

Package ‘prettyGraphs’

May 9, 2026

Type Package

Title Publication-Quality Graphics

Version 2.2.0

Date 2025-03-30

Description Simple and crisp publication-quality graphics for the ExPosition family of packages.
See An ExPosition of the Singular Value Decomposition in R (Beaton et al 2014) <[doi:10.1016/j.csda.2013.11.006](https://doi.org/10.1016/j.csda.2013.11.006)>.

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Encoding UTF-8

BugReports <https://github.com/derekbeaton/ExPosition1/issues>

RoxygenNote 7.3.2

NeedsCompilation no

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Repository CRAN

Date/Publication 2025-04-12 18:50:01 UTC

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add.alpha	<i>add.alpha</i>
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Description

A function to add alpha levels to RGB colors.

Usage

```
add.alpha(col, alpha = 0.65)
```

Arguments

col	color from colors()
alpha	alpha level (between 0 and 1)

Note

This code was created by Markus Gesmann. Derek Beaton included the code in prettyGraphs because it is a versatile function and used in prettyGraphs. See: <https://magesblog.com/post/2013-04-30-how-to-change-alpha-value-of-colours-in/>

Author(s)

Markus Gesmann

contributionBars	<i>contributionBars</i>
------------------	-------------------------

Description

Produces bar charts for multivariate analyses. Plots the contribution to the variance from each data point for upwards of two axes (components).

Usage

```
contributionBars(  
  factor_scores,  
  contributions,  
  x_axis = 1,  
  y_axis = 2,  
  col = NULL,  
  main = NULL,  
  upper = "steelblue4",  
  lower = "firebrick2",
```

```

    threshold = 0,
    sortContributions = TRUE,
    pretty = FALSE,
    show.bg.bars = FALSE
  )

```

Arguments

factor_scores	The factor scores, or x- and y-axis points of a data set.
contributions	The amount of contribution to the variance (between 0-1) by each data point.
x_axis	Which axis is the x-axis? Default is 1.
y_axis	Which axis is the y-axis? Default is 2.
col	A single-column matrix of colors for each data point.
main	A title to be placed at the top of the graph.
upper	The color used to identify the upper bound items that contribute above average variance.
lower	The color used to identify the lower bound items that contribute above average variance.
threshold	A threshold (between 0-1) to draw upper and lower bounds for important items. Default is 1/number of items.
sortContributions	boolean, if TRUE, items will be sorted by contribution. if FALSE, items will appear in their row order.
pretty	a boolean. If FALSE, use the current version. If TRUE, make the bars with prettyBars .
show.bg.bars	a boolean. Only used if pretty is TRUE. If TRUE, background bars are plotted for a fill effect.

Author(s)

Derek Beaton

correlationPlotter *correlationPlotter*

Description

Computes and plots a correlation circle (used in multivariate analyses). Correlation is computed between measured items and components (factors, dimensions, principal axes, etc...).

Usage

```

correlationPlotter(
  data_matrix,
  factor_scores,
  x_axis = 1,
  y_axis = 2,
  col = NULL,
  pch = NULL,
  xlab = "",
  ylab = "",
  main = "",
  axis.lwd = 3,
  circle.lwd = 3,
  circle.col = "#00000040",
  asp = 1,
  dev.new = TRUE
)

```

Arguments

<code>data_matrix</code>	A set of data (i.e., original measures and observations)
<code>factor_scores</code>	One set of factor scores that were computed from the original data matrix.
<code>x_axis</code>	Which axis is the x-axis? Default is 1.
<code>y_axis</code>	Which axis is the y-axis? Default is 2.
<code>col</code>	A single-column matrix of colors for each data point.
<code>pch</code>	A single-column matrix of pch for each data point. Indicates which point style to use for each item. See par .
<code>xlab</code>	A label to be placed along the x-axis.
<code>ylab</code>	A label to be placed along the y-axis.
<code>main</code>	A title to be placed at the top of the graph.
<code>axis.lwd</code>	numeric. Line width for the axes.
<code>circle.lwd</code>	numeric. Line width for the circle.
<code>circle.col</code>	color for the circle
<code>asp</code>	numeric. Aspect ratio (see <code>asp</code> in par).
<code>dev.new</code>	boolean. If TRUE, dev.new is called internally to create new device. If FALSE, a device must already be open.

