Package 'nhstplot'

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Type Package

Title Plot Null Hypothesis Significance Tests

Version 1.0.0

Description Illustrate graphically the most common Null Hypothesis Significance Testing procedures. More specifically, this package provides functions to plot Chi-Squared, F, t (one- and two-tailed) and z (one- and two-tailed) tests, by plotting the probability density under the null hypothesis as a function of the different test statistic values. Although highly flexible (color theme, fonts, etc.), only the minimal number of arguments (observed test statistic, degrees of freedom) are necessary for a clear and useful graph to be plotted, with the observed test statistic and the p value, as well as their corresponding value labels. The axes are automatically scaled to present the relevant part and the overall shape of the probability density function. This package is especially intended for education purposes, as it provides a helpful support to help explain the Null Hypothesis Significance Testing process, its use and/or shortcomings.

License GPL-3

LazyData TRUE

Depends R (>= 3.3.1)

Imports ggplot2 (>= 2.1.0), stats (>= 3.3.1), grDevices (>= 3.3.1)

RoxygenNote 5.0.1

Suggests knitr, rmarkdown

VignetteBuilder knitr

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R topics documented:

`plotchisqtest` *Illustrate a Chi-Squared Test graphically.*

Description

This function plots the density probability distribution of a Chi-Squared statistic, with a vertical cutline at the observed Chi-Squared value specified. The p-value and the observed Chi-Squared value are plotted. Although largely customizable, only two arguments are required (the observed Chi-Squared and the degrees of freedom).

Usage

```
plotchisqtest(chisq, df, blank = FALSE, title = parse(text =
  expression(chi^2 ~ "test")), xlabel = parse(text = expression(chi^2)),
  ylabel = "Density of probability\nunder the null hypothesis",
  fontfamily = "serif", colorleft = "aliceblue",
  colorright = "firebrick3", colorleftcurve = "black",
  colorrightcurve = "black", colorcut = "black", colorplabel = colorright,
  theme = "default", signifdigitsp = 3, signifdigitschisq = 3,
  curvelinesize = 0.4, cutlinesize = curvelinesize)
```

Arguments

`chisq`	A numeric value indicating the observed Chi-squared statistic.
`df`	A numeric value indicating the degrees of freedom.
`blank`	A logical that indicates whether to hide (blank = TRUE) the test statistic value, p value and cutline. The corresponding colors are actually only made transparent when blank = TRUE, so that the output is scaled exactly the same (this is useful and especially intended for step-by-step explanations).
`title`	A string or expression indicating a custom title for the plot (optional).
`xlabel`	A string or expression indicating a custom title for the x axis (optional).
`ylabel`	A string or expression indicating a custom title for the y axis (optional).
`fontfamily`	A string indicating the font family of all the titles and labels (e.g. "serif" (default), "sans", "Helvetica", "Palatino", etc.) (optional).
`colorleft`	A string indicating the color for the "left" area under the curve (optional).
`colorright`	A string indicating the color for the "right" area under the curve (optional).
`colorleftcurve`	A string indicating the color for the "left" part of the curve (optional).
`colorrightcurve`	A string indicating the color for the "right" part of the curve (optional). By default, for color consistency, this color is also passed to the label, but this can be changed by providing an argument for the "colorlabel" parameter.
`colorcut`	A string indicating the color for the cut line at the observed test statistic (optional).

`colorplabel` A string indicating the color for the label of the p-value (optional). By default, for color consistency, this color is the same as color of "colorright".

`theme` A string indicating one of the predefined color themes. The themes are "default" (light blue and red), "blackandwhite", "whiteandred", "blueandred", "greenandred" and "goldandblue") (optional). Supersedes "colorleft" and "colorright" if another argument than "default" is provided.

`signifdigitsp` A numeric indicating the number of desired significant figures reported for the p-value label (optional).

`signifdigitschisq` A numeric indicating the number of desired significant figures reported for the Chi-Squared label (optional).

`curvelinesize` A numeric indicating the size of the curve line (optional).

`cutlinesize` A numeric indicating the size of the cut line (optional). By default, the size of the curve line is used.

Value

Returns a plot with the density of probability of Chi-Squared under the null hypothesis, annotated with the observed test statistic and the p-value.

