Package 'ComplexHeatmap'

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Type Package

Title Make Complex Heatmaps

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Description Complex heatmaps are efficient to visualize associations between different sources of data sets and reveal potential patterns. Here the ComplexHeatmap package provides a highly flexible way to arrange multiple heatmaps and supports various annotation graphics.

biocViews Software, Visualization, Sequencing

URL https://github.com/jokergoo/ComplexHeatmap, https://jokergoo.github.io/ComplexHeatmap-reference/book/

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Contents

`ComplexHeatmap-package`

Make complex heatmaps

Description

Make complex heatmaps

Details

This package aims to provide a simple and flexible way to arrange multiple heatmaps as well as flexible annotation graphics.

The package is implemented in an object-oriented way. The heatmap lists are abstracted into several classes.

- `Heatmap-class`: a single heatmap containing heatmap body, row/column names, titles, dendrograms and annotations.
- `HeatmapList-class`: a list of heatmaps and annotations.
- `HeatmapAnnotation-class`: a list of row/column annotations.

There are also several internal classes:

- `SingleAnnotation-class`: a single row annotation or column annotation.
- `ColorMapping-class`: mapping from values to colors.
- `AnnotationFunction-class`: construct an annotation function which allows subsetting.

Following two high-level functions take use of functionality of complex heatmaps:

- `oncoPrint`: oncoPrint plot which visualize genomic alterations in a set of genes.

- densityHeatmap: use heatmaps to visualize density distributions.

The complete reference of ComplexHeatmap package is available at http://jokergoo.github.io/ComplexHeatmap-reference/book.

Examples

```
# There is no example
NULL
```

+.AdditiveUnit *Horizontally Add Heatmaps or Annotations to a Heatmap List*

Description

Horizontally Add Heatmaps or Annotations to a Heatmap List

Usage

```
## S3 method for class 'AdditiveUnit'
x + y
```

Arguments

x	A Heatmap-class object, a HeatmapAnnotation-class object or a HeatmapList-class object.
y	A Heatmap-class object, a HeatmapAnnotation-class object or a HeatmapList-class object.

Details

It is only a helper function. It actually calls add_heatmap,Heatmap-method, add_heatmap,HeatmapList-method or add_heatmap,HeatmapAnnotation-method depending on the class of the input objects.

The HeatmapAnnotation-class object to be added should only be row annotations. Column annotations should be added to the heatmap list by %v%.

x and y can also be NULL.

Value

A HeatmapList-class object.

Author(s)

Zuguang Gu <z.gu@dkfz.de>

See Also

%v% operator is used for vertical heatmap list.

Examples

```
# There is no example
NULL
```

AdditiveUnit *Constructor Method for AdditiveUnit Class*

Description

Constructor Method for AdditiveUnit Class

Usage

```
AdditiveUnit(...)
```

Arguments

...	Black hole arguments.

Details

This method is not used in the package.

Value

No value is returned.

Author(s)

Zuguang Gu <z.gu@dkfz.de>

Examples

```
# There is no example
NULL
```

AdditiveUnit-class *Class for Concatenating Heatmaps and Annotations*

Description

Class for Concatenating Heatmaps and Annotations

Details

This class is a super class for Heatmap-class, HeatmapList-class and HeatmapAnnotation-class classes. It is only designed for + generic method and the %v%v method so that above three classes can be appended to each other.

Examples

```
# There is no example
NULL
```

add_heatmap-dispatch *Method dispatch page for add_heatmap*

Description

Method dispatch page for add_heatmap.

Dispatch

add_heatmap can be dispatched on following classes:

- add_heatmap,HeatmapAnnotation-method, HeatmapAnnotation-class class method
- add_heatmap,Heatmap-method, Heatmap-class class method
- add_heatmap,HeatmapList-method, HeatmapList-class class method

Examples

```
# no example
NULL
```

add_heatmap-Heatmap-method *Add Heatmap to the Heatmap List*

Description

Add Heatmap to the Heatmap List

Usage

```
## S4 method for signature 'Heatmap'
add_heatmap(object, x, direction = c("horizontal", "vertical"))
```

Arguments

object	A Heatmap-class object.
x	a Heatmap-class object, a HeatmapAnnotation-class object or a HeatmapList-class object.
direction	Whether the heatmap is added horizontal or vertically?

Details

Normally we directly use + for horizontal concatenation and %v% for vertical concatenation.

Value

A HeatmapList-class object.

Author(s)

Zuguang Gu <z.gu@dkfz.de>

Examples

```
# There is no example
NULL
```

---

add_heatmap-HeatmapAnnotation-method
Add Annotations or Heatmaps as a Heatmap List

Description

Add Annotations or Heatmaps as a Heatmap List

Usage

```
## S4 method for signature 'HeatmapAnnotation'
add_heatmap(object, x, direction = c("horizontal", "vertical"))
```

Arguments

object	A HeatmapAnnotation-class object.
x	A Heatmap-class object, a HeatmapAnnotation-class object or a HeatmapList-class object.
direction	Whether it is horizontal list or a vertical list?

Details

Normally we directly use + for horizontal concatenation and %v% for vertical concatenation.

Value

A HeatmapList-class object.

Author(s)

Zuguang Gu <z.gu@dkfz.de>

Examples

```
# There is no example
NULL
```

add_heatmap-HeatmapList-method
Add heatmaps and row annotations to the heatmap list

Description

Add heatmaps and row annotations to the heatmap list

Usage

```
## S4 method for signature 'HeatmapList'
add_heatmap(object, x, direction = c("horizontal", "vertical"))
```

Arguments

object	a HeatmapList-class object.
x	a Heatmap-class object or a HeatmapAnnotation-class object or a HeatmapList-class object.
direction	direction of the concatenation.

Details

There is a shortcut function +.AdditiveUnit.

Value

A HeatmapList-class object.

Author(s)

Zuguang Gu <z.gu@dkfz.de>

Examples

```
# There is no example
NULL
```

adjust_dend_by_x *Adjust the Positions of nodes/leaves in the Dendrogram*

Description

Adjust the Positions of nodes/leaves in the Dendrogram

Usage

```
adjust_dend_by_x(dend, leaf_pos = 1:nobs(dend)-0.5)
```

Arguments

dend	A dendrogram object.
leaf_pos	A vector of positions of leaves. The value can also be a unit object.

Details

The positions of nodes stored as x attribute are recalculated based on the new positions of leaves.

By default, the position of leaves are at 0.5, 1.5, ..., n-0.5.

Examples

```
m = matrix(rnorm(100), 10)
dend = as.dendrogram(hclust(dist(m)))
dend = adjust_dend_by_x(dend, sort(runif(10)))
str(dend)
dend = adjust_dend_by_x(dend, unit(1:10, "cm"))
str(dend)
```

adjust_heatmap_list-HeatmapList-method *Adjust Heatmap List*

Description

Adjust Heatmap List

Usage

```
## S4 method for signature 'HeatmapList'
adjust_heatmap_list(object)
```

Arguments

object	A HeatmapList-class object.

Details

This function adjusts settings in all other heatmaps according to the main heatmap. It also adjust the size of heatmap annotations to make them aligned nicely.

This function is only for internal use.

Author(s)

Zuguang Gu <z.gu@dkfz.de>

Examples

```
# There is no example
NULL
```

`alter_graphic` *Automatically generate alter_fun*

Description

Automatically generate alter_fun

Usage

```
alter_graphic(graphic = c("rect", "point"),
    width = 1, height = 1,
    horiz_margin = unit(1, "pt"), vertical_margin = unit(1, "pt"),
    fill = "red", col = NA, pch = 16, ...)
```

Arguments

`graphic`	Graphic to draw.
`width`	Relative width of the rectangle.
`height`	Relative height of the rectangle.
`horiz_margin`	Horizontal margin. E.g. if you want 1mm margin on top and 1mm margin at bottom of the rectangle, set this value to `unit(1, 'mm')`.
`vertical_margin`	Vertical margin.
`fill`	Filled color.
`col`	Border color.
`pch`	Pch for points
`...`	Pass to `gpar`

Details

This function aims to simplify the definition of functions in `alter_fun`. Now it only supports rectangles and points.

Examples

```
mat = read.table(textConnection(
"s1,s2,s3
g1,snv;indel,snv,indel
g2,,snv;indel,snv
g3,snv,,indel;snv"), row.names = 1, header = TRUE, sep = ",", stringsAsFactors = FALSE)
mat = as.matrix(mat)
col = c(snv = "red", indel = "blue")

oncoPrint(mat,
alter_fun = list(
snv = alter_graphic("rect", width = 0.9, height = 0.9, fill = col["snv"]),
indel = alter_graphic("rect", width = 0.9, height = 0.9, fill = col["indel"])
), col = col)
```

`AnnotationFunction` *Constructor of AnnotationFunction Class*

Description

Constructor of AnnotationFunction Class

Usage

```
AnnotationFunction(fun, fun_name = "", which = c("column", "row"), cell_fun = NULL,
    var_import = list(), n = NA, data_scale = c(0, 1), subset_rule = list(),
  subsettable = length(subset_rule) > 0, show_name = TRUE, width = NULL, height = NULL)
```

Arguments

`fun`	A function which defines how to draw the annotation. See **Details** section.
`fun_name`	The name of the function. It is only used for printing the object.
`which`	Whether it is drawn as a column annotation or a row annotation?
`cell_fun`	A simplified version of `fun`. `cell_fun` only accepts one single index and it draws repeatedly in each annotation cell.
`var_import`	The names of the variables or the variable themselves that the annotation function depends on. See **Details** section.
`n`	Number of observations in the annotation. It is not mandatory, but it is better to provide this information so that the higher order `HeatmapAnnotation` knows it and it can perform check on the consistency of annotations and heatmaps.

data_scale	The data scale on the data axis (y-axis for column annotation and x-axis for row annotation). It is only used when decorate_annotation is used with "native" unit coordinates.
subset_rule	The rule of subsetting variables in var_import. It should be set when users want the final object to be subsettable. See **Details** section.
subsettable	Whether the object is subsettable?
show_name	It is used to turn off the drawing of annotation names in HeatmapAnnotation. Annotations always have names associated and normally they will be drawn beside the annotation graphics to tell what the annotation is about. e.g. the annotation names put beside the points annotation graphics. However, for some of the annotations, the names are not necessarily to be drawn, such as text annotations drawn by anno_text or an empty annotation drawn by anno_empty. In this case, when show_names is set to FALSE, there will be no annotation names drawn for the annotation.
width	The width of the plotting region (the viewport) that the annotation is drawn. If it is a row annotation, the width must be an absolute unit. Since the AnnotationFunction object is always contained by the SingleAnnotation-classobject, you can only set the width of row annotations or height of column annotations, while e.g. the height of the row annotation is always unit(1, "npc") which means it always fully filled in the parent SingleAnnotation and only in SingleAnnotation or even HeatmapAnnotation can adjust the height of the row annotations.
height	The height of the plotting region (the viewport) that the annotation is drawn. If it is a column annotation, the width must be an absolute unit.

Details

In the package, we have implemted quite a lot annotation functions by AnnotationFunction constructor: anno_empty, anno_image, anno_points, anno_lines, anno_barplot, anno_boxplot, anno_histogram, anno_density, anno_joyplot, anno_horizon, anno_text and anno_mark. These built-in annotation functions support as both row annotations and column annotations and they are are all subsettable.

The build-in annotation functions are already enough for most of the analysis, nevertheless, if users want to know more about how to construct the AnnotationFunction class manually, they can refer to https://jokergoo.github.io/ComplexHeatmap-reference/book/heatmap-annotations.html#implement-new-annotation-functions.

Value

A AnnotationFunction-class object which can be used in HeatmapAnnotation.

Examples

```
x = 1:10
anno1 = AnnotationFunction(
    fun = function(index, k, n) {
        n = length(index)
        pushViewport(viewport(xscale = c(0.5, n + 0.5), yscale = c(0, 10)))
        grid.rect()
```

```
        grid.points(1:n, x[index], default.units = "native")
        if(k == 1) grid.yaxis()
        popViewport()
    },
    var_import = list(x = x),
    n = 10,
    subsettable = TRUE,
    height = unit(2, "cm")
)
m = rbind(1:10, 11:20)
Heatmap(m, top_annotation = HeatmapAnnotation(foo = anno1))
Heatmap(m, top_annotation = HeatmapAnnotation(foo = anno1), column_km = 2)
```

AnnotationFunction-class *The AnnotationFunction Class*

Description

The AnnotationFunction Class

Details

The heatmap annotation is basically graphics aligned to the heatmap columns or rows. There is no restriction for the graphic types, e.g. it can be heatmap-like annotation or points. Here the AnnotationFunction class is designed for creating complex and flexible annotation graphics. As the main part of the class, it uses a user-defined function to define the graphics. It also keeps information of the size of the plotting regions of the annotation. And most importantly, it allows subsetting to the annotation to draw a subset of the graphics, which is the base for the splitting of the annotations.

See AnnotationFunction constructor for details.

Examples

```
# There is no example
NULL
```

---

annotation_axis_grob *Grob for Annotation Axis*

Description

Grob for Annotation Axis

Usage

```
annotation_axis_grob(at = NULL, labels = at, labels_rot = 0, gp = gpar(),
    side = "left", facing = "outside", direction = "normal", scale = NULL)
```

Arguments

at	Break values. If it is not specified, it is inferred from data scale in current viewport.
labels	Corresponding labels.
labels_rot	Rotations of labels.
gp	Graphic parameters.
side	side of the axis of the annotation viewport.
facing	Facing of the axis.
direction	Direction of the axis. Value should be "normal" or "reverse".
scale	The data scale. If it is NULL, it is inferred from current viewport.

Value

A grob object.

Examples

```
gb = annotation_axis_grob(at = 1:5, labels = month.name[1:5], labels_rot = 0,
    side = "left", facing = "outside")
grid.newpage()
pushViewport(viewport(xscale = c(0, 4), yscale = c(0, 6), width = 0.6, height = 0.6))
grid.rect()
grid.text('side = "left", facing = "outside"')
grid.draw(gb)
popViewport()

gb = annotation_axis_grob(at = 1:5, labels = month.name[1:5], labels_rot = 0,
    side = "left", facing = "inside")
grid.newpage()
pushViewport(viewport(xscale = c(0, 4), yscale = c(0, 6), width = 0.6, height = 0.6))
grid.rect()
grid.text('side = "left", facing = "inside"')
grid.draw(gb)
popViewport()

gb = annotation_axis_grob(at = 1:5, labels = month.name[1:5], labels_rot = 0,
    side = "right", facing = "outside")
grid.newpage()
pushViewport(viewport(xscale = c(0, 4), yscale = c(0, 6), width = 0.6, height = 0.6))
grid.rect()
grid.text('side = "right", facing = "outside"')
grid.draw(gb)
popViewport()

gb = annotation_axis_grob(at = 1:5, labels = month.name[1:5], labels_rot = 0,
    side = "right", facing = "inside")
grid.newpage()
pushViewport(viewport(xscale = c(0, 4), yscale = c(0, 6), width = 0.6, height = 0.6))
grid.rect()
```

```
grid.text('side = "right", facing = "inside"')
grid.draw(gb)
popViewport()

gb = annotation_axis_grob(at = 1:3, labels = month.name[1:3], labels_rot = 0,
    side = "top", facing = "outside")
grid.newpage()
pushViewport(viewport(xscale = c(0, 4), yscale = c(0, 6), width = 0.6, height = 0.6))
grid.rect()
grid.text('side = "top", facing = "outside"')
grid.draw(gb)
popViewport()

gb = annotation_axis_grob(at = 1:3, labels = month.name[1:3], labels_rot = 90,
    side = "top", facing = "outside")
grid.newpage()
pushViewport(viewport(xscale = c(0, 4), yscale = c(0, 6), width = 0.6, height = 0.6))
grid.rect()
grid.text('side = "top", facing = "outside"')
grid.draw(gb)
popViewport()

gb = annotation_axis_grob(at = 1:3, labels = month.name[1:3], labels_rot = 45,
    side = "top", facing = "outside")
grid.newpage()
pushViewport(viewport(xscale = c(0, 4), yscale = c(0, 6), width = 0.6, height = 0.6))
grid.rect()
grid.text('side = "top", facing = "outside"')
grid.draw(gb)
popViewport()

gb = annotation_axis_grob(at = 1:3, labels = month.name[1:3], labels_rot = 0,
    side = "top", facing = "inside")
grid.newpage()
pushViewport(viewport(xscale = c(0, 4), yscale = c(0, 6), width = 0.6, height = 0.6))
grid.rect()
grid.text('side = "top", facing = "inside"')
grid.draw(gb)
popViewport()

gb = annotation_axis_grob(at = 1:3, labels = month.name[1:3], labels_rot = 0,
    side = "bottom", facing = "outside")
grid.newpage()
pushViewport(viewport(xscale = c(0, 4), yscale = c(0, 6), width = 0.6, height = 0.6))
grid.rect()
grid.text('side = "bottom", facing = "outside"')
grid.draw(gb)
popViewport()

gb = annotation_axis_grob(at = 1:3, labels = month.name[1:3], labels_rot = 0,
    side = "bottom", facing = "inside")
grid.newpage()
pushViewport(viewport(xscale = c(0, 4), yscale = c(0, 6), width = 0.6, height = 0.6))
```

```
grid.rect()
grid.text('side = "bottom", facing = "inside"')
grid.draw(gb)
popViewport()

grid.newpage()
pushViewport(viewport(xscale = c(0, 4), yscale = c(0, 6), width = 0.6, height = 0.6))
gb = annotation_axis_grob(labels_rot = 0, side = "left", facing = "outside")
grid.rect()
grid.text('side = "left", facing = "outside"')
grid.draw(gb)
popViewport()

grid.newpage()
pushViewport(viewport(xscale = c(0, 4), yscale = c(0, 6), width = 0.6, height = 0.6))
gb = annotation_axis_grob(side = "left", direction = "reverse")
grid.rect()
grid.text('side = "left", direction = "reverse')
grid.draw(gb)
popViewport()

grid.newpage()
pushViewport(viewport(xscale = c(0, 4), yscale = c(0, 6), width = 0.6, height = 0.6))
gb = annotation_axis_grob(side = "bottom", direction = "reverse")
grid.rect()
grid.text('side = "bottom", directio = "reverse"')
grid.draw(gb)
popViewport()
```

`annotation_legend_size-HeatmapList-method`
Size of the Annotation Legends

Description

Size of the Annotation Legends

Usage

```
## S4 method for signature 'HeatmapList'
annotation_legend_size(object, legend_list = list(), ...)
```

Arguments

`object`	a `HeatmapList-class` object.
`legend_list`	A list of self-defined legend, should be wrapped into `grob` objects. It is normally constructed by `Legend`.
`...`	Other arguments.

Details

Internally, all annotation legends are packed by packLegend as a single grob object.

This function is only for internal use.

Value

A unit object.

