Package ‘heatmap3’

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Description

The function colByValue convert the values in matrix into colors

Usage

colByValue(x, col, range = NA, breaks = NA, cex.axis = 2, las = 1,
...)

Arguments

x      matrix with values.
col    a list of colors such as that generated by rainbow, heat.colors, topo.colors, terrain.colors or similar functions.
range  the range of x. values out of the range will be changed to the max or min value of the range.
breaks either a numeric vector of two or more unique cut points or a single number (greater than or equal to 2) giving the number of intervals into which x is to be cut.
cex.axis The magnification to be used for axis annotation relative to the current setting of cex.
las    numeric in 0,1,2,3; the style of axis labels.
...    additional arguments passed on to image function to generate the color bar.

Value

A matrix with colors.

Examples

temp<-rnorm(1000)
col<-colByValue(temp,col=colorRampPalette(c('chartreuse4','white','firebrick'))(1024),range=c(-2,2))
col<-colByValue(temp,col=colorRampPalette(c('chartreuse4','white','firebrick'))(5),breaks=c(-5,-1,-0.1,0.1,1,5),cex.axis=0.8)
Description

The function heatmap3 is completely compatible with the original R function heatmap, and provides
more new features.

Usage

heatmap3(x, Rowv = NULL, Colv = if (symm) "Rowv" else NULL,
distfun = function(x) as.dist(1 - cor(t(x), use = "pa")), distfunC,
distfunR, balanceColor = F, ColSideLabs, RowSideLabs,
showColDendro = T, showRowDendro = T,
col = colorRampPalette(c("navy", "white", "firebrick3"))(1024),
legendfun, method = "complete", ColAxisColors = 0,
RowAxisColors = 0, hclustfun = hclust, reorderfun = function(d, w)
reorder(d, w), add.expr, symm = FALSE, revC = identical(Colv,
"Rowv"), scale = c("row", "column", "none"), na.rm = TRUE,
ColSideFun, ColSideAnn, ColSideWidth = 0.4, ColSideCut, colorCell,
highlightCell, file = "heatmap3.pdf", topN = NA, filterFun = sd,
returnDistMatrix = FALSE, margins = c(5, 5), ColSideColors,
RowSideColors, cexRow = 0.2 + 1/log10(nrow(x)), cexCol = 0.2 +
1/log10(ncol(x)), lasRow = 2, lasCol = 2, labRow = NULL,
labCol = NULL, main = NULL, xlab = NULL, ylab = NULL,
keep.dendro = FALSE, verbose = getOption("verbose"), useRaster = if
(ncol(x) * nrow(x) >= 50000) TRUE else FALSE, ...)

Arguments

x
numeric matrix of the values to be plotted.

Rowv
determines if and how the row dendrogram should be computed and reordered.
Either a dendrogram or a vector of values used to reorder the row dendrogram
or NA to suppress any row dendrogram (and reordering) or by default, NULL, see
‘Details’ below.

Colv
determines if and how the column dendrogram should be reordered. Has the
same options as the Rowv argument above and additionally when x is a square
matrix, Colv = "Rowv" means that columns should be treated identically to the
rows (and so if there is to be no row dendrogram there will not be a column one
either).

distfun
function used to compute the distance (dissimilarity) between both rows and
columns. Defaults to dist.

distfunC
function used to compute the distance (dissimilarity) between and columns. Will
be the same as distfun if not specified.

distfunR
function used to compute the distance (dissimilarity) between and rows. Will be
the same as distfun if not specified.
balanceColor: logical indicating if the colors need to be balanced so that the median color will represent the 0 value. The default value is F.

ColSideLabs: label for ColSideColors

RowSideLabs: label for RowSideColors

showColDendro: logical indicating if the colour dendrogram should be plotted (when Colv isn’t NA).

showRowDendro: logical indicating if the row dendrogram should be plotted (when Rowv isn’t NA).

col: specifying the colors, used in `image` function.

legendfun: function used to generate legend in top left of the figure. If not specified, the color bar will be plotted. The users can use any plot functions to generate their own legend. Or a function `showLegend` is also provided as an example.

method: the agglomeration method to be used by `hclust` function. This should be (an unambiguous abbreviation of) one of "ward", "single", "complete", "average", "mcquitty", "median" or "centroid".

