Package 'ISCAM'

February 12, 2026

Title Companion to the Book ``Investigating Statistical Concepts, Applications, and Methods"

Version 1.2.0

Description Introductory statistics methods to accompany ``Investigating Statistical Concepts, Applications, and Methods" (ISCAM) by Beth Chance & Allan Rossman (2024) <https://rossmanchance.com/iscam4/>. Tools to introduce statistical concepts with a focus on simulation approaches. Functions are verbose, designed to provide ample output for students to understand what each function does. Additionally, most functions are accompanied with plots. The package is designed to be used in an educational setting alongside the ISCAM textbook.

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URL https://iscam4.github.io/ISCAM/, https://github.com/ISCAM4/ISCAM

BugReports https://github.com/ISCAM4/ISCAM/issues

Depends R (>= 3.5)

Imports graphics, stats

Suggests testthat (>= 3.0.0), usethis, vdiffr (>= 1.0.8)

Config/testthat/edition 3

Encoding UTF-8

LazyData true

RoxygenNote 7.3.3

NeedsCompilation no

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Repository CRAN

Date/Publication 2026-02-12 09:50:16 UTC

Contents

`CloudSeeding` *Cloud Seeding Data*

Description

Our lives depend on rainfall. Consequently, scientists have long investigated whether humans can intervene and, as needed, help nature produce more rainfall. In one study, researchers in southern Florida explored whether injecting silver iodide into cumulus clouds would lead to increased rainfall. On each of 52 days that were judged to be suitable for cloud seeding, a target cloud was identified and a plane flew through the target cloud in order to seed it. Randomization was used to determine whether or not to load a seeding mechanism and seed the target cloud with silver iodide on that day. Radar was used to measure the volume of rainfall from the selected cloud during the next 24 hours. The results from Simpson, Olsen, and Eden, (1975) measure rainfall in volume units of acre-feet, "height" of rain across one acre.

Usage

```
CloudSeeding
```

Format

`CloudSeeding`**:**

A data frame with 52 rows and 2 columns:

treatment Whether a cloud was seeded with silver iodide or not.

rainfall Volume of rainfall during the next 24 hours, in acre-feet.

Source

doi:10.2307/1268346

`elephants` *Elephant Walking Data*

Description

Researchers Holdgate et al. (2016) studied walking behavior of elephants in North American zoos to see whether there is a difference in average distance traveled by African and Asian elephants in captivity. They put GPS loggers on 33 African elephants and 23 Asian elephants, and measured the distance (in kilometers) the elephants walked per day.

Usage

```
elephants
```

Format

`Elephants`**:**

A data frame with 56 rows and 2 columns:

Species What species this Elephant was.

Distance How many kilometers they walked per day.

Source

doi:10.1371/journal.pone.0150331

FlintMDEQ *Flint Michigan Lead Data*

Description

Lead poisoning can be a serious problem associated with drinking tap water. Many older water pipes are made of lead. Over time, the pipes corrode, releasing lead into the drinking water. In April 2014, the city of Flint Michigan switched its water supply to the Flint River in an effort to save money. The Michigan Department of Environmental Quality (MDEQ) tested the water at the time and declared it safe to drink. Officials were supposed to test at least 100 homes, targeting those most at risk. The U.S. Environmental Protection Agency (EPA)'s Lead and Copper Rule states that if lead concentrations exceed an action level of 15 parts per billion (ppb) in more than 10% of homes sampled, then actions must be undertaken to control corrosion, and the public must be informed.

Usage

```
FlintMDEQ
```

Format

`flint`**:**

A data frame with 71 rows and 1 column:

lead Lead concentration per household, measured in parts per billion.

