

Package ‘convdistr’

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Type Package

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Description Convolute probabilistic distributions using the random generator function of each distribution. A new random number generator function is created that perform the mathematical operation on the individual random samples from the random generator function of each distribution. See the documentation for examples.

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Author Aponte John [aut, cre] (<<https://orcid.org/0000-0002-3014-3673>>)

Maintainer Aponte John <john.j.aponte@gmail.com>

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|-----------|-------------------------------|
| add_total | <i>Adds a total dimension</i> |
|-----------|-------------------------------|

Description

This function returns a [DISTRIBUTION](#) with a new dimension created by row sum of the dimensions of the distribution.

Usage

```
add_total(p_distribution, p_totalname = "TOTAL")
```

Arguments

`p_distribution` an object of class [DISTRIBUTION](#)
`p_totalname` the name of the new dimension

Details

Only works with multidimensional distributions.

Value

a [DISTRIBUTION](#)

Author(s)

John J. Aponte

Examples

```
d1 <- new_DIRICHLET(c(0.2,0.5,0.3))
d2 <- add_total(d1)
```

BETA

Factory for a BETA distribution object

Description

Returns an BETA distribution object that produce random numbers from a beta distribution using the [rbeta](#) function

Usage

```
new_BETA(p_shape1, p_shape2, p_dimnames = "rvar")
new_BETA_lci(p_mean, p_lci, p_uci, p_dimnames = "rvar")
new_BETA_lci2(p_mean, p_lci, p_uci, p_dimnames = "rvar")
```

Arguments

`p_shape1` non-negative parameters of the Beta distribution
`p_shape2` non-negative parameters of the Beta distribution
`p_dimnames` A character that represents the name of the dimension
`p_mean` A numeric that represents the expected value of the proportion
`p_lci` A numeric for the lower 95% confidence interval
`p_uci` A numeric for the upper 95% confidence interval

Value

An object of class DISTRIBUTION, BETA

Functions

- `new_BETA_lci`: Constructor based on confidence intervals. Preserve expected value.
- `new_BETA_lci2`: Constructor based on ML confidence intervals

Note

When using confidence intervals, the shape parameters are obtained using the following formula:

$$varp = (p_{uci} - p_{lci})/4^2$$

$$shape1 = p_{mean} * (p_{mean} * (1 - p_{mean})/varp - 1)$$

$$shape2 = (1 - p_{mean}) * (p_{mean} * (1 - p_{mean})/varp - 1)$$

`new_BETA_lci2` estimate parameters using maximum likelihood `myDistr <- new_BETA_lci2(0.30,0.25,0.35)`
`myDistr$rfunc(10)`

Author(s)

John J. Aponte

Examples

```
myDistr <- new_BETA(1,1)
myDistr$rfunc(10)
myDistr <- new_BETA_lci(0.30,0.25,0.35)
myDistr$rfunc(10)
```

BINOMIAL

Factory for a BINOMIAL distribution object

Description

Returns a BINOMIAL distribution object that produce random numbers from a binomial distribution using the `rbinom` function

Usage

```
new_BINOMIAL(p_size, p_prob, p_dimnames = "rvar")
```

Arguments

| | |
|-------------------------|---|
| <code>p_size</code> | integer that represent the number of trials |
| <code>p_prob</code> | probability of success |
| <code>p_dimnames</code> | A character that represents the name of the dimension |

Value

An object of class `DISTRIBUTION`, `BINOMIAL`

Author(s)

John J. Aponte

Examples

```
myDistr <- new_BINOMIAL(1000,0.3)
myDistr$rfunc(10)
```

cinqnum

cinqnum

Description

Make a list with 5 numbers of the distribution (`mean_`, `sd_`, `lci_`, `uci_`, `median_`).

