Package: DAAGbio (via r-universe)

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Title Data Sets and Functions, for Demonstrations with Expression Arrays and Gene Sequences

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Description Data sets and functions, for the display of gene expression array (microarray) data, and for demonstrations with such data.

LazyLoad true

LazyData true

Depends R (>= 3.0.0), limma (>= 2.9.15)

Suggests DAAG, locfit, knitr

ZipData no

License GPL (>= 2)

VignetteBuilder knitr

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NeedsCompilation no

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`coralRG` *Spotted microarray red and green foreground and background values*

Description

Unnormalised red and green values, and corresponding background values. Further information is in the data frame `coralTargets`

Usage

```
data(coralRG)
```

Format

The format is: Formal class 'RGList' [package "limma"] Can be accessed as a list, with named elements "R" ,"G" ,"Rb" ,"Gb" ,"targets", "source" ,"genes" and "printer"

Source

Lauretto Grasso and Eldon Ball, Molecular Genetics and Evolution Group, Research School of Biological Sciences, Australian National University.

Examples

```
data(coralRG)
```

`coralTargets` *Targets file to accompany spotted expression array data*

Description

Targets file, in the form expected by limma, to accompany the expression array data in `coralRg`

Usage

```
data(coralTargets)
```

Format

A data frame with 6 observations on the following 4 variables.

`SlideNumber` a character vector

`FileName` Names of files that hold spotted array data

`Cy3` Treatment assigned to Cy3 ("red")

`Cy5` Treatment assigned to Cy5 ("green")

Examples

```
data(coralTargets)
## maybe str(coralTargets) ; plot(coralTargets) ...
```

`DEnma` *Spotted microarray M and A values; differentially expressed controls*

Description

Values, derived from the data in `coralRG`, are the subset of the M and A values, after normalisation within and between arrays, for the differentially expressed controls

Usage

```
data(DEnma)
```

Format

The format is: Formal class 'MAList' [package "limma"] Can be accessed as a list, with named elements "targets", "source", "genes", "printer", "M" and "A"

Source

Centre for the Molecular Genomics of Genetic Development, ANU

Examples

```
data(DEnma)
```

imgplot *Image plot of spotted expression array data*

Description

Creates an image of graduated colors that represent the values of a statistic for each spot on a spotted microarray. By default, the only the 5 shown. The initial version was based on `plot.spatial` in the sma package.

Usage

```
imgplot(z = DAAGbio::coralRG$R[, 1], layout = DAAGbio::coralRG$printer, crit1 = 0.05,
crit2 = crit1, key.side=2,
lohi.colors = c("#9E0142", "#D53E4F", "#F46D43", "#FDAE61", "#ABDDA4",
"#66C2A5", "#3288BD", "#5E4FA2"), nacolor = "#FFFF00",
boxplot.side = 1, split = "quantiles")
```

Arguments

`z`	values to be plotted
`layout`	layout of spots, in the order (rows of grids, columns of grids, rows of spots in a grid, columns in a grid)
`crit1`	Choose the lower threshold to include this proportion at the high end
`crit2`	Choose the upper threshold to include this proportion of values at the low end
`key.side`	Side on which the color key should appear
`lohi.colors`	Graduated sequence of colors
`nacolor`	Use this color for `NA`s
`boxplot.side`	Show boxplot on this side of figure region
`split`	Specify `"intervals"` or `"quantiles"`, as required

Value

A plot is created on the current graphics device

Author(s)

