Package ‘calibrate’

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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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R topics documented:

bplot .................................................. 2
calibrate ............................................. 3
calves ................................................ 6
canocor .............................................. 6
circle ............................................... 8
dlines .............................................. 9
goblets ............................................. 10
heads ............................................... 10
linnerud ............................................ 11
ones ............................................... 11
origin ............................................. 12
PrinCoor .......................................... 13
rad2degree ....................................... 14
rda ................................................ 15
shiftvector ....................................... 16
spaindist ......................................... 17
storks ............................................ 18
textxy ............................................ 18
**Description**

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

**Usage**

```r
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.  
arowangle: angle for the edges of the arrowhead.  
... extra arguments for plot.

Value
None. The function produces a graphic.

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

Examples

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

---

**calibrate**

Calibration of Biplot and Scatterplot Axis

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

Usage

```r
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=l), 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.
  t1  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)
**calibrate**

**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)
- `gog` 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)
```

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

```r
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

```r
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

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))
```
**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**

```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

```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
ones(n, p = n)
```

Arguments

- `n` number of rows
- `p` number of columns
### origin

**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**
```r
Id <- ones(3)
print(Id)
```

---

**origin**

---

**Description**
Draws coordinate axes in a plot.

**Usage**
```r
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**
```r
X <- matrix(runif(40),ncol=2)
plot(X[,1],X[,2])
origin(m=c(mean(X[,1]),mean(X[,2])))
```
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

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")

See Also
princomp

Examples
data(spaindist)
results <- PrinCoor(as.matrix(spaindist))
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)
rda.results <- rda(X,Y)

shiftvector

Compute a shift vector for a calibrated axis.

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

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
...
... additiona 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)))
```
Index

*Topic aplot
  circle, 8
dlines, 9
textxy, 18

*Topic arith
  rad2degree, 14

*Topic datasets
  calves, 6
goblets, 10
heads, 10
linnerud, 11
spaindist, 17
storks, 18

*Topic misc
  textxy, 18

*Topic multivariate
  bplot, 2
calibrate, 3
cancor, 6
ones, 11
origin, 12
PrinCoor, 13
rda, 15
shiftvector, 16
spaindist, 17
storks, 18

biplot, 5, 16
bplot, 2
calibrate, 3, 17
calves, 6
cancor, 7
cancor, 6, 16
circle, 8
dlines, 9
goblets, 10
heads, 10
lines, 9, 12
linnerud, 11
matrix, 12
ones, 11
origin, 12
princomp, 14, 16
PrinCoor, 13
rad2degree, 14
rda, 15
shiftvector, 16
spaindist, 17
storks, 18
text, 19
textxy, 18