE,
  n_points = 1000,
  transformation = NULL,
  transformation_arguments = NULL,
  transformation_settings = FALSE,
  rescale_x = FALSE,
  par_name = NULL,
  dots_prior = list(),
  ...
)
```

Arguments

samples	samples from a posterior distribution for a parameter generated by marginal_inference .
parameter	parameter name to be plotted.
plot_type	whether to use a base plot "base" or ggplot2 "ggplot" for plotting.
prior	whether prior distribution should be added to the figure
n_points	number of equally spaced points in the x_range if x_seq is unspecified
transformation	transformation to be applied to the prior distribution. Either a character specifying one of the prepared transformations: lin linear transformation in form of $a + b \cdot x$ tanh also known as Fisher's z transformation exp exponential transformation , or a list containing the transformation function fun, inverse transformation function inv, and the Jacobian of the transformation jac. See examples for details.
transformation_arguments	a list with named arguments for the transformation
transformation_settings	boolean indicating whether the settings the x_seq or x_range was specified on the transformed support
rescale_x	allows to rescale x-axis in case a weightfunction is plotted.
par_name	a type of parameter for which the prior is specified. Only relevant if the prior corresponds to a mu parameter that needs to be transformed.
dots_prior	additional arguments for the prior distribution plot
...	additional arguments

Value

plot_marginal returns either NULL or an object of class 'ggplot' if plot_type is plot_type = "ggplot".

See Also

[prior\(\)](#) [marginal_inference\(\)](#) [plot_posterior\(\)](#)

plot_models

Plot estimates from models

Description

Plot estimates from models

Usage

```
plot_models(
  model_list,
  samples,
  inference,
  parameter,
  plot_type = "base",
  prior = FALSE,
  conditional = FALSE,
  order = NULL,
  transformation = NULL,
  transformation_arguments = NULL,
  transformation_settings = FALSE,
  par_name = NULL,
  formula_prefix = TRUE,
  ...
)
```

Arguments

model_list	list of models, each of which contains marginal likelihood estimated with bridge sampling <code>marglik</code> and prior model odds <code>prior_weights</code>
samples	samples from a posterior distribution for a parameter generated by mix_posteriors .
inference	object created by ensemble_inference function
parameter	parameter name to be plotted. Does not support PET-PEESE and weightfunction.
plot_type	whether to use a base plot "base" or ggplot2 "ggplot" for plotting.
prior	whether prior distribution should be added to the figure
conditional	whether conditional models should be displayed
order	list specifying ordering of the models. The first element describes whether the ordering should be "increasing" or "decreasing" and the second element describes whether the ordering should be based "model" order, "estimate" size, posterior "probability", or the inclusion "BF".

transformation	transformation to be applied to the prior distribution. Either a character specifying one of the prepared transformations: lin linear transformation in form of $a + b \cdot x$ tanh also known as Fisher's z transformation exp exponential transformation , or a list containing the transformation function <code>fun</code> , inverse transformation function <code>inv</code> , and the Jacobian of the transformation <code>jac</code> . See examples for details.
transformation_arguments	a list with named arguments for the transformation
transformation_settings	boolean indicating whether the settings the <code>x_seq</code> or <code>x_range</code> was specified on the transformed support
par_name	a type of parameter for which the prior is specified. Only relevant if the prior corresponds to a <code>mu</code> parameter that needs to be transformed.
formula_prefix	whether the <code>formula_parameters</code> names should be kept. Defaults to <code>TRUE</code> .
...	additional arguments. E.g.: "show_updating" whether Bayes factors and change from prior to posterior odds should be shown on the secondary y-axis "show_estimates" whether posterior estimates and 95% CI should be shown on the secondary y-axis "y_axis2" whether the secondary y-axis should be shown

Details

Plots prior and posterior estimates of the same parameter across multiple models (prior distributions with orthonormal/meandif contrast are always plotted as differences from the grand mean).

Value

`plot_models` returns either `NULL` or an object of class 'ggplot' if `plot_type` is `plot_type = "ggplot"`.

See Also

[prior\(\)](#) [lines_prior_list\(\)](#) [geom_prior_list\(\)](#)

plot_posterior

Plot samples from the mixed posterior distributions

Description

Plot samples from the mixed posterior distributions

Usage

```
plot_posterior(
  samples,
  parameter,
  plot_type = "base",
  prior = FALSE,
  n_points = 1000,
  n_samples = 10000,
  force_samples = FALSE,
  transformation = NULL,
  transformation_arguments = NULL,
  transformation_settings = FALSE,
  rescale_x = FALSE,
  par_name = NULL,
  dots_prior = list(),
  ...
)
```

Arguments

samples	samples from a posterior distribution for a parameter generated by mix_posteriors .
parameter	parameter name to be plotted. Use "PETPEESE" for PET-PEESE plot with parameters "PET" and "PEESE", and "weightfunction" for plotting a weightfunction with parameters "omega".
plot_type	whether to use a base plot "base" or ggplot2 "ggplot" for plotting.
prior	whether prior distribution should be added to the figure
n_points	number of equally spaced points in the x_range if x_seq is unspecified
n_samples	number of samples from the prior distribution if the density cannot be obtained analytically (or if samples are forced with force_samples = TRUE)
force_samples	should prior be sampled instead of obtaining analytic solution whenever possible
transformation	transformation to be applied to the prior distribution. Either a character specifying one of the prepared transformations: lin linear transformation in form of $a + b \cdot x$ tanh also known as Fisher's z transformation exp exponential transformation , or a list containing the transformation function fun, inverse transformation function inv, and the Jacobian of the transformation jac. See examples for details.
transformation_arguments	a list with named arguments for the transformation
transformation_settings	boolean indicating whether the settings the x_seq or x_range was specified on the transformed support
rescale_x	allows to rescale x-axis in case a weightfunction is plotted.

par_name	a type of parameter for which the prior is specified. Only relevant if the prior corresponds to a mu parameter that needs to be transformed.
dots_prior	additional arguments for the prior distribution plot
...	additional arguments

Value

plot_posterior returns either NULL or an object of class 'ggplot' if plot_type is plot_type = "ggplot".

See Also

[prior\(\)](#) [lines_prior_list\(\)](#) [geom_prior_list\(\)](#)

plot_prior_list	<i>Plot a list of prior distributions</i>
-----------------	---

Description

Plot a list of prior distributions

Usage