Author(s)

Zuguang Gu <z.gu@dkfz.de>

Examples

```
# There is no example
NULL
```

---

anno_barplot *Barplot Annotation*

Description

Barplot Annotation

Usage

```
anno_barplot(x, baseline = 0, which = c("column", "row"), border = TRUE, bar_width = 0.6,
    beside = FALSE, attach = FALSE,
    gp = gpar(fill = "#CCCCCC"), ylim = NULL, extend = 0.05, axis = TRUE,
    axis_param = default_axis_param(which),
    add_numbers = FALSE, numbers_gp = gpar(fontsize = 8),
   numbers_rot = ifelse(which == "column", 45, 0), numbers_offset = unit(2, "mm"),
    width = NULL, height = NULL, ...)
```

Arguments

x	The value vector. The value can be a vector or a matrix. The length of the vector or the number of rows of the matrix is taken as the number of the observations of the annotation. If x is a vector, the barplots will be represented as stacked barplots.
baseline	baseline of bars. The value should be "min" or "max", or a numeric value. It is enforced to be zero for stacked barplots.
which	Whether it is a column annotation or a row annotation?
border	Wether draw borders of the annotation region?
bar_width	Relative width of the bars. The value should be smaller than one.

beside	When x is a matrix, will bars be positioned beside each other or as stacked bars?
attach	When beside is TRUE, it controls whether bars should be attached.
gp	Graphic parameters for bars. The length of each graphic parameter can be 1, length of x if x is a vector, or number of columns of x is x is a matrix.
ylim	Data ranges. By default it is range(x) if x is a vector, or range(rowSums(x)) if x is a matrix.
extend	The extension to both side of ylim. The value is a percent value corresponding to ylim[2] - ylim[1].
axis	Whether to add axis?
axis_param	parameters for controlling axis. See default_axis_param for all possible settings and default parameters.
add_numbers	Whether to add numbers to the bars. It only works when x is a simple vector.
numbers_gp	Graphics parameters for the numbers.
numbers_rot	Rotation of numbers.
numbers_offset	Offset to the default positions (1mm away the top of the bars).
width	Width of the annotation. The value should be an absolute unit. Width is not allowed to be set for column annotation.
height	Height of the annotation. The value should be an absolute unit. Height is not allowed to be set for row annotation.
...	Other arguments.

Value

An annotation function which can be used in HeatmapAnnotation.

See Also

https://jokergoo.github.io/ComplexHeatmap-reference/book/heatmap-annotations.html#barplot_annotation

Examples

```
anno = anno_barplot(1:10)
draw(anno, test = "a vector")

m = matrix(runif(4*10), nc = 4)
m = t(apply(m, 1, function(x) x/sum(x)))
anno = anno_barplot(m, gp = gpar(fill = 2:5), bar_width = 1, height = unit(6, "cm"))
draw(anno, test = "proportion matrix")
```

anno_block *Block annotation*

Description

Block annotation

Usage

```
anno_block(align_to = NULL, gp = gpar(), labels = NULL, labels_gp = gpar(),
    labels_rot = ifelse(which == "row", 90, 0),
    labels_offset = unit(0.5, "npc"), labels_just = "center",
    which = c("column", "row"), width = NULL, height = NULL, show_name = FALSE,
    panel_fun = NULL)
```

Arguments

align_to	If you don't want to create block annotation for all slices, you can specify a list of indices that cover continuously adjacent rows or columns.
gp	Graphic parameters.
labels	Labels put on blocks.
labels_gp	Graphic parameters for labels.
labels_rot	Rotation for labels.
labels_offset	Positions of the labels. It controls offset on y-directions for column annotation and on x-directoin for row annotation.
labels_just	Jusification of the labels.
which	Is it a row annotation or a column annotation?
width	Width of the annotation. The value should be an absolute unit. Width is not allowed to be set for column annotation.
height	Height of the annotation. The value should be an absolute unit. Height is not allowed to be set for row annotation.
show_name	Whether show annotatio name.
panel_fun	A self-defined function that draws graphics in each slice. It must have two arguments: 1. row/column indices for the current slice and 2. a vector of levels from the split variable that correspond to current slice. When `graphics` is set, all other graphics parameters in `anno_block` are ignored.

Details

The block annotation is used for representing slices. The length of all arguments should be 1 or the number of slices.

Value

An annotation function which can be used in `HeatmapAnnotation`.

See Also

https://jokergoo.github.io/ComplexHeatmap-reference/book/heatmap-annotations.html#block-annotation

Examples

```
Heatmap(matrix(rnorm(100), 10),
    top_annotation = HeatmapAnnotation(foo = anno_block(gp = gpar(fill = 2:4),
        labels = c("group1", "group2", "group3"), labels_gp = gpar(col = "white"))),
    column_km = 3,
    left_annotation = rowAnnotation(foo = anno_block(gp = gpar(fill = 2:4),
        labels = c("group1", "group2", "group3"), labels_gp = gpar(col = "white"))),
    row_km = 3)

# =============  set the panel_fun argument ==============
col = c("1" = "red", "2" = "blue", "A" = "green", "B" = "orange")
Heatmap(matrix(rnorm(100), 10), row_km = 2, row_split = sample(c("A", "B"), 10, replace = TRUE)) +
rowAnnotation(foo = anno_block(
panel_fun = function(index, levels) {
grid.rect(gp = gpar(fill = col[levels[2]], col = "black"))
grid.text(paste(levels, collapse = ","), 0.5, 0.5, rot = 90,
gp = gpar(col = col[levels[1]]))
}
))

labels = c("1" = "one", "2" = "two", "A" = "Group_A", "B" = "Group_B")
Heatmap(matrix(rnorm(100), 10), row_km = 2, row_split = sample(c("A", "B"), 10, replace = TRUE)) +
rowAnnotation(foo = anno_block(panel_fun = function(index, levels) {
grid.rect(gp = gpar(fill = col[levels[2]], col = "black"))
grid.text(paste(labels[levels], collapse = ","), 0.5, 0.5, rot = 90,
gp = gpar(col = col[levels[1]]))
}))

Heatmap(matrix(rnorm(100), 10), row_km = 2, row_split = sample(c("A", "B"), 10, replace = TRUE)) +
rowAnnotation(foo = anno_block(
panel_fun = function(index, levels) {
grid.rect(gp = gpar(fill = col[levels[2]], col = "black"))
txt = paste(levels, collapse = ",")
txt = paste0(txt, "\n", length(index), " rows")
grid.text(txt, 0.5, 0.5, rot = 0,
gp = gpar(col = col[levels[1]]))
},
width = unit(3, "cm")
))

# =========== set align_to ################
col = c("foo" = "red", "bar" = "blue")
Heatmap(matrix(rnorm(100), 10), cluster_rows = FALSE) +
rowAnnotation(foo = anno_block(
align_to = list(foo = 1:4, bar = 6:10),
panel_fun = function(index, nm) {
grid.rect(gp = gpar(fill = col[nm]))
```

```
grid.text(nm, 0.5, 0.5)
},
width = unit(2, "cm"))
)
```

---

anno_boxplot *Boxplot Annotation*

Description

Boxplot Annotation

Usage

```
anno_boxplot(x, which = c("column", "row"), border = TRUE,
   gp = gpar(fill = "#CCCCCC"), ylim = NULL, extend = 0.05, outline = TRUE, box_width = 0.6,
   add_points = FALSE, pch = 16, size = unit(4, "pt"), pt_gp = gpar(), axis = TRUE,
    axis_param = default_axis_param(which), width = NULL, height = NULL, ...)
```

Arguments

x	A matrix or a list. If x is a matrix and if which is column, statistics for boxplots are calculated by columns, if which is row, the calculation is done by rows.
which	Whether it is a column annotation or a row annotation?
border	Wether draw borders of the annotation region?
gp	Graphic parameters for the boxes. The length of the graphic parameters should be one or the number of observations.
ylim	Data ranges.
extend	The extension to both side of ylim. The value is a percent value corresponding to ylim[2] - ylim[1].
outline	Whether draw outline of boxplots?
box_width	Relative width of boxes. The value should be smaller than one.
add_points	Whether add points on top of the boxes?
pch	Point style.
size	Point size.
pt_gp	Graphics parameters for points.
axis	Whether to add axis?
axis_param	parameters for controlling axis. See default_axis_param for all possible settings and default parameters.
width	Width of the annotation. The value should be an absolute unit. Width is not allowed to be set for column annotation.
height	Height of the annotation. The value should be an absolute unit. Height is not allowed to be set for row annotation.
...	Other arguments.

Value

An annotation function which can be used in HeatmapAnnotation.

See Also

https://jokergoo.github.io/ComplexHeatmap-reference/book/heatmap-annotations.html#box-annotation

Examples

```
set.seed(123)
m = matrix(rnorm(100), 10)
anno = anno_boxplot(m, height = unit(4, "cm"))
draw(anno, test = "anno_boxplot")
anno = anno_boxplot(m, height = unit(4, "cm"), gp = gpar(fill = 1:10))
draw(anno, test = "anno_boxplot with gp")
```

---

anno_customize *Customized annotation*

Description

Customized annotation

Usage

```
anno_customize(x, graphics = list(), which = c("column", "row"),
    border = TRUE, width = NULL, height = NULL, verbose = TRUE)
```

Arguments

x	A categorical variable.
graphics	A list of functions that define graphics for each level in x.
which	Is it a row annotation or a column annotation?
width	Width of the annotation. The value should be an absolute unit. Width is not allowed to be set for column annotation.
height	Height of the annotation. The value should be an absolute unit. Height is not allowed to be set for row annotation.
border	Whether to draw border.
verbose	Whether to print messages.

Details

Functions in graphics define simple graphics drawn in each annotation cell. The function takes four arguments:

x,y Center of the annotation cell.

w,h Width and height of the annotation cell.

Value

An annotation function which can be used in HeatmapAnnotation.

Examples

```
x = sort(sample(letters[1:3], 10, replace = TRUE))
graphics = list(
    "a" = function(x, y, w, h) grid.points(x, y, pch = 16),
    "b" = function(x, y, w, h) grid.rect(x, y, w*0.8, h*0.8, gp = gpar(fill = "red")),
   "c" = function(x, y, w, h) grid.segments(x - 0.5*w, y - 0.5*h, x + 0.5*w, y + 0.5*h, gp = gpar(lty = 2))
)

anno = anno_customize(x, graphics = graphics)

m = matrix(rnorm(100), 10)
Heatmap(m, top_annotation = HeatmapAnnotation(bar = x, foo = anno))

# Add legends for `foo`
ht = Heatmap(m, top_annotation = HeatmapAnnotation(bar = x, foo = anno))
lgd = Legend(title = "foo", at = names(graphics), graphics = graphics)
draw(ht, annotation_legend_list = list(lgd))
```

---

anno_density *Density Annotation*

Description

Density Annotation

Usage

```
anno_density(x, which = c("column", "row"),
    type = c("lines", "violin", "heatmap"), xlim = NULL, max_density = NULL,
    heatmap_colors = rev(brewer.pal(name = "RdYlBu", n = 11)),
    joyplot_scale = 1, border = TRUE, gp = gpar(fill = "#CCCCCC"),
    axis = TRUE, axis_param = default_axis_param(which),
    width = NULL, height = NULL)
```

Arguments

x	A matrix or a list. If x is a matrix and if which is column, statistics for boxplots are calculated by columns, if which is row, the calculation is done by rows.
which	Whether it is a column annotation or a row annotation?
type	Type of graphics to represent density distribution. "lines" for normal density plot; "violine" for violin plot and "heatmap" for heatmap visualization of density distribution.
xlim	Range on x-axis.

max_density	Maximal density values in the plot. Normally you don't need to manually set it, but when you have multiple density annotations and you want to compare between them, you should manually set this argument to make density distributions are in a same scale.
heatmap_colors	A vector of colors for interpolating density values.
joyplot_scale	Relative height of density distribution. A value higher than 1 increases the height of the density distribution and the plot will represented as so-called "joyplot".
border	Wether draw borders of the annotation region?
gp	Graphic parameters for the boxes. The length of the graphic parameters should be one or the number of observations.
axis	Whether to add axis?
axis_param	parameters for controlling axis. See default_axis_param for all possible settings and default parameters.
width	Width of the annotation. The value should be an absolute unit. Width is not allowed to be set for column annotation.
height	Height of the annotation. The value should be an absolute unit. Height is not allowed to be set for row annotation.

Value

An annotation function which can be used in HeatmapAnnotation.

See Also

https://jokergoo.github.io/ComplexHeatmap-reference/book/heatmap-annotations.html#density-annotation

Examples

```
m = matrix(rnorm(100), 10)
anno = anno_density(m, which = "row")
draw(anno, test = "normal density")
anno = anno_density(m, which = "row", type = "violin")
draw(anno, test = "violin")
anno = anno_density(m, which = "row", type = "heatmap")
draw(anno, test = "heatmap")
anno = anno_density(m, which = "row", type = "heatmap",
    heatmap_colors = c("white", "orange"))
draw(anno, test = "heatmap, colors")
```

anno_empty *Empty Annotation*

Description

Empty Annotation

Usage

```
anno_empty(which = c("column", "row"), border = TRUE, zoom = FALSE,
    width = NULL, height = NULL, show_name = FALSE)
```

Arguments

which	Whether it is a column annotation or a row annotation?
border	Whether draw borders of the annotation region?
zoom	If it is true and when the heatmap is split, the empty annotation slices will have equal height or width, and you can see the correspondance between the annotation slices and the original heatmap slices.
width	Width of the annotation. The value should be an absolute unit. Width is not allowed to be set for column annotation.
height	Height of the annotation. The value should be an absolute unit. Height is not allowed to be set for row annotation.
show_name	Whether to show annotation name.

Details

It creates an empty annotation and holds space, later users can add graphics by decorate_annotation. This function is useful when users have difficulty to implement AnnotationFunction object.

In following example, an empty annotation is first created and later points are added:

```
m = matrix(rnorm(100), 10)
ht = Heatmap(m, top_annotation = HeatmapAnnotation(pt = anno_empty()))
ht = draw(ht)
co = column_order(ht)[[1]]
pt_value = 1:10
decorate_annotation("pt", {
pushViewport(viewport(xscale = c(0.5, ncol(mat)+0.5), yscale = range(pt_value)))
grid.points(seq_len(ncol(mat)), pt_value[co], pch = 16, default.units = "native")
grid.yaxis()
popViewport()
})
```

And it is similar as using anno_points:

```
Heatmap(m, top_annotation = HeatmapAnnotation(pt = anno_points(pt_value)))
```

Value

An annotation function which can be used in HeatmapAnnotation.

See Also

https://jokergoo.github.io/ComplexHeatmap-reference/book/heatmap-annotations.html#empty-annotation

Examples

```
anno = anno_empty()
draw(anno, test = "anno_empty")
anno = anno_empty(border = FALSE)
draw(anno, test = "anno_empty without border")
```

---

anno_histogram *Histogram Annotation*

Description

Histogram Annotation

Usage

```
anno_histogram(x, which = c("column", "row"), n_breaks = 11,
    border = FALSE, gp = gpar(fill = "#CCCCCC"),
    axis = TRUE, axis_param = default_axis_param(which),
    width = NULL, height = NULL)
```

Arguments

x	A matrix or a list. If x is a matrix and if which is column, statistics for boxplots are calculated by columns, if which is row, the calculation is done by rows.
which	Whether it is a column annotation or a row annotation?
n_breaks	Number of breaks for calculating histogram.
border	Wether draw borders of the annotation region?
gp	Graphic parameters for the boxes. The length of the graphic parameters should be one or the number of observations.
axis	Whether to add axis?
axis_param	parameters for controlling axis. See default_axis_param for all possible settings and default parameters.
width	Width of the annotation. The value should be an absolute unit. Width is not allowed to be set for column annotation.
height	Height of the annotation. The value should be an absolute unit. Height is not allowed to be set for row annotation.

Value

An annotation function which can be used in HeatmapAnnotation.

See Also

https://jokergoo.github.io/ComplexHeatmap-reference/book/heatmap-annotations.html#histogram-annotation

Examples

```
m = matrix(rnorm(1000), nc = 10)
anno = anno_histogram(t(m), which = "row")
draw(anno, test = "row histogram")
anno = anno_histogram(t(m), which = "row", gp = gpar(fill = 1:10))
draw(anno, test = "row histogram with color")
anno = anno_histogram(t(m), which = "row", n_breaks = 20)
draw(anno, test = "row histogram with color")
```

---

anno_horizon *Horizon chart Annotation*

Description

Horizon chart Annotation

Usage

```
anno_horizon(x, which = c("column", "row"),
    gp = gpar(pos_fill = "#D73027", neg_fill = "#313695"),
    n_slice = 4, slice_size = NULL, negative_from_top = FALSE,
    normalize = TRUE, gap = unit(0, "mm"),
    axis = TRUE, axis_param = default_axis_param(which),
    width = NULL, height = NULL)
```

Arguments

x	A matrix or a list. If x is a matrix or a data frame, columns correspond to observations.
which	Whether it is a column annotation or a row annotation?
gp	Graphic parameters for the boxes. The length of the graphic parameters should be one or the number of observations. There are two unstandard parameters specificly for horizon chart: pos_fill and neg_fill controls the filled color for positive values and negative values.
n_slice	Number of slices on y-axis.
slice_size	Height of the slice. If the value is not NULL, n_slice will be recalculated.

`negative_from_top`
: Whether the areas for negative values start from the top or the bottom of the plotting region?

`normalize`
: Whether normalize `x` by max(abs(x)).

`gap`
: Gap size of neighbouring horizon chart.

`axis`
: Whether to add axis?

`axis_param`
: parameters for controlling axis. See `default_axis_param` for all possible settings and default parameters.

`width`
: Width of the annotation. The value should be an absolute unit. Width is not allowed to be set for column annotation.

`height`
: Height of the annotation. The value should be an absolute unit. Height is not allowed to be set for row annotation.

Details

Horizon chart as row annotation is only supported.

Value

An annotation function which can be used in `HeatmapAnnotation`.

See Also

https://jokergoo.github.io/ComplexHeatmap-reference/book/heatmap-annotations.html#horizon-chart-annotation

Examples

```
lt = lapply(1:20, function(x) cumprod(1 + runif(1000, -x/100, x/100)) - 1)
anno = anno_horizon(lt, which = "row")
draw(anno, test = "horizon chart")
anno = anno_horizon(lt, which = "row",
    gp = gpar(pos_fill = "orange", neg_fill = "darkgreen"))
draw(anno, test = "horizon chart, col")
anno = anno_horizon(lt, which = "row", negative_from_top = TRUE)
draw(anno, test = "horizon chart + negative_from_top")
anno = anno_horizon(lt, which = "row", gap = unit(1, "mm"))
draw(anno, test = "horizon chart + gap")
anno = anno_horizon(lt, which = "row",
    gp = gpar(pos_fill = rep(c("orange", "red"), each = 10),
    neg_fill = rep(c("darkgreen", "blue"), each = 10)))
draw(anno, test = "horizon chart, col")
```

anno_image *Image Annotation*

Description

Image Annotation

Usage

```
anno_image(image, which = c("column", "row"), border = TRUE,
    gp = gpar(fill = NA, col = NA), space = unit(1, "mm"),
    width = NULL, height = NULL)
```

Arguments

image	A vector of file paths of images. The format of the image is inferred from the suffix name of the image file. NA values or empty strings in the vector means no image to drawn.
which	Whether it is a column annotation or a row annotation?
border	Wether draw borders of the annotation region?
gp	Graphic parameters for annotation grids. If the image has transparent background, the fill parameter can be used to control the background color in the annotation grids.
space	The space around the image to the annotation grid borders. The value should be a unit object.
width	Width of the annotation. The value should be an absolute unit. Width is not allowed to be set for column annotation.
height	Height of the annotation. The value should be an absolute unit. Height is not allowed to be set for row annotation.

