Package ‘calibrate’

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Title Calibration of Scatterplot and Biplot Axes
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Description Package for drawing calibrated scales with tick marks on (non-orthogonal)
variable vectors in scatterplots and biplots. Also provides some functions for multivariate analysis
such principal coordinate analysis.
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calibrate Calibration of Biplot and Scatterplot Axis

Description
Routine for the calibration of any axis (variable vector) in a biplot or a scatterplot

Usage
```
calibrate(g,y,tm,Fr,tmlab=tm,tl=0.05,dt=TRUE,dp=FALSE,
   lm=TRUE,verb=TRUE,axislab="",reverse=FALSE,
   alpha=NULL,labpos=1,weights=diag(rep(1,length(y))),
   axiscol="blue",cex.axislab=0.75,graphics=TRUE,where=3,
   laboffset=c(0,0),m=matrix(c(0,0),nrow=1),markerpos=3,
   showlabel=TRUE,lwd=1,shiftvec=c(0,0),shiftdir="none",shiftfactor=1.05)
```

Arguments
- **g**: the vector to be calibrated (2 x 1).
- **y**: the data vector corresponding to g, appropriately centred and/or standardized.
- **tm**: the vector of tick marks, appropriately centred and/or scaled.
- **Fr**: the coordinates of the rows markers in the biplot.
- **tmlab**: a list or vector of tick mark labels.
- **tl**: the tick length. By default, the tick markers have length 0.05.
- **dt**: draw ticks. By default, ticks markers are drawn. Set dt=F in order to compute calibration results without actually drawing the calibrated scale.
- **dp**: drop perpendiculars. With dp=T perpendicular lines will be drawn from the row markers specified by Fr onto the calibrated axis. This is a graphical aid to read off the values in the corresponding scale.
- **lm**: label markers. By default, all tick marks are labelled. Setting lm=F turns off the labelling of the tick marks. This allows for creating tick marks without labels. It is particularly useful for creating finer scales of tickmarks without labels.
- **verb**: verbose parameter (F=be quiet, T=show results).
- **axislab**: a label for the calibrated axis.
- **reverse**: puts the tick marks and tick mark labels on the other side of the axis.
- **alpha**: a value for the calibration factor. This parameter should only be specified if a calibration is required that is different from the one that is optimal for data recovery.
- **labpos**: position of the label for the calibrated axis (1,2,3 or 4).
- **laboffset**: offset vector for the axis label. If specified, shifts the label by the specified amounts with respect to the current position.
**calibrate**

- **weights**: a matrix of weights (optional).
- **axiscol**: color of the calibrated axis.
- **cex.axislab**: character expansion factor for axis label and tick mark labels.
- **graphics**: do graphics or not (F=no graphical output, T=draws calibrated scale).
- **where**: label placement (1=beginning, 2=middle, 3=end).
- **m**: vector of means.
- **markerpos**: position specifier for the tick mark labels (1, 2, 3, 4).
- **showlabel**: show axis label in graph (T) or not (F).
- **lwd**: line with for the calibrated axis.
- **shiftvec**: a shift vector for the calibrated axis ((0,0) by default).
- **shiftdir**: indicates in which direction the axis should be shifted ("left", "right" or "none").
  This direction is w.r.t. vector g.
- **shiftfactor**: scalar by which the shift vector is stretched (or shrunken). By default, the length
  of the shift vector is stretched by 5 percent (shiftfactor = 1.05)

**Details**

This program calibrates variable vectors in biplots and scatterplots, by drawing tick marks along a
given the vector and labelling the tick marks with specified values. The optimal calibration is found
by (generalized) least squares. Non-optimal calibrations are possible by specifying a calibration
factor (alpha).

**Value**

Returns a list with calibration results

- **useralpha**: calibration factor specified by the user
- **optalpha**: optimal calibration factor
- **lengthoneunit**: length in the plot of one unit in the scale of the calibrated variable
- **gof**: goodness of fit (as in regression)
- **gos**: goodness of scale
- **M**: coordinates of the tick markers
- **ang**: angle in degrees of the biplot axis with the positive x-axis
- **shiftvec**: the supplied or computed shift vector
- **yt**: fitted values for the variable according to the calibration
- **e**: errors according to the calibration
- **Fpr**: coordinates of the projections of the row markers onto the calibrated axis
- **Mn**: coordinates of the tick marker end points

**Author(s)**

Jan Graffelman <jan.graffelman@upc.edu>
References


See Also

biplot

Examples

```r
x <- rnorm(20,1)
y <- rnorm(20,1)
x <- x - mean(x)
y <- y - mean(y)
z <- x + y
b <- c(1,1)
plot(x,y,asp=1,pch=19)
tm<-seq(-2,2,by=0.5)
Calibrate.z <- calibrate(b,z,tm,cbind(x,y),axislab="Z",graphics=TRUE)
```
canocor

Canonical correlation analysis

Description

canocor performs canonical correlation analysis on the basis of the standardized variables and stores extensive output in a list object.