Usage

```
cinqnum(x, ...)
```

Arguments

`x` an object of class `DISTRIBUTION`
`...` further parameters

Details

Uses the stored seed to have the same sequence always and produce the same numbers This is an internal function for the summary function

Value

a vector with the mean, sd, lci, uci and median values

Author(s)

John J. Aponte

cinqnum.DIRAC *And optimized version for DIRAC distributions*

Description

And optimized version for DIRAC distributions

Usage

```
## S3 method for class 'DIRAC'  
cinqnum(x, n)
```

Arguments

x an object of class [DISTRIBUTION](#)
n number of draws

Value

a list of NA

Author(s)

John J. Aponte

cinqnum.DISTRIBUTION *Generic function for a distribution*

Description

Generate n random numbers from the distribution, using the seed of the object, so always return the same value. Internal function to be used in the summary

Usage

```
## S3 method for class 'DISTRIBUTION'  
cinqnum(x, n)
```

Arguments

x an object of class [DISTRIBUTION](#)
n number of draws

Value

a list with the mean, sd, 95

Author(s)

John J. Aponte

cinqnum.NA *And optimized version for NA distribution*

Description

And optimized version for NA distribution

Usage

```
## S3 method for class ``NA``  
cinqnum(x, n)
```

Arguments

x an object of class [DISTRIBUTION](#)
n number of draws

Value

a list of NA

Author(s)

John J. Aponte

convdistr *convdistr: A package useful for convolution of distributions.*

Description

The convdistr package provides tools to define [DISTRIBUTION](#) objects and make mathematical operations with them. It keeps track of the results as if they were scalar numbers but maintaining the ability to obtain random samples of the convoluted distributions.

 CONVOLUTION

Make the convolution of two or more [DISTRIBUTION](#) objects

Description

The convolution of the simple algebraic operations is made by the operation of individual draws of the distributions. The [DISTRIBUTION](#) objects must have the same dimensions.

Usage

```
new_CONVOLUTION(listdistr, op, omit_NA = FALSE)
```

```
new_SUM(..., omit_NA = FALSE)
```

```
## S3 method for class 'DISTRIBUTION'
e1 + e2
```

```
new_SUBTRACTION(..., omit_NA = FALSE)
```

```
## S3 method for class 'DISTRIBUTION'
e1 - e2
```

```
new_MULTIPLICATION(..., omit_NA = FALSE)
```

```
## S3 method for class 'DISTRIBUTION'
e1 * e2
```

```
new_DIVISION(..., omit_NA = FALSE)
```

```
## S3 method for class 'DISTRIBUTION'
e1 / e2
```

Arguments

| | |
|------------------------|--|
| <code>listdistr</code> | a list of DISTRIBUTION objects |
| <code>op</code> | a function to convolute '+', '-', '*', \' |
| <code>omit_NA</code> | if TRUE, NA distributions will be omitted |
| <code>...</code> | DISTRIBUTION objects or a list of distribution objects |
| <code>e1</code> | object of class DISTRIBUTION |
| <code>e2</code> | object of class DISTRIBUTION |

Details

If any of the distributions is of class NA ([NA_DISTRIBUTION](#)) the result will be a new distribution of class NA unless the `omit_NA` option is set to TRUE

Value

and object of class CONVOLUTION, [DISTRIBUTION](#)

Functions

- new_SUM: Sum of distributions
- new_SUBTRACTION: Subtraction for distributions
- new_MULTIPLICATION: Multiplication for distributions
- new_DIVISION: DIVISION for distributions

Author(s)

John J. Aponte

Examples

```
x1 <- new_NORMAL(0,1)
x2 <- new_UNIFORM(1,2)
new_CONVOLUTION(list(x1,x2), `+`)
new_SUM(x1,x2)
x1 + x2
new_SUBTRACTION(x1,x2)
x1 - x2
new_MULTIPLICATION(list(x1,x2))
x1 * x2
new_DIVISION(list(x1,x2))
x1 / x2
```

CONVOLUTION_assoc

Convolution with association of dimensions

Description

In case of different dimensions of the distribution this function perform the operation on the common distributions and add without modifications the other dimensions of the distribution.