Details

This function supports image formats in png, svg, pdf, eps, jpeg/jpg, tiff. png, jpeg/jpg and tiff images are imported by readPNG, readJPEG and readTIFF, and drawn by grid.raster. svg images are firstly reformatted by rsvg::rsvg_svg and then imported by readPicture and drawn by grid.picture. pdf and eps images are imported by PostScriptTrace and readPicture, later drawn by grid.picture.

Different image formats can be mixed in the image vector.

Value

An annotation function which can be used in HeatmapAnnotation.

See Also

https://jokergoo.github.io/ComplexHeatmap-reference/book/heatmap-annotations.html#image-annotation

Examples

```
# download the free icons from https://github.com/Keyamoon/IcoMoon-Free
## Not run:
image = sample(dir("~/Downloads/IcoMoon-Free-master/PNG/64px", full.names = TRUE), 10)
anno = anno_image(image)
draw(anno, test = "png")
image[1:5] = ""
anno = anno_image(image)
draw(anno, test = "some of png")

## End(Not run)
```

---

anno_joyplot *Joyplot Annotation*

Description

Joyplot Annotation

Usage

```
anno_joyplot(x, which = c("column", "row"), gp = gpar(fill = "#000000"),
    scale = 2, transparency = 0.6,
    axis = TRUE, axis_param = default_axis_param(which),
    width = NULL, height = NULL)
```

Arguments

x	A matrix or a list. If x is a matrix or a data frame, columns correspond to observations.
which	Whether it is a column annotation or a row annotation?
gp	Graphic parameters for the boxes. The length of the graphic parameters should be one or the number of observations.
scale	Relative height of the curve. A value higher than 1 increases the height of the curve.
transparency	Transparency of the filled colors. Value should be between 0 and 1.
axis	Whether to add axis?
axis_param	parameters for controlling axis. See default_axis_param for all possible settings and default parameters.
width	Width of the annotation. The value should be an absolute unit. Width is not allowed to be set for column annotation.
height	Height of the annotation. The value should be an absolute unit. Height is not allowed to be set for row annotation.

Value

An annotation function which can be used in HeatmapAnnotation.

See Also

https://jokergoo.github.io/ComplexHeatmap-reference/book/heatmap-annotations.html#joyplot-annotation

Examples

```
m = matrix(rnorm(1000), nc = 10)
lt = apply(m, 2, function(x) data.frame(density(x)[c("x", "y")]))
anno = anno_joyplot(lt, width = unit(4, "cm"), which = "row")
draw(anno, test = "joyplot")
anno = anno_joyplot(lt, width = unit(4, "cm"), which = "row", gp = gpar(fill = 1:10))
draw(anno, test = "joyplot + col")
anno = anno_joyplot(lt, width = unit(4, "cm"), which = "row", scale = 1)
draw(anno, test = "joyplot + scale")

m = matrix(rnorm(5000), nc = 50)
lt = apply(m, 2, function(x) data.frame(density(x)[c("x", "y")]))
anno = anno_joyplot(lt, width = unit(4, "cm"), which = "row", gp = gpar(fill = NA), scale = 4)
draw(anno, test = "joyplot")
```

---

anno_lines *Lines Annotation*

Description

Lines Annotation

Usage

```
anno_lines(x, which = c("column", "row"), border = TRUE, gp = gpar(),
   add_points = smooth, smooth = FALSE, pch = 16, size = unit(2, "mm"), pt_gp = gpar(), ylim = NULL,
    extend = 0.05, axis = TRUE, axis_param = default_axis_param(which),
    width = NULL, height = NULL)
```

Arguments

x	The value vector. The value can be a vector or a matrix. The length of the vector or the number of rows of the matrix is taken as the number of the observations of the annotation.
which	Whether it is a column annotation or a row annotation?
border	Wether draw borders of the annotation region?
gp	Graphic parameters for lines. The length of each graphic parameter can be 1, or number of columns of x is x is a matrix.

add_points	Whether to add points on the lines?
smooth	If it is TRUE, smoothing by loess is performed. If it is TRUE, add_points is set to TRUE by default.
pch	Point type. The length setting is the same as gp.
size	Point size, the value should be a unit object. The length setting is the same as gp.
pt_gp	Graphic parameters for points. The length setting is the same as gp.
ylim	Data ranges. By default it is range(x).
extend	The extension to both side of ylim. The value is a percent value corresponding to ylim[2] - ylim[1].
axis	Whether to add axis?
axis_param	parameters for controlling axis. See default_axis_param for all possible settings and default parameters.
width	Width of the annotation. The value should be an absolute unit. Width is not allowed to be set for column annotation.
height	Height of the annotation. The value should be an absolute unit. Height is not allowed to be set for row annotation.

Value

An annotation function which can be used in HeatmapAnnotation.

See Also

https://jokergoo.github.io/ComplexHeatmap-reference/book/heatmap-annotations.html#lines-annotation

Examples

```
anno = anno_lines(runif(10))
draw(anno, test = "anno_lines")
anno = anno_lines(cbind(c(1:5, 1:5), c(5:1, 5:1)), gp = gpar(col = 2:3))
draw(anno, test = "matrix")
anno = anno_lines(cbind(c(1:5, 1:5), c(5:1, 5:1)), gp = gpar(col = 2:3),
add_points = TRUE, pt_gp = gpar(col = 5:6), pch = c(1, 16))
draw(anno, test = "matrix")
```

---

anno_link *Link Annotation*

Description

Link Annotation

Usage

```
anno_link(...)
```

Arguments

...	Pass to anno_zoom.

Details

This function is the same as anno_zoom. It links subsets of rows or columns to a list of graphic regions.

Examples

```
# There is no example
NULL
```

---

anno_mark *Link annotation with labels*

Description

Link annotation with labels

Usage

```
anno_mark(at, labels, which = c("column", "row"),
    side = ifelse(which == "column", "top", "right"),
    lines_gp = gpar(), labels_gp = gpar(),
    labels_rot = ifelse(which == "column", 90, 0), padding = unit(1, "mm"),
    link_width = unit(5, "mm"), link_height = link_width,
    link_gp = lines_gp,
    extend = unit(0, "mm"))
```

Arguments

at	Numeric index from the original matrix.
labels	Corresponding labels.
which	Whether it is a column annotation or a row annotation?
side	Side of the labels. If it is a column annotation, valid values are "top" and "bottom"; If it is a row annotation, valid values are "left" and "right".
lines_gp	Please use link_gp instead.
link_gp	Graphic settings for the segments.
labels_gp	Graphic settings for the labels.

labels_rot	Rotations of labels, scalar.
padding	Padding between neighbouring labels in the plot.
link_width	Width of the segments.
link_height	Similar as link_width, used for column annotation.
extend	By default, the region for the labels has the same width (if it is a column annotation) or same height (if it is a row annotation) as the heatmap. The size can be extended by this options. The value can be a proportion number or a unit object. The length can be either one or two.

Details

Sometimes there are many rows or columns in the heatmap and we want to mark some of the rows. This annotation function is used to mark these rows and connect labels and corresponding rows with links.

Value

An annotation function which can be used in HeatmapAnnotation.

See Also

https://jokergoo.github.io/ComplexHeatmap-reference/book/heatmap-annotations.html#mark-annotation

Examples

```
anno = anno_mark(at = c(1:4, 20, 60, 97:100), labels = month.name[1:10], which = "row")
draw(anno, index = 1:100, test = "anno_mark")

m = matrix(1:1000, byrow = TRUE, nr = 100)
anno = anno_mark(at = c(1:4, 20, 60, 97:100), labels = month.name[1:10], which = "row")
Heatmap(m, cluster_rows = FALSE, cluster_columns = FALSE) + rowAnnotation(mark = anno)
Heatmap(m) + rowAnnotation(mark = anno)
```

---

anno_numeric *Numeric labels annotation*

Description

Numeric labels annotation

Usage

```
anno_numeric(x, rg = range(x), labels_gp = gpar(), x_convert = NULL,
    labels_format = NULL, labels_offset = unit(4, "pt"),
    bg_gp = gpar(fill = "#8080FF", col = "#8080FF"),
    bar_width = unit(1, "npc") - unit(4, "pt"),
    round_corners = TRUE, r = unit(0.05, "snpc"),
    which = c("row", "column"), align_to = "left", width = NULL)
```

Arguments

x	A vector of numeric values.
rg	Range. A numeric vector of length two.
labels_gp	Graphics parameters for labels.
x_convert	A function applied on x. E.g. when x contains p-values, to map x to the heights of bars, a transformation of -log10(x) is normally applied.
labels_format	A function applied on x. E.g., when x is a numeric, labels_format can be set to function(x) sprintf("%.2f", x).
labels_offset	Offset of labels to the left or right of bars.
bg_gp	Graphics parameters for the background bars.
bar_width	Width of bars. Note it corresponds to the vertical direction.
round_corners	Whether to draw bars with round corners?
r	Radius of the round corners.
which	Row or column. Currently it only supports row annotation.
align_to	Which side bars as well as the labels are aligned to. Values can be "left" or "right". If x contains both positive and negative values, align_to can also be set to 0 so that bars are aligned to pos = 0.
width	Width of the annotation.

Examples

```
m = matrix(rnorm(100), 10)
x = rnorm(10)
Heatmap(m, right_annotation = rowAnnotation(numeric = anno_numeric(x)))
```

---

anno_oncoprint_barplot

Barplot Annotation for oncoPrint

Description

Barplot Annotation for oncoPrint

Usage

```
anno_oncoprint_barplot(type = NULL, which = c("column", "row"),
   bar_width = 0.6, beside = FALSE, ylim = NULL, show_fraction = FALSE, axis = TRUE,
   axis_param = if(which == "column") default_axis_param("column") else list(side = "top", labels_rot =
    width = NULL, height = NULL, border = FALSE)
```

Arguments

type	A vector of the alteration types in the data. It can be a subset of all alteration types if you don't want to show them all.
which	Is it a row annotation or a column annotation?
bar_width	Width of the bars.
beside	Will bars be stacked or be positioned beside each other?
ylim	Data range.
show_fraction	Whether to show the numbers or the fractions?
axis	Whether draw axis?
axis_param	Parameters for controlling axis.
width	Width of the annotation.
height	Height of the annotation.
border	Whether draw the border?

Details

This annotation function should always be used with oncoPrint.

Author(s)

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Examples

```
# There is no example
NULL
```

---

anno_points *Points Annotation*

Description

Points Annotation

Usage

```
anno_points(x, which = c("column", "row"), border = TRUE, gp = gpar(), pch = 16,
    size = unit(2, "mm"), ylim = NULL, extend = 0.05, axis = TRUE,
    axis_param = default_axis_param(which), width = NULL, height = NULL, ...)
```

Arguments

x	The value vector. The value can be a vector or a matrix. The length of the vector or the number of rows of the matrix is taken as the number of the observations of the annotation.
which	Whether it is a column annotation or a row annotation?
border	Wether draw borders of the annotation region?
gp	Graphic parameters for points. The length of each graphic parameter can be 1, length of x if x is a vector, or number of columns of x is x is a matrix.
pch	Point type. The length setting is the same as gp.
size	Point size, the value should be a unit object. The length setting is the same as gp.
ylim	Data ranges. By default it is range(x).
extend	The extension to both side of ylim. The value is a percent value corresponding to ylim[2] - ylim[1].
axis	Whether to add axis?
axis_param	parameters for controlling axis. See default_axis_param for all possible settings and default parameters.
width	Width of the annotation. The value should be an absolute unit. Width is not allowed to be set for column annotation.
height	Height of the annotation. The value should be an absolute unit. Height is not allowed to be set for row annotation.
...	Other arguments.

Value

An annotation function which can be used in HeatmapAnnotation.

See Also

https://jokergoo.github.io/ComplexHeatmap-reference/book/heatmap-annotations.html#points-annotation

Examples

```
anno = anno_points(runif(10))
draw(anno, test = "anno_points")
anno = anno_points(matrix(runif(20), nc = 2), pch = 1:2)
draw(anno, test = "matrix")
```

anno_simple *Simple Annotation*

Description

Simple Annotation

Usage

```
anno_simple(x, col, na_col = "grey",
    which = c("column", "row"), border = FALSE, gp = gpar(),
    pch = NULL, pt_size = unit(1, "snpc")*0.8, pt_gp = gpar(),
    simple_anno_size = ht_opt$simple_anno_size,
    width = NULL, height = NULL)
```

Arguments

x	The value vector. The value can be a vector or a matrix. The length of the vector or the nrow of the matrix is taken as the number of the observations of the annotation. The value can be numeric or character and NA value is allowed.
col	Color that maps to x. If x is numeric and needs a continuous mapping, col should be a color mapping function which accepts a vector of values and returns a vector of colors. Normally it is generated by colorRamp2. If x is discrete (numeric or character) and needs a discrete color mapping, col should be a vector of colors with levels in x as vector names. If col is not specified, the color mapping is randomly generated by ComplexHeatmap:::default_col.
na_col	Color for NA value.
which	Whether it is a column annotation or a row annotation?
border	Wether draw borders of the annotation region?
gp	Graphic parameters for grid borders. The fill parameter is disabled.
pch	Points/symbols that are added on top of the annotation grids. The value can be numeric or single letters. It can be a vector if x is a vector and a matrix if x is a matrix. No points are drawn if the corresponding values are NA.
pt_size	Size of the points/symbols. It should be a unit object. If x is a vector, the value of pt_size can be a vector, while if x is a matrix, pt_size can only be a single value.
pt_gp	Graphic parameters for points/symbols. The length setting is same as pt_size. If pch is set as letters, the fontsize should be set as pt_gp = gpar(fontsize = ...).
simple_anno_size	size of the simple annotation.
width	Width of the annotation. The value should be an absolute unit. Width is not allowed to be set for column annotation.
height	Height of the annotation. The value should be an absolute unit. Height is not allowed to be set for row annotation.

Details

The "simple annotation" is the most widely used annotation type which is heatmap-like, where the grid colors correspond to the values. anno_simple also supports to add points/symbols on top of the grids where the it can be normal point (when pch is set as numbers) or letters (when pch is set as single letters).

Value

An annotation function which can be used in HeatmapAnnotation.

See Also

https://jokergoo.github.io/ComplexHeatmap-reference/book/heatmap-annotations.html#simple-annotation-as-an-annotation-function

Examples

```
anno = anno_simple(1:10)
draw(anno, test = "a numeric vector")

anno = anno_simple(cbind(1:10, 10:1))
draw(anno, test = "a matrix")

anno = anno_simple(1:10, pch = c(1:4, NA, 6:8, NA, 10))
draw(anno, test = "pch has NA values")

anno = anno_simple(1:10, pch = c(rep("A", 5), rep(NA, 5)))
draw(anno, test = "pch has NA values")

pch = matrix(1:20, nc = 2)
pch[sample(length(pch), 10)] = NA
anno = anno_simple(cbind(1:10, 10:1), pch = pch)
draw(anno, test = "matrix, pch is a matrix with NA values")
```

---

anno_summary *Summary Annotation*

Description

Summary Annotation

Usage

```
anno_summary(which = c("column", "row"), border = TRUE, bar_width = 0.8,
    axis = TRUE, axis_param = default_axis_param(which),
    ylim = NULL, extend = 0.05, outline = TRUE, box_width = 0.6,
    pch = 1, size = unit(2, "mm"), gp = gpar(),
    width = NULL, height = NULL)
```

Arguments

which	Whether it is a column annotation or a row annotation?
border	Wether draw borders of the annotation region?
bar_width	Relative width of the bars. The value should be smaller than one.
axis	Whether to add axis?
axis_param	parameters for controlling axis. See default_axis_param for all possible settings and default parameters.
ylim	Data ranges. ylim for barplot is enforced to be c(0, 1).
extend	The extension to both side of ylim. The value is a percent value corresponding to ylim[2] - ylim[1]. This argument is only for boxplot.
outline	Whether draw outline of boxplots?
box_width	Relative width of boxes. The value should be smaller than one.
pch	Point style.
size	Point size.
gp	Graphic parameters.
width	Width of the annotation. The value should be an absolute unit. Width is not allowed to be set for column annotation.
height	Height of the annotation. The value should be an absolute unit. Height is not allowed to be set for row annotation.

Details

anno_summary is a special annotation function that it only works for one-column or one-row heatmap. It shows the summary of the values in the heatmap. If the values in the heatmap is discrete, the proportion of each level (the sum is normalized to 1) is visualized as stacked barplot. If the heatmap is split into multiple slices, multiple bars are put in the annotation. If the value is continuous, boxplot is used.

In the barplot, the color schema is used as the same as the heatmap, while for the boxplot, the color needs to be controlled by gp.

Value

An annotation function which can be used in HeatmapAnnotation.

See Also

https://jokergoo.github.io/ComplexHeatmap-reference/book/heatmap-annotations.html#summary-annotation

Examples

```
ha = HeatmapAnnotation(summary = anno_summary(height = unit(4, "cm")))
v = sample(letters[1:2], 50, replace = TRUE)
split = sample(letters[1:2], 50, replace = TRUE)
Heatmap(v, top_annotation = ha, width = unit(1, "cm"), split = split)
```

```
ha = HeatmapAnnotation(summary = anno_summary(gp = gpar(fill = 2:3), height = unit(4, "cm")))
v = rnorm(50)
Heatmap(v, top_annotation = ha, width = unit(1, "cm"), split = split)
```

---

anno_text *Text Annotation*

Description

Text Annotation

Usage

```
anno_text(x, which = c("column", "row"), gp = gpar(),
    rot = guess_rot(), just = guess_just(),
    offset = guess_location(), location = guess_location(),
    width = NULL, height = NULL, show_name = FALSE)
```

Arguments

x	A vector of text.
which	Whether it is a column annotation or a row annotation?
gp	Graphic parameters.
rot	Rotation of the text, pass to grid.text.
just	Justification of text, pass to grid.text.
offset	Depracated, use location instead.
location	Position of the text. By default rot, just and location are automatically inferred according to whether it is a row annotation or column annotation. The value of location should be a unit object, normally in npc unit. E.g. unit(0, 'npc') means the most left of the annotation region and unit(1, 'npc') means the most right of the annotation region.
width	Width of the annotation. The value should be an absolute unit. Width is not allowed to be set for column annotation.
height	Height of the annotation. The value should be an absolute unit. Height is not allowed to be set for row annotation.
show_name	Whether to show the annotation name.