Usage

canocor(X, Y)

Arguments

X a matrix containing the X variables
Y a matrix containing the Y variables

Details

canocor computes the solution by a singular value decomposition of the transformed between set correlation matrix.

Value

Returns a list with the following results

ccor the canonical correlations
A canonical weights of the x variables
B canonical weights of the y variables
U canonical x variates
V canonical y variates
Fs biplot markers for x variables (standard coordinates)
Gs biplot markers for y variables (standard coordinates)
Fp biplot markers for x variables (principal coordinates)
Gp biplot markers for y variables (principal coordinates)
fitRxy goodness of fit of the between-set correlation matrix
fitXs adequacy coefficients of x variables
fitXp redundancy coefficients of x variables
fitYs adequacy coefficients of y variables
fitYp redundancy coefficients of y variables

Author(s)

Jan Graffelman <jan.graffelman@upc.edu>
References


See Also
cancor

Examples

```r
set.seed(123)
X <- matrix(runif(75),ncol=3)
Y <- matrix(runif(75),ncol=3)
cca.results <- canocor(X,Y)
```

---

circle  

**Draw a circle**

description

**circle** draws a circle in an existing plot.

Usage

```r
circle(radius,origin)
```

Arguments

- `radius`: the radius of the circle
- `origin`: the origin of the circle

Value

NULL

Author(s)

Jan Graffelman <jan.graffelman@upc.edu>

Examples

```r
set.seed(123)
X <- matrix(rnorm(20),ncol=2)
plot(X[,1],X[,2])
circle(1,c(0,0))
```
Example

```r
X <- matrix(runif(20), ncol=2)
Y <- matrix(runif(20), ncol=2)
plot(rbind(X, Y))
text(X[,1], X[,2], paste("X", 1:10, sep=""))
text(Y[,1], Y[,2], paste("Y", 1:10, sep=""))
dlines(X, Y)
```
goblets  Size measurements of archeological goblets

Description
This data set gives 6 different size measurements of 25 goblets

Usage
data(goblets)

Format
A data frame containing 25 observations.

Source
Manly, 1989

References

heads  Dimensions of heads of first and second sons for 25 families

Description
Variables X1 and X2 are the head length and head breadth of the first son and Y1 and Y2 are the same variables for the second son.

Usage
data(heads)

Format
A data frame containing 25 observations.

Source
Mardia, 1979, p. 121
References


linnerud

*linnerud’s exercise and body measurements*

Description

The data set consist of 3 exercise variables (Tractions a la barre fixe, Flexions, Sauts) and 3 body measurements (Poids, Tour de talle, Pouls) of 20 individuals.

Usage

data(linnerud)

Format

A data frame containing 20 observations.

Source

Tenenhaus, 1998, table 1, page 15

References


ones

*Generates a matrix of ones*

Description

ones generates a matrix of ones.

Usage

ones(n, p = n)

Arguments

n  number of rows
p  number of columns
Details
if only n is specified, the resulting matrix will be square.

Value
a matrix filled with ones.

Author(s)
Jan Graffelman (jan.graffelman@upc.edu)

See Also
matrix

Examples
Id <- ones(3)
print(Id)

---

origin  Origin

Description
Draws coordinate axes in a plot.

Usage
origin(m=c(0,0), ...)

Arguments
m      the coordinates of the means (2 x 1).
...    other arguments passed on to the lines function

Author(s)
Jan Graffelman (jan.graffelman@upc.edu)

See Also
lines

Examples
X <- matrix(runif(40),ncol=2)
plot(X[,1],X[,2])
origin(m=c(mean(X[,1]),mean(X[,2])))
Function for Principal Coordinate Analysis

Description

Function PrinCoor implements Principal Coordinate Analysis, also known as classical metric multidimensional scaling or classical scaling. In comparison with other software, it offers refined statistics for goodness-of-fit at the level of individual observations and pairs of observations.

Usage

PrinCoor(Dis, eps = 1e-10)

Arguments

- **Dis**: A distance matrix or dissimilarity matrix
- **eps**: A tolerance criterion for deciding if eigenvalues are zero or not

Details

Calculations are based on the spectral decomposition of the scalar product matrix B, derived from the distance matrix.

Value

- **X**: The coordinates of the solution
- **la**: The eigenvalues of the solution
- **B**: The scalar product matrix
- **standard.decom**: Standard overall goodness-of-fit table using all eigenvalues
- **positive.decom**: Overall goodness-of-fit table using only positive eigenvalues
- **absolute.decom**: Overall goodness-of-fit table using absolute values of eigenvalues
- **squared.decom**: Overall goodness-of-fit table using squared eigenvalues
- **RowStats**: Detailed goodness-of-fit statistics for each row
- **PairStats**: Detailed goodness-of-fit statistics for each pair

Author(s)

Jan Graffelman <jan.graffelman@upc.edu>

References


rad2degree

See Also

princomp

Examples

data(spaindist)
results <- PrinCoor(as.matrix(spaindist))

data

rad2degree

Convert radians to degrees.

