Package 'CircularBoxplots'

May 13, 2026

Title Grouped Boxplots for Circular Data

Version 0.1.2

Description Plotting functions to create circular boxplots for grouped data. The primary 2-dimensional version creates concentric circular boxplots for specified groups, scaling the width of each boxplot to adjust for human perception. The 3-dimensional version maps these plots onto a torus which is suitable for periodic circular data such as wind direction over the course of a year. An example dataset of this type is provided for reference. For examples of circular boxplots and additional implementation details, see Berlinski et al. (2026) <doi:10.48550/arXiv.2602.05335>.

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Encoding UTF-8

RoxygenNote 7.3.3

Imports circular, plotrix, rgl, RColorBrewer, plot3D, grDevices

NeedsCompilation no

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Depends R (>= 3.5.0)

Repository CRAN

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Contents

deota *Phases of clock genes*

Description

Data from an experiment performed on mice to determine compare the peak phase times of circadian clock genes under ad-libitum and time-restricted feeding regimines. The two imported data frames are `alf` and `trf` corresponding to ad-libitum and time-restricted results, respectively. The observations are measured in degrees, corresponding to time on a 24-hour zeigeber time clock cycle.

Usage

```
data(deota)
```

Format

An object of class `list` of length 2.

Source

doi:10.1016/j.cmet.2022.12.006

References

Deota S, Lin T, Chaix A, Williams A, Le H, Calligara H, Ramasamy R, Huang L, Panda S (2023) Diurnal transcriptome landscape of a multi-tissue response to time-restricted feeding in mammals. Cell Metabolism 35(1):150-164.e4

GroupedCircularBoxplot *Create grouped circular boxplot*

Description

Given a named list of circular objects, create a grouped circular boxplot.

Usage

```
GroupedCircularBoxplot(
  data_in,
  template = "degrees",
  place = "none",
  units = "degrees",
  marg = "large",
  shrink = 1,
  H = FALSE,
```

```
  stack = FALSE,
  constant = "optimal",
  rad_shift = 0.25,
  lwd = 1,
  plot_cols = RColorBrewer::brewer.pal(8, "Set2"),
  line_cols = RColorBrewer::brewer.pal(8, "Dark2"),
  arrow_cols = line_cols,
  legend_pos = "topleft",
  legend_title = NULL,
  draw_arrow = TRUE,
  ordinal = FALSE,
  template_options = NULL,
  minimal = FALSE,
  scale_widths = FALSE,
  arrow_width = lwd,
  center_point = FALSE,
  cex = 0.5,
  mex = 1
)
```

Arguments

data_in	List of circular objects to be plotted
template	One of "degrees", "radians", "geographics", or NULL
place	If template is NULL, either "outside" or "inside" denoting where the axis should be drawn
units	If template is NULL, units to use on the drawn axis
marg	character specifying the plot region as either "large" (default) or "small".
shrink	Numeric specifying the factor by which to scale the plot. Numbers less than 1 will increase the size.
H	Logical indicating if each data point should be drawn outside the hinges of the boxplot
stack	Logical indicating if drawn points should be stacked
constant	Numeric specifying the multiplicative factor determining how far whiskers extend from box. A value of "optimal" will choose values based on a von Mises distribution (see Buttarazzi et al. 2018)
rad_shift	Scalar indicating the distance between each boxplot
lwd	Scalar indicating the width of boxplot lines, also impacts other lines, relatively
plot_cols	Vector with the same length as data_in, specifying the color of the boxplot
line_cols	Vector with the same length as data_in, specifying the color of the median lines
arrow_cols	Vector with the same length as data_in, specifying the color of the arrows pointing to the medians. Default value is the same as line_cols
legend_pos	String indicating where the legend should be drawn, or "none" for no legend
legend_title	String indicating legend for title, if necessary

draw_arrow	Logical specifying if arrows pointing to each median should be drawn
ordinal	Logical, if template is NULL and units is "geographics", should the ordinal directions also be drawn?
template_options	If template is "custom", a list containing named elements "ax_labels", "lab_coord", "shift", and "gridlines." ax_labels is a character vector of axis labels to be plotted at the locations lab_coord, a numeric vector in degrees counterclockwise starting from 0. shift is a numeric value that controls how far outside the last boxplot the axis should be drawn, and gridlines is a logical indicating if dashed lines should be drawn at the specified axis labels.
minimal	Logical. If true, a simple colored line and point will replace the box and median line. Radial lines at fence points will also not be drawn
scale_widths	Logical, should the width of each boxplot be scaled based on (the square root of) it's distance from the center?
arrow_width	Numeric controlling the width of the arrow drawn pointing to each median. Defaults to lwd.
center_point	Logical, should a point be drawn at the center of the grouped circular boxplot
cex	numerical, the size of the plotting character, also adjusts other characters relatively
mex	numerical, the size of the character in the margins.

