Package 'bullseye'

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Title Visualising Multiple Pairwise Variable Correlations and Other Scores

Version 1.0.0

Description
We provide a tidy data structure and visualisations for multiple or grouped variable correlations, general association measures scagnostics and other pairwise scores suitable for numerical, ordinal and nominal variables.
Supported measures include distance correlation, maximal information, ace correlation, Kendall's tau, and polychoric correlation.

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Author Amit Chinwan [aut], Catherine Hurley [aut, cre]

Maintainer Catherine Hurley <catherine.hurley@mu.ie>

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Contents

`ace_cor` *Calculates ace based transformations and correlation, handling missing values and factors.*

Description

Calculates ace based transformations and correlation, handling missing values and factors.

Usage

```
ace_cor(x, y, handle.na = TRUE)
```

Arguments

x	a numeric vector or factor
y	a numeric vector or factor
handle.na	If TRUE uses pairwise complete observations.

Value

result of acepack::ace

Examples

```
ace_cor(iris$Sepal.Length, iris$Species)
```

---

add_nobs_to_pairwise *Adds number of observations column to pairwise tibble*

Description

Adds number of observations column to pairwise tibble

Usage

```
add_nobs_to_pairwise(scores, d, by = NULL)
```

Arguments

scores	An object of class pairwise, calculated from dataset d.
d	a dataframe
by	a character string for the name of the conditioning variable from d used to construct scores. Set to NULL by default.

Value

A pairwise tibble with a column n

Examples

```
irisc <- pairwise_scores(iris[40:150,], by= "Species")
irisc <- add_nobs_to_pairwise(irisc, iris[40:150,], by= "Species")
irisc
plot_pairwise(irisc) # setosa gets a small slice in proportion to n
```

`as.matrix.pairwise` *Converts a pairwise to a symmetric matrix. Uses the first entry for each (x,y) pair.*

Description

Converts a pairwise to a symmetric matrix. Uses the first entry for each (x,y) pair.

Usage

```
## S3 method for class 'pairwise'
as.matrix(x, ...)
```

Arguments

`x`	An object of class pairwise
`...`	other arguments

Value

A symmetric matrix

`pairwise` *A generic function to create a data structure for summarising variable pairs in a dataset*

Description

Creates a data structure for every variable pair in a dataset.

Usage

```
pairwise(x, score = NA_character_, pair_type = NA_character_)

## S3 method for class 'matrix'
pairwise(x, score = NA_character_, pair_type = NA_character_)

## S3 method for class 'data.frame'
pairwise(x, score = NA_character_, pair_type = NA_character_)

## S3 method for class 'easycorrelation'
pairwise(x, score = NA_character_, pair_type = NA_character_)

as.pairwise(x, score = NA_character_, pair_type = NA_character_)
```

Arguments

x	A dataframe or symmetric matrix.
score	a character string indicating the value of association
pair_type	a character string specifying the type of variable pair, should be either "nn", "fn", "ff", for a numeric-numeric pair, factor-numeric pair, or factor-factor pair, or NA if unknown.

Details

The pairwise class has columns x and y for (ordered pairs) of variables, where x < y. The column score has the name of the summary measure used for the two variables, and the column value has the associated value. The group column defaults to "all", meaning summary measures apply to the complete dataset, otherwise it describes a subset of the data. The functions pair_* calculate pairwise tibbles for the summary measure named by *, eg pair_cor(), pair_cancor(). The functions pairwise_scores() and pairwise_by() calculate pairwise tibbles for levels of a grouping variable. The function pairwise_multi() calculates a pairwise_tibble for multiple named scores. The pairwise tibble has at most one row for each combination of x, y, score and group. This is checked prior to plotting by plot.pairwise. Note that the pair_type column is included for information purposes, but it is not currently used by plot.pairwise.

Value

A tbl_df of class pairwise for pairs of variables with a column value for the score value, score for a type of association value and pair_type for the type of variable pair.

Methods (by class)

- pairwise(matrix): pairwise method
- pairwise(data.frame): pairwise method
- pairwise(easycorrelation): pairwise method

Functions

- as.pairwise(): Same as pairwise

Examples

```
pairwise(cor(iris[,1:4]), score="pearson")
pairwise(iris)
pair_cor(iris)
pair_cancor(iris)
pairwise_scores(iris, by="Species")
pairwise_multi(iris)
```

pairwise_by *Constructs a pairwise result for each level of a by variable.*

Description

Constructs a pairwise result for each level of a by variable.