J. H. Maindonald

Examples

```
## The function is currently defined as
function (z=DAAGbio::coralRG$R[,1], layout=cDAAGbio::oralRG$printer, crit1 = 0.05,
            crit2 = crit1, key.side=2,
            lohi.colors=c("#9E0142","#D53E4F","#F46D43","#FDAE61",
              "#ABDDA4","#66C2A5","#3288BD","#5E4FA2"),
            nacolor="#FFFF00", boxplot.side=1, split="quantiles")
```

```
{
  "block2matrix" <-
    function(z, sr=3, sc=2, gr=2, gc=2){
      ## Assumes that values in the vector z are  in row major
      ## order within blocks of dimension sr x sc, with blocks
      ## in row major order within a gr x gc array of grids.
      ## Elements in the vector that is returned are in row
      ## major order wrt the sr*gr x sc*gc matrix of values on
      ## the slide. (It is given the dimensions of a matrix.)
      xy <- array(z, dim=c(sc, sr, gc, gr))
      xy <- aperm(xy, c(1,3,2,4))
      dim(xy) <- c(sc*gc, gr*sr)
      xy}
  quantile.na <- function (z, ...)
    {
      tmp <- !(is.na(z) | is.infinite(z))
      quantile(z[tmp], ...)
    }
  length.na <- function (z, ...)
    {
      tmp <- !(is.na(z) | is.infinite(z))
      length(z[tmp], ...)
    }
    if(is.matrix(z))warning("z is a matrix, You probably want a column vector")
  bplot <- function(z, boxplot.side=1){
    xrange <- range(z,na.rm=TRUE)
    iqr <- diff(quantile(xrange, c(.25,.75)))
    bwex <- diff(xrange)/(3*iqr)
    xhi <- max(z,na.rm=TRUE)
    xusr <- par()$usr[c(1:2)]
    xpos=pretty(z[!is.na(z)], n=5)
    z <- xusr[1]+(z-xrange[1])*diff(xusr)/diff(xrange)
    newpos <- xusr[1]+(xpos-xrange[1])*diff(xusr)/diff(xrange)
    par(xpd=TRUE)
    atvert <- switch(boxplot.side, par()$usr[3]-par()$cxy[2]*0.8,
                     "", par()$usr[4]+par()$cxy[2]*0.8, "")
    if(atvert!=""){
      boxplot(z, at=atvert, boxwex=bwex, add=TRUE, horizontal=TRUE, xaxt="n")
      axis(side=boxplot.side, line=1.5,
           at=newpos, labels=xpos, cex.axis=0.75, mgp=c(2, 0.5, 0))
    }
    par(xpd=FALSE)
  }
  if (crit1 >= 1)
    crit1 <- crit1/(length.na(z))
  if (crit2 >= 1)
    crit2 <- crit2/(length.na(z))
  tmpind <- (z > quantile.na(z, probs = 1 - crit2)) | (z <
                                  quantile.na(z, probs = crit1))
  n <- prod(unlist(layout))
  n.all <- length(z)
  n.na <- sum(is.na(z))
  nhalf <- length(lohi.colors)%/%2
```

```
n2 <- 2*nhalf
n.one <- length(lohi.colors)
plo <- crit1*(0:nhalf)/nhalf
phi <- 1-crit2*(nhalf:0)/nhalf
quiles1 <- quantile.na(z, plo)
quiles2 <- quantile.na(z, phi)
if(split=="intervals"){
  quiles1[2:nhalf] <- quiles1[1]+(quiles1[nhalf+1]-quiles1[1])*
    (1:(nhalf-1))/nhalf
  quiles2[2:nhalf] <- quiles2[1]-(quiles2[nhalf+1]-quiles2[1])*
    ((nhalf-1):1)/nhalf
  plo[-1] <- sapply(quiles1[-1],
                    function(x, z)sum(z<=x, na.rm=TRUE)/length.na(z), z=z)
  phi[-1] <- sapply(quiles2[-1],
                    function(x, z)sum(z<=x, na.rm=TRUE)/length.na(z), z=z)
}

if(crit1+crit2<1){
  quiles <- c(quiles1,quiles2)
  frac <- c(plo, phi)
  colpal <- c(lohi.colors[1:nhalf],"#FFFFFF",
              lohi.colors[(n.one-nhalf+1):(n.one)])
  midbreak <- TRUE
}
else {colpal <- lohi.colors
      midbreak <- FALSE
      quiles <- quantile.na(z, (0:n.one)/n.one)
      frac <- c(plo, phi[-1])
    }
dups <- duplicated(quiles)
if(any(dups)){
  cats <- seq(along=quiles[-1])
  filledcats <- cats[!dups]
  cutcats <- as.integer(cut(z, quiles[!dups], include.lowest=TRUE))
  fullm <- filledcats[cutcats]}
else fullm <- as.integer(cut(z, quiles, include.lowest=TRUE))
