Package 'corrgram'

May 18, 2026

Type Package

Title Plot a Correlogram

Version 1.15

Date 2026-05-18

Description Calculates correlation of variables and displays the results graphically. Included panel functions can display points, shading, ellipses, and correlation values with confidence intervals. See Friendly (2002) <doi:10.1198/000313002533>.

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URL https://kwstat.github.io/corrgram/

BugReports https://github.com/kwstat/corrgram/issues/

Imports ellipse, graphics, grDevices, grid, lattice, stats

Suggests gridBase, hexbin, knitr, MASS, Matrix, psych, rmarkdown, seriation, sfsmisc, testthat

VignetteBuilder knitr

Encoding UTF-8

LazyData true

RoxygenNote 7.3.3

NeedsCompilation no

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Repository CRAN

Date/Publication 2026-05-18 19:10:02 UTC

Contents

`auto` *Statistics of 1979 automobile models*

Description

Statistics for 74 automobiles in the 1979 model year as sold in the US.

Usage

```
auto
```

Format

A data frame with 74 observations on the following 14 variables.

Model Make and model of car.

Origin a factor with levels A,E,J

Price Price in dollars.

MPG Miles per gallon.

Rep78 Repair record for 1978 on 1 (worst) to 5 (best) scale.

Rep77 Repair record for 1978 on 1 to 5 scale.

Hroom Headroom in inches.

Rseat Rear seat clearance in inches.

Trunk Trunk volume in cubic feet.

Weight Weight in pounds.

Length Length in inches.

Turn Turning diameter in feet.

Displa Engine displacement in cubic inches.

Gratio Gear ratio for high gear.

Details

The data is from various sources, primarily *Consumer Reports*, April, 1979, and the United States government EPA statistics on fuel consumption.

Source

This data frame was created from http://euclid.psych.yorku.ca/ftp/sas/sssg/data/auto.sas

References

Originally published in Chambers, Cleveland, Kleiner, and Tukey, *Graphical Methods for Data Analysis*, 1983, pages 352-355.

Examples

```
corrgram(auto[, -c(1:2)])
```

`baseball` *Baseball Hitter's Data*

Description

Data are for 322 Major Leaque Baseball regular and substitute hitters in 1986.

Usage

```
baseball
```

Format

A data frame with 322 observations on the following 22 variables.

Name The hitter/player's name

League Player's league (American/National) at the beginning of 1987

Team Player's team at the beginning of 1987

Position Player's position in 1986: 1B=First base, 2B=Second base, 3B=Third base, C=Catcher, OF=Outfild, DH=Designated hitter, SS=Short stop, UT=Utility

Atbat Number of times at bat in 1986

Hits Number of hits in 1986

Homer Number of home runs in 1986

Runs Number of runs in 1986

RBI Runs batted in during 1986

Walks Number of walks in 1986

Years Number of years in the major leagues

Atbatc Number of times at bat in his career

Hitsc Number of hits in career

Homerc Number of home runs in career

Runsc Number of runs in career

RBIc Number of Runs Batted In in career

Walksc Number of walks in career

Putouts Number of putouts in 1986

Assists Number of assists in 1986

Errors Number of errors in 1986

Salary Annual salary (in thousands) on opening day 1987

logSal Log of salary

Details

The levels of the player's positions have been collapsed to fewer levels for a simpler analysis. See the original data for the full list of positions.

The salary data were taken from Sports Illustrated, April 20, 1987. The salary of any player not included in that article is listed as an NA. The 1986 and career statistics were taken from The 1987 Baseball Encyclopedia Update published by Collier Books, Macmillan Publishing Company, New York.

Source

The data was originally published for the 1988 ASA Statistical Graphics and Computing Data Exposition: http://lib.stat.cmu.edu/data-expo/1988.html.