Usage

```
new_CONVOLUTION_assoc(dist1, dist2, op)
```

```
new_SUM_assoc(dist1, dist2)
```

```
new_SUBTRACTION_assoc(dist1, dist2)
```

```
new_MULTIPLICATION_assoc(dist1, dist2)
```

```
new_DIVISION_assoc(dist1, dist2)
```

Arguments

dist1 an object of class `DISTRIBUTION`
 dist2 and object of class `DISTRIBUTION`
 op one of '+', '-', '*', '/'

Details

If distribution A have dimensions a and b and distribution B have dimensions b and c, the A + B would produce a distribution with dimensions a, c, b+b,

Value

an object of class `DISTRIBUTION`

Functions

- `new_SUM_assoc`: Sum of distributions
- `new_SUBTRACTION_assoc`: Subtraction of distributions
- `new_MULTIPLICATION_assoc`: Multiplication of distributions
- `new_DIVISION_assoc`: Division of distributions

Author(s)

John J. Aponte

Examples

```
x1 <- new_MULTINORMAL(c(0,1), matrix(c(1,0.5,0.5,1),ncol=2), p_dimnames = c("A", "B"))
x2 <- new_MULTINORMAL(c(10,1), matrix(c(1,0.4,0.4,1),ncol=2), p_dimnames = c("B", "C"))
new_CONVOLUTION_assoc(x1,x2, `+`)
new_SUM_assoc(x1,x2)
new_SUBTRACTION_assoc(x1,x2)
new_MULTIPLICATION_assoc(x1,x2)
new_DIVISION_assoc(x1,x2)
```

CONVOLUTION_comb

Convolution with combination of dimensions

Description

In case of different dimensions of the distribution this function perform the operation on the combination of the distributions of both distribution.

Usage

```
new_CONVOLUTION_comb(dist1, dist2, op, p_dimnames)
```

```
new_SUM_comb(dist1, dist2)
```

```
new_SUBTRACTION_comb(dist1, dist2)
```

```
new_MULTIPLICATION_comb(dist1, dist2)
```

```
new_DIVISION_comb(dist1, dist2)
```

Arguments

| | |
|------------|--|
| dist1 | an object of class DISTRIBUTION |
| dist2 | and object of class DISTRIBUTION |
| op | one of '+', '-', '*', '/' |
| p_dimnames | a character vector with the name of the dimensions. If missing the combination of the individual dimensions will be used |

Details

If distribution A have dimensions a and b and distribution B have dimensions b and c, the A + B would produce a distribution with dimensions a_b,a_c,b_b, b_c

Value

an object of class [DISTRIBUTION](#)

Functions

- new_SUM_comb: Sum of distributions
- new_SUBTRACTION_comb: Subtraction of distributions
- new_MULTIPLICATION_comb: Multiplication of distributions
- new_DIVISION_comb: Division of distributions

Note

In case of the same dimensions, only the first combination is taken

Author(s)

John J. Aponte

Examples

```
x1 <- new_MULTINORMAL(c(0,1), matrix(c(1,0.5,0.5,1),ncol=2), p_dimnames = c("A","B"))
x2 <- new_MULTINORMAL(c(10,1), matrix(c(1,0.4,0.4,1),ncol=2), p_dimnames = c("B","C"))
new_CONVOLUTION_comb(x1,x2, `+`)
new_SUM_comb(x1,x2)
new_SUBTRACTION_comb(x1,x2)
new_MULTIPLICATION_comb(x1,x2)
new_DIVISION_comb(x1,x2)
```

DIRAC

Factory for a DIRAC distribution object

Description

Returns an DIRAC distribution object that always return the same number, or the same matrix of numbers in case multiple dimensions are setup

Usage

```
new_DIRAC(p_scalar, p_dimnames = "rvar")
```

Arguments

| | |
|------------|---|
| p_scalar | A numeric that set the value for the distribution |
| p_dimnames | A character that represents the name of the dimension |

Value

An object of class DISTRIBUTION, DIRAC

Author(s)

John J. Aponte

Examples

```
myDistr <- new_DIRAC(1)
myDistr$rfunc(10)
```

DIRICHLET

Factory for a DIRICHLET distribution object

Description

Returns an DIRICHLET distribution object that draw random numbers generated by the function `rdirichlet`

Usage

```
new_DIRICHLET(p_alpha, p_dimnames)
```

Arguments

`p_alpha` k-value vector for concentration parameter. Must be positive
`p_dimnames` A vector of characters for the names of the k-dimensions