Author(s)

Derek Beaton

```
createColorVectorsByDesign
      createColorVectorsByDesign
```

Description

Produces a color vector for items by using a design matrix.

Usage

```
createColorVectorsByDesign(design_matrix, hsv = TRUE, offset = NULL)
```

Arguments

`design_matrix` A dummy coded design matrix.

`hsv` a boolean. If TRUE, use [prettyGraphsHSVColorSelection](#). If FALSE, use [prettyGraphsColorSelection](#).

`offset` numeric. An offset value to be passed to [prettyGraphsHSVColorSelection](#) or [prettyGraphsColorSelection](#).

Value

Produces a list with the following items

`oc` The colors of the observations (based on group)

`gc` The colors of the groups

Author(s)

Derek Beaton

```
minmaxHelper      minmaxHelper
```

Description

Computes the x- and y- axis constraints for all prettyGraphs functions.

Usage

```
minmaxHelper(mat1, mat2 = NULL, axis1 = 1, axis2 = 2, findBounds = TRUE)
```

Arguments

<code>mat1</code>	Matrix that will be plotted. Must be at least 2 rows by 2 columns.
<code>mat2</code>	if NULL, <code>mat2=mat1</code> . Second matrix that will be plotted. Must be at least 2 rows by 2 columns.
<code>axis1</code>	Which column of the matrix will be the x-axis? Default = 1.
<code>axis2</code>	Which column of the matrix will be the y-axis? Default = 2.
<code>findBounds</code>	a boolean. If TRUE, min and max values are found for positive and negative on <code>axis1</code> and <code>axis2</code> . If FALSE, one value is used for all constraints.

Value

<code>minMaxList</code>	A list with the following values: <code>minx</code> , <code>miny</code> , <code>maxx</code> , <code>maxy</code>
-------------------------	---

Author(s)

Derek Beaton

Examples

```
data(beavers)
minMaxList <- minmaxHelper(as.matrix(beaver1),as.matrix(beaver1),1,2)
```

`peeledHull`

peeledHull

Description

Computes and plots a peeled hull around a set of points onto a current graphics device.

Usage

```
peeledHull(  
  data_matrix,  
  x_axis = 1,  
  y_axis = 2,  
  percentage = 1,  
  col = "black",  
  lwd = 3,  
  lty = 1  
)
```

Arguments

data_matrix	A set of data you would like to plot on 2 dimensions (e.g., a scatter plot). Can be original data or factor scores or anything with at least 2 columns.
x_axis	Which axis is the x-axis? Default is 1.
y_axis	Which axis is the y-axis? Default is 2.
percentage	The percentage of points that should be enveloped by the hull.
col	The color of the hull (see col in plot()).
lwd	The thickness of the hull line (see lwd in plot())
lty	The line type (see lty in plot()).

Note

The code for this function was (barely) adapted from Michael Greenacre's book on correspondence analysis. All credit for this code should go to Michael Greenacre; I only turned it into a function. The original code can be found at <http://carme-n.org/?sec=code2>

Author(s)

Derek Beaton turned Michael Greenacre's code into a function.

References

Greenacre, M. J. (2007). *Correspondence Analysis in Practice*. Chapman and Hall.

prettyBars

prettyBars

Description

prettyBars creates simple, crisp, publication-style quality bar graphs.

Usage

```
prettyBars(  
  data,  
  axis = 1,  
  cex.names = 0.5,  
  fg.col = NULL,  
  axis.lims = NULL,  
  show.bg.bars = FALSE,  
  threshold.line = FALSE,  
  main = "",  
  bg.border = "white",  
  bg.col = NULL,  
  bg.lims = NULL,
```

```

    sort.data = TRUE,
    horiz = TRUE,
    dev.new = TRUE
)

