Package ‘pscore’
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Title Standardizing Physiological Composite Risk Endpoints
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Description Provides a number of functions to simplify and automate the scoring, comparison, and evaluation of different ways of creating composites of data. It is particularly aimed at facilitating the creation of physiological composites of metabolic syndrome symptom score (MSSS) and allostatic load (AL).
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BioDB

**Biomarker Thresholds Database**

**Description**

This data set lists the clinical high risk thresholds for a variety of biomarkers.

**Format**

a list.

**Source**

Various publications

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**distanceScores**

Calculate distance scores on data in preparation for composite scoring

**Description**

Calculate distance scores on data in preparation for composite scoring

**Usage**

```
distanceScores(d, g, thresholds, higherisbetter, winsorize = FALSE,
              better = TRUE, na.rm = TRUE, saveall = FALSE)
```

**Arguments**

- **d**: The data
- **g**: A grouping variable
- **thresholds**: Thresholds to use when calculating distances (e.g., median, clinical thresholds, etc.). If groups are used, must be thresholds for each group (e.g., to allow separate thresholds for females and males).
- **higherisbetter**: A logical vector for each biomarker whether higher scores are better or not.
- **winsorize**: Whether to winsorize the data or not. Defaults to FALSE. If not FALSE, the percentile to winsorize at. For example, .01 would be the .01 and the 1 - .01 percentiles.
- **better**: Logical indicating whether “better” values than the threshold are allowed. Defaults to TRUE.
- **na.rm**: A logical whether missing values should be ommitted. Defaults to TRUE.
- **saveall**: A logical whether to save all intermediary datasets and graphs. Defaults to FALSE.
**factorComposite**

**Value**

A list of results.

**See Also**

Other composite: `factorComposite; mahalanobisComposite; prepareComposite; sumComposite`

**Examples**

```r
# this example creates distances for the built in mtcars data
# see ?mtcars for more details
# The distances are calculated from the "best" in the dataset
# defined by these thresholds
thresholds <- with(mtcars, c(
  mpg = max(mpg),
  hp = max(hp),
  wt = min(wt),
  qsec = min(qsec)))

# higher mpg and hp are better,
# whereas lower wt and qsec are better
dres <- distanceScores(mtcars[, c("mpg", "hp", "wt", "qsec")],
  thresholds = list(thresholds),
  higherisbetter = c(TRUE, TRUE, FALSE, FALSE),
  saveall = TRUE)

# see a density plot of the distance scores
dres$density

# cleanup
dm(thresholds, dres)
```

---

**factorComposite**  
**Score Data Using a Factor Model**

**Description**

Create a composite using a Factor Model

**Usage**

```r
factorComposite(object, type = c("onefactor", "secondorderfactor", "bifactor"), factors = "")
```

**Arguments**

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>object</td>
<td>An object ready for use</td>
</tr>
<tr>
<td>type</td>
<td>A character string indicating the type of factor model to use</td>
</tr>
<tr>
<td>factors</td>
<td>A named list where names are the factor names and each element is a character string of the indicator names.</td>
</tr>
</tbody>
</table>
factorComposite

Value

A list of results.

See Also

Other composite: distanceScores; mahalanobisComposite; prepareComposite; sumComposite

Examples

```r
# this example creates distances for the built in mtcars data
# see ?mtcars for more details
# The distances are calculated from the "best" in the dataset
# defined by these thresholds
thresholds <- with(mtcars, c(
  mpg = max(mpg),
  hp = max(hp),
  wt = min(wt),
  qsec = min(qsec))

# higher mpg and hp are better,
# whereas lower wt and qsec are better
dres <- distanceScores(mtcars[, c("mpg", "hp", "wt", "qsec")],
  thresholds = list(thresholds),
  higherisbetter = c(TRUE, TRUE, FALSE, FALSE),
  saveall = TRUE)

# see a density plot of the distance scores
dres$Density

dres <- distanceScores(mtcars[, c("mpg", "hp", "wt", "qsec")],
  thresholds = list(thresholds),
  higherisbetter = c(TRUE, TRUE, FALSE, FALSE),
  saveall = TRUE)

# now prepare to create the composite
# covariance matrix will be calculated from the data
# and data will be standardized to unit variance by default
cprep <- prepareComposite(dres)

# now we can create the composite based on summing the (standardized)
# distances from our defined thresholds
# by default, distances are squared, then summed, and then square rooted
# to be back on the original scale
fcomp <- factorComposite(cprep, type = "onefactor")

# view a histogram of the composite scores
fcomp$ScoreHistogram

# summarize the composite scores
summary(fcomp$Scores$Comp)

# cleanup
rm(thresholds, dres, cprep, fcomp)
```
Density Plot for a Long Dataset

Description

Internal function only, not meant for general use. Simple wrapper around ggplot2 functionality to create density plots, potentially for many variables and coloured by group.