Infant *Infant Data*

Description

In a study reported in the November 2007 issue of Nature, researchers investigated whether infants take into account an individual's actions towards others in evaluating that individual as appealing or aversive, perhaps laying for the foundation for social interaction (Hamlin, Wynn, and Bloom, 2007). In other words, do children who aren't even yet talking still form impressions as to someone's friendliness based on their actions? In one component of the study, 10-month-old infants were shown a "climber" character (a piece of wood with "googly" eyes glued onto it) that could not make it up a hill in two tries. Then the infants were shown two scenarios for the climber's next try, one where the climber was pushed to the top of the hill by another character (the "helper" toy) and one where the climber was pushed back down the hill by another character (the "hinderer" toy). The infant was alternately shown these two scenarios several times. Then the child was presented with both pieces of wood (the helper and the hinderer characters) and asked to pick one to play with. Videos demonstrating this component of the study can be found at https://campuspress.yale.edu/infantlab/media/.

Usage

```
Infant
```

Format

Infant:

A data frame with 16 rows and 1 column:

choice Whether a baby selected the "helper" or "hinderer" toy.

Source

https://pubmed.ncbi.nlm.nih.gov/18033298/

---

iscamaddexp *Overlay an Exponential Density Function on Histogram*

Description

addexp creates a histogram of x and overlays an exponential density function with $\lambda = \frac{1}{mean}$.

Usage

```
iscamaddexp(
  x,
  main = "Histogram with exponential curve",
  xlab = deparse(substitute(x)),
  bins = NULL
)
```

Arguments

x	A numeric vector representing the data to be plotted.
main	(optional) title for the plot.
xlab	(optional) x-axis label for the plot.
bins	(optional) number of bins for the histogram.

Value

A histogram of x overlayed with an exponential density function.

Examples

```
set.seed(0)
x <- rexp(100, rate = 0.5)
iscamaddexp(x)
iscamaddexp(x, main = "Your Active Title", xlab = "Exponential Data", bins = 20)
```

iscamaddlnorm *Overlay a Log Normal Density Function on Histogram*

Description

addlnorm creates a histogram of x and overlays a log normal density function.

Usage

```
iscamaddlnorm(
  x,
  main = "Histogram with log-normal curve",
  xlab = deparse(substitute(x)),
  bins = NULL
)
```

Arguments

x	A numeric vector representing the data to be plotted.
main	(optional) title for the plot.
xlab	(optional) x-axis label for the plot.
bins	(optional) number of bins for the histogram.

Value

A histogram of x overlayed with an log normal density function.

Examples

```
set.seed(0)
x <- rlnorm(100)
iscamaddlnorm(x)
iscamaddlnorm(x, main = "Your Active Title", xlab = "Log Normal Data", bins = 20)
```

iscamaddnorm *Overlay a Normal Density Function on Histogram*

Description

addnorm creates a histogram of x and overlays a normal density function.

Usage

```
iscamaddnorm(
  x,
  main = "Histogram with normal curve",
  xlab = deparse(substitute(x)),
  bins = NULL
)
```

Arguments

x	A numeric vector representing the data to be plotted.
main	(optional) title for the plot.
xlab	(optional) x-axis label for the plot.
bins	(optional) number of bins for the histogram.

Value

A histogram of x overlayed with an normal density function.

Examples

```
set.seed(0)
x <- rnorm(100)
iscamaddnorm(x)
iscamaddnorm(x, main = "Your Active Title", xlab = "Normal Data", bins = 20)
```

---

iscamaddt *Overlay a t Density Function on Histogram*

Description

Overlay a t Density Function on Histogram

Usage

```
iscamaddt(
  x,
  df,
  main = "Histogram with t curve",
  xlab = deparse(substitute(x)),
  bins = NULL
)
```

Arguments

x	A numeric vector representing the data to be plotted.
df	A numeric value representing the degrees of freedom of x.
main	(optional) title for the plot.
xlab	(optional) x-axis label for the plot.
bins	(optional) number of bins for the histogram.

Value

A histogram of x overlayed with an t density function.