```
plot_prior_list(
  prior_list,
  plot_type = "base",
  x_seq = NULL,
  xlim = NULL,
  x_range_quant = NULL,
  n_points = 500,
  n_samples = 10000,
  force_samples = FALSE,
  transformation = NULL,
  transformation_arguments = NULL,
  transformation_settings = FALSE,
  rescale_x = FALSE,
  par_name = NULL,
  prior_list_mu = NULL,
  ...
)
```

Arguments

prior_list	list of prior distributions
plot_type	whether to use a base plot "base" or ggplot2 "ggplot" for plotting.
x_seq	sequence of x coordinates

xlim	x plotting range
x_range_quant	quantile used for automatically obtaining x_range if both x_range and x_seq are unspecified. Defaults to 0.005 for all but Cauchy, Student-t, Gamma, and Inverse-gamme distributions that use 0.010.
n_points	number of equally spaced points in the x_range if x_seq is unspecified
n_samples	number of samples from the prior distribution if the density cannot be obtained analytically (or if samples are forced with force_samples = TRUE)
force_samples	should prior be sampled instead of obtaining analytic solution whenever possible
transformation	transformation to be applied to the prior distribution. Either a character specifying one of the prepared transformations: lin linear transformation in form of $a + b \cdot x$ tanh also known as Fisher's z transformation exp exponential transformation , or a list containing the transformation function fun, inverse transformation function inv, and the Jacobian of the transformation jac. See examples for details.
transformation_arguments	a list with named arguments for the transformation
transformation_settings	boolean indicating whether the settings the x_seq or x_range was specified on the transformed support
rescale_x	allows to rescale x-axis in case a weightfunction is plotted.
par_name	a type of parameter for which the prior is specified. Only relevant if the prior corresponds to a mu parameter that needs to be transformed.
prior_list_mu	list of priors for the mu parameter required when plotting PET-PEESE
...	additional arguments

Value

plot_prior_list returns either NULL or an object of class 'ggplot' if plot_type is plot_type = "ggplot".

See Also

[prior\(\)](#) [lines_prior_list\(\)](#) [geom_prior_list\(\)](#)

point	<i>Point mass distribution</i>
-------	--------------------------------

Description

Density, distribution function, quantile function and random generation for point distribution.

Usage

```
dpoint(x, location, log = FALSE)
```

```
rpoint(n, location)
```

```
ppoint(q, location, lower.tail = TRUE, log.p = FALSE)
```

```
qpoint(p, location, lower.tail = TRUE, log.p = FALSE)
```

Arguments

x, q	vector or matrix of quantiles.
location	vector of locations.
log, log.p	logical; if TRUE, probabilities p are given as log(p).
n	number of observations.
lower.tail	logical; if TRUE (default), probabilities are $P[X \leq x]$, otherwise, $P[X \geq x]$.
p	vector of probabilities.

Value

dpoint gives the density, ppoint gives the distribution function, qpoint gives the quantile function, and rpoint generates random deviates.

Examples

```
# draw samples from a point distribution  
rpoint(10, location = 1)
```

```
print.BayesTools_table  
Print a BayesTools table
```

Description

Print a BayesTools table

Usage

```
## S3 method for class 'BayesTools_table'  
print(x, ...)
```

Arguments

x a BayesTools_values_tables
... additional arguments.

Value

print.BayesTools_table returns NULL.

```
print.prior            Prints a prior object
```

Description

Prints a prior object

Usage

```
## S3 method for class 'prior'  
print(  
  x,  
  short_name = FALSE,  
  parameter_names = FALSE,  
  plot = FALSE,  
  digits_estimates = 2,  
  silent = FALSE,  
  ...  
)
```

Arguments

x	a prior
short_name	whether prior distribution names should be shorted
parameter_names	whether parameter names should be printed
plot	to return <code>bquote</code> formatted prior name for plotting.
digits_estimates	number of decimals to be displayed for printed parameters.
silent	to silently return the print message.
...	additional arguments

Value

`print.prior` invisibly returns the print statement.

See Also

[prior\(\)](#)

Examples

```
# create some prior distributions
p0 <- prior(distribution = "point", parameters = list(location = 0))
p1 <- prior(distribution = "normal", parameters = list(mean = 0, sd = 1))

# print them
p0
p1

# use short names
print(p1, short_name = TRUE)

# print parameter names
print(p1, parameter_names = TRUE)

# generate bquote plotting syntax
plot(0, main = print(p1, plot = TRUE))
```

prior

Creates a prior distribution

Description

`prior` creates a prior distribution. The prior can be visualized by the `plot` function.

Usage