Usage

```
pairwise_by(
  d,
  by,
  pair_fun,
  ungrouped = TRUE,
  warnings = TRUE,
  add.nobs = FALSE
)
```

Arguments

d	a dataframe
by	a character string for the name of the conditioning variable.
pair_fun	A function returning a pairwise from a dataset.
ungrouped	If TRUE calculates the ungrouped score in addition to grouped scores.
warnings	If TRUE, generates a warning for datasets of one row, one column, or with constant variables.
add.nobs	If TRUE, adds an extra column containing the number of observations used for each score.

Value

tibble of class "pairwise"

Examples

```
pairwise_by(iris, by="Species", pair_cor)
```

pairwise_multi *Calculates multiple scores*

Description

Calculates multiple scores for every variable pair in a dataset.

Usage

```
pairwise_multi(
  d,
  scores = c("pair_cor", "pair_spearman", "pair_dcor", "pair_mine", "pair_ace",
    "pair_cancor", "pair_nmi", "pair_uncertainty", "pair_chi"),
  handle.na = TRUE,
  warnings = TRUE
)
```

Arguments

d	dataframe
scores	a character vector naming functions returning a pairwise from a dataset.
handle.na	If TRUE uses pairwise complete observations to calculate pairwise score, otherwise NAs not handled.
warnings	If TRUE, generates a warning for datasets of one row, one column, or with constant variables.

Value

tibble of class "pairwise"

Examples

```
iris1 <- iris
iris1$Sepal.Length <- cut(iris1$Sepal.Length,3)
pairwise_multi(iris1)
```

pairwise_scores *Calculates scores or conditional scores for a dataset*

Description

Calculates scores for every variable pair in a dataset when by is NULL. If by is a name of a variable in the dataset, conditional scores for every variable pair at different levels of the grouping variable are calculated.

Usage

```
pairwise_scores(
  d,
  by = NULL,
  ungrouped = TRUE,
  control = pair_control(),
  handle.na = TRUE,
  warnings = TRUE,
  add.nobs = FALSE
)
```

Arguments

d	a dataframe
by	a character string for the name of the conditioning variable. Set to NULL by default.
ungrouped	Ignored if by is NULL. If TRUE calculates the ungrouped score in addition to grouped scores.
control	a list for the measures to be calculated for different variable types. The default is pair_control() which calculates Pearson's correlation if the variable pair is numeric, canonical correlation for factor or mixed pairs, and polychoric correlation for two ordered factors.
handle.na	If TRUE uses pairwise complete observations to calculate measure of association.
warnings	If TRUE, generates a warning for datasets of one row, one column, or with constant variables.
add.nobs	If TRUE, adds an extra column containing the number of observations used for each score.

Details

Returns a pairwise tibble structure.

Value

A tibble with class pairwise.

Examples

```
irisc <- pairwise_scores(iris)
irisc <- pairwise_scores(iris, control=pair_control(nnargs= c(method="spearman")))
irisc <- pairwise_scores(iris, control=pair_control(fn="pair_ace"))

#Lots of numerical measures
irisc <- pairwise_scores(iris, control=pair_control(nn="pairwise_multi", fn=NULL))
irisc <- pairwise_scores(iris,
            control=pair_control(nn="pairwise_multi",  nnargs="pair_cor", fn=NULL))
#conditional measures
```

```
cond_iris <- pairwise_scores(iris, by = "Species")
cond_iris_wo <- pairwise_scores(iris, by = "Species",ungrouped=FALSE) # without overall
irisc <- pairwise_scores(iris, control=pair_control(nn="pairwise_multi", fn=NULL))
irisc <- pairwise_scores(iris, by = "Species",control=pair_control(nn="pairwise_multi", fn=NULL))

#scagnostics
sc <- pairwise_scores(iris, control=pair_control(nn="pair_scagnostics", fn=NULL)) # ignore fn pairs
sc <- pairwise_scores(iris, by = "Species",
                control=pair_control(nn="pair_scagnostics", fn=NULL)) # ignore fn pairs
```

`pair_ace` *Alternating conditional expectations correlation*

Description

Calculates the maximal correlation coefficient from alternating conditional expectations algorithm for every variable pair in a dataset.