Value

An annotation function which can be used in HeatmapAnnotation.

See Also

https://jokergoo.github.io/ComplexHeatmap-reference/book/heatmap-annotations.html#text-annotation

Examples

```
anno = anno_text(month.name)
draw(anno, test = "month names")
anno = anno_text(month.name, gp = gpar(fontsize = 16))
draw(anno, test = "month names with fontsize")
anno = anno_text(month.name, gp = gpar(fontsize = 1:12+4))
draw(anno, test = "month names with changing fontsize")
anno = anno_text(month.name, which = "row")
draw(anno, test = "month names on rows")
anno = anno_text(month.name, location = 0, rot = 45,
    just = "left", gp = gpar(col = 1:12))
draw(anno, test = "with rotations")
anno = anno_text(month.name, location = 1,
    rot = 45, just = "right", gp = gpar(fontsize = 1:12+4))
draw(anno, test = "with rotations")
```

---

anno_textbox *Text box annotations*

Description

Text box annotations

Usage

```
anno_textbox(align_to, text, background_gp = gpar(fill = "#DDDDDD", col = "#AAAAAA"),
    which = c("row", "column"), by = "anno_link", side = c("right", "left"), ...)
```

Arguments

`align_to`	It controls how the text boxes are aligned to the heatmap rows. The value can be a categorical vector which have the same length as heatmap rows, or a list of row indices. It does not necessarily include all row indices.
`text`	The corresponding texts. The value should be a list of texts. To control graphics parameters of texts in the boxes, The value of `text` can also be set as a list of data frames where the first column contains the text, from the second column contains graphics parameters for each text. The column names should be "col", "fontsize", "fontfamily" and "fontface".
`background_gp`	Graphics for the background.
`which`	Only "row" is allowed.
`by`	Are text boxed arranged by `anno_link` or by `anno_block`?
`side`	Side of the annotation to the heatmap.
`...`	Pass to `textbox_grob`.

Examples

```
require(circlize)
mat = matrix(rnorm(100*10), nrow = 100)

split = sample(letters[1:10], 100, replace = TRUE)
text = lapply(unique(split), function(x) {
data.frame(month.name, col = rand_color(12, friendly = TRUE), fontsize = runif(12, 6, 14))
})
names(text) = unique(split)

Heatmap(mat, cluster_rows = FALSE, row_split = split,
    right_annotation = rowAnnotation(wc = anno_textbox(split, text))
)
```

---

anno_zoom *Zoom annotation*

Description

Zoom annotation

Usage

```
anno_zoom(align_to, panel_fun = function(index, nm = NULL) { grid.rect() },
    which = c("column", "row"), side = ifelse(which == "column", "top", "right"),
    size = NULL, gap = unit(1, "mm"),
    link_width = unit(5, "mm"), link_height = link_width, link_gp = gpar(),
    extend = unit(0, "mm"), width = NULL, height = NULL, internal_line = TRUE)
```

Arguments

align_to	It defines how the boxes correspond to the rows or the columns in the heatmap. If the value is a list of indices, each box corresponds to the rows or columns with indices in one vector in the list. If the value is a categorical variable (e.g. a factor or a character vector) that has the same length as the rows or columns in the heatmap, each box corresponds to the rows/columns in each level in the categorical variable.
panel_fun	A self-defined function that defines how to draw graphics in the box. The function must have a index argument which is the indices for the rows/columns that the box corresponds to. It can have second argument nm which is the "name" of the selected part in the heatmap. The corresponding value for nm comes from align_to if it is specified as a categorical variable or a list with names.
which	Whether it is a column annotation or a row annotation?
side	Side of the boxes If it is a column annotation, valid values are "top" and "bottom"; If it is a row annotation, valid values are "left" and "right".

size	The size of boxes. It can be pure numeric that they are treated as relative fractions of the total height/width of the heatmap. The value of size can also be absolute units.
gap	Gaps between boxes.
link_gp	Graphic settings for the segments.
link_width	Width of the segments.
link_height	Similar as link_width, used for column annotation.
extend	By default, the region for the labels has the same width (if it is a column annotation) or same height (if it is a row annotation) as the heatmap. The size can be extended by this options. The value can be a proportion number or a unit object. The length can be either one or two.
width	Width of the annotation. The value should be an absolute unit. Width is not allowed to be set for column annotation.
height	Height of the annotation. The value should be an absolute unit. Height is not allowed to be set for row annotation.
internal_line	Internally used.

Details

anno_zoom creates several plotting regions (boxes) which can be corresponded to subsets of rows/columns in the heatmap.

Value

An annotation function which can be used in HeatmapAnnotation.

See Also

https://jokergoo.github.io/ComplexHeatmap-reference/book/heatmap-annotations.html#zoom-annotation

Examples

```
set.seed(123)
m = matrix(rnorm(100*10), nrow = 100)
subgroup = sample(letters[1:3], 100, replace = TRUE, prob = c(1, 5, 10))
rg = range(m)
panel_fun = function(index, nm) {
pushViewport(viewport(xscale = rg, yscale = c(0, 2)))
grid.rect()
grid.xaxis(gp = gpar(fontsize = 8))
grid.boxplot(m[index, ], pos = 1, direction = "horizontal")
grid.text(paste("distribution of group", nm), mean(rg), y = 1.9,
just = "top", default.units = "native", gp = gpar(fontsize = 10))
popViewport()
}
anno = anno_zoom(align_to = subgroup, which = "row", panel_fun = panel_fun,
size = unit(2, "cm"), gap = unit(1, "cm"), width = unit(4, "cm"))
Heatmap(m, right_annotation = rowAnnotation(foo = anno), row_split = subgroup)
```

attach_annotation-Heatmap-method *Attach heatmap annotations to the heatmap*

Description

Attach heatmap annotations to the heatmap

Usage

```
## S4 method for signature 'Heatmap'
attach_annotation(object, ha, side = c("top", "bottom", "left", "right"),
    gap = unit(1, "points"))
```

Arguments

object	A Heatmap-class object.
ha	A HeatmapAnnotation-class object.
side	Which side of the heatmap. Value should be in "top", "bottom", "left", "right".
gap	Space between the two heatmap annotations.

Examples

```
m = matrix(rnorm(100), 10)
ht = Heatmap(m)
ha = HeatmapAnnotation(foo = 1:10)
ht = attach_annotation(ht, ha)
ht
ha2 = HeatmapAnnotation(bar = letters[1:10])
ht = attach_annotation(ht, ha2)
ht
```

bar3D *Draw 3D bars*

Description

Draw 3D bars

Usage

```
bar3D(x, y, w, h, l, theta = 60, default.units = "npc", fill = "white", col = "black")
```

Arguments

x	x coordinate of the center point in the bottom face.
y	y coordinate of the center point in the bottom face.
w	Width of the botton face.
h	Height of the botton face.
l	Length of the bars (in the z-direction).
theta	The angle for the projection.
default.units	Units.
fill	Filled colors for the bars.
col	Border colors.

Examples

```
grid.newpage()
bar3D(c(0.3, 0.7), 0.5, 0.2, 0.2, 0.2, fill = 2:3)
```

---

bin_genome *Bin the genome*

Description

Bin the genome

Usage

```
bin_genome(species = "hg19", bins = 2000, bin_size = NULL, ...)
```

Arguments

species	Abbreviation of the genome, pass to read.chromInfo.
bins	Number of bins. The final number of bins is approximately equal to it.
bin_size	Size of the bins. If bin_size is set, bins is ignored.
...	All pass to read.chromInfo. E.g. you can set a subset of chromosomes there.

Value

A GRanges object of the genomic bins.

Examples

```
# There is no example
NULL
```

c.ColorMapping *Concatenate A List of ColorMapping objects*

Description

Concatenate A List of ColorMapping objects

Usage

```
## S3 method for class 'ColorMapping'
c(..., name = NULL)
```

Arguments

...	A list of ColorMapping-class objects.
name	Name of the new merged color mapping.

Details

Only discrete color mappings can be concatenated.

Examples

```
cm1 = ColorMapping(colors = c("A" = "red", "B" = "black"))
cm2 = ColorMapping(colors = c("B" = "blue", "C" = "green"))
c(cm1, cm2)
```

c.HeatmapAnnotation *Concatenate Heatmap Annotations*

Description

Concatenate Heatmap Annotations

Usage

```
## S3 method for class 'HeatmapAnnotation'
c(..., gap = unit(1, "points"))
```

Arguments

...	HeatmapAnnotation-class objects.
gap	Gap between the groups of annotations.

Details

The heatmap annotations should have same number of observations.

Examples

```
ha1 = HeatmapAnnotation(foo = 1:10)
ha2 = HeatmapAnnotation(bar = anno_points(10:1))
ha = c(ha1, ha2)
ha
ha3 = HeatmapAnnotation(sth = cbind(1:10, 10:1))
ha = c(ha1, ha2, ha3, gap = unit(c(1, 4), "mm"))
ha
```

---

cluster_between_groups

Cluster only between Groups

Description

Cluster only between Groups

Usage

```
cluster_between_groups(mat, factor)
```

Arguments

mat	A matrix where clustering is applied on columns.
factor	A categorical vector.

Details

The clustering is only applied between groups and inside a group, the order is unchanged.

Value

A dendrogram object.

Examples

```
m = matrix(rnorm(120), nc = 12)
colnames(m) = letters[1:12]
fa = rep(c("a", "b", "c"), times = c(2, 4, 6))
dend = cluster_between_groups(m, fa)
grid.dendrogram(dend, test = TRUE)
```

cluster_within_group *Cluster within and between Groups*

Description

Cluster within and between Groups

Usage

```
cluster_within_group(mat, factor)
```

Arguments

mat	A matrix where clustering is applied on columns.
factor	A categorical vector.

Details

The clustering is firstly applied in each group, then clustering is applied to group means. The within-group dendrograms and between-group dendrogram are finally connected by merge_dendrogram.

In the final dendrogram, the within group dendrograms are enforced to be flat lines to emphasize that the within group dendrograms have no sense to compare to between-group dendrogram.

Value

A dendrogram object. The order of columns can be retrieved by order.dendrogram.

Examples

```
m = matrix(rnorm(120), nc = 12)
colnames(m) = letters[1:12]
fa = rep(c("a", "b", "c"), times = c(2, 4, 6))
dend = cluster_within_group(m, fa)
grid.dendrogram(dend, test = TRUE)
```

ColorMapping *Constructor Method for ColorMapping Class*

Description

Constructor Method for ColorMapping Class

Usage

```
ColorMapping(name, colors = NULL, levels = NULL,
    col_fun = NULL, breaks = NULL, na_col = "#FFFFFF", full_col = NULL)
```

Arguments

name	Name for this color mapping. The name is automatically generated if it is not specified.
colors	Discrete colors.
levels	Levels that correspond to colors. If colors is name indexed, levels can be ignored.
col_fun	Color mapping function that maps continuous values to colors.
breaks	Breaks for the continuous color mapping. If col_fun is generated by colorRamp2, breaks is automatically inferred from the color mapping function.
na_col	Colors for NA values.
full_col	A super set of colors, used internally.

Details

colors and levels are used for discrete color mapping, col_fun and breaks are used for continuous color mapping.

Value

A ColorMapping-class object.

Author(s)

Zuguang Gu <z.gu@dkfz.de>

Examples

```
cm = ColorMapping(colors = c("A" = "red", "B" = "black"))
cm
require(circlize)
col_fun = colorRamp2(c(0, 1), c("white", "red"))
cm = ColorMapping(col_fun = col_fun)
```

ColorMapping-class *Class for Color Mapping*

Description

Class for Color Mapping

Details

The ColorMapping-class handles color mapping for discrete values and continuous values. Discrete values are mapped by setting a vector of colors and continuous values are mapped by setting a color mapping function.

Methods

The ColorMapping-class provides following methods:

- ColorMapping: contructor methods.
- map_to_colors,ColorMapping-method: mapping values to colors.
- color_mapping_legend,ColorMapping-method: draw legend or get legend as an object.

Author(s)

Zuguang Gu <z.gu@dkfz.de>

Examples

```
# There is no example
NULL
```

---

color_mapping_legend-ColorMapping-method

Draw Legend Based on Color Mapping

Description

Draw Legend Based on Color Mapping

Usage

```
## S4 method for signature 'ColorMapping'
color_mapping_legend(object,
    plot = TRUE, ...,

    color_bar = object@type,

    title = object@name,
    title_gp = gpar(fontsize = 10, fontface = "bold"),
    title_position = "topleft",
    grid_height = unit(4, "mm"),
    grid_width = unit(4, "mm"),
    tick_length = unit(0.8, "mm"),
    border = NULL,
    at = object@levels,
    labels = at,
    labels_gp = gpar(fontsize = 10),
    labels_rot = 0,
    nrow = NULL,
    ncol = 1,
    by_row = FALSE,
```

```
    legend_gp = gpar(),
    legend_height = NULL,
    legend_width = NULL,
    legend_direction = c("vertical", "horizontal"),
    break_dist = NULL,

    graphics = NULL,
    param = NULL)
```

Arguments

object	A ColorMapping-class object.
plot	Whether to plot or just return the legend object?
...	Pass to draw,Legends-method.
color_bar	"continous" or "discrete". It controls whether to show the discrete legend for the continuous color mapping.
title	Title of the legend, by default it is the name of the legend.
title_gp	Graphical parameters for legend title.
title_position	Position of the title. See Legend for all possible values.
grid_height	Height of each legend grid. Pass to Legend.
grid_width	Width of each legend grid. Pass to Legend.
tick_length	Length of the ticks on the continuous legends. Value should be a unit object.
border	Color for legend grid borders. Pass to Legend.
at	Break values of the legend. By default it is the levels in the ColorMapping-class object.
labels	Labels corresponding to break values.
labels_gp	Graphcial parameters for legend labels.
labels_rot	Rotation of labels.
nrow	Pass to Legend. It controls the layout of legend grids if they are arranged in multiple rows or columns.
ncol	Pass to Legend. It controls the layout of legend grids if they are arranged in multiple rows or columns.
by_row	Pass to Legend. It controls the order of legend grids if they are arranged in multiple rows or columns.
legend_gp	Graphic parameters for legend.
legend_height	Height of the legend body. It only works when color_bar is continuous and direction is vertical. Pass to Legend.
legend_width	Width of the legend body. It only works when color_bar is continuous and direction is horizontal. Pass to Legend.
legend_direction	When color_bar is continuous, whether the legend is vertical or horizontal? Pass to Legend.

break_dist	A zooming factor to control relative distance of two neighbouring break values.The length of it should be length(at) - 1 or a scalar.
graphics	Internally used.
param	All the legend-related parameters can be specified as a single list.

Details

The legend is constructed by Legend.

Value

A Legends-class object.

Author(s)

Zuguang Gu <z.gu@dkfz.de>

Examples

```
# There is no example
NULL
```

---

columnAnnotation *Construct Column Annotations*

Description

Construct Column Annotations

Usage

```
columnAnnotation(...)
```

Arguments

...	Pass to HeatmapAnnotation.

Details

The function is identical to

```
HeatmapAnnotation(..., which = "column")
```

Value

A HeatmapAnnotation-class object.

Author(s)

Zuguang Gu <z.gu@dkfz.de>

Examples

```
# There is no example
NULL
```

---

column_dend-dispatch *Method dispatch page for column_dend*

Description

Method dispatch page for column_dend.

Dispatch

column_dend can be dispatched on following classes:

- column_dend,Heatmap-method, Heatmap-class class method
- column_dend,HeatmapList-method, HeatmapList-class class method

Examples

```
# no example
NULL
```

---

column_dend-Heatmap-method *Get Column Dendrograms from a Heatmap*

Description

Get Column Dendrograms from a Heatmap

Usage

```
## S4 method for signature 'Heatmap'
column_dend(object, on_slice = FALSE)
```

Arguments

object	A Heatmap-class object.
on_slice	If the value is TRUE, it returns the dendrogram on the slice level.

Value

The format of the returned object depends on whether rows/columns of the heatmaps are split.

Author(s)

Zuguang Gu <z.gu@dkfz.de>

Examples

```
mat = matrix(rnorm(100), 10)
ht = Heatmap(mat)
ht = draw(ht)
column_dend(ht)
ht = Heatmap(mat, column_km = 2)
ht = draw(ht)
column_dend(ht)
```

---

column_dend-HeatmapList-method

Get Column Dendrograms from a hHeatmap List

Description

Get Column Dendrograms from a hHeatmap List

Usage

```
## S4 method for signature 'HeatmapList'
column_dend(object, name = NULL, on_slice = FALSE)
```

Arguments

object	A HeatmapList-class object.
name	Name of a specific heatmap.
on_slice	If the value is TRUE, it returns the dendrogram on the slice level.

Value

The format of the returned object depends on whether rows/columns of the heatmaps are split.

Author(s)

Zuguang Gu <z.gu@dkfz.de>

Examples

```
mat = matrix(rnorm(100), 10)
ht_list = Heatmap(mat) + Heatmap(mat)
ht_list = draw(ht_list)
column_dend(ht_list)
ht_list = Heatmap(mat, column_km = 2) + Heatmap(mat, column_km = 2)
ht_list = draw(ht_list)
column_dend(ht_list)
column_dend(ht_list, on_slice = TRUE)
ht_list = Heatmap(mat) %v% Heatmap(mat)
ht_list = draw(ht_list)
column_dend(ht_list)
ht_list = Heatmap(mat, column_km = 2) %v% Heatmap(mat)
ht_list = draw(ht_list)
column_dend(ht_list)
```

---

column_order-dispatch *Method dispatch page for column_order*

Description

Method dispatch page for `column_order`.

Dispatch

`column_order` can be dispatched on following classes:

- `column_order,Heatmap-method`, `Heatmap-class` class method
- `column_order,HeatmapList-method`, `HeatmapList-class` class method

Examples

```
# no example
NULL
```

---

column_order-Heatmap-method *Get Column Order from a Aeatmap List*

Description

Get Column Order from a Aeatmap List

Usage

```
## S4 method for signature 'Heatmap'
column_order(object)
```

Arguments

object	A Heatmap-class object.

Value

The format of the returned object depends on whether rows/columns of the heatmaps are split.

Author(s)

Zuguang Gu <z.gu@dkfz.de>

Examples

```
mat = matrix(rnorm(100), 10)
ht = Heatmap(mat)
ht = draw(ht)
column_order(ht)
ht = Heatmap(mat, column_km = 2)
ht = draw(ht)
column_order(ht)
```

---

column_order-HeatmapList-method

Get Column Order from a Heatmap List

Description

Get Column Order from a Heatmap List

Usage

```
## S4 method for signature 'HeatmapList'
column_order(object, name = NULL)
```

Arguments

object	A HeatmapList-class object.
name	Name of a specific heatmap.

Value

The format of the returned object depends on whether rows/columns of the heatmaps are split.