Details

A name can be provided for the dimensions. Otherwise `rvar1`, `rvar2`, ..., `rvark` will be assigned

Value

An object of class DISTRIBUTION, `p_distribution$distribution`, TRUNCATED

Author(s)

John J. Aponte

Examples

```
myDistr <- new_DIRICHLET(c(0.3,0.2,0.5), c("a","b","c"))  
myDistr$rfunc(10)
```

DISCRETE

Factory for a DISCRETE distribution object

Description

Returns an DISCRETE distribution object that sample from the vector `p_supp` of options with probability the vector of probabilities `p_prob`.

Usage

```
new_DISCRETE(p_supp, p_prob, p_dimnames = "rvar")
```

Arguments

| | |
|-------------------------|---|
| <code>p_supp</code> | A numeric vector of options |
| <code>p_prob</code> | A numeric vector of probabilities. |
| <code>p_dimnames</code> | A character that represents the name of the dimension |

Value

An object of class DISTRIBUTION, DISCRETE

Note

If the second argument is missing, all options will be sample with equal probability. If provided, the second argument would add to 1 and must be the same length that the first argument

Author(s)

John J. Aponte

Examples

```
myDistr <- new_DISCRETE(p_supp=c(1,2,3,4), p_prob=c(0.40,0.30,0.20,0.10))
myDistr$rfunc(10)
```

DISTRIBUTION

DISTRIBUTION class

Description

DISTRIBUTION is a kind of abstract class (or interface) that the specific constructors should implement.

Details

It contains 4 fields

distribution A character with the name of the distribution implemented

seed A numerical that is used for `details` to produce reproducible details of the distribution

oval Observed value. Is the value expected. It is used as a number for the mathematical operations of the distributions as if they were a simple scalar

rfunc A function that generate random numbers from the distribution. Its only parameter `n` is the number of draws of the distribution. It returns a matrix with as many rows as `n`, and as many columns as the dimensions of the distributions

The DISTRIBUTION objects could support multidimensional distributions for example [DIRICHLET](#). The names of the dimensions should coincide with the names of the oval vector. If only one dimension, the default name is rvar.

It is expected that the rfunc is included in the creation of new distributions by convolution so the environment should be carefully controlled to avoid reference leaking that is possible within the R language. For that reason, rfunc should be created within a [restrict_environment](#) function

Once the object is instantiated, the fields are immutable and should not be changed. If the seed needs to be modified, a new object can be created using the [set_seed](#) function

Objects are defined for the following distributions

- [UNIFORM](#)
- [NORMAL](#)
- [BETA](#)
- [TRIANGULAR](#)
- [POISSON](#)
- [EXPONENTIAL](#)
- [DISCRETE](#)
- [DIRAC](#)
- [DIRICHLET](#)
- [TRUNCATED](#)
- [NA_DISTRIBUTION](#)

Value

a DISTRIBUTION object

Author(s)

John J. Aponte

DISTRIBUTION_factory *A factory of [DISTRIBUTION](#) classes*

Description

Generate a function that creates [DISTRIBUTION](#) objects

Usage

```
DISTRIBUTION_factory(distname, rfunction, ovalfunc)
```

Arguments

| | |
|------------------------|---|
| <code>distname</code> | name of the distribution. By convention they are upper case |
| <code>rfunction</code> | a function to generate random numbers from the distribution |
| <code>ovalfunc</code> | a function that calculate the oval value, should used only the same arguments that the <code>rfunction</code> |

Value

A function that is able to create [DISTRIBUTION](#) objects.