Usage

```
pair_ace(d, handle.na = TRUE, warnings = TRUE, ...)
```

Arguments

`d`	A dataframe
`handle.na`	If TRUE uses pairwise complete observations, otherwise NAs not handled.
`warnings`	If TRUE, generates a warning for datasets of one row, one column, or with constant variables.
`...`	other arguments

Details

The maximal correlation is calculated using alternating conditional expectations algorithm which find the transformations of variables such that the squared correlation is maximised. The `ace` function from `acepack` package is used for the calculation.

Value

A tibble of class `pairwise` with a maximal correlation from the alternating conditional expectations algorithm for every variable pair

References

Breiman, Leo, and Jerome H. Friedman. "Estimating optimal transformations for multiple regression and correlation." Journal of the American statistical Association 80.391 (1985): 580-598.

Examples

```
pair_ace(iris)
```

pair_cancor *Canonical correlation*

Description

Calculates canonical correlation for every variable pair in a dataset.

Usage

```
pair_cancor(d, handle.na = TRUE, warnings = TRUE, ...)
```

Arguments

d	A dataframe
handle.na	If TRUE uses pairwise complete observations to calculate correlation coefficient,, otherwise NAs not handled.
warnings	If TRUE, generates a warning for datasets of one row, one column, or with constant variables.
...	other arguments

Value

A tibble of class `pairwise` with canonical correlation for every numeric or factor or mixed variable pair

Examples

```
pair_cancor(iris)
```

pair_chi *Pearson's Contingency Coefficient for association between factors.*

Description

Calculates Pearson's Contingency coefficient for every factor variable pair in a dataset.

Usage

```
pair_chi(d, handle.na = TRUE, warnings = TRUE, ...)
```

Arguments

d	A dataframe
handle.na	ignored. Pairwise complete observations are used automatically.
warnings	If TRUE, generates a warning for datasets of one row, one column, or with constant variables.
...	other arguments

Details

The Pearson's contingency coefficient is calculated using `ContCoef`. NAs are automatically handled by pairwise omit.

Value

A tibble of class `pairwise` with calculated Pearson's contingency coefficient for every factor variable pair, or NULL if there are not at least two factor variables

Examples

```
pair_chi(iris)
```

`pair_control` *Default scores calculated by* `pairwise_scores`

Description

Gives a list specifying the function to be used for two numeric (nn) variables, two factors (ff), two ordinals (oo) and for a factor-numeric pair (fn).

Usage

```
pair_control(
  nn = "pair_cor",
  oo = "pair_polychor",
  ff = "pair_cancor",
  fn = "pair_cancor",
  nnargs = NULL,
  ooargs = NULL,
  ffargs = NULL,
  fnargs = NULL
)
```

Arguments

`nn`	function for numeric pairs of variables, should return object of class `pairwise`. Use NULL to ignore numeric pairs.
`oo`	function for ordered factor pairs of variables, should return object of class `pairwise`. Use NULL to ignore ordered factor pairs.
`ff`	function for factor pairs of variables (not ordered), should return object of class `pairwise`. Use NULL to ignore factor-factor pairs.
`fn`	function for factor-numeric pairs of variables, should return object of class `pairwise`. Use NULL to ignore factor-numeric pairs.
`nnargs`	other arguments for the nn function
`ooargs`	other arguments for the oo function

ffargs	other arguments for the ff function
fnargs	other arguments for the fn function

Value

list

`pair_cor` *Pearson, Spearman or Kendall correlation*

Description

Calculates one of either pearson, spearman or kendall correlation for every numeric variable pair in a dataset.

Usage

```
pair_cor(d, method = "pearson", handle.na = TRUE, warnings = TRUE, ...)
```

Arguments

d	A dataframe
method	A character string for the correlation coefficient to be calculated. Either "pearson" (default), "spearman", or "kendall". If the value is "all", then all three correlations are calculated.
handle.na	If TRUE uses pairwise complete observations to calculate correlation coefficient, otherwise NAs not handled.
warnings	If TRUE, generates a warning for datasets of one row, one column, or with constant variables.
...	other arguments

Value

A tibble of class `pairwise` with calculated association value for every numeric variable pair, or NULL if there are not at least two numeric variables

See Also

See `pair_methods` for other score options.