n.one <- length(colpal)
nrects <- length(quiles)
if(any(is.na(z))){
  nacat <- TRUE
  fullm[is.na(fullm)] <- max(unique(fullm[!is.na(fullm)]))+1
  colpal <- c(colpal, nacolor)
}
else nacat <- FALSE
if ((length(as.vector(z)) != n) & (!is.null(names(z)))) {
  y <- fullm[tmpind]
  fullm <- rep(NA, n)
  fullm[as.integer(names(y))] <- y
}
else fullm[!tmpind] <- NA
if ((length(as.vector(z)) != n) & (is.null(names(z)))) {
  stop(paste("Error: Length of vector is different from total number\n",
             "of spots and vector has no row.name.\n"))
```

```
  }
#####################################################################
  gc <- layout$ngrid.c
  gr <- layout$ngrid.r
  sc <- layout$nspot.c
  sr <- layout$nspot.r
  full <- block2matrix(fullm, sr, sc, gr, gc)
  image(1:ncol(full), 1:nrow(full), t(full), axes = FALSE,
        xlab = "", ylab = "", col=colpal)
  box()
  abline(v = ((gr - 1):1) * (sr) + 0.5)
  abline(h = (1:(gc - 1)) * (sc) + 0.5)
#####################################################################
  if(boxplot.side%in%c(1,3))bplot(z, boxplot.side=boxplot.side)
  if(key.side%in%c(2,4)){
    chw <- par()$cxy[1]
    barwid <- 0.75*chw
    if(key.side==2){
      x0 <- par()$usr[1]-chw-barwid
      xcutpos <- x0 - 0.4*chw
      xquilepos <- x0+barwid+0.55*chw
      srt <- 90
    }
    else {
      x0 <- par()$usr[2]+chw
      xcutpos <- x0 + barwid + 0.4*chw
      xquilepos <- x0-0.4*chw
      srt <- -90
    }
    yvals2 <- seq(from=par()$usr[3], to=par()$usr[4],
                  length=n2+midbreak+2*nacat+1)[-(n2+midbreak+2*nacat+1)]
    eps2 <- diff(yvals2[1:2])

    if(nacat){
      nlast <- length(yvals2)
      nclast <- length(colpal)
      rect(x0, yvals2[nlast], x0+barwid, yvals2[nlast]+eps2,
           col=colpal[nclast], xpd=TRUE)
      text(x0+0.5*barwid, yvals2[nlast]+0.5*eps2, "NA",
           xpd=TRUE, srt=srt)
      yvals2 <- yvals2[-((nlast-1):nlast)]
      colpal <- colpal[-nclast]
    }
    if(!midbreak){
      rect(x0, yvals2, x0+barwid, yvals2+eps2,
           col=colpal, xpd=TRUE)
      text(xcutpos, c(yvals2[1],yvals2+eps2),
           paste(signif(quiles,3)), srt=srt, xpd=TRUE, cex=0.8)
      text(xquilepos, yvals2[1], "(0%)", srt=srt, xpd=TRUE, cex=0.65)
      fracs <- frac[-c(1, length(frac))]
      text(xquilepos, yvals2[-1],
           paste("(",round(fracs*100,2),")",sep=""),
           srt=srt, xpd=TRUE, cex=0.65)
```

```
  text(xquilepos, yvals2[length(yvals2)]+eps2, "(100%)", srt=srt,
       xpd=TRUE, cex=0.65)

 }
 else {rect(x0, yvals2[1:nhalf], x0+barwid, yvals2[1:nhalf]+eps2,
            col=colpal[1:nhalf], xpd=TRUE)
       rect(x0, yvals2[(nhalf+2):(2*nhalf+1)], x0+barwid,
            yvals2[(nhalf+2):(2*nhalf+1)]+eps2,
            col=colpal[(nhalf+2):(2*nhalf+1)], xpd=TRUE)
       text(xcutpos, yvals2[1:(nhalf+1)],
            paste(signif(quiles1,3)), srt=srt, xpd=TRUE, cex=0.8)
       text(xquilepos, yvals2[2:(nhalf+1)],
            paste("(",round(plo[-1]*100,2),")",sep=""), srt=srt,
            xpd=TRUE, cex=0.65)
       text(xquilepos, yvals2[1], "(0%)", srt=srt, xpd=TRUE, cex=0.65)
       text(xcutpos,
            c(yvals2[(nhalf+2):(2*nhalf+1)], yvals2[2*nhalf+1]+eps2),
            paste(signif(quiles2,3)), srt=srt, xpd=TRUE, cex=0.8)
       text(xquilepos, yvals2[(nhalf+2):(2*nhalf+1)],
            paste("(",round(phi[-length(phi)]*100,2),")",sep=""),
            srt=srt, xpd=TRUE, cex=0.65)
       text(xquilepos, yvals2[2*nhalf+1]+eps2, "(100%)", srt=srt,
            xpd=TRUE, cex=0.65)
     }
}
invisible()
}
```