```
prior(
  distribution,
  parameters,
  truncation = list(lower = -Inf, upper = Inf),
  prior_weights = 1
)

prior_none(prior_weights = 1)
```

Arguments

distribution	name of the prior distribution. The possible options are "point" for a point density characterized by a location parameter. "normal" for a normal distribution characterized by a mean and sd parameters. "lognormal" for a lognormal distribution characterized by a meanlog and sdlog parameters. "cauchy" for a Cauchy distribution characterized by a location and scale parameters. Internally converted into a generalized t-distribution with df = 1. "t" for a generalized t-distribution characterized by a location, scale, and df parameters. "gamma" for a gamma distribution characterized by either shape and rate, or shape and scale parameters. The later is internally converted to the shape and rate parametrization "invgamma" for an inverse-gamma distribution characterized by a shape and scale parameters. The JAGS part uses a 1/gamma distribution with a shape and rate parameter. "beta" for a beta distribution characterized by an alpha and beta parameters. "exp" for an exponential distribution characterized by either rate or scale parameter. The later is internally converted to rate. "uniform" for a uniform distribution defined on a range from a to b
parameters	list of appropriate parameters for a given distribution.
truncation	list with two elements, lower and upper, that define the lower and upper truncation of the distribution. Defaults to list(lower = -Inf, upper = Inf). The truncation is automatically set to the bounds of the support.
prior_weights	prior odds associated with a given distribution. The value is passed into the model fitting function, which creates models corresponding to all combinations of prior distributions for each of the model parameters and sets the model priors odds to the product of its prior distributions.

Value

prior and prior_none return an object of class 'prior'. A named list containing the distribution name, parameters, and prior weights.

See Also

[plot.prior\(\)](#), [Normal](#), [Lognormal](#), [Cauchy](#), [Beta](#), [Exponential](#), [LocationScaleT](#), [InvGamma](#).

Examples

```
# create a standard normal prior distribution
p1 <- prior(distribution = "normal", parameters = list(mean = 1, sd = 1))

# create a half-normal standard normal prior distribution
p2 <- prior(distribution = "normal", parameters = list(mean = 1, sd = 1),
truncation = list(lower = 0, upper = Inf))

# the prior distribution can be visualized using the plot function
# (see ?plot.prior for all options)
plot(p1)
```

prior_factor

Creates a prior distribution for factors

Description

prior_factor creates a prior distribution for fitting models with factor predictors. (Note that results across different operating systems might vary due to differences in JAGS numerical precision.)

Usage

```
prior_factor(
  distribution,
  parameters,
  truncation = list(lower = -Inf, upper = Inf),
  prior_weights = 1,
  contrast = "meandif"
)
```

Arguments

distribution name of the prior distribution. The possible options are

- "point" for a point density characterized by a location parameter.
- "normal" for a normal distribution characterized by a mean and sd parameters.
- "lognormal" for a lognormal distribution characterized by a meanlog and sdlog parameters.
- "cauchy" for a Cauchy distribution characterized by a location and scale parameters. Internally converted into a generalized t-distribution with df = 1.
- "t" for a generalized t-distribution characterized by a location, scale, and df parameters.

	"gamma" for a gamma distribution characterized by either shape and rate, or shape and scale parameters. The later is internally converted to the shape and rate parametrization
	"invgamma" for an inverse-gamma distribution characterized by a shape and scale parameters. The JAGS part uses a 1/gamma distribution with a shape and rate parameter.
	"beta" for a beta distribution characterized by an alpha and beta parameters.
	"exp" for an exponential distribution characterized by either rate or scale parameter. The later is internally converted to rate.
	"uniform" for a uniform distribution defined on a range from a to b
parameters	list of appropriate parameters for a given distribution.
truncation	list with two elements, lower and upper, that define the lower and upper truncation of the distribution. Defaults to <code>list(lower = -Inf, upper = Inf)</code> . The truncation is automatically set to the bounds of the support.
prior_weights	prior odds associated with a given distribution. The value is passed into the model fitting function, which creates models corresponding to all combinations of prior distributions for each of the model parameters and sets the model priors odds to the product of its prior distributions.
contrast	type of contrast for the prior distribution. The possible options are <ul style="list-style-type: none"> "meandif" for contrast centered around the grand mean with equal marginal distributions, making the prior distribution exchangeable across factor levels. In contrast to "orthonormal", the marginal distributions are identical regardless of the number of factor levels and the specified prior distribution corresponds to the difference from grand mean for each factor level. Only supports <code>distribution = "mnormal"</code> and <code>distribution = "mt"</code> which generates the corresponding multivariate normal/t distributions. "orthonormal" for contrast centered around the grand mean with equal marginal distributions, making the prior distribution exchangeable across factor levels. Only supports <code>distribution = "mnormal"</code> and <code>distribution = "mt"</code> which generates the corresponding multivariate normal/t distributions. "treatment" for contrasts using the first level as a comparison group and setting equal prior distribution on differences between the individual factor levels and the comparison level. "independent" for contrasts specifying dependent prior distribution for each factor level (note that this leads to an overparameterized model if the intercept is included).

Value

return an object of class 'prior'.

See Also

[prior\(\)](#)

Examples

```
# create an orthonormal prior distribution
p1 <- prior_factor(distribution = "mnormal", contrast = "orthonormal",
                  parameters = list(mean = 0, sd = 1))
```

prior_functions *Elementary prior related functions*

Description

Density (pdf / lpdf), distribution function (cdf / ccdf), quantile function (quant), random generation (rng), mean, standard deviation (sd), and marginal variants of the functions (mpdf, mlpf, mcdf, mccdf, mquant) for prior distributions.

Usage

```
## S3 method for class 'prior'
rng(x, n, ...)