```

Arguments

<code>data</code>	A set of data you would like to plot with bars for 1 dimension. Can be original data or factor scores or anything with at least 1 column.
<code>axis</code>	which axis (column of data) should be plotted?
<code>cex.names</code>	size of the text
<code>fg.col</code>	a matrix (single column) of colors for bars corresponding to rows of data.
<code>axis.lims</code>	two values in the form of <code>c(min,max)</code> for plot limits. If <code>NULL</code> , the min and max are computed.
<code>show.bg.bars</code>	a set of bars to be plotted under the bars in <code>data</code> . Used for a fill effect.
<code>threshold.line</code>	boolean. If <code>TRUE</code> , a line perpendicular to the bars is plotted. The lines appear at <code>bg.lims</code> .
<code>main</code>	A title to be placed at the top of the graph.
<code>bg.border</code>	color for <code>show.bg.bars</code> borders (see <code>border</code> in barplot)
<code>bg.col</code>	a matrix (single column) of colors for background bars to be plotted under <code>fg.col</code> .
<code>bg.lims</code>	two values in the form of <code>c(min,max)</code> for where to plot background bars or threshold line.
<code>sort.data</code>	a boolean. Will sort the bars by descending values.
<code>horiz</code>	see <code>horiz</code> in barplot .
<code>dev.new</code>	boolean. If <code>TRUE</code> , <code>dev.new</code> is called internally to create new device. If <code>FALSE</code> , a device must already be open.

Value

<code>bp.cols</code>	locations of bars (as would be returned by barplot).
----------------------	---

Author(s)

Derek Beaton

See Also

[barplot](#), [prettyPlot](#)

Examples

```
##stolen from ?barplot
#tN <- table(Ni <- stats::rpois(100, lambda = 5))
#the.colors <- rainbow(length(tN))
#dev.new()
#r <- barplot(tN, col = the.colors)
#prettyBars(as.matrix(tN),axis=1,fg.col=as.matrix(the.colors),horiz=FALSE,dev.new=TRUE)
```

prettyGraphs

prettyGraphs: for publication-quality graphics.

Description

prettyGraphs is a package that produces simple, crisp, publication-quality graphics for multivariate analyses.

Author(s)

Derek Beaton <exposition.software@gmail.com>

References

Three functions were copied/derived for use in prettyGraphs: peeledHull, add.alpha, and repmat.

For peeledHull see:

<http://carme-n.org/?sec=code2>

Greenacre, M. J. (2007). Correspondence Analysis in Practice. *Chapman and Hall*.

For repmat see:

<http://cran.r-project.org/doc/contrib/R-and-octave.txt>

For add.alpha see:

<https://magesblog.com/post/2013-04-30-how-to-change-alpha-value-of-colours-in/>

See Also

[prettyPlot](#) [contributionBars](#) [correlationPlotter](#) [peeledHull](#) [minmaxHelper](#) [repmat](#)

`prettyGraphsColors` *prettyGraphsColors*

Description

A function to return only a subset of R colors used by the `prettyGraphs` package.

Usage

```
prettyGraphsColors()
```

Value

`possibleColors` A list of colors used by `prettyGraphs`

Author(s)

Derek Beaton

`prettyGraphsColorSelection`
Algorithmically select colors from prettyGraphs

Description

This function uses prime numbers to select colors from [prettyGraphsColors](#).

Usage

```
prettyGraphsColorSelection(n.colors = 1, offset = NULL, starting.color = 163)
```

Arguments

`n.colors` number of colors needed

`offset` numeric. Should be a prime number, if it is not, the closest prime is selected. This number decides the distance between indices for color selection.

`starting.color` numeric. This is the starting location (e.g., color) in a matrix of [prettyGraphsColors](#).

Value

`a matrix` a matrix of colors are returned.

Author(s)

Derek Beaton

prime number selection from here:

<http://stackoverflow.com/questions/3789968/generate-a-list-of-primes-in-r-up-to-a-certain-number>

See Also

[prettyGraphsColors](#), [prettyGraphsHSVColorSelection](#)

prettyGraphsHSVColorSelection

Algorithmically select HSV colors.

Description

This function uses an HSV color selection algorithm to create HSV color palletes.