Examples

```
pair_cor(iris)
pair_cor(iris, method="kendall")
pair_cor(iris, method="spearman")
pair_cor(iris, method="all")
```

pair_dcor *Distance correlation*

Description

Calculates distance correlation for every numeric variable pair in a dataset.

Usage

```
pair_dcor(d, handle.na = TRUE, warnings = TRUE, ...)
```

Arguments

d	A dataframe
handle.na	If TRUE uses pairwise complete observations to calculate distance correlation, otherwise NAs not handled.
warnings	If TRUE, generates a warning for datasets of one row, one column, or with constant variables.
...	other arguments

Details

The distance correlation is calculated using dcor2d from energy package

Value

A tibble of class pairwise with distance correlation for every numeric variable pair, or NULL if there are not at least two numeric variables

Examples

```
pair_dcor(iris)
```

pair_gkGamma *Goodman Kruskal's Gamma for association between ordinal factors.*

Description

Calculates Goodman Kruskal's Gamma coefficient for every factor variable pair in a dataset.

Usage

```
pair_gkGamma(d, handle.na = TRUE, warnings = TRUE, ...)
```

Arguments

d	A dataframe
handle.na	ignored. Pairwise complete observations are used automatically.
warnings	If TRUE, generates a warning for datasets of one row, one column, or with constant variables.
...	other arguments

Details

The Goodman Kruskal's Gamma coefficient is calculated using GoodmanKruskalGamma function from the DescTools package. Assumes factor levels are in the given order. NAs are automatically handled by pairwise omit.

Value

A tibble of class pairwise with factor variable pairs and Goodman Kruskal's Gamma coefficient, or NULL if there are not at least two factor variables

Examples

```
pair_gkGamma(iris)
```

---

pair_gkTau *Goodman Kruskal's Tau for association between ordinal factors.*

Description

Calculates Goodman Kruskal's Tau coefficient for every factor variable pair in a dataset.

Usage

```
pair_gkTau(d, handle.na = TRUE, warnings = TRUE, ...)
```

Arguments

d	A dataframe
handle.na	ignored. Pairwise complete observations are used automatically.
warnings	If TRUE, generates a warning for datasets of one row, one column, or with constant variables.
...	other arguments

Details

The Goodman Kruskal's Tau coefficient is calculated using GoodmanKruskalTau function from the DescTools package. Assumes factor levels are in the given order. NAs are automatically handled by pairwise omit.

Value

A tibble of class `pairwise` with Goodman Kruskal's Tau for every factor variable pair, or NULL if there are not at least two factor variables

Examples

```
pair_gkTau(iris)
```

`pair_kendall` *Kendall's correlation*

Description

Calculates Kendall's correlation for every numeric variable pair in a dataset.

Usage

```
pair_kendall(d, handle.na = TRUE, warnings = TRUE, ...)
```

Arguments

`d`	A dataframe
`handle.na`	If TRUE uses pairwise complete observations to calculate correlation coefficient, otherwise NAs not handled.
`warnings`	If TRUE, generates a warning for datasets of one row, one column, or with constant variables.
`...`	other arguments

Value

A tibble of class `pairwise` with calculated association value for every numeric variable pair, or NULL if there are not at least two numeric variables

See Also

See `pair_methods` for other score options.

Examples

```
pair_kendall(iris)
# same as
pair_cor(iris, method="kendall")
```

pair_methods *Pairwise score functions available in the package*

Description

A tibble of score functions along with the types of variable pairs these functions can be applied to. It also contains information regarding the packages used to calculate scores and the range of the values calculated.

Usage

```
pair_methods
```

Format

An object of class `tbl_df` (inherits from `tbl`, `data.frame`) with 17 rows and 7 columns.

Value

tibble

Examples

```
pair_methods
```

pair_mine *MINE family values*

Description

Calculates MINE family values for every numeric variable pair in a dataset.

