

Package ‘mcStats’

May 8, 2026

Title Visualize Results of Statistical Hypothesis Tests

Version 0.1.3

Maintainer Michael Czekanski <mczekanski@middlebury.edu>

Description Provides functionality to produce graphs of sampling distributions of test statistics from a variety of common statistical tests. With only a few keystrokes, the user can conduct a hypothesis test and visualize the test statistic and corresponding p-value through the shading of its sampling distribution. Initially created for statistics at Middlebury College.

Depends R (>= 3.4.0)

License GPL-3

Encoding UTF-8

RoxygenNote 7.3.3

Imports dplyr, ggplot2, ggthemes, gridExtra, magrittr, rlang, stats, tidy

Suggests testthat

NeedsCompilation no

Author Michael Czekanski [aut, cre],
Alex Lyford [aut]

Repository CRAN

Date/Publication 2025-09-10 06:40:39 UTC

Contents

bootstrap	2
hello	3
labelBootResults	3
labelPDFDis	4
mcDChiSq	4
mcDF	5
mcDNorm	5
mcDT	6
shadePDFCts	6

showANOVA	7
showChiSq.Test	7
showMcNemarTest	8
showMosaicPlot	9
showOLS	9
showProp.Test	10
showT.Test	10
showXtremeEventsCts	11
showXtremeEventsDis	12

Index	14
--------------	-----------

bootstrap	<i>Bootstrap</i>
-----------	------------------

Description

Bootstrap using given data and statistic

Usage

```
bootstrap(fun, data, h0, nreps, conf.level = 0.95, verbose = 1)
```

Arguments

fun	function to calculate on each sample. This can be a user-defined function that takes in data as a vector and returns a statistic.
data	data to use for bootstrapping. Should be a representative sample
h0	null hypothesis value
nreps	number of times to bootstrap
conf.level	confidence value
verbose	default is 1 which will create a graph. To turn this off use verbose = 0.

Value

results from bootstrapping. A vector of length @param nreps containing each statistic calculated

Examples

```
x <- rnorm(100)
bootstrap(mean, x, 0.5, 1000, verbose = 0)
bootstrap(mean, x, 0.5, 1000)
```

hello	<i>Print "hello world!"</i>
-------	-----------------------------

Description

```
print "hello world!"
```

Usage

```
hello()
```

Examples

```
hello()
```

labelBootResults	<i>Label Bootstrapped Results</i>
------------------	-----------------------------------

Description

labels bootstrapped results. We use this to create colored histograms.

Usage

```
labelBootResults(results, lBound, uBound)
```

Arguments

results	a vector, data from bootstrapping
lBound	lower bound of confidence interval
uBound	upper bound of confidence interval

Value

vector of labels corresponding to result values

Examples

```
x <- rnorm(100)
labelBootResults(x, -1, 1)
```

labelPDFDis	<i>Label discrete PDF</i>
-------------	---------------------------

Description

labels a discrete pdf

Usage

```
labelPDFDis(x, obsVal, expVal)
```

Arguments

x	x value
obsVal	observed event
expVal	expected value

Value

vector of labels for x value in relation to observed event

Examples

```
labelPDFDis(0:10, 3, 5)
```

mcDChiSq	<i>Density of Chi-Square distribution</i>
----------	---

Description

Density of Chi-Square distribution

Usage

```
mcDChiSq(x, degFree, ...)
```

Arguments

x	x value
degFree	degrees of freedom
...	optional additional parameters which are ignored

Value

density of given Chi-Square dist. at x

mcDF *Density of F-distribution*

Description

Density of F-distribution

Usage

mcDF(x, degFree1, degFree2, ...)

Arguments

x	x value
degFree1	degrees of freedom 1
degFree2	degrees of freedom 2
...	optional additional parameters which are ignored

Value

density of given F-dist. at x

mcDNorm *dnorm but with more arguments*

Description

compute density of normal distribution while allowing for more arguments which are ignored

Usage

mcDNorm(x, mean = 0, sd = 1, log = FALSE, ...)

Arguments

x	x value
mean	mean of normal distribution
sd	std. dev. of normal distribution
log	logical; if TRUE probabilities are given as log(p). See stats::dnorm
...	extra parameters which are ignored

Value

density of normal distribution

mcDT	<i>Density of t-distribution</i>
------	----------------------------------

Description

Density of t-distribution

Usage

mcDT(x, degFree, ...)

Arguments

x	x value
degFree	degrees of freedom
...	optional additional parameters which are ignored

Value

density of given t-dist. at x

shadePDFCts	<i>Used to shade in a PDF</i>
-------------	-------------------------------

Description

Returns density with extreme event region having NAs

Usage

shadePDFCts(x, fun, testStat, ...)

Arguments

x	x value
fun	density function to use
testStat	test statistic value
...	optional parameters passed to density function

Value

density if outside of extreme event region

showANOVA	<i>Show results of ANOVA</i>
-----------	------------------------------

Description

Visualization of distributional results of ANOVA. Please see [aov](#) for more information on parameters

Usage

```
showANOVA(formula, data = NULL, verbose = 1, ...)
```

Arguments

formula	formula specifying a model.
data	data on which to perform ANOVA
verbose	if verbose > 0 the resulting graph is printed
...	Arguments passed to lm. See aov for more detail

Value

output of call to [aov](#)

Examples

```
showANOVA(yield ~ N + P + K, npk)
```

showChiSq.Test	<i>Show Chi-Square Test</i>
----------------	-----------------------------

Description

show results of a chi-square test visually using [chisq.test](#)