The version of the data used to create this data was found at http://euclid.psych.yorku.ca/ftp/sas/sssg/data/baseball.sas

References

Michael Friendly (2002). Corrgrams: Exploratory Displays for Correlation Matrices, *The American Statistician*, Vol 56.

Examples

```
vars2 <- c("Assists","Atbat","Errors","Hits","Homer","logSal",
           "Putouts","RBI","Runs","Walks","Years")
corrgram(baseball[,vars2],
         lower.panel=panel.shade, upper.panel=panel.pie)
```

---

corrgram *Draw a correlogram*

Description

Note: 'corrgram()' uses base R graphics. The corrgram function produces a graphical display of a correlation matrix, called a correlogram. The cells of the matrix can be shaded or colored to show the correlation value. Automatic variable reordering can be used to improve the visualization.

Usage

```
corrgram(
  x,
  type = NULL,
  order = FALSE,
  labels,
  panel = panel.shade,
  lower.panel = panel,
  upper.panel = panel,
  diag.panel = NULL,
  text.panel = textPanel,
  label.pos = c(0.5, 0.5),
  label.srt = 0,
  cex.labels = NULL,
  row1attop = TRUE,
  dir = "",
  gap = 0,
  abs = FALSE,
 col.regions = colorRampPalette(c("red", "salmon", "white", "royalblue", "navy")),
  cor.method = "pearson",
  outer.labels = NULL,
  ...
)
```

Arguments

x	A *tall* data frame with one observation per row, or a correlation matrix.
type	Use 'data' or 'cor'/'corr' to explicitly specify that 'x' is data or a correlation matrix. Rarely needed.
order	Should variables be re-ordered? This will improve the visualization by placing similar variables next to each other. Use TRUE or "PCA" for angular PCA-based re-ordering (see Friendly, 2002). If the 'seriation' package is installed, then any distance-based method for seriate can be used. Examples are "OLO" for optimal leaf ordering, "GW", "HC", and "MDS" (see Hahsler and Buchta, 2008).
labels	Labels to use (instead of data frame variable names) for diagonal panels. If 'order' option is used, this vector of labels will be also be appropriately reordered by the function.
panel	Function used to plot the contents of each panel.
lower.panel, upper.panel	Separate panel functions used below/above the diagonal.
diag.panel, text.panel	Panel function used on the diagonal.
label.pos	Horizontal and vertical placement of label in diagonal panels.
label.srt	String rotation for diagonal labels.
cex.labels	Graphics parameter for diagonal panels.

row1attop	TRUE for diagonal like " \ ", FALSE for diagonal like " / ".
dir	Use dir="left" instead of 'row1attop'.
gap	Distance between panels.
abs	Use absolute value of correlations for clustering? Default FALSE.
col.regions	A *function* returning a vector of colors.
cor.method	Correlation method to use in panel functions. Default is 'pearson'. Alternatives: 'spearman', 'kendall'.
outer.labels	A list of the form 'list(bottom,left,top,right)'. If 'bottom=TRUE' (for example), variable labels are added along the bottom outside edge. For more control, use 'bottom=list(labels,cex,srt,adj)', where 'labels' is a vector of variable labels, 'cex' affects the size, 'srt' affects the rotation, and 'adj' affects the adjustment of the labels. Defaults: 'labels' uses column names; cex=1'; 'srt=90' (bottom/top), 'srt=0' (left/right); 'adj=1' (bottom/left), 'adj=0' (top/right).
...	Additional arguments passed to plotting methods.

Details

Note: Use the 'col.regions' argument to specify colors.

Non-numeric columns in the data will be ignored.

The off-diagonal panels are specified with panel.pts, panel.pie, panel.shade, panel.fill, panel.bar, panel.ellipse, panel.conf. panel.cor.

Diagonal panels are specified with panel.txt, panel.minmax, panel.density.

Use a NULL panel to omit drawing the panel.

This function is basically a modification of the pairs.default function with the use of customized panel functions.

