Package 'distrTeach'

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Version 2.9.2

Date 2025-01-11

Title Extensions of Package 'distr' for Teaching Stochastics/Statistics in Secondary School

Description Provides flexible examples of LLN and CLT for teaching purposes in secondary school.

Depends R(>= 3.4), methods, distr(>= 2.2), distrEx(>= 2.2)

Suggests tcltk

Imports startupmsg(>= 1.0.0), grDevices, graphics, stats

ByteCompile yes

License LGPL-3

Encoding UTF-8

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Contents

`distrTeach-package` *distrTeach – Teaching Extensions of Package distr*

Description

distrTeach provides some illustrations based on package **distr** for teaching Stochastics / Statistics in secondary school; so far the following has been implemented

- `illustrateLLT`: function for the generation of LLN - visualizations
- `illustrateCLT`: function for the generation of CLT - visualizations
- `plotCLT`: Generic function for the plotting of CLT-approximations

as well as a Tcl/Tk based demo for`illustrateCLT`

Details

Package:	distrTeach
Version:	2.9.2
Date:	2025-01-11
Depends:	R(>= 3.4), methods, distr(>= 2.2), distrEx(>= 2.2)
Suggests:	tcltk
Imports:	startupmsg(>= 1.0.0), grDevices, graphics, stats
LazyLoad:	yes
License:	LGPL-3
URL:	http://distr.r-forge.r-project.org/
VCS/SVNRevision:	1493

Classes

`Teaching Classes`

Methods

```
illustration:
illustrateLLT          function for the generation of LLN - visualizations
illustrateCLT          function for the generation of CLT - visualizations
plotCLT                Generic function for the plotting of CLT-approximations
```

Demos

Demos are available — see `demo(package="distrTeach")`.

Start-up-Banner

You may suppress the start-up banner/message completely by setting `options("StartupBanner"="off")` somewhere before loading this package by `library` or `require` in your R-code / R-session. If option `"StartupBanner"` is not defined (default) or setting `options("StartupBanner"=NULL)` or `options("StartupBanner"="complete")` the complete start-up banner is displayed. For any other value of option `"StartupBanner"` (i.e., not in `c(NULL,"off","complete")`) only the version information is displayed. The same can be achieved by wrapping the `library` or `require` call into either `suppressStartupMessages()` or `onlytypeStartupMessages(.,atypes="version")`.

As for general `packageStartupMessage`'s, you may also suppress all the start-up banner by wrapping the `library` or `require` call into `suppressPackageStartupMessages()` from **startupmsg**-version 0.5 on.

Package versions

Note: The first two numbers of package versions do not necessarily reflect package-individual development, but rather are chosen for the distrXXX family as a whole in order to ease updating "depends" information.

Author(s)

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References

P. Ruckdeschel, M. Kohl, T. Stabla, F. Camphausen (2006): S4 Classes for Distributions, *R News*, *6*(2), 2-6. https://CRAN.R-project.org/doc/Rnews/Rnews_2006-2.pdf a vignette for packages **distr**, **distrSim**, **distrTEst**,

and **distrTeach** is included into the mere documentation package **distrDoc** and may be called by `require("distrDoc");vignette("distr")` a homepage to this package is available under https://distr.r-forge.r-project.org/ and the pages ... M. Kohl (2005): *Numerical Contributions to the Asymptotic Theory of Robustness.* PhD Thesis. Bayreuth. Available as https://www.stamats.de/wp-content/uploads/2018/04/ThesisMKohl.pdf

See Also

distr-package distrEx-package

illustrateCLT *Functions for Illustrating the CLT*

Description

Functions for generating a sequence of plots of the density and cdf of the consecutive standardized and centered sums of iid r.v. distributed according to a prescribed discrete or absolutely continuous distribution compared to the standard normal — uses the generic function `plotCLT`.

Usage

```
illustrateCLT(Distr, len, sleep = 0)
illustrateCLT.tcl(Distr, k, Distrname)
```

Arguments

`Distr`	object of class `"AbscontDistribution"`, `"LatticeDistribution"` or `"DiscreteDistribution"`: distribution of the summands
`len`	integer: up to which number of summands plots are generated
`k`	integer: number of summands for which a plot is to be generated
`Distrname`	character: name of the summand distribution to be used as title in the plot
`sleep`	numeric: pause in seconds between subsequent plots

Details

`illustrateCLT` generates a sequence of plots, while `illustrateCLT.tcl` may be used with Tcl/Tk-widgets as in demo `illustCLT_tcl.R`.