Usage

```
showChiSq.Test(  
  x,  
  y = NULL,  
  p = rep(1/length(x), length(x)),  
  simulate.p.value = FALSE,  
  nreps = 2000,  
  verbose = 1  
)
```

Arguments

x	a numeric vector or matrix. x and can also be factors
y	a numeric vector
p	a vector of probabilities the same length as x. Used for goodness-of-fit tests. Must be a valid distribution
simulate.p.value	boolean, if TRUE use simulation to estimate p-value
nreps	if simulate.p.value = TRUE number of simulations to complete
verbose	level of visual output, 0 = silent

Value

results of [chisq.test](#) call

Examples

```
showChiSq.Test(x = c(1,2,1), y= c(1,2,2))
```

showMcNemarTest

Visualize results of McNemar's Test

Description

relevant parameters are passed to [mcnemar.test](#)

Usage

```
showMcNemarTest(x, y = NULL, correct = TRUE, verbose = 1)
```

Arguments

x	two dimensional contingency table as a matrix or a factor object
y	factor object, ignored if x is a matrix
correct	logical indicating whether or not to perform continuity correction
verbose	if verbose > 0 the resulting graph is printed

Value

results of call to [mcnemar.test](#)

showMosaicPlot	<i>Mosaic Plot</i>
----------------	--------------------

Description

Mosaic Plot

Usage

```
showMosaicPlot(x)
```

Arguments

x must be a matrix with each row and column labelled

Value

mosaic plot showing observed proportions, colored by residuals from chi-sq. test

Examples

```
x <- matrix(runif(9,5,100), ncol = 3, dimnames = list(c("Yes1", "No1", "Maybe1"),
c("Yes2", "No2", "Maybe2")))
showMosaicPlot(x)
```

showOLS	<i>Show hypothesis tests from OLS</i>
---------	---------------------------------------

Description

Show hypothesis tests from OLS

Usage

```
showOLS(formula, data, verbose = 1)
```

Arguments

formula formula for regression. Passed to [lm](#)
data data for regression. Passed to [lm](#)
verbose if verbose > 0 the resulting graph is printed

Value

model object resulting from the regression

Examples

```
showOLS(mpg ~ cyl + disp, mtcars)
```

showProp.Test	<i>Show results of proportion test using binom.test</i>
---------------	---

Description

Show results of proportion test using [binom.test](#)

Usage

```
showProp.Test(x, n, p = 0.5)
```

Arguments

x	x value
n	number of repetitions
p	probability of success in one Bernoulli trial

Value

output of call to [binom.test](#)

Examples

```
showProp.Test(3, 10)
```

showT.Test	<i>Conduct z-test</i>
------------	-----------------------

Description

Runs z-test and outputs graph for interpretation using `stats::t.test`

Usage

```
showT.Test(  
  group1,  
  group2 = NULL,  
  mu = 0,  
  paired = FALSE,  
  conf.level = 0.9,  
  verbose = 1  
)
```

Arguments

group1	continuous data to test
group2	optional: second group to include for two sample t-test
mu	optional: mean to test against for one-sample t-test
paired	boolean, if TRUE perform matched pairs t-test
conf.level	confidence level - passed to t.test
verbose	default is 1 which will create a graph. To turn this off use verbose = 0.

Value

results of call to t.test

Examples

```
x <- rnorm(100)
showT.Test(x, verbose = 0)
showT.Test(x)
```

showXtremeEventsCts *Highlight extreme events*

Description

Make graph highlighting events more extreme than observed sample

Usage

```
showXtremeEventsCts(
  testID,
  testStat,
  densFun,
  degFree = NULL,
  degFree1 = NULL,
  degFree2 = NULL,
  xlims,
  verbose = 1,
  ...
)
```

Arguments

testID	name of hypothesis test
testStat	test statistic
densFun	function that computes appropriate density
degFree	degrees of freedom when only one is needed. This gets passed into densFun
degFree1	first degrees of freedom parameter when more than one is needed
degFree2	second degrees of freedom parameter when more than one is needed
xlims	x limits of the graph to be used. This is passed to ggplot
verbose	if verbose > 0 the resulting graph is printed
...	extra arguments passed to density function

Value

results of call testFun

Examples

```
x <- rnorm(100)
showT.Test(x, verbose = 0)
showT.Test(x)
```

showXtremeEventsDis *Show Extreme Events from a Discrete Distribution*

Description

Show Extreme Events from a Discrete Distribution

Usage

```
showXtremeEventsDis(testID, obsVal, expVal, xVals, probFun, ...)
```

Arguments

testID	name of test being performed. This is used to title the graph
obsVal	observed x value
expVal	expected x value
xVals	domain of x (possible values)
probFun	probability mass function for the given distribution
...	addition arguments passed to probFun

Value

graph coloring events by how extreme they are under the null hypothesis

Examples

```
showXtremeEventsDis("Prop. Test", 3, 5, 0:10, probFun = dbinom, size = 10, prob = 0.5)
```

Index

aov, [7](#)

binom.test, [10](#)

bootstrap, [2](#)

chisq.test, [7](#), [8](#)

hello, [3](#)

labelBootResults, [3](#)

labelPDFDis, [4](#)

lm, [9](#)

mcDChiSq, [4](#)

mcDF, [5](#)

mcDNorm, [5](#)

mcDT, [6](#)

mcnemar.test, [8](#)

shadePDFCts, [6](#)

showANOVA, [7](#)

showChiSq.Test, [7](#)

showMcNemarTest, [8](#)

showMosaicPlot, [9](#)

showOLS, [9](#)

showProp.Test, [10](#)

showT.Test, [10](#)

showXtremeEventsCts, [11](#)

showXtremeEventsDis, [12](#)