The panel.conf function uses cor.test and calculates pearson correlations. Confidence intervals are not available in cor.test for other methods (kendall, spearman).

You can create your own panel functions by starting with one of the included panel functions and making suitable modifications. Note that because of the way the panel functions are called inside the main function, your custom panel function must include the arguments shown in the panel.pts function, even if the custom panel function does not use those arguments!

Value

The correlation matrix used for plotting is returned. The 'order' and 'abs' arguments affect the returned value.

Author(s)

Kevin Wright

References

Friendly, Michael. 2002. Corrgrams: Exploratory Displays for Correlation Matrices. *The American Statistician*, 56, 316–324. http://datavis.ca/papers/corrgram.pdf

D. J. Murdoch and E. D. Chow. 1996. A Graphical Display of Large Correlation Matrices. The American Statistician, 50, 178-180.

Hahsler M, Hornik K, Buchta C. 2008. Getting things in order: An introduction to the R package seriation. *Journal of Statistical Software*, 25(3), 1–34. ISSN 1548-7660, doi:10.18637/jss.v025.i03

Examples

```
# To reproduce the figures in Michael Friendly's paper, see the
# vignette, or see the file 'friendly.r' in this package's
# test directory.

# Demonstrate density panel, correlation confidence panel
corrgram(iris, lower.panel=panel.pts, upper.panel=panel.conf,
         diag.panel=panel.density)

# Demonstrate panel.shade, panel.pie, principal component ordering
vars2 <- c("Assists","Atbat","Errors","Hits","Homer","logSal",
           "Putouts","RBI","Runs","Walks","Years")
corrgram(baseball[vars2], order=TRUE, main="Baseball data PC2/PC1 order",
         lower.panel=panel.shade, upper.panel=panel.pie)

# Use reordering options from package seriation (only available if
#    package seriation is installed)
if ("seriation" %in% rownames(installed.packages())) {
corrgram(baseball[vars2], order= "OLO",
          main="Baseball data with optimal leaf order",
          lower.panel=panel.shade, upper.panel=panel.pie)

corrgram(baseball[vars2], order= "R2E",
          main="Baseball data with rank 2 ellipse seriation",
          lower.panel=panel.shade, upper.panel=panel.pie)

# the following seriation methods are available
seriation::list_seriation_methods("dist")
}

# CAUTION: The latticeExtra package also has a 'panel.ellipse' function
# that clashes with the same-named function in corrgram. In order to use
# the right one, the example below uses 'lower.panel=corrgram::panel.ellipse'.
# If you do not have latticeExtra loaded, you can just use
# 'lower.panel=panel.ellipse'.

# Demonstrate panel.bar, panel.ellipse, panel.minmax, col.regions
corrgram(auto, order=TRUE, main="Auto data (PC order)",
         lower.panel=corrgram::panel.ellipse,
         upper.panel=panel.bar, diag.panel=panel.minmax,
         col.regions=colorRampPalette(c("darkgoldenrod4", "burlywood1",
                                        "darkkhaki", "darkgreen")))
```

```
# 'vote' is a correlation matrix, not a data frame
corrgram(vote, order=TRUE, upper.panel=panel.cor)


# outer labels, all options, larger margins, xlab, ylab
labs=colnames(state.x77)
corrgram(state.x77, oma=c(7, 7, 2, 2),
         outer.labels=list(bottom=list(labels=labs,cex=1.5,srt=60),
                           left=list(labels=labs,cex=1.5,srt=30,adj=c(1,0))))
mtext("Bottom", side=1, cex=2, line = -1.5, outer=TRUE, xpd=NA)
mtext("Left", side=2, cex=2, line = -1.5, outer=TRUE, xpd=NA)
```

---

corrgram2 *Draw a correlogram using 'grid' graphics*

Description

'corrgram2()' produces a correlogram using grid graphics. The off-diagonal cells can be shaded or filled with custom panel functions to show the correlation structure of a data matrix or correlation matrix.