Note

The function return a new function, that have as arguments the formals of the `rfunction` plus a new argument `dimnames` for the dimension names. If The distribution is unidimensional, the default value `dimnames = "rvar"` will works well, but if not, the `dimnames` argument should be specified when the generated function is used as in the example for the `new_MyDIRICHLET`

Author(s)

John J. Aponte

Examples

```
new_MYDISTR <- DISTRIBUTION_factory("MYDISTR", rnorm, function(){mean})
d1 <- new_MYDISTR(0,1)
summary(d1)
require(extraDistr)
new_MyDIRICHLET <- DISTRIBUTION_factory('rdirichlet',
                                       rdirichlet,
                                       function() {
                                         salpha = sum(alpha)
                                         alpha / salpha
                                       })
d2 <- new_MyDIRICHLET(c(10, 20, 70), dimnames = c("A", "B", "C"))
summary(d2)
```

EXPONENTIAL

Factory for a EXPONENTIAL distribution using confidence intervals

Description

Returns an EXPONENTIAL distribution object that produce random numbers from an exponential distribution using the [rexp](#) function

Usage

```
new_EXPONENTIAL(p_rate, p_dimnames = "rvar")
```


Arguments

`p_rate` A numeric that represents the rate of events
`p_dimnames` A character that represents the name of the dimension

Value

An object of class DISTRIBUTION, EXPONENTIAL

Author(s)

John J. Aponte

Examples

```
myDistr <- new_EXPONENTIAL(5)
myDistr$rfunc(10)
```

| | |
|---------|--|
| fitbeta | <i>Fits a beta distribution based on quantiles</i> |
|---------|--|

Description

Fits a beta distribution based on quantiles

Usage

```
fitbeta_ml(point, lci, uci)
fitbeta(point, lci, uci)
```

Arguments

`point` Point estimates corresponding to the median
`lci` Lower limit (quantile 0.025)
`uci` Upper limit (quantile 0.975)

Value

parameters `shape1` and `shape2` of a beta distribution

Functions

- `fitbeta_ml`: using ML to estimate parameters
- `fitbeta`: preserve the expected value

Note

This is a wrap of the `fitdist` to obtain the best parameters for a beta distribution based on quantiles. When using confidence intervals (not ML), the shape parameters are obtained using the following formula:

$$varp = (p_{uci} - p_{lci})/4^2$$

$$shape1 = p_{mean} * (p_{mean} * (1 - p_{mean})/varp - 1)$$

$$shape2 = (1 - p_{mean}) * (p_{mean} * (1 - p_{mean})/varp - 1)$$

Author(s)

John J. Aponte

See Also

`fitdist`

Examples

```
fitbeta_ml(0.45,0.40,0.50)
fitbeta(0.45,0.40,0.50)
```

fitdirichlet

Fits a Dirichlet distribution,

Description

Fits a Dirichlet distribution based on the parameters of Beta distributions

Usage

```
fitdirichlet(..., plotBeta = FALSE, n.fitted = "opt")
```

Arguments

| | |
|----------|---|
| ... | named vectors with the distribution parameters shape1, shape2 |
| plotBeta | if TRUE a ggplot of the densities are plotted |
| n.fitted | Method to fit the values |

Details

Each one of the arguments is a named vector with values for shape1, shape2. Values from `fitbeta` are suitable for this. This is a wrap of `fitDirichlet`

Value

a vector with the parameters for a Dirichlet distribution

Author(s)

John J. Aponte

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

```
a <- fitbeta(0.3, 0.2, 0.4)
c <- fitbeta(0.2, 0.1, 0.3)
b <- fitbeta(0.5, 0.4, 0.6)
fitdirichlet(cat1=a,cat2=b,cat3=c)
```

`ggDISTRIBUTION`*Plot of `DISTRIBUTION` objects using `ggplot2`*

DescriptionPlot of `DISTRIBUTION` objects using `ggplot2`**Usage**

```
ggDISTRIBUTION(x, n = 10000)
```

Arguments

| | |
|----------------|--|
| <code>x</code> | an object of class <code>DISTRIBUTION</code> |
| <code>n</code> | number of observation |

Valuea `ggplot` object with the density of the distribution**Examples**

```
x <- new_NORMAL(0,1)
ggDISTRIBUTION(x)
y <- new_DIRICHLET(c(10,20,70))
ggDISTRIBUTION(x)
```

| | |
|-----------|--|
| LOGNORMAL | <i>Factory for a LOGNORMAL distribution object</i> |
|-----------|--|

Description

Returns a LOGNORMAL distribution object that produce random numbers from a log normal distribution using the `rlnorm` function