---

plantStressCounts *Matrix holding mRNA counts*

Description

Three treatments (3 samples each) were applied to Arabidopsis plants. RNA-Seq technology was used to determine messenger RNA (mRNA) counts. These were processed to remove counts for sequences that could not be identified as corresponding to a gene.

Usage

```
data("plantStressCounts")
```

Format

The matrix `plantStressCounts` has 28775 rows, and 9 columns. Rows have the nondescript names "Gene1" "Gene2" "Gene3" "Gene4" ... . Columns are named "CTL1", "CTL2", "CTL3", "Light1", "Light2", "Light3", "Drought1", "Drought2", "Drought3"

Details

The treatments were:

Control Plants were grown under normal light and watering conditions

Light stress One hour of continuous exposure to light at ten times the level that the plants are normally grown under

Drought stress Nine days without water, causing wilting of the leaves

The interest is in how light and drought stress affect gene expression to produce proteins.

Source

Data are from Peter Crisp, obtained as part of his PhD work in the ARC Centre of Excellence in Plant Energy Biology at Australian National University.

Examples

```
data(plantStressCounts)
## maybe str(plantStressCounts) ; plot(plantStressCounts) ...
```

---

plotprintseq *Sequence of movements of spotted microarray printhead*

Description

Shows the sequence of movements of a spotted microarray printhead, when a slide is printed.

Usage

```
plotprintseq(ngrid.r = 4, ngrid.c = 4, nspot.r = 16, nspot.c = 12,
gridorder = expand.grid(row = 1:ngrid.c, col = 1:ngrid.r),
spotorder = list(x = nspot.r:1, y = nspot.c:1), rowmajor = FALSE, eps =
1, delay1 = 100,
delay2 = 2000)
```

Arguments

ngrid.r	Number of rows of grids
ngrid.c	Number of columns of grids
nspot.r	Number of rows of spots in a grid
nspot.c	Number of columns of spots in a grid
gridorder	A data frame whose rows specify grids, in order of printing
spotorder	A list, specifying the order across rows and up or down each column in a grid
rowmajor	Order of printing of spots within grids.
eps	Distance between grids
delay1	Delay in shifting by one spot
delay2	Delay in shifting to new column or new row

Examples

```
plotprintseq()

## The function is currently defined as
function(ngrid.r=4, ngrid.c=4,
             nspot.r=16, nspot.c=12,
             gridorder=expand.grid(row=1:ngrid.c, col=1:ngrid.r),
             spotorder=list(x=nspot.r:1, y=nspot.c:1),
             rowmajor=FALSE, eps=1, delay1=100, delay2=2000){
        oldpar <- par(mar=par()$mar-c(0,0,2.5,0))
        on.exit(par(oldpar))
        plotpoints <- function(i, j, delay1=5000, delay2=10000){
            points(i+xy$x, j+xy$y, pch=15,
                   cex=0.5, col="cyan")
            x <- 0
            for(k in 1:delay2)x <- x+1
            points(i+xy$x, j+xy$y, pch=15,
                   cex=0.85, col="grey60")
            x <- 0
            for(k in 1:delay1)x <- x+1
        }

        xy <- gridorder-1
        names(xy) <- c("x","y")
        xy$x <- xy$x*(nspot.c+eps)
        xy$y <- xy$y*(nspot.r+eps)
        plot(c(1, ngrid.c*(nspot.c+eps)),
             c(1, ngrid.r*(nspot.r+eps)),
             type="n",xlab="",ylab="",axes=FALSE)
        mtext(side=1, line=1,
              paste("Grid layout:  #rows of Grids =", ngrid.r,
                    "   #columns of Grids =", ngrid.c))
        mtext(side=1, line=2.5,
              paste("In each grid:  #rows of Spots =", nspot.r,
                    "  #columns of Spots =", nspot.c))
        if (rowmajor)
        for(j in spotorder$x) for(i in spotorder$y)
         plotpoints(i,j, delay1=delay1, delay2=delay2)
         else
         for(i in spotorder$y) for(j in spotorder$x)
         plotpoints(i,j, delay1=delay1, delay2=delay2)
            }
```

`primateDNA` *Mitochondrial DNA sequence data from 14 primates*

Description

Bases at 232 mitochondrial locations (not continuous), for each of 14 primates.