Value

A list of lists containing the circular median, hinges, and whiskers for each of the groups in the dataset, invisibly.

Author(s)

Josh Berlinski

Davide Buttarazzi

Examples

```
library(circular)
set.seed(123)
data <- list(
    x = rvonmises(100, circular(pi), 5),
    y = rvonmises(100, circular(pi/2), 2.5),
    z = rvonmises(100, circular(7*pi/4), 8)
)
GroupedCircularBoxplot(data)
```

GroupedCircularBoxplot.3D *Create grouped circular boxplots around the 3D torus surface.*

Description

Given a named list of circular objects, create a grouped circular boxplot.

Usage

```
GroupedCircularBoxplot.3D(
  data_in,
  template = "degrees",
  marg = "large",
  shrink = 1,
  H = FALSE,
  constant = "optimal",
  lwd = 2,
  plot_cols = RColorBrewer::brewer.pal(8, "Set2"),
  line_cols = RColorBrewer::brewer.pal(8, "Dark2"),
  arrow_cols = line_cols,
  draw_arrow = TRUE,
  minimal = FALSE,
  scale_widths = FALSE
)
```

Arguments

data_in	List of circular objects to be plotted
template	One of "degrees" (default), "radians" and "geographics" with eight directions
marg	character specifying the baseline 2D circle region as either "large" (default) or "small"
shrink	Numeric specifying the factor by which to scale the baseline circular plot. Numbers less than 1 will increase the size.
H	Logical indicating if each data point should be drawn outside the hinges of the boxplot
constant	Numeric specifying the multiplicative factor determining how far whiskers extend from box. A value of "optimal" will choose values based on a von Mises distribution (see Buttarazzi et al. 2018)
lwd	Scalar indicating the width of the quartile boxplot lines if minimal = TRUE
plot_cols	Vector with the same length as data_in, specifying the color of the boxplot
line_cols	Vector with the same length as data_in, specifying the color of the median lines
arrow_cols	Vector with the same length as data_in, specifying the color of the arrows pointing to the medians. Default value is the same as line_cols

draw_arrow	Logical specifying if arrows pointing to each median should be drawn
minimal	Logical. If true, a quartile boxplot is created with simple colored line and point will replace the box and median line. Radial lines at fence points will also not be drawn
scale_widths	Logical, should the width of each boxplot be scaled based on (the square root of) it's distance from the center?

Value

A list of lists containing the circular median, hinges, and whiskers for each of the groups in the dataset, invisibly.

Author(s)

Josh Berlinski

Fan Dai

Examples

```
library(circular)
set.seed(123)
data <- list(
    x = rvonmises(100, circular(pi), 5),
    y = rvonmises(100, circular(pi/2), 2.5),
    z = rvonmises(100, circular(7*pi/4), 8)
)
GroupedCircularBoxplot.3D(data)
```

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wind_direction *Wind direction*

Description

Measurements of wind direction from Ames, Iowa, USA and Jamshedpur, India. Data were obtained for over the entire 2023 year. The list contains two data frames, `AMW` and `VEJS`, corresponding to Ames and Jamshedpur, respectively. The Ames data were collected every five minutes, while the Jamshedpur data are hourly.

Usage

```
data(wind_direction)
```

Format

An object of class `list` of length 2.

Details

Each datframe contains three columns, the first corresponding to the code of the weather station `name`, the second `valid` which contains the time the mesurement was taken, and `drct`, which is the direction from which the wind was measured in degrees from true north, clockwise.

Note that a direction of 0 degrees indicates no measurable wind, and thus does not contain useful information on the wind direction. A value of 360 degrees corresponds to true north.

Source

Iowa State University's Iowa Environmental Mesonet https://mesonet.agron.iastate.edu/

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