Usage

ldensity(data, melt = FALSE, x, facet, g, hist = FALSE)

Arguments

data    A dataset (or melt()ed dataset)
melt    Logical whether to melt() dataset
x       name of variable for density
facet   A variable to use for facetting
g       A variable to use for grouping/colouring. If melt=TRUE, this is used as id.var as well.
hist    Logical whether to make a density plot or histogram (if TRUE).

Value

A ggplot2 graph.

Examples

# simple facetted plot
pscore::ldensity(mtcars, TRUE)
# simple coloured plot
pscore::ldensity(mtcars, x = "mpg", g = "factor(cyl)"

Score Data Using the Mahalanobis Distance

Description

Create a composite using the Mahalanobis Distance

Usage

mahalanobisComposite(object, ncomponents)
Arguments

- **object**: An object of class *compositedata* ready for use.
- **ncomponents**: the number of components to use from the principal component analysis. If missing, defaults to the number of columns in the data.

Value

A list of results.

See Also

Other composite: *distanceScores; factorComposite; prepareComposite; sumComposite*

Examples

```r
# this example creates distances for the built-in mtcars data
# see ?mtcars for more details
# The distances are calculated from the "best" in the dataset
# defined by these thresholds
thresholds <- with(mtcars, c(
  mpg = max(mpg),
  hp = max(hp),
  wt = min(wt),
  qsec = min(qsec)))

# higher mpg and hp are better,
# whereas lower wt and qsec are better
dres <- distanceScores(mtcars[, c("mpg", "hp", "wt", "qsec")],
  thresholds = list(thresholds),
  higherIsBetter = c(TRUE, TRUE, FALSE, FALSE),
  saveAll = TRUE)

# see a density plot of the distance scores
dres$Density

# now prepare to create the composite
# covariance matrix will be calculated from the data
# and data will be standardized to unit variance by default
cprep <- prepareComposite(dres)

# now we can create the composite based on mahalanobis distances
# from our defined thresholds
mcomp <- mahalanobisComposite(cprep)

# view a histogram of the composite scores
mcomp$ScoreHistogram

# summarize the composite scores
summary(mcomp$Scores)

# check the screeplot and loadings
```
prepareComposite

mcomp$Screeplot
mcomp$LoadingGraph
# examine the loadings as a table
mcomp$LoadingTable

# one component is adequate to explain these data
# to be safe can pick first two and re-run model

# use only first two components
mcomp2 <- mahalanobisComposite(cprep, ncomponents = 2)

# view a histogram of the updated composite scores
mcomp2$ScoreHistogram

# summarize the composite scores
summary(mcomp2$Scores)

# compare using all versus two components
plot(mcomp$Scores, mcomp2$Scores)

# cleanup
rm(thresholds, dres, cprep, mcomp, mcomp2)

prepareComposite  Prepare data to have a composite calculated

Description
Prepare data to have a composite calculated

Usage
prepareComposite(object, covmat, standardize = TRUE)

Arguments

object  An object ready for use
covmat  The covariance matrix to use. If missing, automatically calculated from the data.
standardize  A logical value whether to standardize the data or not. Defaults to TRUE.

Value
A list of results.