Usage

```
pair_mine(d, method = "MIC", handle.na = TRUE, warnings = TRUE, ...)
```

Arguments

`d`	A dataframe
`method`	character vector for the MINE value to be calculated. Subset of "MIC","MAS","MEV","MCN","MICR2", "GMIC", "TIC"
`handle.na`	If TRUE uses pairwise complete observations to calculate score, otherwise NAs not handled.
`warnings`	If TRUE, generates a warning for datasets of one row, one column, or with constant variables.
`...`	other arguments

Details

The values are calculated using mine from minerva

Value

A tibble of class pairwise with scores for numeric variable pairs, or NULL if there are not at least two numeric variables

References

Reshef, David N., et al. "Detecting novel associations in large data sets." science 334.6062 (2011): 1518-1524

Examples

```
pair_mine(iris)
pair_mine(iris, method="MAS")
```

---

pair_nmi *Normalized mutual information*

Description

Calculates normalized mutual information for every numeric or factor or mixed variable pair in a dataset.

Usage

```
pair_nmi(d, handle.na = TRUE, warnings = TRUE, ...)
```

Arguments

d	A dataframe
handle.na	If TRUE uses pairwise complete observations to calculate normalized mutual information, otherwise NAs not handled.
warnings	If TRUE, generates a warning for datasets of one row, one column, or with constant variables.
...	other arguments

Details

The normalized mutual information is calculated using maxNMI from linkpotter package

Value

A tibble of class pairwise

Examples

```
if (requireNamespace("linkspotter", quietly = TRUE)) {
   pair_nmi(iris)
}
```

`pair_polychor` *Polychoric correlation*

Description

Calculates Polychoric correlation using for every factor variable pair in a dataset.

Usage

```
pair_polychor(d, handle.na = TRUE, warnings = TRUE, ...)
```

Arguments

`d`	A dataframe
`handle.na`	ignored. Pairwise complete observations are used automatically.
`warnings`	If TRUE, generates a warning for datasets of one row, one column, or with constant variables.
`...`	other arguments

Details

The polychoric correlation is calculated using the `polychor` function from the `polycor` package, and assumes factor levels are in the given order. NAs are automatically handled by pairwise omit.

Value

A tibble of class `pairwise` with polychoric correlation for factor pairs, or NULL if there are not at least two factor variables

Examples

```
pair_polychor(iris)
```

pair_polyserial *Polyserial correlation*

Description

Calculates Polyserial correlation using for every factor-numeric variable pair in a dataset.

Usage

```
pair_polyserial(d, handle.na = TRUE, warnings = TRUE, ...)
```

Arguments

d	A dataframe
handle.na	ignored. Pairwise complete observations are used automatically.
warnings	If TRUE, generates a warning for datasets of one row, one column, or with constant variables.
...	other arguments

Details

The polyserial correlation is calculated using the polyserial function from the polycor package, and assumes factor levels are in the given order. NAs are automatically handled by pairwise omit.

Value

A tibble of class pairwise with polyserial correlation for factor-numeric pairs, or NULL if there are not at least one such pair.

Examples

```
pair_polyserial(iris)
```

pair_scagnostics *Graph-theoretic scagnostics values*

Description

Calculates scagnostic values for every numeric variable pair in a dataset.

Usage

```
pair_scagnostics(
  d,
  scagnostic = c("Outlying", "Skewed", "Clumpy", "Sparse", "Striated", "Convex",
    "Skinny", "Stringy", "Monotonic"),
  handle.na = TRUE,
  warnings = TRUE,
  ...
)
```

Arguments

d	A dataframe
scagnostic	a character vector for the scagnostic to be calculated. Subset of "Outlying", "Stringy", "Striated", "Clumpy", "Sparse", "Skewed", "Convex", "Skinny" or "Monotonic"
handle.na	If TRUE uses pairwise complete observations.
warnings	If TRUE, generates a warning for datasets of one row, one column, or with constant variables.
...	other arguments

Details

The scagnostic values are calculated using scagnostics function from the scagnostics package.

Value

A tibble of class pairwise with scagnostic values for every numeric variable pair, or NULL if there are not at least two numeric variables

References

Wilkinson, Leland, Anushka Anand, and Robert Grossman. "Graph-theoretic scagnostics." Information Visualization, IEEE Symposium on. IEEE Computer Society, 2005

Examples

```
pair_scagnostics(iris)
```

pair_spearman *Spearman correlation*

Description

Calculates Spearman's correlation for every numeric variable pair in a dataset.