Author(s)

Zuguang Gu <z.gu@dkfz.de>

Examples

```
mat = matrix(rnorm(100), 10)
ht_list = Heatmap(mat) + Heatmap(mat)
ht_list = draw(ht_list)
column_order(ht_list)
ht_list = Heatmap(mat, column_km = 2) + Heatmap(mat, column_km = 2)
ht_list = draw(ht_list)
column_order(ht_list)
ht_list = Heatmap(mat) %v% Heatmap(mat)
ht_list = draw(ht_list)
column_order(ht_list)
ht_list = Heatmap(mat, column_km = 2) %v% Heatmap(mat)
ht_list = draw(ht_list)
column_order(ht_list)
```

---

comb_degree *Degrees of the Combination sets*

Description

Degrees of the Combination sets

Usage

```
comb_degree(m)
```

Arguments

m	A combination matrix returned by make_comb_mat.

Details

The degree for a combination set is the number of sets that are selected.

Value

A vector of degrees of the combination sets.

Examples

```
set.seed(123)
lt = list(a = sample(letters, 10),
          b = sample(letters, 15),
          c = sample(letters, 20))
m = make_comb_mat(lt)
comb_degree(m)
```

comb_name *Names of the Combination sets*

Description

Names of the Combination sets

Usage

```
comb_name(m, readable = FALSE)
```

Arguments

m	A combination matrix returned by make_comb_mat.
readable	Whether the combination represents as e.g. "A&B&C".

Details

The name of the combination sets are formatted as a string of binary bits. E.g. for three sets of "a", "b", "c", the combination set with name "101" corresponds to select set a, not select set b and select set c. The definition of "select" depends on the value of mode from make_comb_mat.

Value

A vector of names of the combination sets.

Examples

```
set.seed(123)
lt = list(a = sample(letters, 10),
          b = sample(letters, 15),
          c = sample(letters, 20))
m = make_comb_mat(lt)
comb_name(m)
comb_name(m, readable = TRUE)
```

comb_size *Sizes of the Combination sets*

Description

Sizes of the Combination sets

Usage

```
comb_size(m, degree = NULL)
```

Arguments

m	A combination matrix returned by make_comb_mat.
degree	degree of the intersection. The value can be a vector.

Value

A vector of sizes of the combination sets.

Examples

```
set.seed(123)
lt = list(a = sample(letters, 10),
          b = sample(letters, 15),
          c = sample(letters, 20))
m = make_comb_mat(lt)
comb_size(m)
```

---

compare_heatmap *Compare heatmaps between stats::heatmap() and ComplexHeatmap::heatmap()*

Description

Compare heatmaps between stats::heatmap() and ComplexHeatmap::heatmap()

Usage

```
compare_heatmap(...)
```

Arguments

...	The same set of arguments passed to stats::heatmap and ComplexHeatmap::heatmap.

Details

The function plots two heatmaps, one by stats::heatmap and one by ComplexHeatmap::heatmap. Users can see the difference between the two implementations.

Examples

```
mat = matrix(rnorm(100), 10)
compare_heatmap(mat)
```

compare_heatmap.2 *Compare heatmaps between gplots::heatmap.2() and ComplexHeatmap::heatmap()*

Description

Compare heatmaps between gplots::heatmap.2() and ComplexHeatmap::heatmap()

Usage

```
compare_heatmap.2(...)
```

Arguments

...	The same set of arguments passed to `gplots::heatmap.2` and `ComplexHeatmap::heatmap.2`.

Details

The function plots two heatmaps, one by `gplots::heatmap.2` and one by `ComplexHeatmap::heatmap.2`. Users can see the difference between the two implementations.

Examples

```
mat = matrix(rnorm(100), 10)
compare_heatmap.2(mat)
```

compare_pheatmap *Compare heatmaps between pheatmap::pheatmap() and ComplexHeatmap::pheatmap()*

Description

Compare heatmaps between pheatmap::pheatmap() and ComplexHeatmap::pheatmap()

Usage

```
compare_pheatmap(...)
```

Arguments

...	The same set of arguments passed to `pheatmap::pheatmap` and `ComplexHeatmap::pheatmap`.

Details

The function plots two heatmaps, one by `pheatmap::pheatmap` and one by `ComplexHeatmap::pheatmap`. Users can see the difference between the two implementations.

Examples

```
mat = matrix(rnorm(100), 10)
compare_pheatmap(mat)
```

`complement_size` *Complement Set Size*

Description

Complement Set Size

Usage

```
complement_size(m)
```

Arguments

`m`	A combination matrix returned by `make_comb_mat`.

Value

If there is no complement set, it returns zero.

Examples

```
# There is no example
NULL
```

`component_height-dispatch`
Method dispatch page for component_height

Description

Method dispatch page for `component_height`.

Dispatch

`component_height` can be dispatched on following classes:

- `component_height,HeatmapList-method`, `HeatmapList-class` class method
- `component_height,Heatmap-method`, `Heatmap-class` class method

Examples

```
# no example
NULL
```

---

component_height-Heatmap-method

Heights of Heatmap Components

Description

Heights of Heatmap Components

Usage

```
## S4 method for signature 'Heatmap'
component_height(object, k = HEATMAP_LAYOUT_COLUMN_COMPONENT)
```

Arguments

object	A Heatmap-class object.
k	Which components in the heatmap. The value should numeric indices or the names of the corresponding column component. See **Detials**.

Details

All column components are: column_title_top, column_dend_top, column_names_top, column_anno_top, heatmap_body, column_anno_bottom, column_names_bottom, column_dend_bottom, column_title_bottom.

This function is only for internal use.

Value

A unit object.

Author(s)

Zuguang Gu <z.gu@dkfz.de>

Examples

```
# There is no example
NULL
```

component_height-HeatmapList-method
Height of Heatmap List Components

Description

Height of Heatmap List Components

Usage

```
## S4 method for signature 'HeatmapList'
component_height(object, k = HEATMAP_LIST_LAYOUT_COLUMN_COMPONENT)
```

Arguments

object	A HeatmapList-class object.
k	Which component in the heatmap list. Values are in ComplexHeatmap:::HEATMAP_LIST_LAYOUT_COLUMN

Value

A unit object.

Author(s)

Zuguang Gu <z.gu@dkfz.de>

Examples

```
# There is no example
NULL
```

component_width-dispatch
Method dispatch page for component_width

Description

Method dispatch page for component_width.

Dispatch

component_width can be dispatched on following classes:

- component_width,HeatmapList-method, HeatmapList-class class method
- component_width,Heatmap-method, Heatmap-class class method

Examples

```
# no example
NULL
```

---

component_width-Heatmap-method

Widths of Heatmap Components

Description

Widths of Heatmap Components

Usage

```
## S4 method for signature 'Heatmap'
component_width(object, k = HEATMAP_LAYOUT_ROW_COMPONENT)
```

Arguments

object	A Heatmap-class object.
k	Which components in the heatmap. The value should numeric indices or the names of the corresponding row component. See **Detials**.

Details

All row components are: row_title_left, row_dend_left, row_names_left, row_anno_left, heatmap_body, row_anno_right, row_names_right, row_dend_right, row_title_right.

This function is only for internal use.

Value

A unit object.

Author(s)

Zuguang Gu <z.gu@dkfz.de>

Examples

```
# There is no example
NULL
```

component_width-HeatmapList-method
Width of Heatmap List Components

Description

Width of Heatmap List Components

Usage

```
## S4 method for signature 'HeatmapList'
component_width(object, k = HEATMAP_LIST_LAYOUT_ROW_COMPONENT)
```

Arguments

object	A HeatmapList-class object.
k	Which component in the heatmap list. Values are in ComplexHeatmap:::HEATMAP_LIST_LAYOUT_ROW_CO

Details

This function is only for internal use.

Value

A unit object.

Author(s)

Zuguang Gu <z.gu@dkfz.de>

Examples

```
# There is no example
NULL
```

copy_all-AnnotationFunction-method *Copy the AnnotationFunction Object*

Description

Copy the AnnotationFunction Object

Usage

```
## S4 method for signature 'AnnotationFunction'
copy_all(object)
```

Arguments

object	The AnnotationFunction-class object.

Details

In AnnotationFunction-class, there is an environment which stores some external variables for the annotation function (specified by the var_import argument when constructing the AnnotationFunction-class object. This copy_all,AnnotationFunction-method hard copies all the variables into a new isolated environment.

The environment is at object@var_env.

Examples

```
# There is no example
NULL
```

copy_all-dispatch *Method dispatch page for copy_all*

Description

Method dispatch page for copy_all.

Dispatch

copy_all can be dispatched on following classes:

- copy_all,AnnotationFunction-method, AnnotationFunction-class class method
- copy_all,SingleAnnotation-method, SingleAnnotation-class class method

Examples

```
# no example
NULL
```

`copy_all-SingleAnnotation-method` *Copy the SingleAnnotation object*

Description

Copy the SingleAnnotation object

Usage

```
## S4 method for signature 'SingleAnnotation'
copy_all(object)
```

Arguments

`object`	The `SingleAnnotation-class` object.

Details

Since the SingleAnnotation object always contains an `AnnotationFunction-class` object, it calls `copy_all,AnnotationFunction-method` to hard copy the variable environment.

Examples

```
# There is no example
NULL
```

`decorate_annotation` *Decorate Heatmap Annotation*

Description

Decorate Heatmap Annotation

Usage

```
decorate_annotation(annotation, code, slice = 1, envir = new.env(parent = parent.frame()))
```

Arguments

annotation	Name of the annotation.
code	Code that adds graphics in the selected heatmap annotation.
slice	Index of the row slices or the column slice in the heatmap.
envir	Where to look for variables inside code.

Details

There is a viewport for every column annotation and row annotation. This function contructs the name of the viewport, goes to the viewport by seekViewport, runs code to that viewport, and finally goes back to the original viewport.

Value

The function returns no value.

Author(s)

Zuguang Gu <z.gu@dkfz.de>

See Also

https://jokergoo.github.io/ComplexHeatmap-reference/book/heatmap-decoration.html

Examples

```
set.seed(123)
ha1 = HeatmapAnnotation(df = data.frame(type = rep(letters[1:2], 5)))
ha2 = rowAnnotation(point = anno_points(runif(10), which = "row"))
Heatmap(matrix(rnorm(100), 10), name = "mat", km = 2,
    top_annotation = ha1) + ha2
decorate_annotation("type", {
    grid.circle(x = unit(c(0.2, 0.4, 0.6, 0.8), "npc"),
        gp = gpar(fill = "#FF000080"))
})
decorate_annotation("point", {
    grid.rect(gp = gpar(fill = "#FF000080"))
}, slice = 2)
```

---

decorate_column_dend *Decorate Heatmap Column Dendrograms*

Description

Decorate Heatmap Column Dendrograms

Usage

```
decorate_column_dend(..., envir = new.env(parent = parent.frame()))
```

Arguments

...	Pass to decorate_dend.
envir	Where to look for variables inside code.

Details

This is a wrapper function which pre-defined which argument in decorate_dend.

Value

The function returns no value.

Author(s)

Zuguang Gu <z.gu@dkfz.de>

Examples

```
# There is no example
NULL
```

---

decorate_column_names *Decorate Heatmap Column Names*

Description

Decorate Heatmap Column Names

Usage

```
decorate_column_names(..., envir = new.env(parent = parent.frame()))
```

Arguments

...	Pass to decorate_dimnames.
envir	Where to look for variables inside code.

Details

This is a helper function which pre-defined which argument in decorate_dimnames.

Value

The function returns no value.

Author(s)

Zuguang Gu <z.gu@dkfz.de>

Examples

```
# There is no example
NULL
```

`decorate_column_title` *Decorate Heatmap Column Titles*

Description

Decorate Heatmap Column Titles

Usage

```
decorate_column_title(..., envir = new.env(parent = parent.frame()))
```

Arguments

`...`	Pass to `decorate_title`.
`envir`	Where to look for variables inside code.

Details

This is a helper function which pre-defined `which` argument in `decorate_title`.

Value

The function returns no value.

Author(s)

Zuguang Gu <z.gu@dkfz.de>

Examples

```
# There is no example
NULL
```

`decorate_dend` *Decorate Heatmap Dendrograms*

Description

Decorate Heatmap Dendrograms

Usage

```
decorate_dend(heatmap, code, slice = 1, which = c("column", "row"),
    envir = new.env(parent = parent.frame()))
```

Arguments

`heatmap`	Name of the heatmap.
`code`	Code that adds graphics in the selected heatmap dendrogram.
`slice`	Index of the row slice or column slice in the heatmap.
`which`	Is the dendrogram on rows or on columns?
`envir`	Where to look for variables inside `code`.

Details

If you know the number of leaves in the dendrogram, it is simple to calculate the position of every leave in the dendrogram. E.g., for the column dendrogram, the i^th leave is located at:

```
# assume nc is the number of columns in the column slice
unit((i-0.5)/nc, "npc")
```

Value

This function returns no value.

Author(s)

Zuguang Gu <z.gu@dkfz.de>

See Also

https://jokergoo.github.io/ComplexHeatmap-reference/book/heatmap-decoration.html

Examples

```
set.seed(123)
Heatmap(matrix(rnorm(100), 10), name = "mat", km = 2)
decorate_dend("mat", {
    grid.rect(gp = gpar(fill = "#FF000080"))
}, which = "row", slice = 2)
```

`decorate_dimnames` *Decorate Heatmap Dimension Names*

Description

Decorate Heatmap Dimension Names

Usage

```
decorate_dimnames(heatmap, code, slice = 1, which = c("column", "row"),
    envir = new.env(parent = parent.frame()))
```

Arguments

`heatmap`	Name of the heatmap.
`code`	Code that adds graphics in the selected viewport.
`slice`	Index of the row slice or column slice in the heatmap.
`which`	on rows or on columns?
`envir`	where to look for variables inside `code`.

Details

If you know the dimensions of the matrix, it is simple to calculate the position of every row name or column name in the heatmap. E.g., for the column column, the i^th name is located at:

```
# assume nc is the number of columns in the column slice
unit((i-0.5)/nc, "npc")
```

Value

The function returns no value.

Author(s)

Zuguang Gu <z.gu@dkfz.de>

Examples

```
set.seed(123)
mat = matrix(rnorm(100), 10)
rownames(mat) = letters[1:10]
colnames(mat) = LETTERS[1:10]
Heatmap(mat, name = "mat", km = 2)

decorate_dimnames("mat", {
    grid.rect(gp = gpar(fill = "#FF000080"))
}, which = "row", slice = 2)
```

`decorate_heatmap_body` *Decorate Heatmap Bodies*

Description

Decorate Heatmap Bodies

Usage

```
decorate_heatmap_body(heatmap, code,
    slice = 1, row_slice = slice, column_slice = 1,
    envir = new.env(parent = parent.frame()))
```

Arguments

`heatmap`	Name of the heatmap which is set as `name` argument in `Heatmap` function.
`code`	Code that adds graphics in the selected heatmap body.
`slice`	Index of the row slice in the heatmap.
`row_slice`	Index of the row slice in the heatmap.
`column_slice`	Index of the column slice in the heatmap.
`envir`	Where to look for variables inside `code`.

Details

There is a viewport for each slice in each heatmap. This function contructs the name of the viewport, goes to the viewport by `seekViewport`, runs the code to that viewport and finally goes back to the original viewport.

Value

This function returns no value.

Author(s)

Zuguang Gu <z.gu@dkfz.de>

See Also

https://jokergoo.github.io/ComplexHeatmap-reference/book/heatmap-decoration.html

Examples

```
set.seed(123)
Heatmap(matrix(rnorm(100), 10), name = "mat")
decorate_heatmap_body("mat", {
    grid.circle(gp = gpar(fill = "#FF000080"))
})
```

decorate_row_dend *Decorate Heatmap Row Dendrograms*

Description

Decorate Heatmap Row Dendrograms

Usage

```
decorate_row_dend(..., envir = new.env(parent = parent.frame()))
```

Arguments

...	Pass to decorate_dend.
envir	Where to look for variables inside code?

Details

This is a helper function which pre-defined which argument in decorate_dend.

Value

The function returns no value.

Author(s)

Zuguang Gu <z.gu@dkfz.de>

Examples

```
# There is no example
NULL
```

decorate_row_names *Decorate Heatmap Row Names*

Description

Decorate Heatmap Row Names

Usage

```
decorate_row_names(..., envir = new.env(parent = parent.frame()))
```

Arguments

...	Pass to decorate_dimnames.
envir	wWhere to look for variables inside code.

Details

This is a helper function which pre-defined which argument in decorate_dimnames.

Value

The function returns no value.

Author(s)

Zuguang Gu <z.gu@dkfz.de>

Examples

```
# There is no example
NULL
```

---

decorate_row_title *Decorate Heatmap Row Titles*

Description

Decorate Heatmap Row Titles

Usage

```
decorate_row_title(..., envir = new.env(parent = parent.frame()))
```

Arguments

...	Pass to decorate_title.
envir	Where to look for variables inside code.

Details

This is a helper function which pre-defined which argument in decorate_title.

Value

The function returns no value.

Author(s)

Zuguang Gu <z.gu@dkfz.de>

Examples

```
# There is no example
NULL
```

`decorate_title` *Decorate Heatmap Titles*

Description

Decorate Heatmap Titles

Usage

```
decorate_title(heatmap, code, slice = 1, which = c("column", "row"),
    envir = new.env(parent = parent.frame()))
```

Arguments

`heatmap`	Name of the heatmap.
`code`	Code that adds graphics in the selected viewport.
`slice`	Index of the row slice or column slice in the heatmap.
`which`	Is it a row title or a column title?
`envir`	Where to look for variables inside `code`.

Details

There is a viewport for row titles and column title in the heatmap. This function contructs the name of the viewport, goes to the viewport by `seekViewport` , runs code to that viewport and finally goes back to the original viewport.

Value

The function returns no value.

Author(s)

Zuguang Gu <z.gu@dkfz.de>

See Also

https://jokergoo.github.io/ComplexHeatmap-reference/book/heatmap-decoration.html

Examples

```
set.seed(123)
Heatmap(matrix(rnorm(100), 10), name = "mat", km = 2)
decorate_title("mat", {
    grid.rect(gp = gpar(fill = "#FF000080"))
}, which = "row", slice = 2)
```

`default_axis_param` *The Default Parameters for Annotation Axis*

Description

The Default Parameters for Annotation Axis

Usage

```
default_axis_param(which)
```

Arguments

`which`	Whether it is for column annotation or row annotation?

Details

There are following parameters for the annotation axis:

at The breaks of axis. By default it is automatically inferred.

labels The corresponding axis labels.

labels_rot The rotation of the axis labels.

gp Graphc parameters of axis labels. The value should be a `unit` object.

side If it is for column annotation, the value should only be one of `left` and `right`. If it is for row annotation, the value should only be one of `top` and `bottom`.

facing Whether the axis faces to the outside of the annotation region or inside. Sometimes when appending more than one heatmaps, the axes of column annotations of one heatmap might overlap to the neighbouring heatmap, setting `facing` to `inside` may invoild it.

direction The direction of the axis. Value should be "normal" or "reverse".

All the parameters are passed to `annotation_axis_grob` to construct an axis grob.