Description

rad2degree converts radians to degrees.

Usage

rad2degree(x)

Arguments

x

an angle in radians

Value

the angle with the positive x-axis in degrees.

Author(s)

Jan Graffelman (jan.graffelman@upc.edu)

Examples

x <- pi/2
a <- rad2degree(x)
cat("angle is",a,"degrees\n")
Description

*rda* performs redundancy analysis and stores extensive output in a list object.

Usage

```r
def: rda(X, Y, scaling = 1)
```

Arguments

- **X**: a matrix of x variables
- **Y**: a matrix of y variables
- **scaling**: scaling used for x and y variables. 0: x and y only centered. 1: x and y standardized

Details

Results are computed by doing a principal component analysis of the fitted values of the regression of y on x.

Plotting the first two columns of Gxs and Gyp, or of Gxp and Gys provides a biplots of the matrix of regression coefficients.

Plotting the first two columns of Fs and Gp or of Fp and Gs provides a biplot of the matrix of fitted values.

Value

Returns a list with the following results

- **Yh**: fitted values of the regression of y on x
- **B**: regression coefficients of the regression of y on x
- **decom**: variance decomposition/goodness of fit of the fitted values AND of the regression coefficients
- **Fs**: biplot markers of the rows of Yh (standard coordinates)
- **Fp**: biplot markers of the rows of Yh (principal coordinates)
- **Gys**: biplot markers for the y variables (standard coordinates)
- **Gyp**: biplot markers for the y variables (principal coordinates)
- **Gxs**: biplot markers for the x variables (standard coordinates)
- **Gxp**: biplot markers for the x variables (principal coordinates)

Author(s)

Jan Graffelman (jan.graffelman@upc.edu)
References


See Also

princomp, canocor, biplot

Examples

X <- matrix(rnorm(75), ncol=3)
Y <- matrix(rnorm(75), ncol=3)
rda.results <- rda(X, Y)

```
shiftvector

shiftvector(g, X, x = c(1, 0), verbose = FALSE)
```

Description

`shiftvector` computes two shift vectors perpendicular to the supplied biplot or scatterplot axis g. The vector norm is computed from the two most extreme data points.

Usage

```
shiftvector(g, X, x = c(1, 0), verbose = FALSE)
```

Arguments

- `g` a biplot or scatterplot axis
- `X` a n by 2 matrix of scatterplot or biplot coordinates
- `x` reference axis, (1,0) by default
- `verbose` print information or not

Details

`shiftvector` locates the tow most extreme datapoints in the direction perpendicular to axis g.

Value

- `dr` the right (w.r.t. the direction of g) shift vector
- `dl` the left (w.r.t. the direction of g) shift vector

Author(s)

Jan Graffelman (jan.graffelman@upc.edu)
spaindist

References


See Also

calibrate

Examples

X <- matrix(rnorm(100),ncol=2)
Xs <- scale(X)

g <- c(1,1)

plot(Xs[,1],Xs[,2],asp=1,pch=19)
textxy(Xs[,1],Xs[,2],1:nrow(X))
arrows(0,0,g[1],g[2])
text(g[1],g[2],"g",pos=1)

out <- shiftvector(g,X,verbose=TRUE)
dr <- out$dr
dl <- out$dl

arrows(0,0,dl[1],dl[2])
text(dl[1],dl[2],"dl",pos=1)
arrows(0,0,dr[1],dr[2])
text(dr[1],dr[2],"dr",pos=1)

spaindist

Road distances between Spanish cities

Description

Road distances in kilometers between 47 Spanish cities

Usage

data(spaindist)

Format

A data frame containing 47 observations.
References


---

storks

*Frequencies of nesting storks in Denmark*

---

Description

Danish data from 1953-1977 giving the frequency of nesting storks, the human birth rate and the per capita electricity consumption.

Usage

```r
data(storks)
```

Format

A data frame containing 25 observations.

Source

Gabriel and Odoroff, Table 1.

References


---

textxy

*Nice placement of labels in a plot*

---

Description

Function `textxy` calls function `text` in order to add text to points in a graph. `textxy` chooses a different position for the text depending on the quadrant. This tends to produces better readable plots, with labels fanning away from the origin.

Usage

```r
textxy(X, Y, labs, m = c(0, 0), cex = 0.5, offset = 0.8, ...)
```
Arguments

- **X**: x coordinates of a set of points
- **Y**: y coordinates of a set of points
- **labs**: labels to be placed next to the points
- **m**: coordinates of the origin of the plot (default (0,0))
- **cex**: character expansion factor
- **offset**: controls the distance between the label and the point. A value of 0 will plot labels on top of the point. Larger values give larger separation between point and label. The default value is 0.8
- ... additional arguments for function `text`.

Value

- NULL

Author(s)

- Jan Graffelman (jan.graffelman@upc.edu)

References


See Also

- `text`

Examples

```r
x <- rnorm(50)
y <- rnorm(50)
plot(x,y,asp=1)
textxy(x,y,1:50,m=c(mean(x),mean(y)))
```
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