Examples

```
set.seed(0)
x <- rt(100, 30)
iscamaddt(x, 30)
iscamaddt(x, 30, main = "Your Active Title", xlab = "t Data", bins = 20)
```

---

iscamaddtnorm *Overlay a t Density Function and a Normal Density Function on Histogram*

Description

Overlay a t Density Function and a Normal Density Function on Histogram

Usage

```
iscamaddtnorm(
  x,
  df,
  main = "Histogram with t and normal curve",
  xlab = deparse(substitute(x)),
  bins = NULL
)
```

Arguments

x	A numeric vector representing the data to be plotted.
df	A numeric value representing the degrees of freedom of x.
main	(optional) title for the plot.
xlab	(optional) x-axis label for the plot.
bins	(optional) number of bins for the histogram.

Value

A histogram of x overlayed with an t density function and a normal density function.

Examples

```
set.seed(0)
x <- rt(100, 5)
iscamaddtnorm(x, 5)
iscamaddtnorm(x, 5, main = "Your Active Title", xlab = "t Data", bins = 20)
```

---

iscambinomnorm *Overlays Normal Approximation onto Binomial*

Description

`binomnorm` creates a binomial distribution of the given inputs and overlays a normal approximation.

Usage

```
iscambinomnorm(k, n, prob, direction, verbose = TRUE)
```

Arguments

`k`	number of successes of interest
`n`	number of trials
`prob`	success probability
`direction`	"above", "below", or "two.sided"
`verbose`	Logical, defaults to `TRUE`. Set to `FALSE` to suppress messages

Value

A plot of the binomial distribution overlayed with the normal approximation

Examples

```
iscambinomnorm(k = 10, n = 20, prob = 0.5, direction = "two.sided")
```

iscambinompower *Rejection Region for Binomial*

Description

binompower determines the rejection region corresponding to the level of significance and the first probability and shows the binomial distribution shading its corresponding region.

Usage

```
iscambinompower(LOS, n, prob1, alternative, prob2 = NULL, verbose = TRUE)
```

Arguments

LOS	A numeric value representing the level of significance
n	A numeric value representing the sample size
prob1	A numeric value representing the first probability
alternative	"less", "greater", or "two.sided"
prob2	A numeric value representing the second probability
verbose	Logical, defaults to TRUE. Set to FALSE to suppress messages

Value

A plot of the binomial distribution with the rejection region highlighted.

Examples

```
iscambinompower(LOS = 0.05, n = 20, prob1 = 0.5, alternative = "less")

iscambinompower(LOS = 0.05, n = 20, prob1 = 0.5, alternative = "greater", prob2 = 0.75)

iscambinompower(LOS = 0.10, n = 30, prob1 = 0.4, alternative = "two.sided")

iscambinompower(LOS = 0.10, n = 30, prob1 = 0.4, alternative = "two.sided", prob2 = 0.2)
```

iscambinomprob *Calculate Binomial Tail Probabilities*

Description

binomprob calculates the probability of the number of success of interest using a binomial distribution and plots the distribution.

Usage

```
iscambinomprob(k, n, prob, lower.tail, verbose = TRUE)
```

Arguments

k	number of successes of interest.
n	number of trials.
prob	success probability. Numeric between 0 & 1.
lower.tail	Boolean for finding the probability above (FALSE) or below (TRUE) the inputted value (inclusive)
verbose	Logical, defaults to TRUE. Set to FALSE to suppress messages

Value

The probability of the binomial distribution along with a graph of the distribution.

Examples

```
iscambinomprob(k = 5, n = 20, prob = 0.4, lower.tail = TRUE)
iscambinomprob(k = 15, n = 30, prob = 0.3, lower.tail = FALSE)
iscambinomprob(k = 22, n = 25, prob = 0.9, lower.tail = TRUE)
```

---

iscambinomtest *Exact Binomial Test*

Description

binomtest calculates performs an exact binomial test and graphs the binomial distribution and/or binomial confidence interval.