Usage

```
new_LOGNORMAL(p_meanlog, p_sdlog, p_dimnames = "rvar")
```

Arguments

| | |
|-------------------------|---|
| <code>p_meanlog</code> | mean of the distribution on the log scale |
| <code>p_sdlog</code> | A numeric that represents the standard deviation on the log scale |
| <code>p_dimnames</code> | A character that represents the name of the dimension |

Value

An object of class `DISTRIBUTION`, LOGNORMAL

Author(s)

John J. Aponte

Examples

```
myDistr <- new_LOGNORMAL(0,1)
myDistr$rfunc(10)
```

| | |
|----------|------------------------------------|
| metadata | <i>Metadata for a DISTRIBUTION</i> |
|----------|------------------------------------|

Description

Shows the distribution and the oval values of a `DISTRIBUTION` object

Usage

```
metadata(x)

## S3 method for class 'DISTRIBUTION'
metadata(x)

## Default S3 method:
metadata(x)
```

Arguments

x a `DISTRIBUTION` object

Value

A `data.frame` with the metadata of the distributions

Methods (by class)

- `DISTRIBUTION`: Metadata for `DISTRIBUTION` objects
- `default`: Metadata for other objects

Note

The number of columns depends on the dimensions of the distribution. There will be one column `distribution` with the name of the distribution and one column for each dimension with the names from the `oval` field.

Author(s)

John J. Aponte

| | |
|-----------------|---|
| NA_DISTRIBUTION | <i>Factory for a NA distribution object</i> |
|-----------------|---|

Description

Returns an NA distribution object that always return `NA_real_`. This is useful to handle NA. By default only one dimension `rvar` is produced, but if several names are provided more columns will be added to the return matrix

Usage

```
new_NA(p_dimnames = "rvar")
```

Arguments

p_dimnames A character that represents the the names of the dimensions. By default only one dimension with name `rvar`

Value

An object of class `DISTRIBUTION`, `NA`

Author(s)

John J. Aponte

Examples

```
myDistr <- new_NA(p_dimnames = "rvar")
myDistr$rfunc(10)
```

| | |
|-------------|--|
| new_MIXTURE | <i>Mixture of DISTRIBUTION objects</i> |
|-------------|--|

Description

Produce a new distribution that obtain random draws of the mixture of the [DISTRIBUTION](#) objects

Usage

```
new_MIXTURE(listdistr, mixture)
```

Arguments

| | |
|-----------|---|
| listdistr | a list of DISTRIBUTION objects |
| mixture | a vector of probabilities to mixture the distributions. Must add 1 If missing the draws are obtained from the distributions with the same probability |

Value

an object of class MIXTURE, [DISTRIBUTION](#)

Author(s)

John J. Aponte

Examples

```
x1 <- new_NORMAL(0,1)
x2 <- new_NORMAL(4,1)
x3 <- new_NORMAL(6,1)
new_MIXTURE(list(x1,x2,x3))
```

new_MULTINORMAL *Multivariate Normal Distribution*

Description

Return a [DISTRIBUTION](#) object that draw random numbers from a multivariate normal distribution using the [mvrnorm](#) function.

Usage

```
new_MULTINORMAL(p_mu, p_sigma, p_dimnames, tol = 1e-06, empirical = FALSE)
```

Arguments

| | |
|-------------------------|---|
| <code>p_mu</code> | a vector of means |
| <code>p_sigma</code> | a positive-definite symmetric matrix for the covariance matrix |
| <code>p_dimnames</code> | A character that represents the name of the dimension |
| <code>tol</code> | tolerance (relative to largest variance) for numerical lack of positive-definiteness in <code>p_sigma</code> . |
| <code>empirical</code> | logical. If true, <code>mu</code> and <code>Sigma</code> specify the empirical not population mean and covariance matrix. |

Value

An object of class [DISTRIBUTION](#), [MULTINORMAL](#)

Author(s)

John J. Aponte

See Also

[mvrnorm](#)

Examples

```
mSigma <- matrix(c(1,0,0,1), ncol=2)
d1 <- new_MULTINORMAL(c(0,1), mSigma)
rfunc(d1, 10)
```