Usage

```
pair_spearman(d, handle.na = TRUE, warnings = TRUE, ...)
```

Arguments

d	A dataframe
handle.na	If TRUE uses pairwise complete observations to calculate correlation coefficient, otherwise NAs not handled.
warnings	If TRUE, generates a warning for datasets of one row, one column, or with constant variables.
...	other arguments

Value

A tibble of class pairwise with calculated association value for every numeric variable pair, or NULL if there are not at least two numeric variables

See Also

See pair_methods for other score options.

Examples

```
pair_spearman(iris)
# same as
pair_cor(iris, method="spearman")
```

pair_tauA *Kendall's tau A for association between ordinal factors.*

Description

Calculates Kendall's tau A for every factor variable pair in a dataset.

Usage

```
pair_tauA(d, handle.na = TRUE, warnings = TRUE, ...)
```

Arguments

d	A dataframe
handle.na	ignored. Pairwise complete observations are used automatically.
warnings	If TRUE, generates a warning for datasets of one row, one column, or with constant variables.
...	other arguments

Details

Calculated using KendallTauA. Assumes factor levels are in the given order. NAs are automatically handled by pairwise omit.

Value

A tibble of class pairwise with factor pairs, or NULL if there are not at least two factor variables

Examples

```
d <- data.frame(x=rnorm(20),
                y=factor(sample(3,20, replace=TRUE)),
                z=factor(sample(2,20, replace=TRUE)))
pair_tauA(d)
```

---

pair_tauB *Kendall's tau B for association between ordinal factors.*

Description

Calculates Kendall's tau B every factor variable pair in a dataset.

Usage

```
pair_tauB(d, handle.na = TRUE, warnings = TRUE, ...)
```

Arguments

d	A dataframe
handle.na	ignored. Pairwise complete observations are used automatically.
warnings	If TRUE, generates a warning for datasets of one row, one column, or with constant variables.
...	other arguments

Details

Calculated using KendallTauB. Assumes factor levels are in the given order. NAs are automatically handled by pairwise omit.

Value

A tibble of class `pairwise` with factor pairs, or NULL if there are not at least two factor variables

Examples

```
d <- data.frame(x=rnorm(20),
                y=factor(sample(3,20, replace=TRUE)),
                z=factor(sample(2,20, replace=TRUE)))
pair_tauB(d)
```

`pair_tauC` *Stuarts's tau C for association between ordinal factors.*

Description

Calculates Stuarts's tau C every factor variable pair in a dataset.

Usage

```
pair_tauC(d, handle.na = TRUE, warnings = TRUE, ...)
```

Arguments

`d`	A dataframe
`handle.na`	ignored. Pairwise complete observations are used automatically.
`warnings`	If TRUE, generates a warning for datasets of one row, one column, or with constant variables.
`...`	other arguments

Details

Calculated using `StuartTauC`. Assumes factor levels are in the given order. NAs are automatically handled by pairwise omit.

Value

A tibble of class `pairwise` with factor pairs, or NULL if there are not at least two factor variables

Examples

```
d <- data.frame(x=rnorm(20),
                y=factor(sample(3,20, replace=TRUE)),
                z=factor(sample(2,20, replace=TRUE)))
pair_tauC(d)
```

pair_tauW *Kendall's W for association between ordinal factors.*

Description

Calculates Kendall's tau W every factor variable pair in a dataset.

Usage

```
pair_tauW(d, handle.na = TRUE, warnings = TRUE, ...)
```

Arguments

d	A dataframe
handle.na	ignored. Pairwise complete observations are used automatically.
warnings	If TRUE, generates a warning for datasets of one row, one column, or with constant variables.
...	other arguments

Details

Calculated using KendallW. Assumes factor levels are in the given order. NAs are automatically handled by pairwise omit.

Value

A tibble of class pairwise with factor pairs, or NULL if there are not at least two factor variables

Examples

```
d <- data.frame(x=rnorm(20),
                y=factor(sample(3,20, replace=TRUE)),
                z=factor(sample(2,20, replace=TRUE)))
pair_tauW(d)
```

pair_uncertainty *Uncertainty coefficient for association between factors.*

Description

Calculates uncertainty coefficient for every factor variable pair in a dataset.

Usage

```
pair_uncertainty(d, handle.na = TRUE, warnings = TRUE, ...)
```

Arguments

d	A dataframe
handle.na	ignored. Pairwise complete observations are used automatically.
warnings	If TRUE, generates a warning for datasets of one row, one column, or with constant variables.
...	other arguments

Details

The Uncertainty coefficient is calculated using UncertCoef function from the DescTools package.

