Package 'plotpc'

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Title Plot Principal Component Histograms Around a Scatter Plot

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Depends grid

Description Plot principal component histograms around a bivariate scatter plot.

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R topics documented:

`plotld` *Plot principal component loadings*

Description

Plot principal component loadings.

Usage

```
plotld(x, npc=3, main="Loadings", lty=1, lwd=4 / 1:npc,
    col=gray(0:(npc-1) / npc), ylim=range(loadings), abs.=FALSE,
    cex=.8, ylab=if(abs.) "abs(loading)" else "loading",
    legend.x=NULL, legend.y=NULL)
```

Arguments

x	A matrix or dataframe, passed directly to princomp.
npc	Number of principal components to plot. Default 3.
main	Plot title. Default "Loadings".
lty	Line type for for plotted lines. Default 1.
lwd	Line width of plotted lines. The default is ugly but effective: 4 / 1:npc.
col	Color of plotted lines. Default is a range of grays: gray(0:(npc-1) / npc).
ylim	Vertical limits of the graph. Default range(loadings).
abs.	Use absolute values of loadings. Default FALSE.
cex	Character expansion for axis and legend text. Default .8.
ylab	Default "loading".
legend.x, legend.y	Position of the legend. Default NULL, meaning automatic. For no legend, use an out-of-range legend.x or legend.y.

See Also

princomp, plotpc

Examples

```
data(iris)
x <- iris[, -5] # -5 to drop Species
plotld(x)
```

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plotpc *Plot principal component histograms around a scatter plot*

Description

Plot principal component histograms around the scatter plot of two variables. Mostly useful as a tool for teaching principal components.

Usage

```
plotpc(x,
    xrange=NULL,
    hist=TRUE,
    main="Principal components",
    xlab=NULL,
    ylab=NULL,
    gp.points=gpar(cex=.6),
    pch=20,
    height=xrange/10,
```

```
        breaks="Sturges",
        adjust=1,
        gp.hist=if(hist) gp.hist <- gpar(col="gray", fill="gray")
                else     gp.hist <- gpar(col="black"),
        gp.text=gpar(cex=.8, font=2),
        gp.axis=gpar(col="gray", lwd=2),
        sd.ellipse=NA,
        gp.ellipse=gpar(col="gray", lwd=2),
        heightx=NULL, breaksx=NULL, adjustx=NULL, gp.histx=NULL,
                      textx="", gp.textx=NULL, axis.lenx=0, gp.axisx=NULL,
        heighty=NULL, breaksy=NULL, adjusty=NULL, gp.histy=NULL,
                      texty="", gp.texty=NULL, axis.leny=0, gp.axisy=NULL,
        height1=NULL, flip1=FALSE,
                      breaks1=NULL, adjust1=NULL, gp.hist1=NULL, offset1=NULL,
                      text1=NULL, gp.text1=NULL, axis.len1=2, gp.axis1=NULL,
        height2=NULL, flip2=FALSE,
                      breaks2=NULL, adjust2=NULL, gp.hist2=NULL, offset2=NULL,
                      text2=NULL, gp.text2=NULL, axis.len2=2, gp.axis2=NULL,
        angle3=NA, height3=NULL, flip3=FALSE,
                      breaks3=NULL, adjust3=NULL, gp.hist3=NULL, offset3=NULL,
                      text3=NULL, gp.text3=NULL, axis.len3=0, gp.axis3=NULL,
        angle4=NA, height4=NULL, flip4=FALSE,
                      breaks4=NULL, adjust4=NULL, gp.hist4=NULL, offset4=NULL,
                      text4=NULL, gp.text4=NULL, axis.len4=0, gp.axis4=NULL,
        angle5=NA, height5=NULL, flip5=FALSE,
                      breaks5=NULL, adjust5=NULL, gp.hist5=NULL, offset5=NULL,
                      text5=NULL, gp.text5=NULL, axis.len5=0, gp.axis5=NULL,
        angle6=NA, height6=NULL, flip6=FALSE,
                      breaks6=NULL, adjust6=NULL, gp.hist6=NULL, offset6=NULL,
                      text6=NULL, gp.text6=NULL, axis.len6=0, gp.axis6=NULL,
        angle7=NA, height7=NULL, flip7=FALSE,
                      breaks7=NULL, adjust7=NULL, gp.hist7=NULL, offset7=NULL,
                      text7=NULL, gp.text7=NULL, axis.len7=0, gp.axis7=NULL,
        yonx = FALSE, offset.yonx=-xrange/2.5,
                      text.yonx="y~x", gp.text.yonx=NULL,
                      axis.len.yonx=xrange/2.5, gp.axis.yonx=gpar(col=1),
        xony = FALSE, offset.xony=-xrange/2.5,
                      text.xony="x~y", gp.text.xony=NULL,
                      axis.len.xony=xrange/2.5, gp.axis.xony=gpar(col=1))
```