ColAxisColors: integer indicating which column of ColSideColors will be used as colors for labels in column axis. The default value is 0, which means all column labels will be in black color.

RowAxisColors: integer indicating which column of RowSideColors will be used as colors for labels in row axis. The default value is 0, which means all row labels will be in black color.

hclustfun: function used to compute the hierarchical clustering when Rowv or Colv are not dendrograms. Defaults to `hclust`. Should take as argument a result of `distfun` and return an object to which `as.dendrogram` can be applied.

reorderfun: function(d, w) of dendrogram and weights for reordering the row and column dendrograms. The default uses `reorder.dendrogram`.

add.expr: expression that will be evaluated after the call to `image`. Can be used to add components to the plot.

symm: logical indicating if x should be treated symmetrically; can only be true when x is a square matrix.

revC: logical indicating if the column order should be reversed for plotting, such that e.g., for the symmetric case, the symmetry axis is as usual.

scale: character indicating if the values should be centered and scaled in either the row direction or the column direction, or none. The default is "row" if symm false, and "none" otherwise.

na.rm: logical indicating whether NA’s should be removed.

ColSideFun: function used to generate annotation and labeling figure in column side. The users can use any plot functions to generate their own figure. And a function `showAnn` is also provided as an example.

ColSideAnn: data frame with continuous and factor variables as annotation information. This parameter will be sorted by column dendrogram and then passed to ColSideFun.

ColSideWidth: numeric the height of column side area, which can be used by ColSideFun function.
ColSideCut numeric the value to be used in cutting column dendrogram. The dendrogram and annotation will be divided into different parts and labeled respectively.

colorCell A data.frame with 3 columns, indicating which cells will be colored by specific colors. The first column is row index, second column is column index, and the third column is color.

highlightCell A data.frame with 3 or 4 columns, indicating which cells will be highlighted by rectangles with specific colors. The first column is row index, second column is column index, the third column is color for rectangle border, and the optional forth column is width for rectangle border.

file pdf file name, only works when topN was used.

topN vector a list of numbers. topN genes will be used to generate the heatmaps.

filterFun function used to filter genes, such as sd, mean, sum. It will be used in a apply function to calculate for each row.

returnDistMatrix logical indicating if the distance matrix will be returned

margins numeric vector of length 2 containing the margins (see \texttt{par(mar = *)}) for column and row names, respectively.

ColSideColors (optional) character vector of length \texttt{ncol(x)} containing the color names for a horizontal side bar that may be used to annotate the columns of \texttt{x}.

RowSideColors (optional) character vector of length \texttt{nrow(x)} containing the color names for a vertical side bar that may be used to annotate the rows of \texttt{x}.

cexRow, cexCol positive numbers, used as cex.axis in for the row or column axis labeling. The defaults currently only use number of rows or columns, respectively.

lasRow, lasCol the style of row or column axis labels.

labRow, labCol character vectors with row and column labels to use; these default to rownames(\texttt{x}) or colnames(\texttt{x}), respectively.

main, xlab, ylab main, x- and y-axis titles; defaults to none.

keep.dendro logical indicating if the dendrogram(s) should be kept as part of the result (when Rowv and/or Colv are not NA).

verbose logical indicating if information should be printed.

useRaster logical; if TRUE a bitmap raster is used to plot the image instead of polygons. The grid must be regular in that case, otherwise an error is raised.

... additional arguments passed on to \texttt{image}.

Value

The same return value as \texttt{hclust} function.

