Package ‘configural’

October 12, 2022

Type Package
Title Multivariate Profile Analysis
Version 0.1.4
Date 2021-01-16

BugReports https://github.com/bwiernik/configural/issues


License GPL (>= 3)
Depends R (>= 3.4.0)
Encoding UTF-8
LazyData true
Imports stats
Suggests crayon
RoxygenNote 7.1.1
NeedsCompilation no

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Repository CRAN

Date/Publication 2021-01-18 21:30:03 UTC

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configural-package

Description

Overview of the configural package.

Details

The configural package provides tools for conducting configural and profile analyses. It currently supports criterion profile analysis (Davison & Davenport, 2002) and meta-analytic criterion profile analysis (Wiernik et al., 2019). Functions are provided to calculate criterion patterns and CPA variance decomposition, as well as for computing confidence intervals, shrinkage corrections, and fungible patterns.

Author(s)

Maintainer: Brenton M. Wiernik <brenton@wiernik.org>

See Also

Useful links:

- Report bugs at https://github.com/bwiernik/configural/issues
**Description**

Estimate shrinkage for regression models

**Usage**

```r
adjust_Rsq(Rsq, n, p, adjust = c("fisher", "pop", "cv"))
```

**Arguments**

- `Rsq`: Observed model R-squared
- `n`: Sample size
- `p`: Number of predictors
- `adjust`: Which adjustment to apply. Options are "fisher" for the Adjusted R-squared method used in `stats::lm()`, "pop" for the positive-part Pratt estimator of the population R-squared, and "cv" for the Browne/positive-part Pratt estimator of the cross-validity R-squared. Based on Shieh (2008), these are the estimators for the population and cross-validity R-squared values that show the least bias with a minimal increase in computational complexity.

**Value**

An adjusted R-squared value.

**References**


**Examples**

```r
adjust_Rsq(.55, 100, 6, adjust = "pop")
```
configural_news

Retrieve the NEWS file for the configural package

Description
This function gives a shortcut to the `utils::news(package = "configural")` function and displays configural's NEWS file, which contains version information, outlines additions and changes to the package, and describes other updates.

Usage
configural_news()

Examples
configural_news()

cor_covariance

Calculate the asymptotic sampling covariance matrix for the unique elements of a correlation matrix

Description
Calculate the asymptotic sampling covariance matrix for the unique elements of a correlation matrix

Usage
cor_covariance(r, n)

Arguments
r A correlation matrix
n The sample size

Value
The asymptotic sampling covariance matrix

Author(s)
Based on an internal function from the fungible package by Niels Waller

References
**cor_covariance_meta**

**Examples**

```r
cor_covariance(matrix(c(1, .2, .3, .2, 1, .3, .3, .3, 1), ncol = 3), 100)
```

**Description**

Estimate the asymptotic sampling covariance matrix for the unique elements of a meta-analytic correlation matrix

**Usage**

```r
cor_covariance_meta(
  r,
  n,
  sevar,
  source = NULL,
  rho = NULL,
  sevar_rho = NULL,
  n_overlap = NULL
)
```

**Arguments**

- `r`: A meta-analytic matrix of observed correlations (can be full or lower-triangular).
- `n`: A matrix of total sample sizes for the meta-analytic correlations in `r` (can be full or lower-triangular).
- `sevar`: A matrix of estimated sampling error variances for the meta-analytic correlations in `r` (can be full or lower-triangular).
- `source`: A matrix indicating the sources of the meta-analytic correlations in `r` (can be full or lower-triangular). Used to estimate overlapping sample size for correlations when `n_overlap == NULL`.
- `rho`: A meta-analytic matrix of corrected correlations (can be full or lower-triangular).
- `sevar_rho`: A matrix of estimated sampling error variances for the meta-analytic corrected correlations in `rho` (can be full or lower-triangular).
- `n_overlap`: A matrix indicating the overlapping sample size for the unique (lower triangular) values in `r` (can be full or lower-triangular). Values must be arranged in the order returned by `cor_labels(colnames(R))`.