## S3 method for class 'prior'
cdf(x, q, ...)

## S3 method for class 'prior'
ccdf(x, q, ...)

## S3 method for class 'prior'
lpdf(x, y, ...)

## S3 method for class 'prior'
pdf(x, y, ...)

## S3 method for class 'prior'
quant(x, p, ...)

## S3 method for class 'prior'
mcdf(x, q, ...)

## S3 method for class 'prior'
mccdf(x, q, ...)

## S3 method for class 'prior'
mlpdf(x, y, ...)

## S3 method for class 'prior'
mpdf(x, y, ...)
```

```
## S3 method for class 'prior'
mquant(x, p, ...)
```

Arguments

x	prior distribution
n	number of observations
...	unused arguments
q	vector or matrix of quantiles
y	vector of observations
p	vector of probabilities

Value

pdf (mpdf) and lpdf (mlpdf) give the (marginal) density and the log of (marginal) density, cdf (mcdf) and ccdf (mccdf) give the (marginal) distribution and the complement of (marginal) distribution function, quant (mquant) give the (marginal) quantile function, and rng generates random deviates for an object of class 'prior'.

Examples

```
# create a standard normal prior distribution
p1 <- prior(distribution = "normal", parameters = list(mean = 1, sd = 1))

# generate a random sample from the prior
rng(p1, 10)

# compute cumulative density function
cdf(p1, 0)

# obtain quantile
quant(p1, .5)

# compute probability density
pdf(p1, c(0, 1, 2))
```

prior_functions_methods

Creates generics for common statistical functions

Description

Density (pdf / lpdf), distribution function (cdf / ccdf), quantile function (quant), random generation (rng), mean, standard deviation (sd), and marginal variants of the functions (mpdf, mlpf, mcdf, mccdf, mquant).

Usage

```

rng(x, ...)

cdf(x, ...)

ccdf(x, ...)

quant(x, ...)

lpdf(x, ...)

pdf(x, ...)

mcdf(x, ...)

mccdf(x, ...)

mquant(x, ...)

mlpdf(x, ...)

mpdf(x, ...)

```

Arguments

x	main argument
...	unused arguments

Value

pdf (mpdf) and lpdf (mlpdf) give the (marginal) density and the log of (marginal) density, cdf (mcdf) and ccdf (mccdf) give the (marginal) distribution and the complement of (marginal) distribution function, quant (mquant) give the (marginal) quantile function, and rng generates random deviates for an object of class 'prior'.

The pdf function proceeds to PDF graphics device if x is a character.

prior_informed	<i>Creates an informed prior distribution based on research</i>
----------------	---

Description

prior_informed creates an informed prior distribution based on past research. The prior can be visualized by the plot function.

Usage

```
prior_informed(name, parameter = NULL, type = "smd")
```

Arguments

name	<p>name of the prior distribution. There are many options based on prior psychological or medical research. For psychology, the possible options are</p> <p>"van Erp" for an informed prior distribution for the heterogeneity parameter tau of meta-analytic effect size estimates based on standardized mean differences (van Erp et al. 2017),</p> <p>"Oosterwijk" for an informed prior distribution for the effect sizes expected in social psychology based on prior elicitation with dr. Oosterwijk (Gronau et al. 2017).</p> <p>For medicine, the possible options are based on Bartoš et al. (2021) and Bartoš et al. (2023) who developed empirical prior distributions for the effect size and heterogeneity parameters of the continuous outcomes (standardized mean differences), dichotomous outcomes (logOR, logRR, and risk differences), and time to event outcomes (logHR) based on the Cochrane database of systematic reviews. Use "Cochrane" for a prior distribution based on the whole database or call <code>print(prior_informed_medicine_names)</code> to inspect the names of all 46 subfields and set the appropriate parameter and type.</p>
parameter	parameter name describing what prior distribution is supposed to be produced in cases where the name corresponds to multiple prior distributions. Relevant only for the empirical medical prior distributions.
type	<p>prior type describing what prior distribution is supposed to be produced in cases where the name and parameter correspond to multiple prior distributions. Relevant only for the empirical medical prior distributions with the following options</p> <p>"smd" for standardized mean differences</p> <p>"logOR" for log odds ratios</p> <p>"logRR" for log risk ratios</p> <p>"RD" for risk differences</p> <p>"logHR" for hazard ratios</p>

Value

`prior_informed` returns an object of class 'prior'.

References

- Bartoš F, Gronau QF, Timmers B, Otte WM, Ly A, Wagenmakers E (2021). "Bayesian model-averaged meta-analysis in medicine." *Statistics in Medicine*, **40**(30), 6743–6761. doi:10.1002/sim.9170.
- Bartoš F, Otte WM, Gronau QF, Timmers B, Ly A, Wagenmakers E (2023). "Empirical prior distributions for Bayesian meta-analyses of binary and time-to-event outcomes." doi:10.48550/arXiv.2306.11468, preprint at <https://doi.org/10.48550/arXiv.2306.11468>.
- Gronau QF, Van Erp S, Heck DW, Cesario J, Jonas KJ, Wagenmakers E (2017). "A Bayesian model-averaged meta-analysis of the power pose effect with informed and default priors: The case of felt power." *Comprehensive Results in Social Psychology*, **2**(1), 123–138. doi:10.1080/

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van Erp S, Verhagen J, Grasman RP, Wagenmakers E (2017). “Estimates of between-study heterogeneity for 705 meta-analyses reported in Psychological Bulletin from 1990–2013.” *Journal of Open Psychology Data*, 5(1). doi:10.5334/jopd.33.

See Also

[prior\(\)](#), [prior_informed_medicine_names](#)

Examples

```
# prior distribution representing expected effect sizes in social psychology
# based on prior elicitation with dr. Oosterwijk
p1 <- prior_informed("Oosterwijk")

# the prior distribution can be visualized using the plot function
# (see ?plot.prior for all options)
plot(p1)

# empirical prior distribution for the standardized mean differences from the oral health
# medical subfield based on meta-analytic effect size estimates from the
# Cochrane database of systematic reviews
p2 <- prior_informed("Oral Health", parameter = "effect", type = "smd")
print(p2)
```

prior_informed_medicine_names

Names of medical subfields from the Cochrane database of systematic reviews

Description

Contain names identifying the individual subfields from the Cochrane database of systematic reviews. The individual elements correspond to valid name arguments for the [prior_informed\(\)](#) function.

Usage