Author(s)

Nils Myszkowski <nmyszkowski@pace.edu>

Examples

```
#Making a chi-squared plot with Chi-squared of 8 and df of 4
plotchisqtest(chisq = 8, df = 4)

#Note that the same can be obtained even quicker with:
plotchisqtest(8,4)

#The same plot without the Chi-Squared or p value
plotchisqtest(8,4, blank = TRUE)

#Changing the fontfamily to "sans" and changing the color theme to "blackandwhite"
plotchisqtest(chisq = 8, df = 4, fontfamily = "sans", theme = "blackandwhite")

#Using specific colors and changing the curve line size
plotchisqtest(chisq = 8, df = 4, colorleft = "grey", colorright = "indianred", curvelinesize = 1.2)

#Changing the title to "Chi-Squared Test of Independence"
plotchisqtest(chisq = 8, df = 4, title = "Chi-Squared Test of Independence")

#Changing the title to "Chi-Squared Test of Independence" with greek chi-squared
plotchisqtest(chisq = 8, df = 4, title = expression(chi^2 ~ "Test" ~ "of" ~ "Independence"))
```

plotftest *Illustrate a Fisher's F Test graphically.*

Description

This function plots the density probability distribution of an F statistic, with a vertical cutline at the observed F value specified. A p-value and the observed F value are plotted. Although largely customizable, only three arguments are required (the observed F and the degrees of freedom).

Usage

```
plotftest(f, dfnum, dfdenom, blank = FALSE, title = "F Test",
  xlabel = "F",
  ylabel = "Density of probability\nunder the null hypothesis",
  fontfamily = "serif", colorleft = "aliceblue",
  colorright = "firebrick3", colorleftcurve = "black",
  colorrightcurve = "black", colorcut = "black", colorplabel = colorright,
  theme = "default", signifdigitsp = 3, signifdigitsf = 3,
  curvelinesize = 0.4, cutlinesize = curvelinesize)
```

Arguments

f	A numeric value indicating the observed F statistic.
dfnum	A numeric value indicating the degrees of freedom of the numerator.
dfdenom	A numeric value indicating the degrees of freedom of the denominator.
blank	A logical that indicates whether to hide (blank = TRUE) the test statistic value, p value and cutline. The corresponding colors are actually only made transparent when blank = TRUE, so that the output is scaled exactly the same (this is useful and especially intended for step-by-step explanations).
title	A string or expression indicating a custom title for the plot (optional).
xlabel	A string or expression indicating a custom title for the x axis (optional).
ylabel	A string or expression indicating a custom title for the y axis (optional).
fontfamily	A string indicating the font family of all the titles and labels (e.g. "serif" (default), "sans", "Helvetica", "Palatino", etc.) (optional).
colorleft	A string indicating the color for the "left" area under the curve (optional).
colorright	A string indicating the color for the "right" area under the curve (optional).
colorleftcurve	A string indicating the color for the "left" part of the curve (optional).
colorrightcurve	A string indicating the color for the "right" part of the curve (optional). By default, for color consistency, this color is also passed to the label, but this can be changed by providing an argument for the "colorlabel" parameter.
colorcut	A string indicating the color for the cut line at the observed test statistic (optional).

colorplabel	A string indicating the color for the label of the p-value (optional). By default, for color consistency, this color is the same as color of "colorright".
theme	A string indicating one of the predefined color themes. The themes are "default" (light blue and red), "blackandwhite", "whiteandred", "blueandred", "greenandred" and "goldandblue") (optional). Supersedes "colorleft" and "colorright" if another argument than "default" is provided.
signifdigitsp	A numeric indicating the number of desired significant figures reported for the p-value label (optional).
signifdigitsf	A numeric indicating the number of desired significant figures reported for the F (optional).
curvelinesize	A numeric indicating the size of the curve line (optional).
cutlinesize	A numeric indicating the size of the cut line (optional). By default, the size of the curve line is used.