Value

void

Author(s)

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References

Kohl, M., Ruckdeschel, P., (2014): General purpose convolution algorithm for distributions in S4-Classes by means of FFT. *J. Statist. Softw.* **59**(4): 1-25.

See Also

`plotCLT`

Examples

```
distroptions("DefaultNrFFTGridPointsExponent" = 13)
illustrateCLT(Distr = Unif(), len = 10)
distroptions("DefaultNrFFTGridPointsExponent" = 12)
illustrateCLT(Distr = Pois(lambda = 2), len = 10)
distroptions("DefaultNrFFTGridPointsExponent" = 13)
illustrateCLT(Distr = Pois(lambda = 2)+Unif(), len = 10)
illustrateCLT.tcl(Distr = Unif(), k = 4, "Unif()")
```

`illustrateLLN` *Functions for Illustrating the LLN*

Description

Functions for generating a sequence of plots of randomly generated replicates of $\bar{X}_n = \frac{1}{n}\sum_{i=1}^{n} X_i$ for sums of iid r.v. distributed according to a prescribed discrete or absolutely continuous distribution. A line for the expectation and CLT based (pointwise) 95%-confidence bands are also plotted and the empirical coverage of this band by the replicated plotted so far is indicated.

Usage

```
illustrateLLN(Distr = Norm(),n = c(1,3,5,10,25,50,100,500,1000,10000),
            m = 50, step = 1, sleep = 0, withConf = TRUE,
            withCover = (length(n)<=12), withEline = TRUE, withLegend = TRUE,
            CLTorCheb = "CLT",  coverage = 0.95, ...,  col.Eline = "blue",
            lwd.Eline = par("lwd"), lty.Eline = par("lty"), col.Conf = "red",
            lwd.Conf = par("lwd"), lty.Conf = 2, cex.Cover = 0.7,
            cex.legend = 0.8)
```

Arguments

`Distr`	object of class `"UnivariateDistribution"`: distribution of the summands
`n`	vector of integers: sample sizes to be considered
`m`	integer: (total) number of replicates to be plotted subsequently
`step`	integer: number of replicates to be drawn at once
`sleep`	numeric: pause in seconds between subsequent plots
`withEline`	logical: shall a line for the limiting expectation (in case of class `Cauchy` instead: median) be drawn?
`withConf`	logical: shall (CLT-based) confidence bands be plotted?
`withCover`	logical: shall empirical coverage of (CLT-based) confidence bands be printed?
`withLegend`	logical: shall a legend be included?
`CLTorCheb`	character: type of confidence interval —"CLT" or "Chebyshev"; partial matching is used; if this fails "CLT" is used.
`coverage`	numerical: nominal coverage of the confidence bands —to be in (0,1)

col.Eline	character or integer code; color for confidence bands
lwd.Eline	integer code (see par); line width of the confidence bands
lty.Eline	integer code (see par); line type of the confidence bands
col.Conf	character or integer code; color for confidence bands
lwd.Conf	integer code (see par); line width of the confidence bands
lty.Conf	integer code (see par); line type of the confidence bands
cex.Cover	magnification w.r.t. the current setting of cex to be used for empirical coverages; as in par
cex.legend	magnification w.r.t. the current setting of cex to be used for the legend as in par
...	further arguments to be passed to matplot, matlines, abline

Details

illustrateLLN generates a sequence of plots. Any parameters of plot.default may be passed on to this particular plot method.

There are default main titles as well as xlab and ylab annotations.

In all title arguments, the following patterns are substituted:

- "%C" class of argument x
- "%P" parameters of x in form of a comma-separated list of <value>'s coerced to character
- "%Q" parameters of x in form of a comma-separated list of <value>'s coerced to character and in parenthesis — unless empty; then ""
- "%N" parameters of x in form of a comma-separated list <name> = <value> coerced to character
- "%A" deparsed argument x
- "%D" time/date-string when the plot was generated
- "%X" the expression $\bar{X}_n = \sum_{i=1}^{n} X_i/n$

If not explicitly set, col.Eline, col.Conf are set to col if this arg is given and else to their default values as given above. Similarly for cex, lwd and lty.

Value

void

Author(s)

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Examples

```
illustrateLLN(Distr = Unif())
illustrateLLN(Distr = Pois(lambda = 2))
illustrateLLN(Distr = Pois(lambda = 2)+Unif())
illustrateLLN(Td(3), m = 50, col.Eline = "green", lwd = 2, cex = 0.6, main =
 "My LLN %C%Q", sub = "generated %D")
illustrateLLN(Td(3), m = 50, CLTorCheb = "Chebyshev")
illustrateLLN(Td(3), m = 50, CLTorCheb = "Chebyshev", coverage = 0.75)
```

Index