```
prior_informed_medicine_names
```

Format

An object of class character of length 57.

Value

returns a character vector with names of medical subfields from Cochrane database of systematic reviews.

See Also

[prior_informed\(\)](#)

Examples

```
print(prior_informed_medicine_names)
```

prior_PP

Creates a prior distribution for PET or PEESE models

Description

prior creates a prior distribution for fitting a PET or PEESE style models in RoBMA. The prior distribution can be visualized by the plot function.

Usage

```
prior_PET(
  distribution,
  parameters,
  truncation = list(lower = 0, upper = Inf),
  prior_weights = 1
)
```

```
prior_PEESE(
  distribution,
  parameters,
  truncation = list(lower = 0, upper = Inf),
  prior_weights = 1
)
```

Arguments

distribution name of the prior distribution. The possible options are

- "point" for a point density characterized by a location parameter.
- "normal" for a normal distribution characterized by a mean and sd parameters.
- "lognormal" for a lognormal distribution characterized by a meanlog and sdlog parameters.
- "cauchy" for a Cauchy distribution characterized by a location and scale parameters. Internally converted into a generalized t-distribution with df = 1.

	"t" for a generalized t-distribution characterized by a location, scale, and df parameters.
	"gamma" for a gamma distribution characterized by either shape and rate, or shape and scale parameters. The later is internally converted to the shape and rate parametrization
	"invgamma" for an inverse-gamma distribution characterized by a shape and scale parameters. The JAGS part uses a 1/gamma distribution with a shape and rate parameter.
	"beta" for a beta distribution characterized by an alpha and beta parameters.
	"exp" for an exponential distribution characterized by either rate or scale parameter. The later is internally converted to rate.
	"uniform" for a uniform distribution defined on a range from a to b
parameters	list of appropriate parameters for a given distribution.
truncation	list with two elements, lower and upper, that define the lower and upper truncation of the distribution. Defaults to <code>list(lower = -Inf, upper = Inf)</code> . The truncation is automatically set to the bounds of the support.
prior_weights	prior odds associated with a given distribution. The value is passed into the model fitting function, which creates models corresponding to all combinations of prior distributions for each of the model parameters and sets the model priors odds to the product of its prior distributions.

Value

`prior_PET` and `prior_PEESE` return an object of class 'prior'.

See Also

`plot.prior()`, `prior()`

Examples

```
# create a half-Cauchy prior distribution
# (PET and PEESE specific functions automatically set lower truncation at 0)
p1 <- prior_PET(distribution = "Cauchy", parameters = list(location = 0, scale = 1))

plot(p1)
```

`prior_spike_and_slab` *Creates a spike and slab prior distribution*

Description

`prior_spike_and_slab` creates a spike and slab prior distribution corresponding to the specification in Kuo and Mallick (1998) (see O'Hara and Sillanpää (2009) for further details). I.e., a prior distribution is multiplied by an independent indicator with values either zero or one.

Usage

```
prior_spike_and_slab(  
  prior_parameter,  
  prior_inclusion = prior(distribution = "spike", parameters = list(location = 0.5)),  
  prior_weights = 1  
)
```

Arguments

prior_parameter a prior distribution for the parameter

prior_inclusion a prior distribution for the inclusion probability. The inclusion probability must be bounded within 0 and 1 range. Defaults to `prior("spike", parameters = list(location = 0.5))` which corresponds to 1/2 prior probability of including the slab prior distribution (but other prior distributions, like beta etc can be also specified).

prior_weights prior odds associated with a given distribution. The value is passed into the model fitting function, which creates models corresponding to all combinations of prior distributions for each of the model parameters and sets the model priors odds to the product of its prior distributions.

Value

return an object of class 'prior'.

See Also

[prior\(\)](#)

Examples

```
# create a spike and slab prior distribution  
p1 <- prior_spike_and_slab(  
  prior(distribution = "normal", parameters = list(mean = 0, sd = 1)),  
  prior_inclusion = prior(distribution = "beta", parameters = list(alpha = 1, beta = 1))  
)
```

`prior_weightfunction` *Creates a prior distribution for a weight function*

Description

`prior_weightfunction` creates a prior distribution for fitting a RoBMA selection model. The prior can be visualized by the `plot` function.

Usage

```
prior_weightfunction(distribution, parameters, prior_weights = 1)
```

Arguments

distribution name of the prior distribution. The possible options are
 "two.sided" for a two-sided weight function characterized by a vector steps and vector alpha parameters. The alpha parameter determines an alpha parameter of Dirichlet distribution which cumulative sum is used for the weights omega.
 "one.sided" for a one-sided weight function characterized by either a vector steps and vector alpha parameter, leading to a monotonic one-sided function, or by a vector steps, vector alpha1, and vector alpha2 parameters leading non-monotonic one-sided weight function. The alpha / alpha1 and alpha2 parameters determine an alpha parameter of Dirichlet distribution which cumulative sum is used for the weights omega.

parameters list of appropriate parameters for a given distribution.

prior_weights prior odds associated with a given distribution. The model fitting function usually creates models corresponding to all combinations of prior distributions for each of the model parameters, and sets the model priors odds to the product of its prior distributions.

Value

prior_weightfunction returns an object of class 'prior'.

See Also

[plot.prior\(\)](#)

Examples

```
p1 <- prior_weightfunction("one-sided", parameters = list(steps = c(.05, .10), alpha = c(1, 1, 1)))