Examples

#generate data
set.seed(123456789)
rnormData<-matrix(rnorm(1000), 40, 25)
```r
rnormData[1:15, seq(6, 25, 2)] = rnormData[1:15, seq(6, 25, 2)] + 2
rnormData[16:40, seq(7, 25, 2)] = rnormData[16:40, seq(7, 25, 2)] + 4
colnames(rnormData)<-c(paste("Control", 1:5, sep = ""), paste(c("TrtA", "TrtB"), rep(1:10,each=2), sep = ""))
rownames(rnormData)<-paste("Probe", 1:40, sep = "")
ColSideColors<-cbind(Group1=c(rep("steelblue2",5), rep(c("brown1", "mediumpurple2"),10)),
                     Group2=sample(c("steelblue2","brown1", "mediumpurple2"),25,replace=TRUE))
colorCell<-data.frame(row=c(1,3,5),col=c(2,4,6),color=c("green4","black","orange2"),
                        stringsAsFactors=FALSE)
highlightCell<-data.frame(row=c(2,4,6),col=c(1,3,5),color=c("black","green4","orange2"),
                          lwd=1:3,stringsAsFactors=FALSE)
#A simple example
heatmap3(rnormData,ColSideColors=ColSideColors,showRowDendro=FALSE,colorCell=colorCell,
         highlightCell=highlightCell)
#A more detail example
ColSideAnn<-data.frame(Information=rnorm(25),Group=c(rep("Control",5), rep(c("TrtA","TrtB"),10)),
                       stringsAsFactors=TRUE)
row.names(ColSideAnn)<-colnames(rnormData)
RowSideColors<-colorRampPalette(c("chartreuse4", "white", "firebrick"))(40)
result<-heatmap3(rnormData,ColSideCut=1.2,ColSideAnn=ColSideAnn,ColSideFun=function(x)
                 showAnn(x),ColSideWidth=0.8,RowSideColors=RowSideColors,col=colorRampPalette(c("green",
                        "black", "red"))(1024),RowAxisColors=1,legendfun=function() showLegend(legend=c("Low",
                        "High"),col=c("chartreuse4","firebrick")),verbose=TRUE)
#annotations distribution in different clusters and the result of statistic tests
result$cutTable
```

### Description

The function `showAnn` is an example for generating annotation figure in the result of heatmap3 function. You can use your any plot functions to generate your own annotation figure.

### Usage

```
showAnn(annData)
```

### Arguments

- **annData**: a data frame contains the annotation information for samples. It can only contain factor or numeric variables, and each row represent a sample with the same order of the columns in expression matrix.

### Examples

```
annData<-data.frame(mtcars[,c("mpg","am","wt","gear")])
annData[,2]<-as.factor(annData[,2])
annData[,4]<-as.factor(annData[,4])
#Display annotation
```
showLegend

```
## Not run:
showAnn(annData)

## End(Not run)

#Heatmap with annotation
heatmap3(t(mtcars),ColSideAnn=annData,ColSideFun=function(x)
  showAnn(x),ColSideWidth=1.2,balanceColor=TRUE)
```

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**Description**

The function showLegend is an example for generating legend in the figure of heatmap3 function. You can use your any plot functions to generate your own legend.

**Usage**

```
showLegend(legend = c("Group A", "Group B"), lwd = 3, cex = 1.1,
col = c("red", "blue"), ...)
```

**Arguments**

- `legend` a character or expression vector of length ≥ 1 to appear in the legend. Other objects will be coerced by `as.graphicsAnnot`.
- `lwd` the line widths for lines appearing in the legend.
- `cex` character expansion factor relative to current `par("cex")`. Used for text, and provides the default for `pt.cex`.
- `col` the color of points or lines appearing in the legend.
- `...` additional arguments passed on to `legend`

**Examples**

```
RowSideColors<-rep("steelblue2",nrow(mtcars))
RowSideColors[c(4:6,15:17,22:26,29)]<"lightgoldenrod"
RowSideColors[c(1:3,19:21)]<"brown1"
heatmap3(mtcars,scale="col",margins=c(2,10),RowSideColors=RowSideColors,legendfun=function()
  showLegend(legend=c("European","American","Japanese"),col=c("steelblue2","lightgoldenrod","brown1"),cex=1.5))
```
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