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 biplot creation and
for multivariate analysis such as principal coordinate analysis.
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bplot

General function for making biplots

Description
Function bplot creates biplots on the basis matrices of row and column markers.

Usage
bplot(Fr,G,rowlab=rownames(Fr),collab=rownames(G),qlt=rep(1,nrow(Fr)),
refaxis=TRUE,ahead=T,xl=NULL,yl=NULL,frame=F,qltlim=0,rowch=19,
colch=19,qltvar=NULL,rowcolor="red",colcolor="blue",rowmark=TRUE,
colmark=TRUE,rowarrow=FALSE,colarrow=TRUE,markrowlab=TRUE,
markcollab=TRUE,xlab="",ylab="",cex.rowlab=1,cex.rowdot=0.75,
cex.collab=1,cex.coldot=0.75,cex.axis=0.75,lwd=1,arrowangle=10,...)

Arguments
Fr       matrix with coordinates of the row markers.
G       matrix with coordinates of the column markers.
rowlab   vector with labels for the rows.
collab   vector with labels for the columns.
qlt      goodness of fit of the rows.
refaxis  draw coordinate system refaxis=TRUE or not.
ahead    put a head on the vectors ahead=TRUE or not.
xl       limits for the x-axis.
yl       limits for the y-axis.
frame    draw a box around the plot frame=TRUE or not.
qltlim   draw only the vectors with a goodness of fit larger than qltlim.
rowch    character used for the row markers.
colch    character used for the column markers.
qltvar   vector with the goodness of fit of each variable.
rowcolor colour used for the row markers.
colcolor colour used for the column markers.
rowmark  show row markers (rowmark=TRUE) or not.
colmark  show column markers (colmark=TRUE) or not.
rowarrow draw vectors from the origin to the row markers (rowarrow=TRUE) or not.
colarrow draw vectors from the origin to the column markers (colarrow=TRUE) or not.
markrowlab depict row marker labels (rowlab=TRUE) or not.
markcollab  depict column marker labels (collab=TRUE) or not.
xlab       a label for the x-axis.
ylab       a label for the y-axis.
cex.rowlab expansion factor for the row labels.
cex.rowdot expansion factor for the row markers.
cex.collab expansion factor for the column labels.
cex.coldot expansion factor for the column markers.
cex.axis   expansion factor for the axis.
lwd        line width for biplot vectors.
arroangle  angle for the edges of the arrowhead.
...        extra arguments for plot.

Value
None. The function produces a graphic.

Author(s)
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Examples
set.seed(123)
X <- matrix(runif(40),byrow=TRUE,ncol=4)
colnames(X) <- paste("X",1:ncol(X),sep="")
out.pca <- princomp(X,cor=TRUE)
Fp <- out.pca$scores
Gs <- as.matrix(as.matrix(unclass(out.pca$loadings))
bplot(Fp,Gs,colch=NA)
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.
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 or 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)
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).

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

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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)
```

calves

*Delivery of Dutch Calves*

Description

This data set gives a cross classification of 7275 calves born in the late nineties according to type of production and type of delivery.

Usage

data(calves)

Format

A data frame containing a contingency table of 7275 observations.

Source

Holland Genetics. [http://www.hg.nl](http://www.hg.nl)

References


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)
canocor

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(rnorm(20), ncol=2)
plot(X[,1], X[,2])
circle(1, c(0,0))
```

**circle**  
*Draw a circle*

**Description**

circle draws a circle in an existing plot.

**Usage**

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(75), ncol=3)
Y <- matrix(rnorm(75), ncol=3)
cca.results <- cancor(X, Y)
```
**dlines**  
*Connect two sets of points by lines*

**Description**

dlines connects two sets of points by lines in a rowwise manner.

**Usage**

dlines(SetA, SetB, lin = "dotted")

**Arguments**

- **SetA**  
  matrix with the first set of points
- **SetB**  
  matrix with the second set of points
- **lin**  
  linestyle for the connecting lines

**Value**

NULL

**Author(s)**

Jan Graffelman (jan.graffelman@upc.edu)

**See Also**

lines

**Examples**

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 (Tracions a la barre fixe, Flexions, Sauts) and 3 body measurements (Poids, Tour de talle, Pouls) of 20 individuals.

Usage
```r
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
```r
doness(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

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])))
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)

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References


rad2degree

See Also

princomp

Examples

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

---

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")
rda

Redundancy analysis

Description

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

Usage

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)
rdas.results <- rda(X, Y)

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)

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

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

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

Value

NULL

Author(s)

Jan Graffelman (jan.graffelman@upc.edu)

References


See Also

text

Examples

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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