See Also
Other composite: distanceScores; factorComposite; mahalanobisComposite; sumComposite
Examples

# this example creates distances for the built in mtcars data
# see ?mtcars for more details
# The distances are calculated from the "best" in the dataset
# defined by these thresholds
thresholds <- with(mtcars, c(
  mpg = max(mpg),
  hp = max(hp),
  wt = min(wt),
  qsec = min(qsec)))

# higher mpg and hp are better,
# whereas lower wt and qsec are better
dres <- distanceScores(mtcars[, c("mpg", "hp", "wt", "qsec")],
  thresholds = list(thresholds),
  higherisbetter = c(TRUE, TRUE, FALSE, FALSE),
  saveall = TRUE)

# see a density plot of the distance scores
dres$Density

# now prepare to create the composite
# covariance matrix will be calculated from the data
# and data will be standardized to unit variance by default
cprep <- prepareComposite(dres)
# cleanup
rm(thresholds, dres, cprep)

---

**sumComposite**  
*Score Data Using a simple sum*

**Description**

Create a composite using summation

**Usage**

```r
sumComposite(object, transform = c("square", "abs", "none"), type = c("sum", "mean"), systems)
```

**Arguments**

- **object**: An object ready for use
- **transform**: A character string indicating the type of transformation to use. One of “square”, “abs”, or “none”, which either sums the raw data, sums the squared data and then takes the square root, or sums the absolute values of the data.
- **type**: A character string indicating the type of aggregation to use. One of “sum” or “mean”. 
sumComposite

systems
An optional list where each element is a character vector of the variable names within a particular system. If given, scores are first averaged within a system, before being aggregated across systems.

Value
A list of results.

See Also
Other composite: distanceScores; factorComposite; mahalanobisComposite; prepareComposite

Examples

```r
# this example creates distances for the built in mtcars data
# see ?mtcars for more details
# The distances are calculated from the "best" in the dataset
# defined by these thresholds
thresholds <- with(mtcars, c(
  mpg = max(mpg),
  hp = max(hp),
  wt = min(wt),
  qsec = min(qsec)))

# higher mpg and hp are better,
# whereas lower wt and qsec are better
dres <- distanceScores(mtcars[, c("mpg", "hp", "wt", "qsec")],
  thresholds = list(thresholds),
  higherisbetter = c(TRUE, TRUE, FALSE, FALSE),
  saveall = TRUE)

# see a density plot of the distance scores
dres$Density

# now prepare to create the composite
# covariance matrix will be calculated from the data
# and data will be standardized to unit variance by default
cprep <- prepareComposite(dres)

# now we can create the composite based on summing the (standardized)
# distances from our defined thresholds
# by default, distances are squared, then summed, and then square rooted
# to be back on the original scale
scomp <- sumComposite(cprep, "square", "sum")

# view a histogram and summary of the composite scores
scomp$ScoreHistogram
summary(scomp$Scores)

# calculate average (mean) instead of sum
scomp2 <- sumComposite(cprep, "square", "mean")
```
# view a histogram and summary of the composite scores
scomp2$ScoreHistogram
summary(scomp2$Scores)

# scores are still the same
plot(scomp$Scores, scomp2$Scores)

# first average scores within a system, then sum
# note that within a system, scores are always averaged, # never summed.
scomp3 <- sumComposite(cprep, "square", "sum",
    systems = list(
        environment = c("mpg"),
        performance = c("hp", "qsec", "wt")))

# view a histogram and summary of the composite scores
scomp3$ScoreHistogram
summary(scomp3$Scores)

# compare all three scores
# because of the different number of indicators within each system
# there is a re-weighting for S3
plot(data.frame(S1 = scomp$Scores, S2 = scomp2$Scores, S3 = scomp3$Scores))

# cleanup
rm(thresholds, dres, cprep, scomp, scomp2, scomp3)

---

\textbf{winsorizor}  \hspace{1cm} \textit{Winsorize at specified percentiles}

\textbf{Description}

Simple function winsorizes data at the specified percentile.

\textbf{Usage}

\begin{verbatim}
winsorizor(d, percentile, na.rm = TRUE)
\end{verbatim}

\textbf{Arguments}

\begin{itemize}
    \item \textbf{d} A vector, matrix, or data frame to be winsorized
    \item \textbf{percentile} The percentile bounded by \([0, 1]\) to winsorize data at
    \item \textbf{na.rm} A logical whether to remove NAs.
\end{itemize}

\textbf{Value}

winsorized data. Attributes are included to list the exact values (for each variable, if a data frame or matrix) used to winsorize at the lower and upper ends.
Examples

```r
dev.new(width = 10, height = 5)
par(mfrow = c(1, 2))
hist(as.vector(euroidist), main = "Euroidist")
hist(winsorizer(as.vector(euroidist), .05), main = "Euroidist with lower and upper\n5% winsorized")
```
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