Package ‘mcStats’

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Title Visualize Results of Statistical Hypothesis Tests
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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.
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bootstrap

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)
**Description**

print "hello world!"

**Usage**

```r
hello()
```

**Examples**

```r
hello()
```

---

**labelBootResults**  
*Label Bootstrapped Results*

**Description**

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

**Usage**

```r
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**

```r
x <- rnorm(100)
labelBootResults(x, -1, 1)
```
labelPDFDis  
*Label discrete PDF*

**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  
*Density of Chi-Square distribution*

**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

**Density of t-distribution**

**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

**Used to shade in a PDF**

**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

Show results of ANOVA

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

Show Chi-Square Test

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
)


Argument
- \(x\): 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.
- \(simulate\_p\_value\): a boolean, if TRUE use simulation to estimate p-value.
- \(nreps\): if \(simulate\_p\_value = \text{TRUE}\) number of simulations to complete.
- \(verbose\): level of visual output, 0 = silent.

Value
- results of \(\text{chisq.test}\) call.

Examples
- \(\text{showChiSq.Test}(x = c(1,2,1), y = c(1,2,2))\)

---

Description
- relevant parameters are passed to \(\text{mcnemar.test}\).

Usage
- \(\text{showMcNemarTest}(x, y = \text{NULL}, correct = \text{TRUE}, verbose = 1)\)

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 \(\text{mcnemar.test}\).
**showMosaicPlot**

Mosaic Plot

**Description**
Mosaic Plot

**Usage**

```r
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**

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

**showOLS**

Show hypothesis tests from OLS

**Description**
Show hypothesis tests from OLS

**Usage**

```r
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

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

Description

Show results of proportion test using `binom.test`

Usage

```r
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

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

showT.Test

Description

Conduct z-test

Usage

```r
showT.Test(group1, group2 = NULL, mu = 0, paired = FALSE, 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
- `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
showXtremeEventsDis

Show Extreme Events from a Discrete Distribution

Examples

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

showXtremeEventsDis

Show Extreme Events from a Discrete Distribution

Usage

```r
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

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