Arguments

Many users will find that they need only the first argument.
Use the `xrange` argument to add whitespace around the histograms.
Set `hist=FALSE` to plot densities rather than histograms.
Use `heightx` and the height arguments to adjust the height of histograms or to remove histograms from the plot.
Use `offset1` and the other offset arguments to adjust the positions of the histograms relative to the center of the graph.

Use angle1 and the other angle arguments to add extra histograms to the plot at arbitrary angles.
Use yonx and xony to add linear regression lines to the plot.

A two column matrix or dataframe. The principal components of the x will be calculated treating each column as a variable.

hist — Default TRUE to plot histograms. Set to FALSE to plot densities instead. The various "histogram" arguments will then apply to densities rather than to histograms.

xrange — The range of the x axis. That is, xlim will be c(mean(x[,1]) - xrange/2, mean(x[,1]) + xrange/2), and ylim will have the same range about mean(x[,2]). Default NULL, meaning automatically deduce axis limits from the x argument.

main — Main title. Default "Principal components".

xlab — x axis label. Default NULL, meaning create the label automatically from the column names of x.

ylab — y axis label. Default NULL, meaning create the label automatically from the column names of x.

gp.points — Graphic parameters for the plotted points. Default gpar(cex=.6).

pch — Plot character for the plotted points. Default 20.

The following arguments apply to all histograms. These can be overridden by using the histogram-specific argument e.g. override the height argument for the first principal component by specifying height1.

height — Height of histograms. Default xrange/10. Use a negative height to flip a histogram around its base.

breaks — Passed on to hist. Default "Sturges". Using something like breaks=12 can be useful.

adjust — Passed on to density. Default 1. Use something like adjust=.5 for more details in the density plots.

gp.hist — Graphic parameters for the histograms or densities.
If hist==TRUE then the default is gpar(col="gray", fill="gray") where col is the color of the lines delineating the histograms, and fill is the color filling the histograms.
If hist==FALSE then the default is gpar(col="black").

gp.axis — Graphic parameters for the axis drawn through the scatter of points. Default gpar(col="gray", lwd=2) meaning draw the axes as thickish gray lines.

sd.ellipse — If greater than 0, draw a confidence ellipse for the principal components at sd.ellipse standard deviations. Default is NA, meaning do not draw an ellipse.

gp.ellipse — Graphic parameters for the ellipse. Default gpar(col="gray", lwd=2).

gp.text — Graphic parameters for text above the histograms. Default gpar(cex=.8, font=2).

The following arguments apply to the histogram on the x axis.

heightx — Default NULL, meaning use height. Use 0 to not plot the x histogram.

breaksx — Default NULL, meaning use breaks.

adjustx — Default NULL, meaning use adjust.

gp.histx — Default NULL, meaning use gp.hist.

textx — Text drawn above the histogram. Default "", meaning no text. The text is drawn using gp.textx.

gp.textx — Graphic parameters for the text above the histogram. Default NULL, meaning use gp.text.

axis.lenx — Length of horizontal line drawn through the center of the points. Units are standard deviations of x[,1]. Default 0, meaning do not plot a horizontal axis.

gp.axisx — Default NULL, meaning use gp.axis.

heighty, breaksy, adjusty, gp.histy, texty, gp.texty, axis.leny, gp.axisy
As above but for the histogram on the y axis.