Usage

```
iscambinomtest(
  observed,
  n,
  hypothesized = NULL,
  alternative,
  conf.level = NULL,
  verbose = TRUE
)
```

Arguments

observed	The observed number of successes or sample proportion (assumed to be proportion if value less than one.)
n	number of trials.
hypothesized	hypothesized probability of success.
alternative	"less", "greater", or "two.sided"
conf.level	Confidence level for a two-sided confidence interval.
verbose	Logical, defaults to TRUE. Set to FALSE to suppress messages

Value

a list of the p-value along with lower and upper bound for the calculated confidence interval.

Examples

```
iscambinomtest(
  observed = 17,
  n = 25,
  hypothesized = 0.5,
  alternative = "greater"
)

iscambinomtest(
  observed = 12,
  n = 80,
  hypothesized = 0.10,
  alternative = "two.sided",
  conf.level = 0.95
)

iscambinomtest(
  observed = 0.14,
  n = 100,
  hypothesized = 0.20,
  alternative = "less"
)

iscambinomtest(observed = 17, n = 25, conf.level = 0.95)

iscambinomtest(observed = 12, n = 80, conf.level = c(0.90, 0.95, 0.99))
```

---

iscamboxplot *A box plot*

Description

boxplot plots the given data in a box plot. If a second categorical variable is given, the data is grouped by this variable.

Usage

```
iscamboxplot(
  response,
  explanatory = NULL,
  main = "",
  xlab = "",
  ylab = substitute(explanatory)
)
```

Arguments

response	Vector of numeric values to plot.
explanatory	(optional) second categorical variable to group by.
main	(optional) title for the plot.
xlab	(optional) x-axis label for the plot.
ylab	(optional) y-axis label for the plot. Only displayed when explanatory is provided.

Value

A box plot.

Examples

```
iscamboxplot(
  mtcars$mpg,
  main = "mtcars Cylinders Dotplot",
  xlab = "Number of Cylinders"
)
iscamboxplot(
  mtcars$mpg,
  mtcars$am,
  main = "Automatic Cars Have Better Mileage on Average",
  xlab = "Mileage (miles per gallon)",
  ylab = "Automatic (yes coded as 1)"
)
```

---

iscamchisqprob *Chi-Square Probability*

Description

chisqrprob returns the upper tail probability for the given chi-square statistic and degrees of freedom.

Usage

```
iscamchisqprob(xval, df, verbose = TRUE)
```

Arguments

xval	the value of the chi-square statistic.
df	the degrees of freedom.
verbose	Logical, defaults to TRUE. Set to FALSE to suppress messages

Value

The upper tail probability for the chi-square distribution, and a plot of the chi-square distribution with the statistic and more extreme shaded.

Examples

```
iscamchisqprob(5, 3)
```

`iscamdotplot` *A dot plot*

Description

`dotplot` creates a horizontal dot plot. If a second categorical variable is given, the data is grouped by this variable. Use `names` & `mytitle` to specify the labels and title.

Usage

```
iscamdotplot(
  response,
  explanatory = NULL,
  main = "",
  xlab = substitute(response),
  ylab = substitute(explanatory)
)
```

Arguments

`response`	Vector of numeric values to plot.
`explanatory`	(optional) second categorical variable to group by.
`main`	(optional) title for the plot.
`xlab`	(optional) x-axis label for the plot.
`ylab`	(optional) y-axis label for the plot. Only displayed when `explanatory` is provided.

Value

A dot plot.