# the prior distribution can be visualized using the plot function
# (see ?plot.prior for all options)
plot(p1)
```

range.prior

Prior range

Description

Computes range of a prior distribution (if the prior distribution is unbounded range from quantiles to 1 -quantiles) is returned.

Usage

```
## S3 method for class 'prior'
range(x, quantiles = NULL, ..., na.rm = FALSE)
```

Arguments

x	a prior
quantiles	quantile to be returned in case of unbounded distribution.
...	additional arguments
na.rm	unused

Value

range.prior returns a numeric vector of length with a plotting range of a prior distribution.

See Also

[prior\(\)](#)

remove_column	<i>Removes column to BayesTools table</i>
---------------	---

Description

Removes column to a BayesTools table while not breaking formatting, attributes, etc...

Usage

```
remove_column(table, column_position = NULL)
```

Arguments

table	BayesTools table
column_position	position of the to be removed column (defaults to NULL which removes the last column)

Value

returns an object of 'BayesTools_table' class.

Savage_Dickey_BF	<i>Compute Savage-Dickey inclusion Bayes factors</i>
------------------	--

Description

Computes Savage-Dickey (density ratio) inclusion Bayes factors based the change of height from prior to posterior distribution at the test value.

Usage

```
Savage_Dickey_BF(
  posterior,
  null_hypothesis = 0,
  normal_approximation = FALSE,
  silent = FALSE
)
```

Arguments

posterior	marginal posterior distribution generated via the <code>marginal_posterior</code> function
null_hypothesis	point null hypothesis to test. Defaults to 0
normal_approximation	whether the height of prior and posterior density should be approximated via a normal distribution (rather than kernel density). Defaults to FALSE.
silent	whether warnings should be returned silently. Defaults to FALSE

Value

`Savage_Dickey_BF` returns a Bayes factor.

sd	<i>Creates generic for sd function</i>
----	--

Description

Creates generic for sd function

Usage

```
sd(x, ...)
```

Arguments

x	main argument
...	additional arguments

Value

sd returns a standard deviation of the supplied object (if it is either a numeric vector or an object of class 'prior').

See Also

[sd](#)

sd.prior

Prior sd

Description

Computes standard deviation of a prior distribution.

Usage

```
## S3 method for class 'prior'  
sd(x, ...)
```

Arguments

x	a prior
...	unused arguments

Value

a standard deviation of an object of class 'prior'.

See Also

[prior\(\)](#)

Examples

```
# create a standard normal prior distribution  
p1 <- prior(distribution = "normal", parameters = list(mean = 1, sd = 1))  
  
# compute sd of the prior distribution  
sd(p1)
```

`transform_factor_samples`*Transform factor posterior samples into differences from the mean*

Description

Transforms posterior samples from model-averaged posterior distributions based on meandif/orthonormal prior distributions into differences from the mean.

Usage

```
transform_factor_samples(samples)
```

Arguments

`samples` (a list) of mixed posterior distributions created with `mix_posteriors` function

Value

`transform_meandif_samples` returns a named list of mixed posterior distributions (either a vector of matrix).

See Also

[mix_posteriors](#) [transform_meandif_samples](#) [transform_meandif_samples](#) [transform_orthonormal_samples](#)

`transform_meandif_samples`*Transform meandif posterior samples into differences from the mean*

Description

Transforms posterior samples from model-averaged posterior distributions based on meandif prior distributions into differences from the mean.

Usage

```
transform_meandif_samples(samples)
```

Arguments

`samples` (a list) of mixed posterior distributions created with `mix_posteriors` function

Value

`transform_meandif_samples` returns a named list of mixed posterior distributions (either a vector of matrix).

See Also

[mix_posteriors.contr.meandif](#)

transform_orthonormal_samples

Transform orthonormal posterior samples into differences from the mean

Description

Transforms posterior samples from model-averaged posterior distributions based on orthonormal prior distributions into differences from the mean.

Usage

```
transform_orthonormal_samples(samples)
```

Arguments

samples (a list) of mixed posterior distributions created with `mix_posteriors` function

Value

`transform_orthonormal_samples` returns a named list of mixed posterior distributions (either a vector of matrix).

See Also

[mix_posteriors.contr.orthonormal](#)

var

Creates generic for var function

Description

Creates generic for var function

Usage

```
var(x, ...)
```

Arguments

x main argument
 ... additional arguments

Value

var returns a variance of the supplied object (if it is either a numeric vector or an object of class 'prior').

See Also

[cor](#)

var.prior	<i>Prior var</i>
-----------	------------------

Description

Computes variance of a prior distribution.

Usage

```
## S3 method for class 'prior'  
var(x, ...)
```

Arguments

x	a prior
...	unused arguments

Value

a variance of an object of class 'prior'.

See Also

[prior\(\)](#)

Examples

```
# create a standard normal prior distribution  
p1 <- prior(distribution = "normal", parameters = list(mean = 1, sd = 1))  
  
# compute variance of the prior distribution  
var(p1)
```

weightfunctions	<i>Weight functions</i>
-----------------	-------------------------

Description

Marginal density, marginal distribution function, marginal quantile function and random generation for weight functions.

Usage

```
mdone.sided(x, alpha = NULL, alpha1 = NULL, alpha2 = NULL, log = FALSE)
```

```
mdtwo.sided(x, alpha, log = FALSE)
```

```
mdone.sided_fixed(x, omega, log = FALSE)
```

```
mdtwo.sided_fixed(x, omega, log = FALSE)
```

```
rone.sided(n, alpha = NULL, alpha1 = NULL, alpha2 = NULL)
```

```
rtwo.sided(n, alpha)
```

```
rone.sided_fixed(n, omega)
```

```
rtwo.sided_fixed(n, omega)
```

```
mpone.sided(
  q,
  alpha = NULL,
  alpha1 = NULL,
  alpha2 = NULL,
  lower.tail = TRUE,
  log.p = FALSE
)
```

