Package 'distrTeach'

January 31, 2024

Version 2.9.1

Date 2024-01-30

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, grDevices, graphics, stats

ByteCompile yes

License LGPL-3

Encoding UTF-8

URL <http://distr.r-forge.r-project.org/>

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R topics documented:

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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:	2.9.1
Date:	2024-01-30
Depends:	R(>= 3.4), methods, distr(>= 2.2), distrEx(>= 2.2)
Suggests:	tcltk
Imports:	startupmsg, grDevices, graphics, stats
LazyLoad:	yes
License:	LGPL-3
URL:	http://distr.r-forge.r-project.org/
VCS/SVNRevision:	1429

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

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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)

Matthias Kohl <Matthias.Kohl@stamats.de>
Peter Ruckdeschel <peter.ruckdeschel@uni-oldenburg.de>

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()")
```

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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)

Peter Ruckdeschel <peter.ruckdeschel@uni-oldenburg.de>

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)
```

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