Usage

```
corrgram2(
  x,
  type = NULL,
  order = FALSE,
  labels,
  panel = grid_panel.shade,
  ...,
  lower.panel = panel,
  upper.panel = panel,
  diag.panel = NULL,
  text.panel = grid_text.panel,
  label.pos = c(0.5, 0.5),
  label.srt = 0,
  cex.labels = "fit",
  dir = "left",
  legend = FALSE,
 col.regions = colorRampPalette(c("red", "salmon", "white", "royalblue", "navy")),
  cor.method = "pearson",
  title = NULL,
  abs = FALSE
)
```

Arguments

x	A data frame or matrix with one observation per row, or a correlation matrix.
type	Use 'data' or 'cor'/'corr' to explicitly specify whether 'x' is raw data or a correlation matrix. Usually this is inferred.
order	Should variables be reordered? Use 'FALSE' for no reordering, 'TRUE' or '"PC"' for PCA-based angular ordering, or '"seriation"' for optimal seriation via the 'cba' package.
labels	Labels to use on the diagonal instead of column names.
panel	Default panel function used for both 'lower.panel' and 'upper.panel'.
...	Additional arguments passed to the panel functions.
lower.panel, upper.panel	Separate panel functions used below and above the diagonal.
diag.panel	Optional panel function used on the diagonal before drawing diagonal labels.
text.panel	Included for API compatibility with [corrgram()]. Diagonal labels are currently drawn with [grid_text.panel()].
label.pos	Horizontal and vertical placement of the diagonal label.
label.srt	Rotation for diagonal labels.
cex.labels	Label size for diagonal labels. Use '"fit"' to size labels to the panel width.
dir	Direction of the main diagonal. Use '"left"' or '"\"' for a descending diagonal, and '"right"' or '"/"' for an ascending diagonal.
legend	If 'TRUE', draw a legend for the color scale.
col.regions	A function returning a vector of colors.
cor.method	Correlation method passed to panel functions. Default is '"pearson"'.
title	Optional title drawn above the correlogram.
abs	Logical; if 'TRUE', use absolute correlations for variable reordering.

Details

This function is a grid-graphics variant of [corrgram()]. It accepts either a data matrix/data frame with one observation per row or a correlation matrix. When raw data are supplied, correlations are computed with 'use = "pairwise.complete.obs"'.

Variable reordering can be used to improve the display by placing related variables near each other. 'order = TRUE' and 'order = "PC"' use the PCA-based angular ordering described by Friendly (2002). 'order = "seriation"' uses 'cba::seriation(..., method = "Optimal")' and requires the 'cba' package.

Value

Invisibly returns 'NULL'.

References

Friendly, Michael. 2002. Corrgrams: Exploratory Displays for Correlation Matrices. *The American Statistician*, 56, 316–324. http://datavis.ca/papers/corrgram.pdf

D. J. Murdoch and E. D. Chow. 1996. A Graphical Display of Large Correlation Matrices. The American Statistician, 50, 178-180.

Examples

```
# Draw a grid-based correlogram from data
vars6 <- setdiff(colnames(auto), c("Model", "Origin"))
corrgram2(auto[vars6], order = TRUE,
    lower.panel = grid_panel.shade,
    upper.panel = grid_panel.pie)

# 'vote' is a correlation matrix
corrgram2(vote, order = TRUE, upper.panel = grid_panel.conf)
```

`levelplot_panel.ellipse` *Panel functions for lattice corrgrams via levelplot*

Description

These functions provide custom panel methods for `lattice::levelplot()`.