Examples

```
iscamdotplot(
  mtcars$cyl,
  main = "mtcars Cylinders Dotplot",
  xlab = "Number of Cylinders"
)
iscamdotplot(
  mtcars$mpg,
  mtcars$am,
  main = "Automatic Cars Have Better Mileage on Average",
  xlab = "Mileage (miles per gallon)",
  ylab = "Automatic (yes coded as 1)"
)
```

---

iscamhypernorm *Hypergeometric p-value and Distribution Overlaid with Normal Distribution*

Description

Hypergeometric p-value and Distribution Overlaid with Normal Distribution

Usage

```
iscamhypernorm(k, total, succ, n, lower.tail, verbose = TRUE)
```

Arguments

k	Number of successes of interest or difference in conditional proportions
total	Total number of observations in the study
succ	Overall number of successes
n	Number of observations in group A
lower.tail	Boolean for finding the probability above (FALSE) or below (TRUE) the inputted value (inclusive)
verbose	Logical, defaults to TRUE. Set to FALSE to suppress messages

Value

Tail probabilities from the hypergeometric distribution, hypergeometric distribution with normal distribution overlayed with the observed statistic and more extreme shaded.

Examples

```
iscamhypernorm(1, 20, 5, 10, TRUE)
```

iscamhyperprob *Hypergeometric p-value and Distribution*

Description

Hypergeometric p-value and Distribution

Usage

```
iscamhyperprob(k, total, succ, n, lower.tail, verbose = TRUE)
```

Arguments

k	Number of successes of interest or difference in conditional proportions
total	Total number of observations in the study
succ	Overall number of successes
n	Number of observations in group A
lower.tail	Boolean for finding the probability above (FALSE) or below (TRUE) the inputted value (inclusive)
verbose	Logical, defaults to TRUE. Set to FALSE to suppress messages

Value

Tail probabilities from the hypergeometric distribution, hypergeometric distribution with the observed statistic and more extreme shaded.

Examples

```
iscamhyperprob(1, 20, 5, 10, TRUE)
```

iscaminvbinom *Inverse Binomial Probability*

Description

Inverse Binomial Probability

Usage

```
iscaminvbinom(alpha, n, prob, lower.tail, verbose = TRUE)
```

Arguments

alpha	The probability of interest.
n	The number of trials.
prob	The probability of success.
lower.tail	Boolean for finding the probability above (FALSE) or below (TRUE) the inputted value (inclusive)
verbose	Logical, defaults to TRUE. Set to FALSE to suppress messages

Value

numeric which achieves at most the stated probability

Examples

```
iscaminvbinom(alpha = 0.05, n = 30, prob = 0.5, lower.tail = TRUE)

iscaminvbinom(alpha = 0.05, n = 30, prob = 0.5, lower.tail = FALSE)

iscaminvbinom(alpha = 0.01, n = 60, prob = 0.10, lower.tail = FALSE)
```

---

iscaminvnorm *Inverse Normal Calculation*

Description

Inverse Normal Calculation

Usage

```
iscaminvnorm(prob1, mean = 0, sd = 1, Sd = sd, direction, verbose = TRUE)
```

Arguments

prob1	probability to find normal quantile of.
mean	mean of normal distribution.
sd	standard deviation of normal distribution.
Sd	deprecated–available for backwards compatibility.
direction	direction for probability calculation: "above", "below", "outside", "between".
verbose	Logical, defaults to TRUE. Set to FALSE to suppress messages

Value

a plot of the normal distribution with the quantile of the specified probability highlighted.

Examples

```
iscaminvnorm(0.05, direction = "below")
iscaminvnorm(0.90, mean = 100, sd = 15, direction = "above")
iscaminvnorm(0.10, direction = "outside")
iscaminvnorm(0.95, direction = "between")
```

---

iscaminvt *Inverse T Calculation*

Description

`invt` calculates the t quantile of a specified probability.

Usage

```
iscaminvt(prob, df, direction, verbose = TRUE)
```

Arguments

`prob`	Desired probability.
`df`	Degrees of freedom
`direction`	direction for probability calculation: "above", "below", "outside", "between".
`verbose`	Logical, defaults to `TRUE`. Set to `FALSE` to suppress messages

Value

The t value for the specified probability.