**Details**

If both `source` and `n_overlap` are `NULL`, it is assumed that all meta-analytic correlations come from the same source.
The estimated asymptotic sampling covariance matrix


```r
cor_covariance_meta(r = mindfulness$r, n = mindfulness$n, sevar = mindfulness$sevar_r, source = mindfulness$source)
```

---

**cor_labels**

*Generate labels for correlations from a vector of variable names*

**Description**

This function returns a vector of labels for the unique correlations between pairs of variables from a supplied vector of variable names

**Usage**

```r
cor_labels(var_names)
```

**Arguments**

- `var_names`: A character vector of variable names

**Value**

A vector of correlation labels

**Examples**

```r
cor_labels(colnames(mindfulness$r))
```
Conduct criterion profile analysis using a correlation matrix

**Description**

Conduct criterion profile analysis using a correlation matrix

**Usage**

```r
cpa_mat(
    formula,
    cov_mat,
    n = NULL,
    se_var_mat = NULL,
    se_beta_method = c("normal", "lm"),
    adjust = c("fisher", "pop", "cv"),
    conf_level = 0.95,
    ...
)
```

**Arguments**

- `formula`: Regression formula with a single outcome variable on the left-hand side and one or more predictor variables on the right-hand side (e.g., Y ~ X1 + X2).
- `cov_mat`: Correlation matrix containing the variables to be used in the regression.
- `n`: Sample size. Used to compute adjusted R-squared and, if `se_var_mat` is NULL, standard errors. If NULL and `se_var_mat` is specified, effective sample size is computed based on `se_var_mat` (cf. Revelle et al., 2017).
- `se_var_mat`: Optional. The sampling error covariance matrix among the unique elements of `cov_mat`. Used to calculate standard errors. If not supplied, the sampling covariance matrix is calculated using `n`.
- `se_beta_method`: Method to use to estimate the standard errors of standardized regression (beta) coefficients. Current options include "normal" (use the Jones-Waller, 2015, normal-theory approach) and "lm" (estimate standard errors using conventional regression formulas).
- `adjust`: Method to adjust R-squared for overfitting. See `adjust_Rsq()` for details.
- `conf_level`: Confidence level to use for confidence intervals.
- `...`: Additional arguments.

**Value**

An object of class "cpa" containing the criterion pattern vector and CPA variance decomposition
References


Examples

```r
sevar <- cor_covariance_meta(mindfulness$r, mindfulness$n, mindfulness$sevar_r, mindfulness$source)
cpa_mat(mindfulness ~ ES + A + C + Ex + O,
cov_mat = mindfulness$r,
n = NULL,
se_var_mat = sevar,
adjust = "pop")
```

cpa_scores

*Compute CPA level and pattern scores for a set of data*

Description

Compute CPA level and pattern scores for a set of data

Usage

```r
cpa_scores(
cpa_mod,
newdata = NULL,
augment = TRUE,
cpa_names = c("cpa_lev", "cpa_pat"),
scale = FALSE,
scale_center = TRUE,
scale_scale = TRUE
)
```

Arguments

- **cpa_mod** A model returned from `cpa_mat()` (a model of class "cpa")
- **newdata** A data frame or matrix containing columns with the same names as the predictors in `cpa_mod`.
- **augment** Should be CPA score columns be added to `newdata` (TRUE, default) or returned alone (FALSE)?
disorders

| cpa_names | Character vector of length 2 giving the variable names to assign to the CPA score columns. |
| scale | Logical. Should the variables in newdata be scaled (standardized)? |
| scale_center | If scale is TRUE, passed to the center argument in base::scale(). Can be TRUE (center columns of newdata around the column means), FALSE (don’t center), or a numeric vector of length equal to the number of predictors in cpa_mod containing the values to center around. |
| scale_scale | If scale is TRUE, passed to the scale argument in base::scale(). Can be TRUE (scale/standardize columns of newdata using the column standard deviations or root mean squares), FALSE (don’t scale), or a numeric vector of length equal to the number of predictors in cpa_mod containing the values to scale by. See base::scale() for details. |

Value

A data frame containing the CPA score variables.

Examples

```r
sevar <- cor_covariance_meta(mindfulness$r, mindfulness$n, mindfulness$sevar_r, mindfulness$source)
cpa_mod <- cpa_mat(mindfulness ~ ES + A + C + Ex + O,
                   cov_mat = mindfulness$r,
                   n = NULL,
                   se_var_mat = sevar,
                   adjust = "pop")
newdata <- data.frame(ES = c(4.2, 3.2, 3.4, 4.2, 3.8, 4.0, 5.6, 2.8, 3.4, 2.8),
                      A = c(4.0, 4.2, 3.8, 4.6, 4.0, 4.6, 4.6, 2.6, 3.6, 5.4),
                      C = c(2.8, 4.0, 4.0, 3.0, 4.4, 5.6, 4.4, 3.4, 4.0, 5.6),
                      Ex = c(3.8, 5.0, 4.2, 3.6, 4.8, 5.6, 4.2, 2.4, 3.4, 4.8),
                      O = c(3.0, 4.0, 4.8, 3.2, 3.6, 5.0, 5.4, 4.2, 5.0, 5.2))
newdata_cpa <- cpa_scores(cpa_mod, newdata, augment = FALSE)
newdata_augment <- cpa_scores(cpa_mod, newdata, augment = TRUE)
```