Usage

```
prettyGraphsHSVColorSelection(  
  n.colors = 1,  
  offset = NULL,  
  h = 13,  
  s = 0.75,  
  v = 0.75  
)
```

Arguments

n.colors	number of colors needed
offset	numeric (decimal/percentage). This number decides the distance between indices for color selection. If NULL, the golden ratio is selected.
h	numeric. The initial hue (see hsv).
s	numeric. The initial saturation (see hsv).
v	numeric. The initial value (see hsv).

Value

a matrix a matrix of colors are returned.

Author(s)

Derek Beaton

HSV selection from here:

<http://martin.ankerl.com/2009/12/09/how-to-create-random-colors-programmatically/>

See Also

[prettyGraphsColors](#), [prettyGraphsColorSelection](#)

prettyPlot

prettyPlot

Description

prettyPlot creates simple, crisp, publication-style quality graphics for multivariate analyses.

Usage

```
prettyPlot(  
  data_matrix,  
  x_axis = 1,  
  y_axis = 2,  
  col = NULL,  
  pch = NULL,  
  cex = NULL,  
  text.cex = NULL,  
  pos = 3,  
  xlab = "",  
  ylab = "",  
  main = "",  
  display_names = TRUE,  
  display_points = TRUE,  
  constraints = NULL,  
  contributionCircles = FALSE,  
  contributions = NULL,  
  axes = TRUE,  
  fg.line.width = 3,  
  fg.type = "l",  
  fg.col = "black",  
  bg.line.width = 1.5,  
  bg.lty = 3,  
  bg.col = "black",  
  flip = FALSE,  
  asp = 1,  
  findBounds = TRUE,  
  dev.new = TRUE,  
  new.plot = TRUE  
)
```

Arguments

`data_matrix` A set of data you would like to plot on 2 dimensions (e.g., a scatter plot). Can be original data or factor scores or anything with at least 2 columns.

x_axis	Which axis is the x-axis? Default is 1.
y_axis	Which axis is the y-axis? Default is 2.
col	any acceptable color format. A single-column matrix of colors for each data point. A single value can be used.
pch	A single-column matrix of pch for each data point. A single value can be used. Indicates which point style to use for each item. See par .
cex	a single column of continuous values. A single value can be used. Indicates the size of the points. See par . Used multiplicatively for points with contributions.
text.cex	A replacement for the cex parameter in text() (to avoid collisions with cex). Used additively for points with contributions. See par and text .
pos	integer between 1-4. Determines position of text for points. See par .
xlab	A label to be placed along the x-axis.
ylab	A label to be placed along the y-axis.
main	A title to be placed at the top of the graph.
display_names	boolean. If TRUE, the names of the points will be displayed on the plot.
display_points	boolean. If TRUE, the points will be displayed on the plot.
constraints	A list that contains the plot constraints. Default is NULL (constraints are computed each time).
contributionCircles	boolean. If TRUE, items plotted will vary in size, dependent on amount of contribution to the variance.
contributions	A matrix of contribution values for data_matrix (should also be the same size & dimensionality as data_matrix)
axes	boolean. If TRUE, a new set of axes are plotted.
fg.line.width	integer. Determines thickness of foreground (default: solid) axis lines, see points and lwd under par .
fg.type	character or string Determines type of points for foreground (default: solid) axis lines, see points and type under par .
fg.col	any acceptable color format. Determines color for foreground (default: solid) axis lines, see points and col under par .
bg.line.width	integer. Determines thickness of background (default: dashed) axis lines, see abline and lwd under par .
bg.lty	integer. Determines type of background (default: dashed) axis lines, see abline and lty under par .
bg.col	any acceptable color format. Determines color of background (default: dashed) axis lines, see abline and col under par .
flip	boolean. If TRUE, exchanges bg and col for all applicable pch values.
asp	numeric. Aspect ratio, see par .
findBounds	boolean. If TRUE, finds the min and max of each plotted axes. If FALSE, the largest value is used for all constraints.
dev.new	boolean. If TRUE, dev.new is called internally to create new device. If FALSE, a device must already be open.
new.plot	boolean. If TRUE, plot is called for a new plot on the current device. If FALSE, items will be overlaid much like points .