Examples

```
iscaminvt(0.05, df = 15, direction = "below")
iscaminvt(0.10, df = 25, direction = "above")
iscaminvt(0.95, df = 30, direction = "between")
iscaminvt(0.05, df = 20, direction = "outside")
```

iscamnormpower *Rejection Region for Normal*

Description

normpower determines the rejection region corresponding to the level of significance and the first probability and shows the normal distribution shading its corresponding region.

Usage

```
iscamnormpower(LOS, n, prob1, alternative, prob2, verbose = TRUE)
```

Arguments

LOS	A numeric value representing the level of significance; 0 < LOS< 1
n	A numeric value representing the sample size
prob1	A numeric value representing the first probability
alternative	"less", "greater", or "two.sided"
prob2	A numeric value representing the second probability
verbose	Logical, defaults to TRUE. Set to FALSE to suppress messages

Value

A plot of the normal distribution with the rejection region highlighted.

Examples

```
iscamnormpower(0.05, n = 100, prob1 = 0.5, alternative = "greater", prob2 = 0.6)
iscamnormpower(0.10, n = 50, prob1 = 0.25, alternative = "less", prob2 = 0.15)
iscamnormpower(0.05, n = 200, prob1 = 0.8, alternative = "two.sided", prob2 = 0.7)
```

iscamnormprob *Normal Tail Probability*

Description

normprob finds a p-value and plots it onto a normal distribution with mean and standard deviation as specified. The function can find the probability above, below, between, or outside of the observed value, as specified by directions.

Usage

```
iscamnormprob(
  xval,
  mean = 0,
  sd = 1,
  direction,
  label = NULL,
  xval2 = NULL,
  digits = 4,
  verbose = TRUE
)
```

Arguments

xval	observed value.
mean	mean of normal distribution.
sd	standard deviation of normal distribution.
direction	direction for probability calculation, "above" or "below"; if "outside" or "between" are used, a second larger observation, xval2 must be specified
label	horizontal axis label.
xval2	second observation value.
digits	number of digits to display.
verbose	Logical, defaults to TRUE. Set to FALSE to suppress messages

Value

a p-value and a plot of the normal distribution with shaded area representing probability of the observed value or more extreme occurring.

Examples

```
iscamnormprob(1.96, direction = "above")
iscamnormprob(-1.5, mean = 1, sd = 2, direction = "below")
iscamnormprob(0, xval2 = 1.5, direction = "between")
iscamnormprob(-1, xval2 = 1, direction = "outside")
```

---

iscamonepropztest *One Proportion Z-Test and Interval*

Description

iscamonepropztest calculates a one-proportion z-test and/or a corresponding confidence interval.

Usage

```
iscamonepropztest(
  observed,
  n,
  hypothesized = NULL,
  alternative = "two.sided",
  conf.level = NULL,
  verbose = TRUE
)
```

Arguments

observed	The observed number of successes. If a value less than 1 is provided, it is assumed to be the sample proportion.
n	The sample size.
hypothesized	(optional) hypothesized probability of success under the null hypothesis.
alternative	(optional) character string specifying the form of the alternative hypothesis. Must be one of "less", "greater", or "two.sided".
conf.level	(optional) confidence level(s) for a two-sided confidence interval.
verbose	Logical, defaults to TRUE. Set to FALSE to suppress messages

Value

This function prints the results of the one-proportion z-test and/or the confidence interval. It also generates plots to visualize the test and interval.

Examples

```
iscamonepropztest(observed = 35, n = 50, hypothesized = 0.5)

iscamonepropztest(
  observed = 0.8,
  n = 100,
  hypothesized = 0.75,
  alternative = "greater",
  conf.level = 0.95
)

iscamonepropztest(observed = 60, n = 100, conf.level = 0.90)
```

---

iscamonesamplet *One Sample T-Test*

Description

onesamplet calculates a one sample t-test and/or interval from summary statistics. It defaults to a hypothesized population mean of 0. You can optionally set an alternative hypothesis and confidence level for a two-sided confidence interval.