NORMAL

Factory for a NORMAL distribution object

Description

Returns a NORMAL distribution object that produce random numbers from a normal distribution using the `rnorm` function

Usage

```
new_NORMAL(p_mean, p_sd, p_dimnames = "rvar")
```

Arguments

| | |
|-------------------------|---|
| <code>p_mean</code> | A numeric that represents the mean value |
| <code>p_sd</code> | A numeric that represents the standard deviation |
| <code>p_dimnames</code> | A character that represents the name of the dimension |

Value

An object of class `DISTRIBUTION`, `NORMAL`

Author(s)

John J. Aponte

Examples

```
myDistr <- new_NORMAL(0,1)
myDistr$rfunc(10)
```

omit_NA

Omit NA distributions from a list of distributions

Description

Omit NA distributions from a list of distributions

Usage

```
omit_NA(listdistr)
```

Arguments

| | |
|------------------------|---|
| <code>listdistr</code> | a list of <code>DISTRIBUTION</code> objects |
|------------------------|---|

Value

the list without the [NA_DISTRIBUTION](#)

Author(s)

John J. Aponte

`plot.DISTRIBUTION` *plot of [DISTRIBUTION](#) objects*

Description

Plot an histogram of the density of the distribution using random numbers from the distribution

Usage

```
## S3 method for class 'DISTRIBUTION'  
plot(x, n = 10000, ...)
```

Arguments

`x` an object of class [DISTRIBUTION](#)
`n` number of observations
`...` other parameters to the [hist](#) function

Value

No return value. Side effect plot the histogram.

Examples

```
x <- new_NORMAL(0,1)  
plot(x)  
y <- new_DIRICHLET(c(10,20,70))  
plot(x)
```

POISSON

Factory for a POISSON distribution using confidence intervals

Description

Returns an POISSON distribution object that produce random numbers from a Poisson distribution using the `rpois` function

Usage

```
new_POISSON(p_lambda, p_dimnames = "rvar")
```

Arguments

`p_lambda` A numeric that represents the expected number of events
`p_dimnames` A character that represents the name of the dimension

Value

An object of class DISTRIBUTION, POISSON

Author(s)

John J. Aponte

Examples

```
myDistr <- new_POISSON(5)  
myDistr$rfunc(10)
```

`restrict_environment` *Build a new function with a smaller environment*

Description

As standard feature, R include in the environment of a function all the variables that are available when the function is created. This, however is prompt to leak reference when you have a factory of function and they are created within a list.. it will include all the component of the list in the function environment. To prevent that, the random generator functions are encapsulated with a restricted environment where only the variables that the function requires to work are included

Usage

```
restrict_environment(f, ...)
```

Arguments

f input function
... define the set of variables to be included as variable = value.

Value

new function with a restricted environment

Author(s)

John J. Aponte

Examples

```
a = 0
b = 1
myfunc <- restrict_environment(
  function(n) {
    rnorm(meanvalue, sdvalue)
  },
  meanvalue = a, sdvalue = b)

myfunc(10)
ls(envir=environment(myfunc))
```

rfunc

Generate random numbers from a [DISTRIBUTION](#) object

Description

This is a generic method that calls the rfunc slot of the object

Usage

```
rfunc(x, n)
```

Arguments

x an object
n the number of random samples

Value

a matrix with as many rows as n and as many columns as dimensions have distribution

Author(s)

John J. Aponte

| | |
|---------------|-------------------------|
| rfunc.default | <i>Default function</i> |
|---------------|-------------------------|

Description

Default function

Usage

```
## Default S3 method:  
rfunc(x, n)
```

Arguments

| | |
|---|--|
| x | an object of class different from DISTRIBUTION |
| n | the number of random samples |

Value

No return value. Raise an error message.