Author(s)

Nils Myszkowski <nmyszkowski@pace.edu>

Examples

```
#Making an F plot with an F of 3, and degrees of freedom of 1 and 5.
plotftest(f = 4, dfnum = 3, dfdenom = 5)

#Note that the same can be obtained even quicker with:
plotftest(4,3,5)

#The same plot without the f or p value
plotftest(4,3,5, blank = TRUE)

#Changing the fontfamily to "sans" and changing the color theme to "blackandwhite"
plotftest(f = 4, dfnum = 3, dfdenom = 5, fontfamily = "sans", theme = "blackandwhite")

#Using specific colors and changing the curve line size
plotftest(4, 3, 5, colorleft = "grey", colorright = "indianred", curvelinesize = 1.2)

#Changing the title to "Fisher's F test"
plotftest(f = 4, dfnum = 3, dfdenom = 5, title = "Fisher's F test")
```

---

plotttest *Illustrate a one- or two-tailed Student's t test graphically.*

Description

This function plots the density probability distribution of a Student's t statistic, with appropriate vertical cutlines at the t value. The p-value and the observed t value are plotted. Although largely customizable, only two arguments are required (the observed t statistic and the degrees of freedom) for a two-tailed t test. The optional argument tails = "one" plots a one-tailed test plot (the tail is on the left or right, depending on the sign of the t statistic).

Usage

```
plotttest(t, df, tails = "two", blank = FALSE, title = "t Test",
  xlabel = "t",
  ylabel = "Density of probability\nunder the null hypothesis",
  fontfamily = "serif", colormiddle = "aliceblue",
  colorsides = "firebrick3", colormiddlecurve = "black",
  colorsidescurve = "black", colorcut = "black", colorplabel = colorsides,
  theme = "default", signifdigitsp = 3, signifdigitst = 3,
  curvelinesize = 0.4, cutlinesize = curvelinesize)
```

Arguments

t	A numeric value indicating the observed t statistic.
df	A numeric value indicating the degrees of freedom.
tails	A string that indicates whether to plot a one ("one") or two ("two") tailed t-test (optional). By default, a two-tailed test is plotted.
blank	A logical that indicates whether to hide (blank = TRUE) the test statistic value, p value and cutline. The corresponding colors are actually only made transparent when blank = TRUE, so that the output is scaled exactly the same (this is useful and especially intended for step-by-step explanations).
title	A string or expression indicating a custom title for the plot (optional).
xlabel	A string or expression indicating a custom title for the x axis (optional).
ylabel	A string or expression indicating a custom title for the y axis (optional).
fontfamily	A string indicating the font family of all the titles and labels (e.g. "serif" (default), "sans", "Helvetica", "Palatino", etc.) (optional).
colormiddle	A string indicating the color for the "middle" area under the curve (optional).
colorsides	A string indicating the color for the "side(s)" area(s) under the curve (optional).
colormiddlecurve	A string indicating the color for the "middle" part of the curve (optional).
colorsidescurve	A string indicating the color for the "side(s)" part of the curve (optional).
colorcut	A string indicating the color for the cut line at the observed test statistic (optional).
colorplabel	A string indicating the color for the label of the p-value (optional). By default, for color consistency, this color is the same as color of "colorright".
theme	A string indicating one of the predefined color themes. The themes are "default" (light blue and red), "blackandwhite", "whiteandred", "blueandred", "greenandred" and "goldandblue") (optional). Supersedes "colormiddle" and "colorsides" if another argument than "default" is provided.
signifdigitsp	A numeric indicating the number of desired significant figures reported for the p-value label (optional).
signifdigitst	A numeric indicating the number of desired significant figures reported for the t label (optional).

curvelinesize	A numeric indicating the size of the curve line (optional).
cutlinesize	A numeric indicating the size of the cut line(s) (optional). By default, the size of the curve line is used.

Value

Returns a plot with the density of probability of t under the null hypothesis, annotated with the observed test statistic and the p-value.