Examples

```
default_axis_param("column")
default_axis_param("row")
```

default_get_type *Default get_type for oncoPrint()*

Description

Default get_type for oncoPrint()

Usage

```
default_get_type(x)
```

Arguments

x	A strings which encode multiple altertations.

Details

It recognizes following separators: ; : , |.

Examples

```
# There is no example
NULL
```

dendrogramGrob *Grob for Dendrogram*

Description

Grob for Dendrogram

Usage

```
dendrogramGrob(dend, facing = c("bottom", "top", "left", "right"),
    order = c("normal", "reverse"), gp = gpar())
```

Arguments

dend	A dendrogram object.
facing	Facing of the dendrogram.
order	If it is set to reverse, the first leaf is put on the right if the dendrogram is horizontal and it is put on the top if the dendrogram is vertical.
gp	Graphic parameters for the dendrogram segments. If any of col, lwd or lty is set in the edgePar attribute of a node, the corresponding value defined in gp will be overwritten for this node, so gp is like global graphic parameters for dendrogram segments.

Details

If dend has not been processed by adjust_dend_by_x, internally adjust_dend_by_x is called to add x attributes to each node/leaf.

Value

A grob object which is contructed by segmentsGrob.

Examples

```
# There is no example
NULL
```

---

dend_heights *Height of the Dendrograms*

Description

Height of the Dendrograms

Usage

```
dend_heights(x)
```

Arguments

x	a dendrogram object or a list of dendrogram objects.

Examples

```
# There is no example
NULL
```

---

dend_xy *Coordinates of the Dendrogram*

Description

Coordinates of the Dendrogram

Usage

```
dend_xy(dend)
```

Arguments

dend	a dendrogram object.

Details

dend will be processed by adjust_dend_by_x if it is processed yet.

Value

A list of leave positions (x) and dendrogram height (y).

Examples

```
m = matrix(rnorm(100), 10)
dend1 = as.dendrogram(hclust(dist(m)))
dend_xy(dend1)

dend1 = adjust_dend_by_x(dend1, sort(runif(10)))
dend_xy(dend1)

dend1 = adjust_dend_by_x(dend1, unit(1:10, "cm"))
dend_xy(dend1)
```

---

densityHeatmap *Visualize Density Distribution by Heatmap*

Description

Visualize Density Distribution by Heatmap

Usage

```
densityHeatmap(data,
    density_param = list(na.rm = TRUE),

    col = rev(brewer.pal(11, "Spectral")),
    color_space = "LAB",
    ylab = deparse(substitute(data)),
    column_title = paste0("Density heatmap of ", deparse(substitute(data))),
    title = column_title,
    ylim = NULL,
    range = ylim,

    title_gp = gpar(fontsize = 14),
    ylab_gp = gpar(fontsize = 12),
    tick_label_gp = gpar(fontsize = 10),
    quantile_gp = gpar(fontsize = 10),
    show_quantiles = TRUE,
```

```
    column_order = NULL,
    column_names_side = "bottom",
    show_column_names = TRUE,
    column_names_max_height = unit(6, "cm"),
    column_names_gp = gpar(fontsize = 12),
    column_names_rot = 90,

    cluster_columns = FALSE,
    clustering_distance_columns = "ks",
    clustering_method_columns = "complete",
    mc.cores = 1, cores = mc.cores,

    ...)
```

Arguments

data	A matrix or a list. If it is a matrix, density is calculated by columns.
density_param	Parameters send to density, na.rm is enforced to be TRUE.
col	A vector of colors that density values are mapped to.
color_space	The color space in which colors are interpolated. Pass to colorRamp2.
ylab	Label on y-axis.
column_title	Title of the heatmap.
title	Same as column_title.
ylim	Ranges on the y-axis.
range	Same as ylim.
title_gp	Graphic parameters for title.
ylab_gp	Graphic parameters for y-labels.
tick_label_gp	Graphic parameters for y-ticks.
quantile_gp	Graphic parameters for the quantiles.
show_quantiles	Whether show quantile lines.
column_order	Order of columns.
column_names_side	Pass to Heatmap.
show_column_names	Pass to Heatmap.
column_names_max_height	Pass to Heatmap.
column_names_gp	Pass to Heatmap.
column_names_rot	Pass to Heatmap.
cluster_columns	Whether cluster columns?

clustering_distance_columns
: There is a specific distance method ks which is the Kolmogorov-Smirnov statistic between two distributions. For other methods, the distance is calculated on the density matrix.

clustering_method_columns
: Pass to Heatmap.

mc.cores
: Multiple cores for calculating ks distance. This argument will be removed in future versions.

cores
: Multiple cores for calculating ks distance.

...
: Pass to Heatmap.

Details

To visualize data distribution in a matrix or in a list, we normally use boxplot or violinplot. We can also use colors to map the density values and visualize distribution of values through a heatmap. It is useful if you have huge number of columns in data to visualize.

The density matrix is generated with 500 rows ranging between the maximun and minimal values in all densities.

Value

A Heatmap-class object. It can oly add other heatmaps/annotations vertically.

Author(s)

Zuguang Gu <z.gu@dkfz.de>

See Also

https://jokergoo.github.io/ComplexHeatmap-reference/book/other-high-level-plots.html#density-heatmap

Examples

```
matrix = matrix(rnorm(100), 10); colnames(matrix) = letters[1:10]
densityHeatmap(matrix)

lt = list(rnorm(10), rnorm(10))
densityHeatmap(lt)

ha = HeatmapAnnotation(points = anno_points(runif(10)),
    anno = rep(c("A", "B"), each = 5), col = list(anno = c("A" = "red", "B" = "blue")))
densityHeatmap(matrix, top_annotation = ha)
densityHeatmap(matrix, top_annotation = ha) %v% Heatmap(matrix, height = unit(6, "cm"))
```

dim.Heatmap *Dimension of the Heatmap*

Description

Dimension of the Heatmap

Usage

```
## S3 method for class 'Heatmap'
dim(x)
```

Arguments

x	A Heatmap-class object.

Examples

```
# There is no example
NULL
```

dist2 *Calculate Pairwise Distance from a Matrix*

Description

Calculate Pairwise Distance from a Matrix

Usage

```
dist2(x, pairwise_fun = function(x, y) sqrt(sum((x - y)^2)), ...)
```

Arguments

x	A matrix or a list. If it is a matrix, the distance is calculated by rows.
pairwise_fun	A function which calculates distance between two vectors.
...	Pass to as.dist.

Details

You can construct any type of distance measurements by defining a pair-wise distance function. The function is implemented by two nested for loops, so the efficiency may not be so good.

Value

A dist object.

Author(s)

Zuguang Gu <z.gu@dkfz.de>

Examples

```
lt = lapply(1:10, function(i) {
    sample(letters, sample(6:10, 1))
})
dist2(lt, function(x, y) {
    length(intersect(x, y))/length(union(x, y))
})
```

---

draw-AnnotationFunction-method

Draw the AnnotationFunction Object

Description

Draw the AnnotationFunction Object

Usage

```
## S4 method for signature 'AnnotationFunction'
draw(object, index, k = 1, n = 1, test = FALSE, ...)
```

Arguments

object	The AnnotationFunction-class object.
index	Index of observations.
k	Current slice index.
n	Total number of slices.
test	Is it in test mode? The value can be logical or a text which is plotted as the title of plot.
...	Pass to viewport.

Details

Normally it is called internally by the SingleAnnotation-class.

When test is set to TRUE, the annotation graphic is directly drawn, which is generally for testing purpose.

Examples

```
# There is no example
NULL
```

---

draw-dispatch *Method dispatch page for draw*

Description

Method dispatch page for draw.

Dispatch

draw can be dispatched on following classes:

- draw,HeatmapAnnotation-method, HeatmapAnnotation-class class method
- draw,Legends-method, Legends-class class method
- draw,SingleAnnotation-method, SingleAnnotation-class class method
- draw,AnnotationFunction-method, AnnotationFunction-class class method
- draw,Heatmap-method, Heatmap-class class method
- draw,HeatmapList-method, HeatmapList-class class method

Examples

```
# no example
NULL
```

---

draw-Heatmap-method *Draw a Single Heatmap*

Description

Draw a Single Heatmap

Usage

```
## S4 method for signature 'Heatmap'
draw(object, internal = FALSE, test = FALSE, ...)
```

Arguments

object	A Heatmap-class object.
internal	If TRUE, it is only used inside the calling of draw,HeatmapList-method. It only draws the heatmap without legends where the legend will be drawn by draw,HeatmapList-method.
test	Only for testing. If it is TRUE, the heatmap body is directly drawn.
...	Pass to draw,HeatmapList-method.

Details

The function creates a HeatmapList-class object which only contains a single heatmap and call draw,HeatmapList-method to make the final heatmap.

There are some arguments which control the some settings of the heatmap such as legends. Please go to draw,HeatmapList-method for these arguments.

Value

A HeatmapList-class object.

Author(s)

Zuguang Gu <z.gu@dkfz.de>

Examples

```
# There is no example
NULL
```

---

draw-HeatmapAnnotation-method

Draw the Heatmap Annotations

Description

Draw the Heatmap Annotations

Usage

```
## S4 method for signature 'HeatmapAnnotation'
draw(object, index, k = 1, n = 1, ...,
    test = FALSE, anno_mark_param = list())
```

Arguments

object	A HeatmapAnnotation-class object.
index	A vector of indices.
k	The current slice index for the annotation if it is split.
n	Total number of slices.
...	Pass to viewport which contains all the annotations.
test	Is it in test mode? The value can be logical or a text which is plotted as the title of plot.
anno_mark_param	It contains specific parameters for drawing anno_mark and pass to the draw,SingleAnnotation-method.

Value

No value is returned.

Author(s)

Zuguang Gu <z.gu@dkfz.de>

Examples

```
# There is no example
NULL
```

---

draw-HeatmapList-method

Draw a list of heatmaps

Description

Draw a list of heatmaps

Usage

```
## S4 method for signature 'HeatmapList'
draw(object,
    newpage = TRUE,
    background = "white",

    row_title = character(0),
    row_title_side = c("left", "right"),
    row_title_gp = gpar(fontsize = 13),
    column_title = character(0),
    column_title_side = c("top", "bottom"),
```

```
column_title_gp = gpar(fontsize = 13),

heatmap_legend_side = c("right", "left", "bottom", "top"),
merge_legends = ht_opt$merge_legends,
show_heatmap_legend = TRUE,
heatmap_legend_list = list(),
annotation_legend_side = c("right", "left", "bottom", "top"),
show_annotation_legend = TRUE,
annotation_legend_list = list(),
align_heatmap_legend = NULL,
align_annotation_legend = NULL,
legend_grouping = c("adjusted", "original"),

gap = unit(2, "mm"),
ht_gap = gap,

main_heatmap = which(sapply(object@ht_list, inherits, "Heatmap"))[1],
padding = GLOBAL_PADDING,
adjust_annotation_extension = NULL,

auto_adjust = TRUE,
row_dend_side = c("original", "left", "right"),
row_sub_title_side = c("original", "left", "right"),
column_dend_side = c("original", "top", "bottom"),
column_sub_title_side = c("original", "top", "bottom"),

row_gap = NULL,
cluster_rows = NULL,
cluster_row_slices = NULL,
clustering_distance_rows = NULL,
clustering_method_rows = NULL,
row_dend_width = NULL,
show_row_dend = NULL,
row_dend_reorder = NULL,
row_dend_gp = NULL,
row_order = NULL,
km = NULL,
split = NULL,
row_km = km,
row_km_repeats = NULL,
row_split = split,
height = NULL,
heatmap_height = NULL,

column_gap = NULL,
cluster_columns = NULL,
cluster_column_slices = NULL,
clustering_distance_columns = NULL,
```

```
    clustering_method_columns = NULL,
    column_dend_width = NULL,
    show_column_dend = NULL,
    column_dend_reorder = NULL,
    column_dend_gp = NULL,
    column_order = NULL,
    column_km = NULL,
    column_km_repeats = NULL,
    column_split = NULL,
    width = NULL,
    heatmap_width = NULL,

    use_raster = NULL,
    raster_device = NULL,
    raster_quality = NULL,
    raster_device_param = NULL,
    raster_resize = NULL,

    post_fun = NULL,
    save_last = ht_opt$save_last,

    ### global setting
    heatmap_row_names_gp = NULL,
    heatmap_column_names_gp = NULL,
    heatmap_row_title_gp = NULL,
    heatmap_column_title_gp = NULL,
    legend_title_gp = NULL,
    legend_title_position = NULL,
    legend_labels_gp = NULL,
    legend_grid_height = NULL,
    legend_grid_width = NULL,
    legend_border = NULL,
    legend_gap = NULL,
    heatmap_border = NULL,
    annotation_border = NULL,
    fastcluster = NULL,
    simple_anno_size = NULL,
    show_parent_dend_line = NULL)
```

Arguments

object	a HeatmapList-class object.
newpage	whether create a new page for the graphics. If you want to arrange multiple plots in one page, I suggest to use grid.grabExpr.
background	Background color of the whole plot.
row_title	title on the row.
row_title_side	will the title be put on the left or right of the heatmap.

`row_title_gp` graphic parameters for drawing text.

`column_title` title on the column.

`column_title_side`
will the title be put on the top or bottom of the heatmap.

`column_title_gp`
graphic parameters for drawing text.

`heatmap_legend_side`
side to put heatmap legend

`merge_legends` merge heatmap legends and annotation legends to put into one column.

`show_heatmap_legend`
whether show all heatmap legends

`heatmap_legend_list`
use-defined legends which are put after the heatmap legends

`annotation_legend_side`
side of the annotation legends

`show_annotation_legend`
whether show annotation legends

`annotation_legend_list`
user-defined legends which are put after the annotation legends

`align_heatmap_legend`
How to align the legends to heatmap. Possible values are "heatmap_center", "heatmap_top" and "global_center". If the value is `NULL`, it automatically picks the proper value from the three options.

`align_annotation_legend`
How to align the legends to heatmap. Possible values are "heatmap_center", "heatmap_top" and "global_center".

`legend_grouping`
How the legends are grouped. Values should be "adjusted" or "original". If it is set as "original", all annotation legends are grouped together.

`gap` gap between heatmaps/annotations

`ht_gap` same as `gap`.

`main_heatmap` index of main heatmap. The value can be a numeric index or the heatmap name

`padding` padding of the whole plot. The value is a unit vector of length 4, which corresponds to bottom, left, top and right.

`adjust_annotation_extension`
whether take annotation name into account when calculating positions of graphic elements.

`auto_adjust` whether apply automatic adjustment? The auto-adjustment includes turning off dendrograms, titles and row/columns for non-main heatmaps.

`row_dend_side` side of the dendrogram from the main heatmap

`row_sub_title_side`
side of the row title from the main heatmap

`column_dend_side`
side of the dendrogram from the main heatmap

`column_sub_title_side`
: side of the column title from the main heatmap

`row_gap`
: this modifies `row_gap` of the main heatmap

`cluster_rows`
: this modifies `cluster_rows` of the main heatmap

`cluster_row_slices`
: this modifies `cluster_row_slices` of the main heatmap

`clustering_distance_rows`
: this modifies `clustering_distance_rows` of the main heatmap

`clustering_method_rows`
: this modifies `clustering_method_rows` of the main heatmap

`row_dend_width`
: this modifies `row_dend_width` of the main heatmap

`show_row_dend`
: this modifies `show_row_dend` of the main heatmap

`row_dend_reorder`
: this modifies `row_dend_reorder` of the main heatmap

`row_dend_gp`
: this modifies `row_dend_gp` of the main heatmap

`row_order`
: this modifies `row_order` of the main heatmap

`km`
: = this modifies `km` of the main heatmap

`split`
: this modifies `split` of the main heatmap

`row_km`
: this modifies `row_km` of the main heatmap

`row_km_repeats`
: this modifies `row_km_repeats` of the main heatmap

`row_split`
: this modifies `row_split` of the main heatmap

`height`
: this modifies `height` of the main heatmap

`heatmap_height`
: this modifies `heatmap_height` of the main heatmap

`column_gap`
: this modifies `column_gap` of the main heatmap

`cluster_columns`
: this modifies `cluster_columns` of the main heatmap

`cluster_column_slices`
: this modifies `cluster_column_slices` of the main heatmap

`clustering_distance_columns`
: this modifies `clustering_distance_columns` of the main heatmap

`clustering_method_columns`
: this modifies `clustering_method_columns` of the main heatmap

`column_dend_width`
: this modifies `column_dend_width` of the main heatmap

`show_column_dend`
: this modifies `show_column_dend` of the main heatmap

`column_dend_reorder`
: this modifies `column_dend_reorder` of the main heatmap

`column_dend_gp`
: this modifies `column_dend_gp` of the main heatmap

`column_order`
: this modifies `column_order` of the main heatmap

`column_km`
: this modifies `column_km` of the main heatmap

`column_km_repeats`
: this modifies `column_km_repeats` of the main heatmap

`column_split`
: this modifies `column_split` of the main heatmap

`width`
: this modifies `width` of the main heatmap

`heatmap_width`
: this modifies `heatmap_width` of the main heatmap

`use_raster`
: this modifies `use_raster` of every heatmap.

`raster_device`
: this modifies `raster_device` of every heatmap.

`raster_quality`
: this modifies `raster_quality` of every heatmap.

`raster_device_param`
: this modifies `raster_device_param` of every heatmap.

`raster_resize`
: this modifies `raster_resize` of every heatmap.

`post_fun`
: A self-defined function will be executed after all the heatmaps are drawn.

`save_last`
: Whether to save the last plot?

`heatmap_row_names_gp`
: this set the value in `ht_opt` and reset back after the plot is done

`heatmap_column_names_gp`
: this set the value in `ht_opt` and reset back after the plot is done

`heatmap_row_title_gp`
: this set the value in `ht_opt` and reset back after the plot is done

`heatmap_column_title_gp`
: this set the value in `ht_opt` and reset back after the plot is done

`legend_title_gp`
: this set the value in `ht_opt` and reset back after the plot is done

`legend_title_position`
: this set the value in `ht_opt` and reset back after the plot is done

`legend_labels_gp`
: this set the value in `ht_opt` and reset back after the plot is done

`legend_grid_height`
: this set the value in `ht_opt` and reset back after the plot is done

`legend_grid_width`
: this set the value in `ht_opt` and reset back after the plot is done

`legend_border`
: this set the value in `ht_opt` and reset back after the plot is done

`legend_gap`
: Gap between legends. The value should be a vector of two units. One for gaps between vertical legends and one for the horizontal legends. If only one single unit is specified, the same gap set for the vertical and horizontal legends.

`heatmap_border`
: this set the value in `ht_opt` and reset back after the plot is done

`annotation_border`
: this set the value in `ht_opt` and reset back after the plot is done

`fastcluster`
: this set the value in `ht_opt` and reset back after the plot is done

`simple_anno_size`
: this set the value in `ht_opt` and reset back after the plot is done

`show_parent_dend_line`
: this set the value in `ht_opt` and reset back after the plot is done

Details

The function first calls make_layout,HeatmapList-method to calculate the layout of the heatmap list and the layout of every single heatmap, then makes the plot by re-calling the graphic functions which are already recorded in the layout.