Author(s)

John J. Aponte

| | |
|--------------------|---|
| rfunc.DISTRIBUTION | <i>Generic function for a DISTRIBUTION object</i> |
|--------------------|---|

Description

Generic function for a [DISTRIBUTION](#) object

Usage

```
## S3 method for class 'DISTRIBUTION'  
rfunc(x, n)
```

Arguments

| | |
|---|---|
| x | an object of class DISTRIBUTION |
| n | the number of random samples |

Value

a matrix with as many rows as n and as many columns as

Author(s)

John J. Aponte

same_dimensions *Check the dimensions of a list of distributions*

Description

Check the dimensions of a list of distributions

Usage

```
same_dimensions(listdistr)
```

Arguments

listdistr a list of **DISTRIBUTION** objects

Value

return TRUE if all the dimensions are the same

set_seed *Modify a the seed of a Distribution object*

Description

This create a new **DISTRIBUTION** object but with the specified seed

Usage

```
set_seed(distribution, seed)
```

Arguments

distribution a **DISTRIBUTION** object
seed the new seed

Value

a code**DISTRIBUTION** object of the same class

Author(s)

John J. Aponte

summary.DISTRIBUTION *Summary of Distributions*

Description

Summary of Distributions

Usage

```
## S3 method for class 'DISTRIBUTION'  
summary(object, n = 10000, ...)
```

Arguments

| | |
|--------|--|
| object | object of class DISTRIBUTION |
| n | the number of random samples from the distribution |
| ... | other parameters. Not used |

Value

A [data.frame](#) with as many rows as dimensions had the distribution and with the following columns

- distribution name
- varname name of the dimension
- oval value
- nsample number of random samples
- mean_ mean value of the sample
- sd_ standard deviation of the sample
- lci_ lower 95
- median_ median value of the sample
- uci_ upper 95

Note

The sample uses the seed saved in the object those it will provide the same values fir an n value

Author(s)

John J. Aponte

TRIANGULAR

Factory for a TRIANGULAR distribution object

Description

Returns an TRIANGULAR distribution object that produce random numbers from a triangular distribution using the `rtriang` function

Usage

```
new_TRIANGULAR(p_min, p_max, p_mode, p_dimnames = "rvar")
```

Arguments

| | |
|-------------------------|---|
| <code>p_min</code> | A numeric that represents the lower limit |
| <code>p_max</code> | A numeric that represents the upper limit |
| <code>p_mode</code> | A numeric that represents the mode |
| <code>p_dimnames</code> | A character that represents the name of the dimension |

Value

An object of class DISTRIBUTION, TRIANGULAR

Author(s)

John J. Aponte

Examples

```
myDistr <- new_TRIANGULAR(-1,1,0)
myDistr$rfunc(10)
```

TRUNCATED

Factory for a TRUNCATED distribution object

Description

Returns an TRUNCATED distribution object that limits the values that are generated by the distribution to be in the limits `p_min`, `p_max`

Usage

```
new_TRUNCATED(p_distribution, p_min = -Inf, p_max = Inf)
```

Arguments

`p_distribution` An object of class `DISTRIBUTION` to truncate
`p_min` A numeric that set the lower limit of the distribution
`p_max` A numeric that set the upper limit of the distribution

Value

An object of class `DISTRIBUTION`, `p_distribution$distribution`, `TRUNCATED`

Note

The expected value of a truncated distribution could be very different from the expected value of the unrestricted distribution. Be careful as the `oval` field is not changed and may not represent any more the expected value of the distribution.

If the distribution is multidimensional, the limits will apply to all dimensions.

Author(s)

John J. Aponte

Examples

```
myDistr <- new_TRUNCATED(p_distribution = new_NORMAL(0,1), p_min = -1, p_max = 1)
myDistr$rfunc(10)
```

UNIFORM

Factory for a UNIFORM distribution object

Description

Returns an `UNIFORM` distribution object that produce random numbers from a uniform distribution using the `runif` function

Usage

```
new_UNIFORM(p_min, p_max, p_dimnames = "rvar")
```

Arguments

`p_min` A numeric that represents the lower limit
`p_max` A numeric that represents the upper limit
`p_dimnames` A character that represents the name of the dimension

Value

An object of class `DISTRIBUTION`, `UNIFORM`

Author(s)

John J. Aponte

Examples

```
myDistr <- new_UNIFORM(0,1)
myDistr$rfunc(10)
```

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