Package 'icr'

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Type Package

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Title Compute Krippendorff's Alpha

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Description Provides functions to compute and plot Krippendorff's inter-coder reliability coefficient alpha and bootstrapped uncertainty estimates (Krippendorff 2004, ISBN:0761915443). The bootstrap routines are set up to make use of parallel threads where supported.

URL https://github.com/staudtlex/icr

BugReports https://github.com/staudtlex/icr/issues

License GPL (>= 2)

Encoding UTF-8

LazyData true

Imports Rcpp (>= 0.12.9)

LinkingTo Rcpp

Suggests ggplot2

RoxygenNote 7.2.3

NeedsCompilation yes

Repository CRAN

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R topics documented:

codings *Example reliability data*

Description

A matrix containing example codings of 12 units (e.g. newspaper articles) by four coders.

Usage

```
codings
```

Format

A matrix with 4 rows and 12 columns. Each column contains the coders' assessments of a coding unit (e.g. newspaper article)

Source

Krippendorff, K. (1980). Content analysis: An introduction to its methodology. Beverly Hills, CA: Sage.

krippalpha *Krippendorff's alpha*

Description

`krippalpha` computes Krippendorff's reliability coefficient alpha.

Usage

```
krippalpha(
  data,
  metric = "nominal",
  bootstrap = FALSE,
  bootnp = FALSE,
  nboot = 20000,
  nnp = 1000,
  cores = 1,
  seed = rep(12345, 6)
)
```

Arguments

data	a matrix or data frame (coercible to a matrix) of reliability data. Data of type character are converted to numeric via as.factor().
metric	metric difference function to be applied to disagreements. Supports nominal, ordinal, interval, ratio, bipolar. Defaults to nominal.
bootstrap	logical indicating whether uncertainty estimates should be obtained using the bootstrap algorithm defined by Krippendorff. Defaults to FALSE.
bootnp	logical indicating whether non-parametric bootstrap uncertainty estimates should be computed. Defaults to FALSE.
nboot	number of bootstraps used in Krippendorff's algorithm. Defaults to 20000.
nnp	number of non-parametric bootstraps. Defaults to 1000.
cores	number of cores across which bootstrap-computations are distributed. Defaults to 1. If more cores are specified than available, the number will be set to the maximum number of available cores.
seed	numeric vector of length 6 for the internal L'Ecuyer-CMRG random number generator (see details). Defaults to c(12345, 12345, 12345, 12345, 12345, 12345).

Details

krippalpha takes the seed vector to seed the internal random number generator of both bootstrap-routines. It does not advance R's RNG state.

When using the ratio metric with reliability data containing scales involving negative as well as positive values, krippalpha may return a value of NaN. The ratio metric difference function is defined as $\left(\frac{(c-k)}{(c+k)}\right)^2$. Hence, if for any two scale values $c = -k$, the fraction is not defined, resulting in $\alpha =$ NaN. In order to avoid this issue, shift your reliability data to have strictly positive values.

Value

Returns a list of type icr with following elements:

alpha	value of inter-coder reliability coefficient
metric	integer representation of metric used to compute alpha: 1 nominal, 2 ordinal, 3 interval, 4 ratio, 6 bipolar
n_coders	number of coders
n_units	number of units to be coded
n_values	number of unique values in reliability data
coincidence_matrix	matrix containing coincidences within coder-value pairs
delta_matrix	matrix of metric differences depending on method
D_e	expected disagreement
D_o	observed disagreement

bootstrap	TRUE if Krippendorff bootstrapping algorithm was run, FALSE otherwise
nboot	number of bootstraps
bootnp	TRUE if nonparametric bootstrap was run, FALSE otherwise
nnp	number of non-parametric bootstraps
bootstraps	vector of bootstrapped values of alpha (Krippendorff's algorithm)
bootstrapsNP	vector of non-parametrically bootstrapped values of alpha

Note

krippalpha's bootstrap-routines use L'Ecuyer's CMRG random number generator (see L'Ecyuer et al. 2002) to create random numbers suitable for parallel computations. The routines interface to L'Ecuyer's C++ code, which can be found at https://www.iro.umontreal.ca/~lecuyer/myftp/streams00/c++/

References

Krippendorff, K. (2004) *Content Analysis: An Introduction to Its Methodology*. Beverly Hills: Sage.

Krippendorff, K. (2011) *Computing Krippendorff's Alpha Reliability*. Departmental Papers (ASC) 43. https://web.archive.org/web/20220713195923/https://repository.upenn.edu/asc_papers/43/.

Krippendorff, K. (2016) *Bootstrapping Distributions for Krippendorff's Alpha*. https://www.asc.upenn.edu/sites/default/files/2021-03/Algorithm%20for%20Bootstrapping%20a%20Distribution%20of%20Alpha.pdf.

L'Ecuyer, P. (1999) Good Parameter Sets for Combined Multiple Recursive Random Number Generators. *Operations Research*, 47 (1), 159–164. https://www.iro.umontreal.ca/~lecuyer/myftp/streams00/opres-combmrg2-1999.pdf.

L'Ecuyer, P., Simard, R, Chen, E. J., and Kelton, W. D. (2002) An Objected-Oriented Random-Number Package with Many Long Streams and Substreams. *Operations Research*, 50 (6), 1073–1075. https://www.iro.umontreal.ca/~lecuyer/myftp/streams00/c++/streams4.pdf.

Examples

```
data(codings)

# compute alpha, without uncertainty estimates
krippalpha(codings)

# additionally compute bootstrapped uncertainty estimates for alpha
alpha <- krippalpha(codings, metric = "nominal", bootstrap = TRUE, bootnp = TRUE)
alpha

# plot bootstrapped alphas
plot(alpha)

# alternatively, use ggplot2
df <- plot(alpha, return_data = TRUE)
```

```
library(ggplot2)
ggplot() +
  geom_line(data = df[df$ci_limit == FALSE, ], aes(x, y, color = type)) +
  geom_area(data = df[df$ci == TRUE, ], aes(x, y, fill = type), alpha = 0.4) +
  theme_minimal() +
  theme(plot.title = element_text(hjust = 0.5)) +
  theme(legend.position = "bottom", legend.title = element_blank()) +
  ggtitle(expression(paste("Bootstrapped ", alpha))) +
  xlab("value") + ylab("density") +
  guides(fill = FALSE)
```

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