Value

This function returns a HeatmapList-class object for which the layout has been created.

Author(s)

Zuguang Gu <z.gu@dkfz.de>

See Also

https://jokergoo.github.io/ComplexHeatmap-reference/book/a-list-of-heatmaps.html

Examples

```
# There is no example
NULL
```

---

draw-Legends-method *Draw the Legends*

Description

Draw the Legends

Usage

```
## S4 method for signature 'Legends'
draw(object, x = unit(0.5, "npc"), y = unit(0.5, "npc"), just = "centre", test = FALSE)
```

Arguments

object	The grob object returned by Legend or packLegend.
x	The x position of the legends, measured in current viewport.
y	The y position of the legends, measured in current viewport.
just	Justification of the legends.
test	Only used for testing.

Details

In the legend grob, there should always be a viewport attached which is like a wrapper of all the graphic elements in a legend. If in the `object`, there is already a viewport attached, it will modify the `x`, `y` and `valid.just` of the viewport. If there is not viewport attached, a viewport with specified `x`, `y` and `valid.just` is created and attached.

You can also directly use `grid.draw` to draw the legend object, but you can only control the position of the legends by first creating a parent viewport and adjusting the position of the parent viewport.

Examples

```
lgd = Legend(at = 1:4, title = "foo")
draw(lgd, x = unit(0, "npc"), y = unit(0, "npc"), just = c("left", "bottom"))

# and a similar version of grid.draw
pushViewport(viewport(x = unit(0, "npc"), y = unit(0, "npc"), just = c("left", "bottom")))
grid.draw(lgd)
popViewport()
```

---

draw-SingleAnnotation-method

Draw the Single Annotation

Description

Draw the Single Annotation

Usage

```
## S4 method for signature 'SingleAnnotation'
draw(object, index, k = 1, n = 1, test = FALSE,
    anno_mark_param = list())
```

Arguments

`object`	A `SingleAnnotation-class` object.
`index`	A vector of indices.
`k`	The index of the slice.
`n`	Total number of slices. `k` and `n` are used to adjust annotation names. E.g. if `k` is 2 and `n` is 3, the annotation names are not drawn.
`test`	Is it in test mode? The value can be logical or a text which is plotted as the title of plot.
`anno_mark_param`	It contains specific parameters for drawing `anno_mark`.

Value

No value is returned.

Author(s)

Zuguang Gu <z.gu@dkfz.de>

Examples

```
# There is no example
NULL
```

`draw_annotation-Heatmap-method`
Draw Heatmap Annotations on the Heatmap

Description

Draw Heatmap Annotations on the Heatmap

Usage

```
## S4 method for signature 'Heatmap'
draw_annotation(object, which = c("top", "bottom", "left", "right"), k = 1, ...)
```

Arguments

`object`	A `Heatmap-class` object.
`which`	The position of the heamtap annotation.
`k`	Slice index.
`...`	Pass to `viewport` which includes the complete heatmap annotation.

Details

A viewport is created which contains column/top annotations.

The function calls `draw,HeatmapAnnotation-method` to draw the annotations.

This function is only for internal use.

Value

This function returns no value.

Author(s)

Zuguang Gu <z.gu@dkfz.de>

Examples

```
# There is no example
NULL
```

`draw_annotation_legend-HeatmapList-method` *Draw legends for All Annotations*

Description

Draw legends for All Annotations

Usage

```
## S4 method for signature 'HeatmapList'
draw_annotation_legend(object, legend_list = list(), ...)
```

Arguments

`object`	A `HeatmapList-class` object.
`legend_list`	A list of self-defined legends, should be wrapped into `grob` objects. It is normally constructed by `Legend`.
`...`	Other arguments.

Details

We call the "annotation legends" as the secondary legends. For horizontal heamtap list, the legends are those from all top/bottom annotations, and for vertical heatmap list, the legends are those from all left/right annotations.

A viewport is created which contains annotation legends.

This function is only for internal use.

Value

This function returns no value.

Author(s)

Zuguang Gu <z.gu@dkfz.de>

Examples

```
# There is no example
NULL
```

draw_dend-Heatmap-method *Draw Heatmap Dendrograms*

Description

Draw Heatmap Dendrograms

Usage

```
## S4 method for signature 'Heatmap'
draw_dend(object,
    which = c("row", "column"), k = 1, max_height = NULL, ...)
```

Arguments

object	A Heatmap-class object.
which	Are the dendrograms put on the row or on the column of the heatmap?
k	Slice index.
max_height	maximal height of dendrogram.
...	Pass to viewport which includes the complete heatmap dendrograms.

Details

A viewport is created which contains dendrograms.

This function is only for internal use.

Value

This function returns no value.

Author(s)

Zuguang Gu <z.gu@dkfz.de>

See Also

grid.dendrogram

Examples

```
# There is no example
NULL
```

`draw_dimnames-Heatmap-method` *Draw row names or column names*

Description

Draw row names or column names

Usage

```
## S4 method for signature 'Heatmap'
draw_dimnames(object,
    which = c("row", "column"), k = 1, ...)
```

Arguments

`object`	A `Heatmap-class` object.
`which`	Are the names put on the row or on the column of the heatmap?
`k`	Slice index.
`...`	Pass to `viewport` which includes the complete heatmap row/column names.

Details

A viewport is created which contains row names or column names.

This function is only for internal use.

Value

This function returns no value.

Author(s)

Zuguang Gu <z.gu@dkfz.de>

Examples

```
# There is no example
NULL
```

draw_heatmap_body-Heatmap-method
Draw Heatmap Body

Description

Draw Heatmap Body

Usage

```
## S4 method for signature 'Heatmap'
draw_heatmap_body(object, kr = 1, kc = 1, ...)
```

Arguments

object	A Heatmap-class object.
kr	Row slice index.
kc	Column slice index.
...	Pass to viewport which includes the slice of heatmap body.

Details

A viewport is created which contains subset rows and columns of the heatmap.

This function is only for internal use.

Value

This function returns no value.

Author(s)

Zuguang Gu <z.gu@dkfz.de>

Examples

```
# There is no example
NULL
```

`draw_heatmap_legend-HeatmapList-method` *Draw legends for All Heatmaps*

Description

Draw legends for All Heatmaps

Usage

```
## S4 method for signature 'HeatmapList'
draw_heatmap_legend(object, legend_list = list(), ...)
```

Arguments

`object`	A `HeatmapList-class` object.
`legend_list`	A list of self-defined legends, should be wrapped into `grob` objects. It is normally constructed by `Legend`.
`...`	Other arguments.

Details

Actually we call the "heatmap legends" as the main legends. For horizontal heatmap list, the legends are those from heamtap/row annotation/left/right annotation. For vertical heatmap list, the legends are those from heamtap/column annotation/top/bottom annotation. if `merge_legends` is true in `draw,HeatmapList-method`, then it contains all legends shown on the plot.

A viewport is created which contains heatmap legends.

This function is only for internal use.

Value

This function returns no value.

Author(s)

Zuguang Gu <z.gu@dkfz.de>

Examples

```
# There is no example
NULL
```

draw_heatmap_list-HeatmapList-method
Draw the List of Heatmaps

Description

Draw the List of Heatmaps

Usage

```
## S4 method for signature 'HeatmapList'
draw_heatmap_list(object)
```

Arguments

object	A HeatmapList-class object.

Details

It only draws the list of heatmaps without legends and titles.

This function is only for internal use.

Value

This function returns no value.

Author(s)

Zuguang Gu <z.gu@dkfz.de>

Examples

```
# There is no example
NULL
```

draw_title-dispatch *Method dispatch page for draw_title*

Description

Method dispatch page for `draw_title`.

Dispatch

`draw_title` can be dispatched on following classes:

- `draw_title,HeatmapList-method`, `HeatmapList-class` class method
- `draw_title,Heatmap-method`, `Heatmap-class` class method

Examples

```
# no example
NULL
```

draw_title-Heatmap-method *Draw Heatmap Title*

Description

Draw Heatmap Title

Usage

```
## S4 method for signature 'Heatmap'
draw_title(object,
    which = c("row", "column"), k = 1, ...)
```

Arguments

`object`	A `Heatmap-class` object.
`which`	Is title put on the row or on the column of the heatmap?
`k`	Slice index.
`...`	Pass to `viewport` which includes the complete heatmap title.

Details

A viewport is created which contains heatmap title.

This function is only for internal use.

Value

This function returns no value.

Author(s)

Zuguang Gu <z.gu@dkfz.de>

Examples

```
# There is no example
NULL
```

`draw_title-HeatmapList-method`
Draw Heatmap List Title

Description

Draw Heatmap List Title

Usage

```
## S4 method for signature 'HeatmapList'
draw_title(object,
    which = c("column", "row"))
```

Arguments

`object`	A `HeatmapList-class` object.
`which`	Is it a row title or a column title.

Details

A viewport is created which contains heatmap list title.

This function is only for internal use.

Value

This function returns no value.

Author(s)

Zuguang Gu <z.gu@dkfz.de>

Examples

```
# There is no example
NULL
```

`extract_comb` *Extract Elements in a Combination set*

Description

Extract Elements in a Combination set

Usage

```
extract_comb(m, comb_name)
```

Arguments

`m`	A combination matrix returned by `make_comb_mat`.
`comb_name`	The valid combination set name should be from `comb_name`.

Details

It returns the combination set.

Examples

```
set.seed(123)
lt = list(a = sample(letters, 10),
          b = sample(letters, 15),
          c = sample(letters, 20))
m = make_comb_mat(lt)
extract_comb(m, "110")
```

`frequencyHeatmap` *Visualize Frequency Distribution by Heatmap*

Description

Visualize Frequency Distribution by Heatmap

Usage

```
frequencyHeatmap(data,
    breaks = "Sturges",
    stat = c("count", "density", "proportion"),

    col = brewer.pal(9, "Blues"),
    color_space = "LAB",
    ylab = deparse(substitute(data)),
    column_title = paste0("Frequency heatmap of ", deparse(substitute(data))),
    title = column_title,
    ylim = NULL,
    range = ylim,

    title_gp = gpar(fontsize = 14),
    ylab_gp = gpar(fontsize = 12),
    tick_label_gp = gpar(fontsize = 10),

    column_order = NULL,
    column_names_side = "bottom",
    show_column_names = TRUE,
    column_names_max_height = unit(6, "cm"),
    column_names_gp = gpar(fontsize = 12),
    column_names_rot = 90,
    cluster_columns = FALSE,

    use_3d = FALSE,
    ...)
```

Arguments

data	A matrix or a list. If it is a matrix, density is calculated by columns.
breaks	Pass to hist. Please only set equal bin size.
stat	Statistic to use.
col	A vector of colors that density values are mapped to.
color_space	The color space in which colors are interpolated. Pass to colorRamp2.
ylab	Label on y-axis.
column_title	Title of the heatmap.
title	Same as column_title.
ylim	Ranges on the y-axis.
range	Same as ylim.
title_gp	Graphic parameters for title.
ylab_gp	Graphic parameters for y-labels.
tick_label_gp	Graphic parameters for y-ticks.
column_order	Order of columns.

column_names_side
: Pass to Heatmap.

show_column_names
: Pass to Heatmap.

column_names_max_height
: Pass to Heatmap.

column_names_gp
: Pass to Heatmap.

column_names_rot
: Pass to Heatmap.

cluster_columns
: Whether cluster columns?

use_3d
: Whether to visualize the frequencies as a 3D heatmap with Heatmap3D?

...
: Pass to Heatmap or Heatmap3D (if use_3d = TRUE).

Value

A Heatmap-class object. It can oly add other heatmaps/annotations vertically.

Author(s)

Zuguang Gu <z.gu@dkfz.de>

Examples

```
matrix = matrix(rnorm(100), 10); colnames(matrix) = letters[1:10]
frequencyHeatmap(matrix)
frequencyHeatmap(matrix, use_3d = TRUE)
```

---

full_comb_code *Full set of code of combination sets*

Description

Full set of code of combination sets

Usage

```
full_comb_code(n, complement = FALSE)
```

Arguments

n
: Number of sets

complement
: Whether include the code for complement set?

Examples

```
full_comb_code(2)
full_comb_code(3)
full_comb_code(4)
full_comb_code(4, TRUE)
```

---

getXY_in_parent_vp *Convert XY in a Parent Viewport*

Description

Convert XY in a Parent Viewport

Usage

```
getXY_in_parent_vp(u, vp_name = "ROOT")
```

Arguments

u	A list of two units which correspond to x and y.
vp_name	The name of the parent viewport.

Details

It converts a coordinate measured in current viewport to the coordinate in a parent viewport.

In the conversion, all units are recalculated as absolute units, so if you change the size of the interactive graphic window, you need to rerun the function.

Value

A list of two units.

Examples

```
grid.newpage()
pushViewport(viewport(x = 0.5, y = 0.5, width = 0.5, height = 0.5, just = c("left", "bottom")))
grid.rect()
grid.points(x = unit(2, "cm"), y = unit(2, "cm"), pch = 1)
u = list(x = unit(2, "cm"), y = unit(2, "cm"))
u2 = getXY_in_parent_vp(u)
popViewport()
grid.rect(gp = gpar(col = "red"))
grid.points(x = u2$x, u2$y, pch = 2)
```

`get_color_mapping_list-HeatmapAnnotation-method` *Get a List of ColorMapping objects*

Description

Get a List of ColorMapping objects

Usage

```
## S4 method for signature 'HeatmapAnnotation'
get_color_mapping_list(object)
```

Arguments

`object`	A `HeatmapAnnotation-class` object.

Details

Color mappings for visible simple annotations are only returned.

This function is only for internal use.

Value

A list of `ColorMapping-class` objects or an empty list.

Author(s)

Zuguang Gu <z.gu@dkfz.de>

Examples

```
# There is no example
NULL
```

get_legend_param_list-HeatmapAnnotation-method *Get a List of Annotation Legend Parameters*

Description

Get a List of Annotation Legend Parameters

Usage

```
## S4 method for signature 'HeatmapAnnotation'
get_legend_param_list(object)
```

Arguments

object	A HeatmapAnnotation-class object.

Details

The annotation legend parameters for visible simple annotations are only returned.

This function is only for internal use.

Value

A list.

Author(s)

Zuguang Gu <z.gu@dkfz.de>

Examples

```
# There is no example
NULL
```

grid.annotation_axis *Draw Annotation Axis*

Description

Draw Annotation Axis

Usage

```
grid.annotation_axis(at = NULL, labels = at, labels_rot = 0, gp = gpar(),
    side = "left", facing = "outside", direction = "normal")
```

Arguments

at	Break values. If it is not specified, it is inferred from data scale in current viewport.
labels	Corresponding labels.
labels_rot	Rotations of labels.
gp	Graphic parameters.
side	side of the axis of the annotation viewport.
facing	Facing of the axis.
direction	direction of the axis. Value should be "normal" or "reverse".

Details

It uses annotation_axis_grob to construct the grob object, then use grid.draw to draw the axis.

Examples

```
# See examples in `annotation_axis_grob`
NULL
```

---

grid.boxplot *Draw a Single Boxplot*

Description

Draw a Single Boxplot

Usage

```
grid.boxplot(value, pos, outline = TRUE, box_width = 0.6,
    pch = 1, size = unit(2, "mm"), gp = gpar(fill = "#CCCCCC"),
    direction = c("vertical", "horizontal"))
```

Arguments

value	A vector of numeric values.
pos	Position of the boxplot.
outline	Whether draw outlines?
box_width	width of the box.
pch	Point type.
size	Point size.
gp	Graphic parameters.
direction	Whether the box is vertical or horizontal.

Details

All the values are measured with native coordinate.

Examples

```
lt = list(rnorm(100), rnorm(100))
grid.newpage()
pushViewport(viewport(xscale = c(0.5, 2.5), yscale = range(lt)))
grid.boxplot(lt[[1]], pos = 1, gp = gpar(fill = "red"))
grid.boxplot(lt[[2]], pos = 2, gp = gpar(fill = "green"))
popViewport()
```

---

grid.dendrogram *Draw the Dendrogram*

Description

Draw the Dendrogram

Usage

```
grid.dendrogram(dend, ..., test = FALSE)
```

Arguments

dend	A dendrogram object.
...	Pass to dendrogramGrob.
test	Is it in test mode? If it is in test mode, a viewport is created by calculating proper xlim and ylim.

Details

grid.dendrogram supports drawing dendrograms with self-defind leaf positions. The positions of leaves can be defined by adjust_dend_by_x. Also the dendrogram can be customized by setting the edgePar attribute for each node (basically for controlling the style of segments), e.g. by color_branches.

To draw the dendrogram, a viewport should be firstly created. dend_xy can be used to get the positions of leaves and height of the dendrogram.

Examples

```
m = matrix(rnorm(100), 10)
dend = as.dendrogram(hclust(dist(m)))
grid.newpage()
pushViewport(viewport(xscale = c(0, 10.5), yscale = c(0, dend_heights(dend)),
    width = 0.9, height = 0.9))
grid.dendrogram(dend)
```

```
popViewport()

grid.dendrogram(dend, test = TRUE)

require(dendextend)
dend = color_branches(dend, k = 2)
dend = adjust_dend_by_x(dend, unit(sort(runif(10)*10), "cm"))
grid.dendrogram(dend, test = TRUE)
```

`grid.draw.Legends` *Draw the Legends*

Description

Draw the Legends

Usage

```
## S3 method for class 'Legends'
grid.draw(x, recording = TRUE)
```

Arguments

`x`	The `grob` object returned by `Legend` or `packLegend`.
`recording`	Pass to `grid.draw`.

Details

This function is actually an S3 method of the `Legends` class for the `grid.draw` general method. It applies `grid.draw` on the `grob` slot of the object.

Examples

```
lgd = Legend(at = 1:4, title = "foo")
pushViewport(viewport(x = unit(0, "npc"), y = unit(0, "npc"), just = c("left", "bottom")))
grid.draw(lgd)
popViewport()
```

grid.textbox *Draw multiple texts in a box*

Description

Draw multiple texts in a box

Usage

```
grid.textbox(text, x = unit(0.5, "npc"), y = unit(0.5, "npc"), gp = gpar(), ...)
```

Arguments

text	A vector of texts. The value can be single words or phrases/sentenses.
x	X position.
y	Y position.
gp	Graphics parameters of texts.
...	Pass to textbox_grob.

Details

All details can be found in the help page of textbox_grob.

Examples

```
# There is no example
NULL
```

gt_render *Mark the text for the rendering by gridtext package*

Description

Mark the text for the rendering by gridtext package

Usage

```
gt_render(x, ...)
```

Arguments

x	Text labels. The value can be a vector.
...	Other parameters passed to richtext_grob.

Details

Text marked by gt_render will be rendered by richtext_grob function.