The following arguments apply to the first principal component.

height1 — Default NULL, meaning use height. Use 0 to not plot the histogram for the first principal component.

flip1 — Flip the position of the histogram around the axis of the first principal component. Default FALSE, meaning do not flip.

breaks1 — Default NULL, meaning use breaks.

adjust1 — Default NULL, meaning use adjust.

gp.hist1 — Default NULL, meaning use gp.hist.

offset1 — Distance of the histogram plot from the center of the graph, in native units. Default NULL, meaning automatic.

text1 — Text drawn above the histogram. Default NULL, meaning generate the text automatically. Use "" for no text. The text is drawn using gp.text1.

gp.text1 — Graphic parameters for the text above the histogram. Default NULL, meaning use gp.text.

axis.len1 — Length of line drawn along the first principal axis. Units are standard deviations of the points projected onto that axis. Default 2, meaning draw a line of length plus and minus two standard deviations. Use 0 for no axis.

gp.axis1 — Default NULL, meaning use gp.axis.

height2, flip2, breaks2, adjust2, gp.hist2, offset2, text2, gp.text2, axis.len2, gp.axis2
: As above but for the second principal component.

The following arguments apply to the optional histogram at angle3. By default, angle3=NA, meaning do not plot the histogram. Use, say, angle3=45 to plot a histogram at 45 degrees. By setting angle3 to angle7 you can plot up to five extra histograms at any angles.

angle3
: Default NA, meaning do not plot a histogram. Use, say, angle3=45 to plot a histogram at 45 degrees.

height3
: Default NULL, meaning use height.

flip3
: Default FALSE.

breaks3
: Default NULL, meaning use breaks.

adjust3
: Default NULL, meaning use adjust.

gp.hist3
: Default NULL, meaning use gp.hist.

offset3
: Default NULL, meaning automatic.

text3
: Default NULL, meaning automatic.

gp.text3
: Default NULL, meaning use gp.text.

axis.len3
: Length of axis drawn at angle3 through the scatter of points. Default 0, meaning do not plot the axis.

gp.axis3
: Default NULL, meaning use gp.axis.

angle4, height4, flip4, breaks4, adjust4, gp.hist4, offset4, text4, gp.text4, axis.len4, gp.axis4
: As above but for the angle4 histogram.

angle5, height5, flip5, breaks5, adjust5, gp.hist5, offset5, text5, gp.text5, axis.len5, gp.axis5
: As above but for the angle5 histogram.

`angle6, height6, flip6, breaks6, adjust6, gp.hist6, offset6, text6, gp.text6, axis.len6, gp.axis6`
: As above but for the `angle6` histogram.

`angle7, height7, flip7, breaks7, adjust7, gp.hist7, offset7, text7, gp.text7, axis.len7, gp.axis7`
: As above but for the `angle7` histogram.

The following arguments apply to the optional "y on x" regression line.

`yonx`
: TRUE to plot a "y on x" linear regression line. Default FALSE.

`offset.yonx`
: Position of text plotted on regression line. Default `-xrange/2.5`.

`text.yonx`
: Text plotted on the regression line. Default `"y~x"`.

`gp.text.yonx`
: Graphic parameters for the text plotted on the regression line. Default `NULL`, meaning use `gp.text`.

`axis.len.yonx`
: Length of regression line in `gpar` `"native"` units. Default `-xrange/2.5`.

`gp.axis.yonx`
: Graphic parameters for the regression line. Default `gpar(col=1)`.

`xony, offset.xony, text.xony, gp.text.xony, axis.len.xony, gp.axis.xony`
: As above but for a "x on y" regression.

