

Package ‘distrTeach’

November 12, 2022

Version 2.9.0

Date 2022-11-12

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 latin1

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

LastChangedDate {`$LastChangedDate: 2022-04-22 12:49:11 +0200 (Fr, 22 Apr 2022) $`}

LastChangedRevision {`$LastChangedRevision: 1364 $`}

VCS/SVNRevision 1380

NeedsCompilation no

Author Eleonora Feist [ctb] (contributed as student in the initial phase --2008),
Matthias Kohl [aut, cph],
Peter Ruckdeschel [cre, cph],
Anja Hueller [ctb] (contributed as student in the initial phase --2008)

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

Repository CRAN

Date/Publication 2022-11-12 22:40:09 UTC

R topics documented:

distrTeach-package	2
illustrateCLT	4
illustrateLLN	5

Index	7
--------------	----------

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:	2.9.0
Date:	2022-11-12
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:	1380

Classes

Teaching Classes

Methods

illustration:	
<code>illustrateLLT</code>	function for the generation of LLN - visualizations
<code>illustrateCLT</code>	function for the generation of CLT - visualizations
<code>plotCLT</code>	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)

Matthias Kohl <Matthias.Kohl@stamats.de> and
Peter Ruckdeschel <peter.ruckdeschel@uni-oldenburg.de>,
Eleonara Feist <eleonoragerber@gmx.de>, and,
Anja Hueller
Maintainer: Peter Ruckdeschel <peter.ruckdeschel@uni-oldenburg.de>

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

<code>Distr</code>	object of class "AbscontDistribution", "LatticeDistribution" or "DiscreteDistribution": distribution of the summands
<code>len</code>	integer: up to which number of summands plots are generated
<code>k</code>	integer: number of summands for which a plot is to be generated
<code>Distrname</code>	character: name of the summand distribution to be used as title in the plot
<code>sleep</code>	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

```

distriboptions("DefaultNrFFTGridPointsExponent" = 13)
illustrateCLT(Distr = Unif(), len = 10)
distriboptions("DefaultNrFFTGridPointsExponent" = 12)
illustrateCLT(Distr = Pois(lambda = 2), len = 10)
distriboptions("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 <code>matplot</code> , <code>matlines</code> , <code>abline</code>

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)
```

Index

- * **CLT**
 - distrTeach-package, 2
 - illustrateCLT, 4
 - * **LLN**
 - distrTeach-package, 2
 - illustrateLLN, 5
 - * **Teaching demos**
 - distrTeach-package, 2
 - * **distribution**
 - illustrateCLT, 4
 - illustrateLLN, 5
 - * **dynamic**
 - illustrateCLT, 4
 - illustrateLLN, 5
 - * **illustration**
 - illustrateCLT, 4
 - illustrateLLN, 5
 - * **methods**
 - illustrateCLT, 4
 - illustrateLLN, 5
 - * **package**
 - distrTeach-package, 2
 - * **teaching**
 - illustrateCLT, 4
 - illustrateLLN, 5
- distrTeach (distrTeach-package), 2
- distrTeach-package, 2
- illustrateCLT, 4
- illustrateLLN, 5
- par, 6
- plotCLT, 4