Details

All items after contributions (i.e., axes onward) are parameters for very fine-grained detail. They are quite powerful but in most cases not required.

Value

Returns a three item list:

col	A matrix of colors where each element is the color for each item plotted.
pch	A matrix of pch values where each element is the pch number for each item plotted.
constraints	A list (from <code>minmaxHelper</code>) of the plot constraints (i.e., min and max for axes)

Author(s)

Derek Beaton

prettyScree	<i>prettyScree</i>
-------------	--------------------

Description

prettyScree creates simple, crisp, publication-style scree plots and “tests” for SVD-based analyses.

Usage

```
prettyScree(
  eigs,
  retain.col = "mediumorchid4",
  dismiss.col = "gray",
  perc.exp = 1,
  n.comps = NULL,
  broken.stick = TRUE,
  kaiser = TRUE,
  main = ""
)
```

Arguments

eigs	a vector of <i>positive</i> eigenvalues.
retain.col	a color for components that are kept.
dismiss.col	a color for components that are dismissed.
perc.exp	a value between 0 and 1. Used to retain components that explain <code>perc.exp * 100</code> variance. Note: <code>perc.exp</code> retains <code>cumsum(explained variance) < (perc.exp * 100) + 1</code> component.

<code>n.comps</code>	a value between 1 and <code>length(eigs)</code> . Used to retain <code>n.comps</code> number of components.
<code>broken.stick</code>	a boolean. If TRUE (default), the broken-stick test is performed (see details).
<code>kaiser</code>	a boolean. If TRUE (default), all components with eigenvalues greater than the <code>mean(eigs)</code> are retained.
<code>main</code>	A title to be placed at the top of the graph.

Details

prettyScree visualizes the distribution of eigenvalues/explained variance from SVD-based analyses. Further, prettyScree performs several rudimentary “tests”. Two rudimentary criteria are implemented: 1) user selected explained variance, and 2) user selected number of components. Additionally, two rudimentary “tests” are implemented: 1) the “broken-stick” distribution of variance model, and 2) the “Kaiser criterion” where all components that explain more variance than the mean are kept.

prettyScree colors components that “pass” all selected tests with `retain.col`. Any components that do not pass tests are colored by a more transparent version of `retain.col`. Components that do not meet any criteria for retention are colored by `dismiss.col`.

prettyScree should be considered “under development” as of 12.09.2013. The function works, but we will be adding more features in the near future.

Value

<code>comps.tests</code>	a matrix with boolean values. Rows indicate which criteria are used, and columns correspond to components. If TRUE, a component is considered “retained” by that test/criteria. If FALSE, the component is “dismissed” according to that test/criteria.
--------------------------	---

Note

A private function (`add.alpha`) was copied from <http://lamages.blogspot.com/2013/04/how-to-change-alpha-value-of-colours-in.html>

Author(s)

Derek Beaton

References

Cangelosi, R., & Goriely, A. (2007). Component retention in principal component analysis with application to cDNA microarray data. *Biology direct*, 2(2), 1–21.

Peres-Neto, P. R., Jackson, D. A., & Somers, K. M. (2005). How many principal components? Stopping rules for determining the number of non-trivial axes revisited. *Computational Statistics & Data Analysis*, 49(4), 974–997.

See Also

Also see (some of) the other packages that perform a wide array of SVD-based analyses: `ExPosition`, `FactoMineR`, `ca`, `ade4`

Examples

```
prcomp.res <- prcomp(USArrests, scale = TRUE)
prettyScree(prcomp.res$sdev^2)
##or
princomp.res <- princomp(USArrests, cor = TRUE)
prettyScree(princomp.res$sdev^2)
```

repmat

repmat

Description

A function to match repmat in Matlab (Mathworks, Natick, MA)

Usage

```
repmat(a, n, m)
```

Arguments

a	Matrix or vector to repeat.
n	Number of row repetitions.
m	Number of column repetitions.

Note

This code was created by Robin Hankin. Derek Beaton included the code in `prettyGraphs` because it is a versatile function and used in `prettyGraphs`.

Author(s)

Robin Hankin.

References

For repmat see:
<http://cran.r-project.org/doc/contrib/R-and-octave.txt>

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