Author(s)

Nils Myszkowski <nmyszkowski@pace.edu>

Examples

```
#Making a t test plot with a t value of 2 and df of 10
plotttest(t = 2, df = 10)

#Note that the same can be obtained even quicker with:
plotttest(2,10)

#The same plot without the t or p value
plotttest(2,10, blank = TRUE)

#Plotting a one-tailed test using the "tails" parameter.
plotttest(t = 2, df = 10, tails = "one")

#If a negative t is provided, the tail is on the left.
plotttest(t = -2, df = 10, tails = "one")

#Changing the fontfamily to "sans" and changing the color theme to "blackandwhite".
plotttest(t = 2, df = 10, fontfamily = "sans", theme = "blackandwhite")

#Using specific colors and changing the curve line size
plotttest(t = 2, df = 10, colormiddle = "grey96", colorsides = "indianred", curvelinesize=1)
```

---

plotztest *Illustrate a one- or two-tailed z test graphically.*

Description

This function plots the density probability distribution of a z statistic, with appropriate vertical cutlines at the z value. The p-value and the observed z value are plotted. Although largely customizable, only one argument is required (the observed z statistic) for a two-tailed z test. The optional argument tails = "one" plots a one-tailed test plot (the tail is on the left or right, depending on the sign of the z statistic).

Usage

```
plotztest(z, tails = "two", blank = FALSE, title = "z Test",
  xlabel = "z",
  ylabel = "Density of probability\nunder the null hypothesis",
  fontfamily = "serif", colormiddle = "aliceblue",
  colorsides = "firebrick3", colormiddlecurve = "black",
  colorsidescurve = "black", colorcut = "black", colorplabel = colorsides,
  theme = "default", signifdigitsp = 3, signifdigitsz = 3,
  curvelinesize = 0.4, cutlinesize = curvelinesize)
```

Arguments

z	A numeric value indicating the observed t statistic.
tails	A string that indicates whether to plot a one ("one") or two ("two") tailed z-test (optional). By default, a two-tailed test is plotted.
blank	A logical that indicates whether to hide (blank = TRUE) the test statistic value, p value and cutline. The corresponding colors are actually only made transparent when blank = TRUE, so that the output is scaled exactly the same (this is useful and especially intended for step-by-step explanations).
title	A string or expression indicating a custom title for the plot (optional).
xlabel	A string or expression indicating a custom title for the x axis (optional).
ylabel	A string or expression indicating a custom title for the y axis (optional).
fontfamily	A string indicating the font family of all the titles and labels (e.g. "serif" (default), "sans", "Helvetica", "Palatino", etc.) (optional).
colormiddle	A string indicating the color for the "middle" area under the curve (optional).
colorsides	A string indicating the color for the "side(s)" area(s) under the curve (optional).
colormiddlecurve	A string indicating the color for the "middle" part of the curve (optional).
colorsidescurve	A string indicating the color for the "side(s)" part of the curve (optional).
colorcut	A string indicating the color for the cut line at the observed test statistic (optional).
colorplabel	A string indicating the color for the label of the p-value (optional). By default, for color consistency, this color is the same as color of "colorright".
theme	A string indicating one of the predefined color themes. The themes are "default" (light blue and red), "blackandwhite", "whiteandred", "blueandred", "greenandred" and "goldandblue") (optional). Supersedes "colormiddle" and "colorsides" if another argument than "default" is provided.
signifdigitsp	A numeric indicating the number of desired significant figures reported for the p-value label (optional).
signifdigitsz	A numeric indicating the number of desired significant figures reported for the z label (optional).
curvelinesize	A numeric indicating the size of the curve line (optional).
cutlinesize	A numeric indicating the size of the cut line(s) (optional). By default, the size of the curve line is used.

Value

Returns a plot with the density of probability of z under the null hypothesis, annotated with the observed z statistic and the p-value.

Author(s)

Nils Myszkowski <nmyszkowski@pace.edu>

Examples

```
#Making a z test plot with a z value of 2.
plotztest(z = 2)

#Note that the same can be obtained even quicker with:
plotztest(2)

#The same plot without the z or p value
plotztest(2, blank = TRUE)

#Plotting a one-tailed test using the "tails" parameter.
plotztest(z = 2, tails = "one")

#If a negative t is provided, the tail is on the left.
plotztest(z = -2, tails = "one")

#Changing the fontfamily to "sans" and changing the color theme to "blackandwhite"
plotztest(z = 2, fontfamily = "sans", theme = "blackandwhite")

#Using specific colors and changing the curve line size
plotztest(z = 2, colormiddle = "grey96", colorsides = "indianred", curvelinesize=1)
```

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