Description

Meta-analytic correlations among Big Five personality traits and psychological disorders

Usage

data(disorders)
fungible

Format

list with entries r (mean observed correlations), rho (mean corrected correlations), n (sample sizes), sevar_r (sampling error variances for mean observed correlations), sevar_rho (sampling error variances for mean corrected correlations), and source (character labels indicating which meta-analytic correlations came from the same source)

References


Examples

data(disorders)

fungible

Locate extrema of fungible weights for regression and related models

Description

Generates fungible regression weights (Waller, 2008) and related results using the method by Waller and Jones (2010).

Usage

fungible(
  object,
  theta = 0.005,
  Nstarts = 1000,
  MaxMin = c("min", "max"),
  silent = FALSE,
  ...
)

Arguments

object A fitted model object. Currently supported classes are: "cpa"
theta A vector of values to decrement from R-squared to compute families of fungible coefficients.
Nstarts Maximum number of (max) minimizations from random starting configurations.
MaxMin

Should the cosine between the observed and alternative weights be maximized ("max") to find the maximally similar coefficients or minimized ("min") to find the maximally dissimilar coefficients?

silent

Should current optimization values be printed to the console (FALSE) or suppressed (TRUE)?

Value

A list containing the alternative weights and other fungible weights estimation parameters

Author(s)

Niels Waller, Jeff Jones, Brenton M. Wiernik. Adapted from fungible::fungibleExtrema().

References


Examples

```r
mind <- cpa_mat(mindfulness ~ ES + A + C + Ex + O,
    cov_mat = mindfulness$r,
    n = harmonic_mean(vechs(mindfulness$n)),
    se_var_mat = cor_covariance_meta(mindfulness$r,
        mindfulness$n,
        mindfulness$sevar_r,
        mindfulness$source),
    adjust = "pop")
mind_fung <- fungible(mind, Nstarts = 100)
```

usage

#' S3 method for class 'cpa'
fungible(
  object,
  theta = 0.005,
  Nstarts = 1000,
  MaxMin = c("min", "max"),
  silent = FALSE,
  ...
)

arguments

object A fitted model object of class "cpa".
theta A vector of values to decrement from R-squared to compute families of fungible coefficients.
Nstarts Maximum number of (max) minimizations from random starting configurations.
MaxMin Should the cosine between the observed and alternative weights be maximized ("max") to find the maximally similar coefficients or minimized ("min") to find the maximally dissimilar coefficients?
silent Should current optimization values be printed to the console (FALSE) or suppressed (TRUE)?
... Additional arguments

value

A list containing the alternative weights and other fungible weights estimation parameters

references


examples

mind <- cpa_mat(mindfulness ~ ES + A + C + Ex + O,
  cov_mat = mindfulness$r,
  n = harmonic_mean(vechs(mindfulness$n)),
  se_var_mat = cor_covariance_meta(mindfulness$r,
    mindfulness$n,
    mindfulness$sevar_r,
    mindfulness$source),
  adjust = "pop")
mind_fung <- fungible(mind, Nstarts = 100)
**fungible.lm**  
*Locate extrema of fungible OLS regression weights*

**Description**
Identify maximally similar or dissimilar sets of fungible standardized regression coefficients from an OLS regression model.

**Usage**
```r
## S3 method for class 'lm'
fungible(
  object,
  theta = 0.005,
  Nstarts = 1000,
  MaxMin = c("min", "max"),
  silent = FALSE,
  ...
)
```

**Arguments**
- `object`: A fitted model object of class "lm" or "summary.lm".
- `theta`: A vector of values to decrement from R-squared to compute families of fungible coefficients.
- `Nstarts`: Maximum number of (max) minimizations from random starting configurations.
- `MaxMin`: Should the cosine between the observed and alternative weights be maximized ("max") to find the maximally similar coefficients or minimized ("min") to find the maximally dissimilar coefficients?
- `silent`: Should current optimization values be printed to the console (FALSE) or suppressed (TRUE)?
- `...`: Additional arguments

**Value**
A list containing the alternative weights and other fungible weights estimation parameters.

**References**

**Examples**
```r
lm_mtcars <- lm(mpg ~ cyl + disp + hp + drat + wt + qsec + vs + am + gear + carb,  
data = mtcars)

lm_mtcars_fung <- fungible(lm_mtcars, Nstarts = 100)
```
Meta-analytic correlations of Graduate Record Examination subtests with graduate grade point average

Description

Correlations between GRE subtests and graduate student GPA from Kuncel et al. (2001).