Value

A tibble of class pairwise with every factor variable pair and uncertainty coefficient value, or NULL if there are not at least two factor variables

Examples

```
pair_uncertainty(iris)
```

---

plot.pairwise *Plot method for class* pairwise.

Description

Plot method for class pairwise.

Usage

```
## S3 method for class 'pairwise'
plot(x, type = c("matrix", "linear"), ...)
```

Arguments

x	An object of class pairwise
type	If "matrix", calls plot_pairwise, if "linear" calls plot_pairwise_linear
...	further arguments to plot_pairwise or plot_pairwise_linear

Value

a plot

Examples

```
plot(pairwise_scores(iris))
```

plot_pairwise *Pairwise plot in a matrix layout*

Description

Plots multiple pairwise variable scores in a matrix layout.

Usage

```
plot_pairwise(
  scores,
  var_order = "seriate_max",
  score_limits = NULL,
  inner_width = 0.5,
  center_level = "all",
  na.value = "grey80",
  pal = "Blue-Red 3",
  interactive = FALSE
)
```

Arguments

scores	The scores for the matrix plot. Either of class pairwise or identical in structure to object of class pairwise.
var_order	The variable order to be used. The default NULL means variables in are ordered alphabetically. A value of "seriate_max" means variables are re-ordered to emphasize pairs with maximum abolute scores. A value of "seriate_max_diff" means variables are re-ordered to emphasize pairs with maximum score differences. Otherwise var_order must be a subset of variables in scores.
score_limits	a numeric vector of length specifying the limits of the scale.
inner_width	A number between 0 and 1 specifying radius of the inner bullseye.
center_level	Specifies which level of group goes into the innter bullseye. Defaults to "all".
na.value	used for scores with a value of NA
pal	If provided, should name a one of the sequential or diverging palettes from package colorspace. See colorspace::hcl_palettes(). Otherwise defaults to a blue-red scheme.
interactive	defaults to FALSE

Value

A girafe object if interactive==TRUE, otherwise a ggplot2.

If scores has one value for x,y pair, then a filled circle is drawn with fill representing the score value. If there are multiple values for each x,y pair then the filled circle is split into wedges, with the wedge fill representing the values. If some rows have group=center_level, then the glyph is drawn as a bullseye. If scores has a column n, then this is used to weight the slices. See the third example below.

Examples

```
pair_cor(iris) |> plot_pairwise()
pairwise_scores(iris,by="Species") |> plot_pairwise()
pairwise_scores(iris[-(1:30),],by="Species", add.nobs=TRUE) |> plot_pairwise()
```

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plot_pairwise_linear *Pairwise plot in a linear layout*

Description

Plots the calculated measures of association among different variable pairs for a dataset in a linear layout.

Usage

```
plot_pairwise_linear(
  scores,
  pair_order = "seriate_max",
  geom = c("point", "tile"),
  add_lines = FALSE,
  score_limits = NULL,
  na.value = "grey80",
  pal = "Blue-Red 3",
  interactive = FALSE
)
```

Arguments

scores	A tibble with the calculated association measures for the matrix plot. Either of class pairwise or identical in structure to object of class pairwise.
pair_order	The variable pair order to be used. The default NULL means pairs are in order of their first appearance in scores. A value of "seriate_max" means pairs are in order of maximum absolute scores. A value of "seriate_max_diff" means pairs are in order of maximum scores difference.
geom	The geom to be used. Should be "point" or "tile".
add_lines	When geom= "point" is used, should the points be connected by lines? Defaults to FALSE.
score_limits	a numeric vector of length specifying the limits of the scale.
na.value	used for geom_tile with a value of NA
pal	For geom="title" only. If provided, should name a one of the sequential or diverging palettes from package colorspace. See colorspace::hcl_palettes(). Otherwise defaults to a blue-red scheme.
interactive	defaults to FALSE

Value

A girafe object if interactive==TRUE, otherwise a ggplot2.

Examples

```
plot_pairwise_linear(pairwise_scores(iris))
plot_pairwise_linear(pairwise_scores(iris,by="Species"))
plot_pairwise_linear(pairwise_multi(iris), geom="point")
```

Index