Value

Invisibly returns the `viewport` used to create the `plotpc` axes. This allows you to add text using the `"native"` coordinates of the plot. See the examples below.

Note

Here is how to draw scatter plots for all pairs of principal components:

```
data(iris)
pc <- princomp(iris[, -5]) # -5 to drop Species
pairs(pc$scores, col=c(2,3,4)[unclass(iris$Species)])
```

Author(s)

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See Also

plotld, princomp, hist, density,

Examples

```
data(iris)
x <- iris[,c(3,4)] # select Petal.Length and Petal.Width
plotpc(x, main="Example 1\n")

# example with some parameters and showing densities
plotpc(x,
       main="Example 2:\nPrincipal component densities\n",
       hist=FALSE,                    # plot densities not histograms
       adjust=.5,                     # finer resolution in the density plots
       gp.axis=gpar(lty=3),           # gpar of axes
       heightx=0,                     # don't display x histogram
       heighty=0,                     # don't display y histogram
       text1="Principal Component 1", # text above hist for 1st principal component
       text2="Principal Component 2", # text above hist for 2nd principal component
       axis.len2=4,                   # length of 2nd principal axis (in std devs)
       offset1=2.5,                   # offset of component 1 density plot
       offset2=5)                     # offset of component 2 density plot

# example using "angles"
vp <- plotpc(x,
       main="Example 3:\nProjections\n",
       xrange=25,      # give ourselves some space
       heightx=0,      # don't display x histogram
       heighty=0,      # don't display y histogram
       angle3=-60,     # project at -60 degrees
       angle4=-25,     # project at -25 degrees
       angle5=20,      # project at 20 degrees
       angle6=70)      # project at 70 degrees

# add text to the graph, can use native coords
pushViewport(vp)
grid.text("Projections at\nvarious angles",
          x=unit(10, "native"), y=unit(12.5, "native"),
          gp=gpar(col="red"))
popViewport()

# example showing principal axes
x <- iris[iris$Species=="versicolor",c(3,4)]
vp <- plotpc(x,
       main="Example 4:\nPrincipal axes with confidence ellipse\n",
       sd.ellipse=2,                      # ellipse at two standard devs
       heightx=0, heighty=0, height1=0, height2=0, # no histograms
       gp.ellipse=gpar(col=1),            # ellipse in black
       axis.lenx=4, axis.leny=5,          # lengthen horiz and vertical axes
       axis.len1=4, gp.axis1=gpar(col=1),  # lengthen pc1 axis, draw in black
       axis.len2=8, gp.axis2=gpar(col=1))  # lengthen pc2 axis, draw in black
```

```
pushViewport(vp) # add text to the graph
un <- function(x) unit(x, "native")
grid.text("PC1", x=un(2.2), y=un(.6),   gp=gpar(cex=.8, font=2))
grid.text("PC2", x=un(3.9), y=un(2.35), gp=gpar(cex=.8, font=2))
grid.text("X1",  x=un(2.2), y=un(1.4),  gp=gpar(cex=.8, font=2))
grid.text("X2",  x=un(4.3), y=un(2.5),  gp=gpar(cex=.8, font=2))
popViewport()

# example comparing linear regression to principal axis
x <- iris[iris$Species=="setosa",c(3,4)]
vp <- plotpc(x,
       main="Example 5:\nRegression lines and\nfirst principal component",
       heightx=0, heighty=0, height1=0, height2=0, # no histograms
       gp.points=gpar(col="steelblue"),      # color of points
       axis.len1=4,  gp.axis1=gpar(col="gray", lwd=3),
       axis.len2=.15, gp.axis2=gpar(col=1),  # just a little blip of an axis
       yonx=TRUE, xony=TRUE)                 # display regression lines

pushViewport(vp) # add text to the principal component line
grid.text("PC1", x=unit(.8, "native"), y=unit(0, "native"),
          gp=gpar(col="gray", cex=.8, font=2))
popViewport()
```

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