Usage

data(jobchar)

Format

list with entries r (mean observed correlations), rho (mean corrected correlations), n (sample sizes), sevar_r (sampling error variances for mean observed correlations), sevar_rho (sampling error variances for mean corrected correlations), and source (character labels indicating which meta-analytic correlations came from the same source)

Details

GRE–GPA correlations in rho are corrected for direct range restriction on the GRE and unreliability in GPA. Subtest intercorrelations in rho are observed correlations computed among applicant norm samples. These values are also used in r. Due to compensatory selection on GRE scores, these values will not accurately reflect subtest intercorrelations in selected-student (range-restricted) samples. sevar_rho and sevar_r for GRE subtest intercorrelations are computed with an assumed $SD_\rho = .02$.

References


Examples

data(gre)
**harmonic_mean**

Find the harmonic mean of a vector, matrix, or columns of a data.frame

**Description**

The harmonic mean is merely the reciprocal of the arithmetic mean of the reciprocals.

**Usage**

harmonic_mean(x, na.rm = TRUE, zero = TRUE)

**Arguments**

- **x**: A vector, matrix, or data.frame
- **na.rm**: Logical. If TRUE, remove NA values before processing
- **zero**: Logical. If TRUE, if there are any zeroes, return 0, else, return the harmonic mean of the non-zero elements

**Value**

The harmonic mean of x

**Author(s)**

Adapted from psych::harmonic.mean() by William Revelle

**Examples**

harmonic_mean(1:10)

---

**hrm**

Meta-analytic correlations of HRM practices with organizational financial performance

**Description**


**Usage**

data(hrm)
Format

list with entries r (mean observed correlations), rho (mean corrected correlations), n (sample sizes), sevar_r (sampling error variances for mean observed correlations), sevar_rho (sampling error variances for mean corrected correlations), and source (character labels indicating which meta-analytic correlations came from the same source)

References


Examples

data(hrm)

table

| jobchar | Meta-analytic correlations of job characteristics with performance and satisfaction |

Description

Self-rated job characteristics intercorrelations and correlations with other-rated job performance and self-rated job satisfaction from Humphrey et al. (2007).

Usage

data(jobchar)

Format

list with entries r (mean observed correlations), rho (mean corrected correlations), n (sample sizes), sevar_r (sampling error variances for mean observed correlations), sevar_rho (sampling error variances for mean corrected correlations), and source (character labels indicating which meta-analytic correlations came from the same source)

References

Examples

data(jobchar)

---

mindfulness  

Meta-analytic correlations among Big Five personality traits and trait mindfulness

Description


Usage

data(mindfulness)

Format

list with entries r (mean observed correlations), rho (mean corrected correlations), n (sample sizes), sevar_r (sampling error variances for mean observed correlations), sevar_rho (sampling error variances for mean corrected correlations), and source (character labels indicating which meta-analytic correlations came from the same source)

References


Examples

data(mindfulness)
n_effective_R2

Effective sample size

Description

Estimate an effective sample size for a statistic given the observed statistic and the estimated sampling error variance (cf. Revelle et al., 2017).

Usage

n_effective_R2(R2, var_R2, p)

Arguments

R2  Observed $R^2$ value
var_R2  Estimated sampling error variance for $R^2$
p  Number of predictors in the regression model

Details

n_effective_R2 estimates the effective sample size for the $R^2$ value from an OLS regression model, using the sampling error variance formula from Cohen et al. (2003).

Value

An effective sample size.

References


Examples

n_effective_R2(0.3953882, 0.0005397923, 5)
prejudice  Correlations between study design moderators and effect sizes for prejudice reduction following intergroup contact

Description
Correlations among study design moderators and study design moderator–observed prejudice reduction effect sizes from Pettigrew and Tropp (2008). Note that correlations with effect size have been reverse-coded so that a positive correlation indicates that a higher level of the moderator is associated with larger prejudice reduction.