Usage

```
iscamonesamplet(
  xbar,
  sd,
  n,
  hypothesized = 0,
  alternative = NULL,
  conf.level = NULL,
  verbose = TRUE
)
```

Arguments

xbar	Observed mean.
sd	Observed standard deviation.
n	Sample size.
hypothesized	Hypothesized population mean.
alternative	"less", "greater", or "two.sided"
conf.level	Confidence level.
verbose	Logical, defaults to TRUE. Set to FALSE to suppress messages

Value

The t value, p value, and confidence interval.

Examples

```
iscamonesamplet(
  xbar = 2.5,
  sd = 1.2,
  n = 30,
  alternative = "greater",
  hypothesized = 2
)
iscamonesamplet(
  xbar = 10.3,
  sd = 2,
  n = 50,
  alternative = "less",
  hypothesized = 11
)
iscamonesamplet(
  xbar = 98.2,
  sd = 2,
  n = 100,
  alternative = "two.sided",
  conf.level = 0.95
)
iscamonesamplet(xbar = 55, sd = 5, n = 40, conf.level = 0.99)
```

iscamsummary *Some Summary Statistics*

Description

summary calculates the five number summary, mean, and standard deviation of the quantitative variable x. An optional second, categorical variable can be specified and values will be calculated separately for each group. The number of digits in output can also be specified. Skewness is sample skewness: $g_1 := \frac{m_3}{m_2^{3/2}}$, where $m_2 := \frac{1}{n}\sum_{i=1}^{n}(x_i - \bar{x})^2$ and $m_3 := \frac{1}{n}\sum_{i=1}^{n}(x_i - \bar{x})^3$ are the second and third central sample moments.

Usage

```
iscamsummary(x, explanatory = NULL, digits = 3)
```

Arguments

x	data to summarize.
explanatory	(optional) explanatory variable to group by.
digits	(optional) number of digits to round to, defaults to 3.

Value

A table with some summary statistics of x.

Examples

```
set.seed(0)
fake_data <- rnorm(30) # simulating some data
groups <- sample(c("group1","group2"), 30, TRUE)
iscamsummary(fake_data)
iscamsummary(fake_data, explanatory = groups, digits = 2) # with groups
```

iscamtprob *Tail Probability for t-distribution*

Description

Tail Probability for t-distribution

Usage

```
iscamtprob(xval, df, direction, xval2 = NULL, verbose = TRUE)
```

Arguments

xval	observed value.
df	degrees of freedom.
direction	direction for probability calculation, "above" or "below"; if "outside" or "between" are used, a second larger observation, xval2 must be specified
xval2	second observation value.
verbose	Logical, defaults to TRUE. Set to FALSE to suppress messages

Value

The tail probability in the specified direction using the given arguments.

Examples

```
iscamtprob(xval = -2.05, df = 10, direction = "below")
iscamtprob(xval = 1.80, df = 20, direction = "above")
iscamtprob(xval = -2, xval2 = 2, df = 15, direction = "between")
iscamtprob(xval = -2.5, xval2 = 2.5, df = 25, direction = "outside")
```

---

iscamtwopropztest *Two Proportion Z-Test and Interval*

Description

iscamtwopropztest calculates a two-proportion z-test and/or a corresponding confidence interval.

Usage

```
iscamtwopropztest(
  observed1,
  n1,
  observed2,
  n2,
  hypothesized = 0,
  alternative = NULL,
  conf.level = NULL,
  datatable = NULL,
  verbose = TRUE
)
```

Arguments

observed1	The observed number of successes in group 1. If a value less than 1 is provided, it is assumed to be the sample proportion.
n1	The sample size for group 1.

observed2	The observed number of successes in group 2. If a value less than 1 is provided, it is assumed to be the sample proportion.
n2	The sample size for group 2.
hypothesized	(optional) hypothesized difference in probability of success under the null hypothesis.
alternative	(optional) character string specifying the form of the alternative hypothesis. Must be one of "less", "greater", or "two.sided".
conf.level	(optional) confidence level(s) for a two-sided confidence interval.
datatable	(optional) two-way table of counts as an alternative input method.
verbose	Logical, defaults to TRUE. Set to FALSE to suppress messages

Value

This function prints the results of the two-proportion z-test and/or the confidence interval. It also generates plots to visualize the test and interval.

