Package `plotpc`

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Title Plot Principal Component Histograms Around a Scatter Plot
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Description Plot principal component histograms around a bivariate scatter plot.
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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 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

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

---

**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

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

```r
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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http://www.milbo.users.sonic.net.
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
")

# example with some parameters and showing densities
plotpc(x,
  main="Example 2:
Principal 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.lenx=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:
Projections\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:
Principal 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: Regression lines and first 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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