Usage
data(prejudice)

Format
list with entries r (observed correlations among moderators) and k (number of samples in meta-analysis)

References

Examples
data(prejudice)

team  Meta-analytic correlations among team processes and team effectiveness

Description
Team process intercorrelations and team process–team performance/affect correlations from LePine et al. (2008).

Usage
data(team)

Format
list with entries r (mean observed correlations), rho (mean corrected correlations), n (sample sizes), sevar_r (sampling error variances for mean observed correlations), sevar_rho (sampling error variances for mean corrected correlations), and source (character labels indicating which meta-analytic correlations came from the same source)
Details

Note that LePine et al. (2008) did not report confidence intervals, sampling error variances, or heterogeneity estimates for correlations among team processes; included sampling error variances in this list are based on total sample size only and do not include uncertainty stemming from any effect size heterogeneity.

References


Examples

data(team)

```
var_error_cpa
```

*Estimate the sampling error variance for criterion profile analysis parameters*

Description

Estimate the sampling error variance for criterion profile analysis parameters

Usage

```r
var_error_cpa(
  Rxx,
  rxy,
  n = NULL,
  se_var_mat = NULL,
  adjust = c("fisher", "pop", "cv")
)
```

Arguments

- `Rxx`  
  An intercorrelation matrix among the predictor variables
- `rxy`  
  A vector of predictor–criterion correlations
- `n`  
  The sample size. If NULL and `se_var_mat` is provided, `n` will be estimated as the effective sample size based on `se_var_mat`. See `n_effective_R2()`.
- `se_var_mat`  
  A matrix of sampling covariance values for the elements of `Rxx` and `rxy`. If NULL, generated using the Normal theory covariance matrix based on `n`.
- `adjust`  
  Method to adjust R-squared for overfitting. See `adjust_Rsq` for details.
Value

A list containing sampling covariance matrices or sampling error variance estimates for CPA parameters

Examples

\[
\text{var_error_cpa(mindfulness$rho[1:5, 1:5], mindfulness$rho[1:5, 6], n = 17060)}
\]

Description

cvec returns the column-wise vectorization of an input matrix (stacking the columns on one another). rvec returns the row-wise vectorization of an input matrix (concatenating the rows after each other). vech returns the column-wise half-vectorization of an input matrix (stacking the lower triangular elements of the matrix, including the diagonal). vechs returns the strict column-wise half-vectorization of an input matrix (stacking the lower triangular elements of the matrix, excluding the diagonal). All functions return the output as a vector.

Usage

\[
\begin{align*}
\text{vech(x)} \\
\text{vechs(x)} \\
\text{cvec(x)} \\
\text{rvec(x)}
\end{align*}
\]

Arguments

\[
x \quad \text{A matrix}
\]

Value

A vector of values

Author(s)

Based on functions from the OpenMx package

Examples

\[
\begin{align*}
\text{cvec(matrix(1:9, 3, 3))} \\
\text{rvec(matrix(1:9, 3, 3))} \\
\text{vech(matrix(1:9, 3, 3))} \\
\text{vechs(matrix(1:9, 3, 3))} \\
\text{vechs(matrix(1:12, 3, 4))}
\end{align*}
\]
vch2full  \hspace{1cm} \textit{Inverse vectorize a matrix}

**Description**

These functions return the symmetric matrix that produces the given half-vectorization result.

**Usage**

- `vch2full(x)`
- `vch2full(x, diagonal = 1)`

**Arguments**

- `x` A vector
- `diagonal` A value or vector of values to enter on the diagonal for `vch2full` (default = 1)

**Details**

The input consists of a vector of the elements in the lower triangle of the resulting matrix (for `vch2full`, including the elements along the diagonal of the matrix, as a column vector), filled column-wise. For `vch2full`, the diagonal values are filled as 1 by default, alternative values can be specified using the `diag` argument. The inverse half-vectorization takes a vector and reconstructs a symmetric matrix such that `vch2full(vch(x))` is identical to `x` if `x` is symmetric.

**Value**

A symmetric matrix

**Author(s)**

Based on functions from the the OpenMx package

**Examples**

```r
vch2full(c(1, 2, 3, 5, 6, 9))
vch2full(c(2, 3, 6), diagonal = 0)
```
**wt_cov**  
*Compute weighted covariances*

**Description**

Compute the weighted covariance among variables in a matrix or between the variables in two separate matrices/vectors.