Examples

```
iscamtwopropztest(observed1 = 35, n1 = 50, observed2 = 28, n2 = 45)

iscamtwopropztest(
  observed1 = 0.8,
  n1 = 100,
  observed2 = 0.6,
  n2 = 80,
  hypothesized = 0,
  alternative = "greater",
  conf.level = 0.95
)

iscamtwopropztest(observed1 = 60, n1 = 100, observed2 = 45, n2 = 90, conf.level = 0.90)
```

---

iscamtwosamplet *Two Sample T-Test*

Description

twosamplet calculates a two sample t-test and/or interval from summary data. It defaults to a hypothesized population mean difference of 0. You can optionally set an alternative hypothesis and confidence level for a two-sided confidence interval.

Usage

```
iscamtwosamplet(
  x1,
  sd1,
  n1,
  x2,
  sd2,
  n2,
  hypothesized = 0,
  alternative = NULL,
  conf.level = 0,
  verbose = TRUE
)
```

Arguments

x1	Observed mean for group 1.
sd1	Observed standard deviation for group 1.
n1	Sample size for group 1.
x2	Observed mean for group 2.
sd2	Observed standard deviation for group 2.
n2	Sample size for group 2.
hypothesized	Hypothesized difference in population means.
alternative	"less", "greater", or "two.sided"
conf.level	Confidence level.
verbose	Logical, defaults to TRUE. Set to FALSE to suppress messages iscamtwosamplet(x1 = 25, sd1 = 5, n1 = 40, x2 = 22, sd2 = 6, n2 = 45, alternative = "greater") iscamtwosamplet(x1 = 10, sd1 = 2, n1 = 50, x2 = 12, sd2 = 2.5, n2 = 50, alternative = "two.sided") iscamtwosamplet(x1 = 8, sd1 = 1.5, n1 = 30, x2 = 5, sd2 = 1.8, n2 = 33, alternative = "greater", hypothesized = 2) iscamtwosamplet(x1 = 15, sd1 = 3, n1 = 25, x2 = 12, sd2 = 3.5, n2 = 28, conf.level = 0.95)

Value

The t value, p value, and confidence interval.

SleepDeprivation *Sleep Deprivation Data*

Description

Researchers have established that sleep deprivation has a harmful effect on visual learning (the subject does not consolidate information to improve on the task). Stickgold, James, and Hobson (2000) investigated whether subjects could "make up" for sleep deprivation by getting a full night's sleep in subsequent nights. This study involved randomly assigning 21 subjects (volunteers between the ages of 18 and 25) to one of two groups: one group was deprived of sleep on the night following training with a visual discrimination task, and the other group was permitted unrestricted sleep on that first night. Both groups were allowed unrestricted sleep on the following two nights, and then were re-tested on the third day. Subjects' performance on the test was recorded as the minimum time (in milliseconds) between stimuli appearing on a computer screen for which they could accurately report what they had seen on the screen. Previous studies had shown that subjects deprived of sleep performed significantly worse the following day, but it was not clear how long these negative effects would last. The data presented here are the improvements in reaction times (in milliseconds), so a negative value indicates a decrease in performance.

Usage

```
SleepDeprivation
```

Format

`SleepDeprivation`**:**

A data frame with 21 rows and 2 columns:

sleepcondition The sleep condition the subject was in.

improvement The subject's improvement in reaction times, measured in milliseconds.

Source

https://www.nature.com/articles/nn1200_1237

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