Usage

```
levelplot_panel.ellipse(
  x,
  y,
  z,
  subscripts,
  at,
  level = 0.9,
  label = FALSE,
  ...
)

levelplot_panel.pie(x, y, z, subscripts, at = pretty(z), scale = 0.9, ...)
```

Arguments

x	Numeric coordinates from levelplot.
y	Numeric coordinates from levelplot.
z	Correlation values from levelplot.

subscripts	Subscripts for lattice panel. (not used)
at	Breaks for color levels.
level	Confidence level for ellipse (default 0.9).
label	Logical; if TRUE, show correlation values as text.
...	Additional arguments passed to panel functions.
scale	Numeric; scaling factor for pie size (default 0.8).

Details

`levelplot_panel.ellipse` Draws ellipses representing correlation coefficients in the upper triangle of a matrix. Optionally adds numeric labels in the lower triangle.

`levelplot_panel.pie` Draws pie glyphs representing correlation coefficients, omitting the diagonal.

Examples

```
library(lattice)
levelplot(vote, at = do.breaks(c(-1.01, 1.01), 20),
            xlab = NULL, ylab = NULL, colorkey = list(space = "top"),
            scales = list(x = list(rot = 90)),
            panel = levelplot_panel.ellipse, label = TRUE)
levelplot(vote, at = do.breaks(c(-1.01, 1.01), 20),
            xlab = NULL, ylab = NULL, colorkey = list(space = "top"),
            scales = list(x = list(rot = 90)),
            panel = levelplot_panel.pie, label = TRUE)
```

---

splom_panel.pie *Panel functions for lattice corrgrams via splom*

Description

These functions provide custom panel methods for `lattice::splom()`.

Usage

```
splom_panel.pie(
  x,
  y,
  z,
  subscripts,
  at = pretty(z),
  cor.method = "pearson",
  ...
)

splom_panel.shade(
```

```
  x,
  y,
  z,
  subscripts,
  at = pretty(z),
  col.regions = NULL,
  cor.method = "pearson",
  ...
)

splom_panel.ellipse(x, y, col.regions, cor.method = "pearson", ...)
```

Arguments

x	Numeric coordinates from levelplot.
y	Numeric coordinates from levelplot.
z	Correlation values from levelplot.
subscripts	Subscripts for lattice panel. (not used)
at	Breaks for color levels.
cor.method	Correlation method (default "pearson").
...	Additional arguments passed to panel functions.
col.regions	Color palette for shading (default NULL uses internal red white blue palette).

Details

`splom_panel.pie` Draws pie glyphs representing correlation coefficients, omitting the diagonal.

`splom_panel.shade` Draws shaded rectangles with hash lines representing correlation coefficients.

`splom_panel.ellipse` Draws ellipses representing correlation coefficients. The position of the ellipse is determined by the position of the data, and the shape of the ellipse is determined by the correlation.

Examples

```
library(lattice)
pengvars <- c("bill_len", "bill_dep", "flipper_len", "body_mass")
splom(~penguins[ , pengvars], upper.panel=splom_panel.pie, pscales=0)
splom(~penguins[ , pengvars]|penguins$species, upper.panel=splom_panel.pie, pscales=0)
splom(~penguins[ , pengvars], upper.panel=splom_panel.shade, pscales=0)
splom(~penguins[ , pengvars]|penguins$species, upper.panel=splom_panel.shade, pscales=0)
splom(~penguins[ , pengvars], upper.panel=splom_panel.ellipse, pscales=0)
splom(~penguins[ , pengvars]|penguins$species, upper.panel=splom_panel.ellipse, pscales=0)
```

vote *Voting correlations*

Description

Voting correlations

Usage

```
vote
```

Format

A 12x12 matrix.

Details

These are the correlations of traits, where each trait is measured for 17 developed countries (Europe, US, Japan, Australia, New Zealand).

Source

Torben Iversen and David Soskice (2006). Electoral institutions and the politics of coalitions: Why some democracies redistribute more than others. *American Political Science Review*, 100, 165-81. Table A2.

References

Using Graphs Instead of Tables. http://tables2graphs.com/doku.php?id=03_descriptive_statistics

Examples

```
corrgram(vote, order=TRUE)
```

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