**Usage**

```r
wt_cov(
  x,
  y = NULL,
  wt = NULL,
  as_cor = FALSE,
  use = c("everything", "listwise", "pairwise"),
  unbiased = TRUE,
  df_type = c("count", "sum_wts")
)
```

```r
wt_cor(x, y = NULL, wt = NULL, use = "everything")
```

**Arguments**

- `x` Vector or matrix of x variables.
- `y` Vector or matrix of y variables
- `wt` Vector of weights
- `as_cor` Logical scalar that determines whether the covariances should be standardized (TRUE) or unstandardized (FALSE).
- `use` Method for handling missing values. "everything" uses all values and does not account for missingness, "listwise" uses only complete cases, and "pairwise" uses pairwise deletion.
- `unbiased` Logical scalar determining whether variance should be unbiased (TRUE) or maximum-likelihood (FALSE).
- `df_type` Character scalar determining whether the degrees of freedom for unbiased estimates should be based on numbers of cases (n - 1; "count"; default) or squared sums of weights (1 - sum(w^2); "sum_wts").

**Value**

Scalar, vector, or matrix of covariances.

**Author(s)**

Jeffrey A. Dahlke
Examples

```r
wt_cov(x = c(1, 0, 2), y = c(1, 2, 3), wt = c(1, 2, 2), as_cor = FALSE, use = "everything")
wt_cov(x = c(1, 0, 2), y = c(1, 2, 3), wt = c(1, 2, 2), as_cor = TRUE, use = "everything")
wt_cov(x = cbind(c(1, 0, 2), c(1, 2, 3)), wt = c(1, 2, 2), as_cor = FALSE, use = "everything")
wt_cov(x = cbind(c(1, 0, 2), c(1, 2, 3)), wt = c(1, 2, 2), as_cor = TRUE, use = "everything")
wt_cov(x = cbind(c(1, 0, 2, NA), c(1, 2, 3, 3)),
       wt = c(1, 2, 2, 1), as_cor = FALSE, use = "listwise")
wt_cov(x = cbind(c(1, 0, 2, NA), c(1, 2, 3, 3)),
       wt = c(1, 2, 2, 1), as_cor = TRUE, use = "listwise")
```

---

**wt_dist**

Weighted descriptive statistics for a vector of numbers

**Description**

Compute the weighted mean and variance of a vector of numeric values. If no weights are supplied, defaults to computing the unweighted mean and the unweighted maximum-likelihood variance.

**Usage**

```r
wt_dist(
  x,
  wt = rep(1, length(x)),
  unbiased = TRUE,
  df_type = c("count", "sum_wts")
)
wt_mean(x, wt = rep(1, length(x)))
wt_var(
  x,
  wt = rep(1, length(x)),
  unbiased = TRUE,
  df_type = c("count", "sum_wts")
)
```

**Arguments**

- `x`: Vector of values to be analyzed.
- `wt`: Weights associated with the values in `x`.
- `unbiased`: Logical scalar determining whether variance should be unbiased (TRUE) or maximum-likelihood (FALSE).
- `df_type`: Character scalar determining whether the degrees of freedom for unbiased estimates should be based on numbers of cases ("count"; default) or sums of weights ("sum_wts").
Details

The weighted mean is computed as

$$\bar{x}_w = \frac{\sum_{i=1}^{k} x_i w_i}{\sum_{i=1}^{k} w_i}$$

where \(x\) is a numeric vector and \(w\) is a vector of weights.

The weighted variance is computed as

$$\text{var}_w(x) = \frac{\sum_{i=1}^{k} (x_i - \bar{x}_w)^2 w_i}{\sum_{i=1}^{k} w_i}$$

and the unbiased weighted variance is estimated by multiplying \(\text{var}_w(x)\) by \(\frac{k}{k-1}\).

Value

A weighted mean and variance if weights are supplied or an unweighted mean and variance if weights are not supplied.

Author(s)

Jeffrey A. Dahlke

Examples

```r
wt_dist(x = c(.1, .3, .5), wt = c(100, 200, 300))
wt_mean(x = c(.1, .3, .5), wt = c(100, 200, 300))
wt_var(x = c(.1, .3, .5), wt = c(100, 200, 300))
```

Description

Calculate the quadratic form

$$Q = x'Ax$$

Usage

A `%&%` x

Arguments

A  A square matrix
x  A vector or matrix

Value

The quadratic product
Examples

diag(5) %&% 1:5
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