Usage

```
data(primateDNA)
```

Format

A matrix of 14 rows (primate species) by 232 locations.

Source

Data, originally from Masami Hasegawa, are from http://evolution.genetics.washington.edu/book/primates.dna

References

Felsenstein, J. 2003. Inferring Phylogenies. Sinauer.

Examples

```
data(primateDNA)
## Not run:
library(ape)
primates.dist <- dist.dna(as.DNAbin(primateDNA), model = "K80")
primates.cmd <- cmdscale(primates.dist)
lefrt <- primates.cmd[,1] < apply(primates.cmd, 1, mean)
plot(primates.cmd)
text(primates.cmd, rownames(primates.cmd), pos=lefrt*2+2)

## End(Not run)
```

---

xplot *Repeat specified plot across multiple columns of a matrix*

Description

This is designed to repeat a plot, usually an image plot, across multiple columns of a matrix of gene expression values. A boxplot that shows the distribution of values appears below each panel.

Usage

```
xplot(data = DAAGbio::coralRG$R, images = 1:6, layout = DAAGbio::coralRG$printer, mfrow =
c(3, 2),
FUN = imgplot, device = NULL, title = NULL, width = 7.5, height = 10,
paneltitles = c("1:R/G", "2:G/R", "3:R/G", "4:G/R", "5:R/G", "6:G/R"),
paneltitles.line = 0.5,
mar = c(3.6, 3.6, 1.6, 0.6), oma = c(0.6, 0.6, 1.6, 0.6), file = NULL)
```

Arguments

data	matrix of expression array values
images	columns of matrix for which plots are required
layout	layout of spots, in the order (rows of grids, columns of grids, rows of spots in a grid, columns in a grid)
mfrow	row by column layout of plots on a page
FUN	imgplot, or imageplot from limma
device	If NULL, plot appears on the monitor. Other possibilities include pdf, postscript, png, jpeg and bitmap
title	A title for the page of graphs
width	width of plot (in)
height	height of plot (in)
paneltitles	character vector of titles for individual panels
paneltitles.line	height (lines) at which panel title are to appear above the upper margin of each panel
mar	Setting for par$mar
oma	Setting for par$mar
file	Optional file name, if output is to a file

Author(s)

J. H. Maindonald

Examples

```
## Not run:
xplot(data=coralRG$R, layout=coralRG$printer, FUN=imgplot)

## End(Not run)

## The function is currently defined as
function(data = DAAGbio::coralRG$R, images=1:6, layout = DAAGbio::coralRG$printer, mfrow=c(3,2),
           FUN = imgplot, device=NULL, title=NULL, width=7.5, height=10,
           paneltitles=c("1:R/G","2:G/R", "3:R/G","4:G/R", "5:R/G","6:G/R"),
           paneltitles.line=0.5,
           mar=c(3.6,3.6,1.6,0.6), oma=c(0.6,0.6,1.6,0.6), file=NULL){
    if(is.null(title)){title <- as.character(substitute(data))
    title <- paste(title[2], title[3], sep=":")
                    }
    if(is.null(file))file <- title
    nch <- nchar(title)
    if(!is.null(device)){devnam <- deparse(substitute(device))
    ext <- switch(devnam, ps="ps", pdf="pdf", png="png",
                  jpeg="jpg", bitmap="bmp")
      file <- paste(title,".", ext, sep="")
```

```
    print(file)
    device(file=file, width=width, height=height)
  }
  oldpar <- par(mfrow=mfrow, mgp=c(1,0.25,0), oma=oma, mar=mar)
  on.exit(par(oldpar))
  for(i in images){
    FUN(data[,i], layout=layout)
    mtext(side=3,line=paneltitles.line,paneltitles[i],adj=0)
  }
  mtext(side=3, line=0.25, title, outer=TRUE)
  if(!is.null(device))dev.off()
}
```

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