```
mptwo.sided(q, alpha, lower.tail = TRUE, log.p = FALSE)
```

```
mpone.sided_fixed(q, omega, lower.tail = TRUE, log.p = FALSE)
```

```
mptwo.sided_fixed(q, omega, lower.tail = TRUE, log.p = FALSE)
```

```
mqone.sided(
  p,
  alpha = NULL,
  alpha1 = NULL,
  alpha2 = NULL,
  lower.tail = TRUE,

```

```

    log.p = FALSE
  )

mqtwo.sided(p, alpha, lower.tail = TRUE, log.p = FALSE)

mqone.sided_fixed(p, omega, lower.tail = TRUE, log.p = FALSE)

mqtwo.sided_fixed(p, omega, lower.tail = TRUE, log.p = FALSE)

```

Arguments

<code>x, q</code>	vector or matrix of quantiles.
<code>alpha</code>	vector or matrix with concentration parameters for the Dirichlet distribution for a monotonic one.sided or a two.sided weight function.
<code>alpha1</code>	vector or matrix with concentration parameters for the Dirichlet distribution for the expected direction of non-monotonic one.sided of weight function.
<code>alpha2</code>	vector or matrix with concentration parameters for the Dirichlet distribution for the unexpected direction of non-monotonic one.sided of weight function.
<code>log, log.p</code>	logical; if TRUE, probabilities p are given as $\log(p)$.
<code>omega</code>	vector or matrix of fixed probabilities for a one.sided or a two.sided weight function.
<code>n</code>	number of observations.
<code>lower.tail</code>	logical; if TRUE (default), probabilities are $P[X \leq x]$, otherwise, $P[X \geq x]$.
<code>p</code>	vector of probabilities.

Value

`mdone.sided`, `mdtwo.sided`, `mdone.sided_fixed`, and `mdtwo.sided_fixed` give the marginal density, `mpone.sided`, `mptwo.sided`, `mpone.sided_fixed`, and `mptwo.sided_fixed` give the marginal distribution function, `mqone.sided`, `mqtwo.sided`, `mqone.sided_fixed`, and `mqtwo.sided_fixed` give the marginal quantile function, and `rone.sided`, `rtwo.sided`, `rone.sided_fixed`, and `rtwo.sided_fixed` generate random deviates.

Examples

```

# draw samples from a two-sided weight function
rtwo.sided(10, alpha = c(1, 1))

# draw samples from a monotone one-sided weight function
rone.sided(10, alpha = c(1, 1, 1))

# draw samples from a non-monotone one-sided weight function
rone.sided(10, alpha1 = c(1, 1), alpha2 = c(1, 1))

```

`weightfunctions_mapping`*Create coefficient mapping between multiple weightfunctions*

Description

Creates coefficients mapping between multiple weightfunctions.

Usage

```
weightfunctions_mapping(prior_list, cuts_only = FALSE)
```

Arguments

<code>prior_list</code>	list of prior distributions
<code>cuts_only</code>	whether only p-value cuts should be returned

Value

`weightfunctions_mapping` returns a list of indices mapping the publication weights ω from the individual weightfunctions into a joint weightfunction.

Index

- * **datasets**
 - kitchen_rolls, 39
 - prior_informed_medicine_names, 67
- * **package**
 - BayesTools, 4
 - _PACKAGE (BayesTools), 4
- add_column, 3
- BayesTools, 4
- BayesTools-package (BayesTools), 4
- BayesTools_ensemble_tables, 4, 10, 17, 22, 44, 47
- BayesTools_model_tables, 7, 7, 22
- Beta, 61
- bquote, 59
- bridge_sampler, 24, 25
- bridgesampling_object, 10
- Cauchy, 61
- ccdf (prior_functions_methods), 64
- ccdf.prior (prior_functions), 63
- cdf (prior_functions_methods), 64
- cdf.prior (prior_functions), 63
- check_bool (check_input), 11
- check_char (check_input), 11
- check_input, 11
- check_int (check_input), 11
- check_list (check_input), 11
- check_real (check_input), 11
- compute_inference (ensemble_inference), 16
- contr.independent, 13
- contr.meandif, 13, 76
- contr.orthonormal, 14, 76
- cor, 77
- density.prior, 15
- difftime, 28, 34
- dmpoint (mpoint), 47
- dpoint (point), 57
- ensemble_diagnostics_empty_table (BayesTools_ensemble_tables), 4
- ensemble_diagnostics_table (BayesTools_ensemble_tables), 4
- ensemble_estimates_empty_table (BayesTools_ensemble_tables), 4
- ensemble_estimates_table (BayesTools_ensemble_tables), 4
- ensemble_inference, 4, 6, 7, 16, 21, 22, 44, 47, 52
- ensemble_inference_empty_table (BayesTools_ensemble_tables), 4
- ensemble_inference_table (BayesTools_ensemble_tables), 4
- ensemble_summary_empty_table (BayesTools_ensemble_tables), 4
- ensemble_summary_table (BayesTools_ensemble_tables), 4
- Exponential, 61
- format_BF, 17
- format_parameter_names (parameter_names), 48
- geom_prior, 18
- geom_prior(), 41, 50
- geom_prior_list, 19
- geom_prior_list(), 43, 53, 55, 56
- inclusion_BF, 21
- interpret, 21
- InvGamma, 61
- is.prior, 22
- JAGS_add_priors, 23
- JAGS_bridgesampling, 24
- JAGS_bridgesampling_posterior, 26
- JAGS_check_and_list, 27

- JAGS_check_and_list_autofit_settings
(JAGS_check_and_list), 27
- JAGS_check_and_list_fit_settings
(JAGS_check_and_list), 27
- JAGS_check_convergence, 28
- JAGS_check_convergence(), 32, 35
- JAGS_diagnostics, 30
- JAGS_diagnostics_autocorrelation
(JAGS_diagnostics), 30
- JAGS_diagnostics_density
(JAGS_diagnostics), 30
- JAGS_diagnostics_trace
(JAGS_diagnostics), 30
- JAGS_estimates_empty_table
(BayesTools_model_tables), 7
- JAGS_estimates_table
(BayesTools_model_tables), 7
- JAGS_evaluate_formula, 32
- JAGS_extend(JAGS_fit), 33
- JAGS_fit, 27, 33
- JAGS_fit(), 29, 31, 32, 36
- JAGS_formula, 35
- JAGS_formula(), 32
- JAGS_get_inits, 37
- JAGS_inference_empty_table
(BayesTools_model_tables), 7
- JAGS_inference_table
(BayesTools_model_tables), 7
- JAGS_marglik_parameters, 37
- JAGS_marglik_parameters_formula
(JAGS_marglik_parameters), 37
- JAGS_marglik_priors, 38
- JAGS_marglik_priors_formula
(JAGS_marglik_priors), 38
- JAGS_parameter_names(parameter_names),
48
- JAGS_summary_table
(BayesTools_model_tables), 7
- JAGS_to_monitor, 39
- kitchen_rolls, 39
- lines.prior, 40
- lines.prior(), 19, 50
- lines_prior_list, 41
- lines_prior_list(), 20, 53, 55, 56
- LocationScaleT, 61
- Lognormal, 61
- lpdf(prior_functions_methods), 64
- lpdf.prior(prior_functions), 63
- marginal_estimates_table, 4
- marginal_estimates_table
(BayesTools_ensemble_tables), 4
- marginal_inference, 4, 43, 51
- marginal_inference(), 52
- marginal_posterior, 44
- mccdf(prior_functions_methods), 64
- mccdf.prior(prior_functions), 63
- mcdf(prior_functions_methods), 64
- mcdf.prior(prior_functions), 63
- mdone.sided(weightfunctions), 78
- mdone.sided_fixed(weightfunctions), 78
- mdtwo.sided(weightfunctions), 78
- mdtwo.sided_fixed(weightfunctions), 78
- mean.prior, 45
- mix_posteriors, 4, 6, 7, 17, 21, 22, 44, 46,
52, 54, 75, 76
- mlpdf(prior_functions_methods), 64
- mlpdf.prior(prior_functions), 63
- model_summary_empty_table
(BayesTools_model_tables), 7
- model_summary_table
(BayesTools_model_tables), 7
- models_inference, 4, 7
- models_inference(ensemble_inference),
16
- mpdf(prior_functions_methods), 64
- mpdf.prior(prior_functions), 63
- mpoint, 47
- mpone.sided(weightfunctions), 78
- mpone.sided_fixed(weightfunctions), 78
- mptwo.sided(weightfunctions), 78
- mptwo.sided_fixed(weightfunctions), 78
- mqone.sided(weightfunctions), 78
- mqone.sided_fixed(weightfunctions), 78
- mqtwo.sided(weightfunctions), 78
- mqtwo.sided_fixed(weightfunctions), 78
- mquant(prior_functions_methods), 64
- mquant.prior(prior_functions), 63
- Normal, 61
- parameter_names, 48
- pdf(prior_functions_methods), 64
- pdf.prior(prior_functions), 63
- plot.prior, 48
- plot.prior(), 19, 41, 61, 69, 71

plot_marginal, 50
 plot_models, 52
 plot_posterior, 53
 plot_posterior(), 52
 plot_prior_list, 55
 plot_prior_list(), 20, 43
 pmpoint (mpoint), 47
 point, 57
 ppoint (point), 57
 print.BayesTools_table, 58
 print.prior, 58
 prior, 59
 prior(), 16, 46, 50, 52, 53, 55, 56, 59, 62, 67, 69, 70, 72, 74, 77
 prior_factor, 61
 prior_functions, 63
 prior_functions_methods, 64
 prior_informed, 65
 prior_informed(), 67, 68
 prior_informed_medicine_names, 67, 67
 prior_none (prior), 59
 prior_PEESE (prior_PP), 68
 prior_PET (prior_PP), 68
 prior_PP, 68
 prior_spike_and_slab, 69
 prior_weightfunction, 70

 qmpoint (mpoint), 47
 qpoint (point), 57
 quant (prior_functions_methods), 64
 quant.prior (prior_functions), 63

 range.prior, 71
 remove_column, 72
 rjags-package, 24, 32
 rmpoint (mpoint), 47
 rng (prior_functions_methods), 64
 rng.prior (prior_functions), 63
 rone.sided (weightfunctions), 78
 rone.sided_fixed (weightfunctions), 78
 rpoint (point), 57
 rtwo.sided (weightfunctions), 78
 rtwo.sided_fixed (weightfunctions), 78
 run.jags, 33
 runjags, 24, 32
 runjags-package, 28
 runjags_estimates_empty_table
 (BayesTools_model_tables), 7
 runjags_estimates_table
 (BayesTools_model_tables), 7
 runjags_inference_empty_table
 (BayesTools_model_tables), 7
 runjags_inference_table
 (BayesTools_model_tables), 7

 Savage_Dickey_BF, 73
 sd, 73, 74
 sd.prior, 74
 stan_estimates_table
 (BayesTools_model_tables), 7

 transform_factor_samples, 75
 transform_meandif_samples, 75, 75
 transform_orthonormal_samples, 75, 76

 var, 76
 var.prior, 77

 weightfunctions, 78
 weightfunctions_mapping, 80