Examples

```
if(requireNamespace("gridtext")) {
mat = matrix(rnorm(100), 10)
rownames(mat) = letters[1:10]
ht = Heatmap(mat,
column_title = gt_render("Some <span style='color:blue'>blue text **in bold.**</span><br>And *italics text.*<br>A
column_title_gp = gpar(box_fill = "orange"),
row_labels = gt_render(letters[1:10], padding = unit(c(2, 10, 2, 10), "pt")),
row_names_gp = gpar(box_col = "red"),
row_km = 2,
row_title = gt_render(c("title1", "title2")),
row_title_gp = gpar(box_fill = "yellow"),
heatmap_legend_param = list(
title = gt_render("<span style='color:orange'>**Legend title**</span>"),
title_gp = gpar(box_fill = "grey"),
at = c(-3, 0, 3),
labels = gt_render(c("*negative* three", "zero", "*positive* three"))
))
ht = rowAnnotation(
foo = anno_text(gt_render(sapply(LETTERS[1:10], strrep, 10), align_widths = TRUE),
                gp = gpar(box_col = "blue", box_lwd = 2),
                just = "right",
                location = unit(1, "npc")
)) + ht
draw(ht)

}
```

Heatmap *Constructor method for Heatmap class*

Description

Constructor method for Heatmap class

Usage

```
Heatmap(matrix, col, name,
    na_col = "grey",
    color_space = "LAB",
    rect_gp = gpar(col = NA),
    border = NA,
    border_gp = gpar(col = "black"),
    cell_fun = NULL,
    layer_fun = NULL,
```

```
  jitter = FALSE,

  row_title = character(0),
  row_title_side = c("left", "right"),
  row_title_gp = gpar(fontsize = 13.2),
  row_title_rot = switch(row_title_side[1], "left" = 90, "right" = 270),
  column_title = character(0),
  column_title_side = c("top", "bottom"),
  column_title_gp = gpar(fontsize = 13.2),
  column_title_rot = 0,

  cluster_rows = TRUE,
  cluster_row_slices = TRUE,
  clustering_distance_rows = "euclidean",
  clustering_method_rows = "complete",
  row_dend_side = c("left", "right"),
  row_dend_width = unit(10, "mm"),
  show_row_dend = TRUE,
  row_dend_reorder = is.logical(cluster_rows) || is.function(cluster_rows),
  row_dend_gp = gpar(),
  cluster_columns = TRUE,
  cluster_column_slices = TRUE,
  clustering_distance_columns = "euclidean",
  clustering_method_columns = "complete",
  column_dend_side = c("top", "bottom"),
  column_dend_height = unit(10, "mm"),
  show_column_dend = TRUE,
  column_dend_gp = gpar(),
column_dend_reorder = is.logical(cluster_columns) || is.function(cluster_columns),

  row_order = NULL,
  column_order = NULL,

  row_labels = rownames(matrix),
  row_names_side = c("right", "left"),
  show_row_names = TRUE,
  row_names_max_width = unit(6, "cm"),
  row_names_gp = gpar(fontsize = 12),
  row_names_rot = 0,
  row_names_centered = FALSE,
  column_labels = colnames(matrix),
  column_names_side = c("bottom", "top"),
  show_column_names = TRUE,
  column_names_max_height = unit(6, "cm"),
  column_names_gp = gpar(fontsize = 12),
  column_names_rot = 90,
  column_names_centered = FALSE,
```

```
    top_annotation = NULL,
    bottom_annotation = NULL,
    left_annotation = NULL,
    right_annotation = NULL,

    km = 1,
    split = NULL,
    row_km = km,
    row_km_repeats = 1,
    row_split = split,
    column_km = 1,
    column_km_repeats = 1,
    column_split = NULL,
    gap = unit(1, "mm"),
    row_gap = unit(1, "mm"),
    column_gap = unit(1, "mm"),
    show_parent_dend_line = ht_opt$show_parent_dend_line,

    heatmap_width = unit(1, "npc"),
    width = NULL,
    heatmap_height = unit(1, "npc"),
    height = NULL,

    show_heatmap_legend = TRUE,
    heatmap_legend_param = list(title = name),

    use_raster = NULL,
  raster_device = c("png", "jpeg", "tiff", "CairoPNG", "CairoJPEG", "CairoTIFF", "agg_png"),
    raster_quality = 1,
    raster_device_param = list(),
    raster_resize_mat = FALSE,
    raster_by_magick = requireNamespace("magick", quietly = TRUE),
    raster_magick_filter = NULL,

    post_fun = NULL)
```

Arguments

matrix	A matrix. Either numeric or character. If it is a simple vector, it will be converted to a one-column matrix.
col	A vector of colors if the color mapping is discrete or a color mapping function if the matrix is continuous numbers (should be generated by colorRamp2). If the matrix is continuous, the value can also be a vector of colors so that colors can be interpolated. Pass to ColorMapping. For more details and examples, please refer to https://jokergoo.github.io/ComplexHeatmap-reference/book/a-single-heatmap.html#colors .
name	Name of the heatmap. By default the heatmap name is used as the title of the heatmap legend.

`na_col` Color for `NA` values.

`rect_gp` Graphic parameters for drawing rectangles (for heatmap body). The value should be specified by `gpar` and `fill` parameter is ignored.

`color_space` The color space in which colors are interpolated. Only used if `matrix` is numeric and `col` is a vector of colors. Pass to `colorRamp2`.

`border` Whether draw border. The value can be logical or a string of color.

`border_gp` Graphic parameters for the borders. If you want to set different parameters for different heatmap slices, please consider to use `decorate_heatmap_body`.

`cell_fun` Self-defined function to add graphics on each cell. Seven parameters will be passed into this function: `j`, `i`, `x`, `y`, `width`, `height`, `fill` which are column index, row index in `matrix`, coordinate of the cell, the width and height of the cell and the filled color. `x`, `y`, `width` and `height` are all `unit` objects.

`layer_fun` Similar as `cell_fun`, but is vectorized. Check https://jokergoo.github.io/ComplexHeatmap-reference/book/a-single-heatmap.html#customize-the-heatmap-body .

`jitter` Random shifts added to the matrix. The value can be logical or a single numeric value. It it is `TRUE`, random values from uniform distribution between 0 and 1e-10 are generated. If it is a numeric value, the range for the uniform distribution is (0, `jitter`). It is mainly to solve the problem of "Error: node stack overflow" when there are too many identical rows/columns for plotting the dendrograms. ADD: From version 2.5.6, the error of node stack overflow has been fixed, now this argument is ignored.

`row_title` Title on the row.

`row_title_side` Will the title be put on the left or right of the heatmap?

`row_title_gp` Graphic parameters for row title.

`row_title_rot` Rotation of row title.

`column_title` Title on the column.

`column_title_side` Will the title be put on the top or bottom of the heatmap?

`column_title_gp` Graphic parameters for column title.

`column_title_rot` Rotation of column titles.

`cluster_rows` If the value is a logical, it controls whether to make cluster on rows. The value can also be a `hclust` or a `dendrogram` which already contains clustering. Check https://jokergoo.github.io/ComplexHeatmap-reference/book/a-single-heatmap.html#clustering .

`cluster_row_slices` If rows are split into slices, whether perform clustering on the slice means?

`clustering_distance_rows` It can be a pre-defined character which is in ("euclidean", "maximum", "manhattan", "canberra", "binary", "minkowski", "pearson", "spearman", "kendall"). It can also be a function. If the function has one argument, the input argument

should be a matrix and the returned value should be a dist object. If the function has two arguments, the input arguments are two vectors and the function calculates distance between these two vectors.

clustering_method_rows
: Method to perform hierarchical clustering, pass to hclust.

row_dend_side
: Should the row dendrogram be put on the left or right of the heatmap?

row_dend_width
: Width of the row dendrogram, should be a unit object.

show_row_dend
: Whether show row dendrogram?

row_dend_gp
: Graphic parameters for the dendrogram segments. If users already provide a dendrogram object with edges rendered, this argument will be ignored.

row_dend_reorder
: Apply reordering on row dendrograms. The value can be a logical value or a vector which contains weight which is used to reorder rows. The reordering is applied by reorder.dendrogram.

cluster_columns
: Whether make cluster on columns? Same settings as cluster_rows.

cluster_column_slices
: If columns are split into slices, whether perform clustering on the slice means?

clustering_distance_columns
: Same setting as clustering_distance_rows.

clustering_method_columns
: Method to perform hierarchical clustering, pass to hclust.

column_dend_side
: Should the column dendrogram be put on the top or bottom of the heatmap?

column_dend_height
: height of the column cluster, should be a unit object.

show_column_dend
: Whether show column dendrogram?

column_dend_gp
: Graphic parameters for dendrogram segments. Same settings as row_dend_gp.

column_dend_reorder
: Apply reordering on column dendrograms. Same settings as row_dend_reorder.

row_order
: Order of rows. Manually setting row order turns off clustering.

column_order
: Order of column.

row_labels
: Optional row labels which are put as row names in the heatmap.

row_names_side
: Should the row names be put on the left or right of the heatmap?

show_row_names
: Whether show row names.

row_names_max_width
: Maximum width of row names viewport.

row_names_gp
: Graphic parameters for row names.

row_names_rot
: Rotation of row names.

row_names_centered
: Should row names put centered?

column_labels Optional column labels which are put as column names in the heatmap.

column_names_side
Should the column names be put on the top or bottom of the heatmap?

column_names_max_height
Maximum height of column names viewport.

show_column_names
Whether show column names.

column_names_gp
Graphic parameters for drawing text.

column_names_rot
Rotation of column names.

column_names_centered
Should column names put centered?

top_annotation A HeatmapAnnotation object.

bottom_annotation
A HeatmapAnnotation object.

left_annotation
It should be specified by rowAnnotation.

right_annotation
it should be specified by rowAnnotation.

km Apply k-means clustering on rows. If the value is larger than 1, the heatmap will be split by rows according to the k-means clustering. For each row slice, hierarchical clustering is still applied with parameters above.

split A vector or a data frame by which the rows are split. But if cluster_rows is a clustering object, split can be a single number indicating to split the dendrogram by cutree.

row_km Same as km.

row_km_repeats Number of k-means runs to get a consensus k-means clustering. Note if row_km_repeats is set to more than one, the final number of groups might be smaller than row_km, but this might means the original row_km is not a good choice.

row_split Same as split.

column_km K-means clustering on columns.

column_km_repeats
Number of k-means runs to get a consensus k-means clustering. Similar as row_km_repeats.

column_split Split on columns. For heatmap splitting, please refer to https://jokergoo.github.io/ComplexHeatmap-reference/book/a-single-heatmap.html#heatmap-split .

gap Gap between row slices if the heatmap is split by rows. The value should be a unit object.

row_gap Same as gap.

column_gap Gap between column slices.

show_parent_dend_line
: When heatmap is split, whether to add a dashed line to mark parent dendrogram and children dendrograms?

width
: Width of the heatmap body.

height
: Height of the heatmap body.

heatmap_width
: Width of the whole heatmap (including heatmap components)

heatmap_height
: Height of the whole heatmap (including heatmap components). Check https://jokergoo.github.io/ComplexHeatmap-reference/book/a-single-heatmap.html#size-of-the-heatmap .

show_heatmap_legend
: Whether show heatmap legend?

heatmap_legend_param
: A list contains parameters for the heatmap legends. See color_mapping_legend,ColorMapping-method for all available parameters.

use_raster
: Whether render the heatmap body as a raster image. It helps to reduce file size when the matrix is huge. If number of rows or columns is more than 2000, it is by default turned on. Note if cell_fun is set, use_raster is enforced to be FALSE.

raster_device
: Graphic device which is used to generate the raster image.

raster_quality
: A value larger than 1.

raster_device_param
: A list of further parameters for the selected graphic device. For raster image support, please check https://jokergoo.github.io/ComplexHeatmap-reference/book/a-single-heatmap.html#heatmap-as-raster-image .

raster_resize_mat
: Whether resize the matrix to let the dimension of the matrix the same as the dimension of the raster image? The value can be logical. If it is TRUE, mean is used to summarize the sub matrix which corresponds to a single pixel. The value can also be a summary function, e.g. max.

raster_by_magick
: Whether to use image_resize to scale the image.

raster_magick_filter
: Pass to filter argument of image_resize. A character scalar and all possible values are in filter_types. The default is "Lanczos".

post_fun
: A function which will be executed after the heatmap list is drawn.

Details

The initialization function only applies parameter checking and fill values to the slots with some validation.

Following methods can be applied to the Heatmap-class object:

- show,Heatmap-method: draw a single heatmap with default parameters
- draw,Heatmap-method: draw a single heatmap.
- + or %v% append heatmaps and annotations to a list of heatmaps.

The constructor function pretends to be a high-level graphic function because the show method of the Heatmap-class object actually plots the graphics.

Value

A Heatmap-class object.

Author(s)

Zuguang Gu <z.gu@dkfz.de>

See Also

https://jokergoo.github.io/ComplexHeatmap-reference/book/a-single-heatmap.html

Examples

```
# There is no example
NULL
```

Heatmap-class *Class for a Single Heatmap*

Description

Class for a Single Heatmap

Details

The Heatmap-class is not responsible for heatmap legend and annotation legends. The draw,Heatmap-method method constructs a HeatmapList-class object which only contains one single heatmap and call draw,HeatmapList-method to make the complete heatmap.

Methods

The Heatmap-class provides following methods:

- Heatmap: constructor method.
- draw,Heatmap-method: draw a single heatmap.
- add_heatmap,Heatmap-method append heatmaps and annotations to a list of heatmaps.
- row_order,HeatmapList-method: get order of rows
- column_order,HeatmapList-method: get order of columns
- row_dend,HeatmapList-method: get row dendrograms
- column_dend,HeatmapList-method: get column dendrograms

Author(s)

Zuguang Gu <z.gu@dkfz.de>

Examples

```
# There is no example
NULL
```

`Heatmap3D` *3D Heatmap*

Description

3D Heatmap

Usage

```
Heatmap3D(matrix,
    ...,

    bar_rel_width = 0.6,
    bar_rel_height = 0.6,
    bar_max_length = unit(1, "cm"),
    bar_angle = 60,

    row_names_side = "left",
    show_row_dend = FALSE,
    show_column_dend = FALSE)
```

Arguments

`matrix`	The input matrix. Values should be non-negative.
`...`	All pass to `Heatmap`.
`bar_rel_width`	A factor between 0 and 1.
`bar_rel_height`	A factor between 0 and 1.
`bar_max_length`	Maximal length of bars. Value should be in absolute unit.
`bar_angle`	Angle for the projection.
`row_names_side`	Row names are by default put on the left side of the heatmap.
`show_row_dend`	By default the dendrogram is not drawn.
`show_column_dend`	By default the dendrogram is not drawn.

Detals

For large matrices, the plotting might be slow.

Examples

```
m = matrix(sample(100, 36), 6)
Heatmap3D(m)
```

`HeatmapAnnotation` *Constructor Method for HeatmapAnnotation class*

Description

Constructor Method for HeatmapAnnotation class

Usage

```
HeatmapAnnotation(...,
    df = NULL, name, col, na_col = "grey",
    annotation_legend_param = list(),
    show_legend = TRUE,
    which = c("column", "row"),
    gp = gpar(col = NA),
    border = FALSE,
    gap = unit(1, "points"),

    show_annotation_name = TRUE,
    annotation_label = NULL,
    annotation_name_gp = gpar(),
    annotation_name_offset = NULL,
    annotation_name_side = ifelse(which == "column", "right", "bottom"),
    annotation_name_rot = NULL,
    annotation_name_align = FALSE,

    annotation_height = NULL,
    annotation_width = NULL,
    height = NULL,
    width = NULL,
    simple_anno_size = ht_opt$simple_anno_size,
    simple_anno_size_adjust = FALSE)
```

Arguments

`...`	Name-value pairs where the names correspond to annotation names and values can be a vector, a matrix and an annotation function. Each pair is sent to `SingleAnnotation` to contruct a single annotation.
`df`	A data frame. Each column will be treated as a simple annotation. The data frame must have column names.
`name`	Name of the heatmap annotation, optional.

col — A list of colors which contain color mapping to df or simple annotations defined in .... See SingleAnnotation for how to set colors.

na_col — Color for NA values in simple annotations.

annotation_legend_param — A list which contains parameters for annotation legends. See color_mapping_legend,ColorMapping-me for all possible options.

show_legend — Whether show annotation legends. The value can be one single value or a vector.

which — Are these row annotations or column annotations?

gp — Graphic parameters for simple annotations (with fill parameter ignored).

border — border of single annotations.

gap — Gap between annotations. It can be a single value or a vector of unit objects.

show_annotation_name — Whether show annotation names? For column annotation, annotation names are drawn either on the left or the right, and for row annotations, names are draw either on top or at the bottom. The value can be a vector.

annotation_label — Labels for the annotations. By default it is the same as individual annotation names.

annotation_name_gp — Graphic parameters for anntation names. Graphic paramters can be vectors.

annotation_name_offset — Offset to the annotation names, a unit object. The value can be a vector.

annotation_name_side — Side of the annotation names.

annotation_name_rot — Rotation of the annotation names. The value can be a vector.

annotation_name_align — Whether to align the annotation names.

annotation_height — Height of each annotation if annotations are column annotations.

annotation_width — Width of each annotation if annotations are row annotations.

height — Height of the whole column annotations.

width — Width of the whole heatmap annotations.

simple_anno_size — Size of the simple annotation.

simple_anno_size_adjust — Whether also adjust the size of simple annotations when adjusting the whole heatmap annotation.

Details

For arguments show_legend, border, annotation_name_offset, annotation_name_side, annotation_name_rot, show_annotation_name, they can be set as named vectors to modify values for some of the annotations, e.g. assuming you have an annotation with name foo, you can specify border = c(foo = TRUE) in HeatmapAnnotation.

There are three ways to specify heatmap annotations:

1. If the annotation is simply a vector or a matrix, it can be specified like `HeatmapAnnotation(foo = 1:10)`. 2. If the annotations are already stored as a data frame, it can be specified like `HeatmapAnnotation(df = df)`. 3. For complex annotations, users can use the pre-defined annotation functions such as `anno_points`: `HeatmapAnnotation(foo = anno_points(1:10))`.

For more details and examples, please check https://jokergoo.github.io/ComplexHeatmap-reference/book/heatmap-annotations.html.

Value

A `HeatmapAnnotation-class` object.

Author(s)

Zuguang Gu <z.gu@dkfz.de>

See Also

There are two helper functions: `rowAnnotation` and `columnAnnotation`.

Examples

```
# There is no example
NULL
```

HeatmapAnnotation-class

Class for Heatmap Annotations

Description

Class for Heatmap Annotations

Details

A complex heatmap contains a list of annotations which are represented as graphics placed on rows and columns. The `HeatmapAnnotation-class` contains a list of single annotations which are represented as a list of `SingleAnnotation-class` objects.

Methods

The `HeatmapAnnotation-class` provides following methods:

- `HeatmapAnnotation`: constructor method.
- `draw,HeatmapAnnotation-method`: draw the annotations.

Author(s)

Zuguang Gu <z.gu@dkfz.de>

Examples

```
# There is no example
NULL
```

`HeatmapList` *Constructor method for HeatmapList class*

Description

Constructor method for HeatmapList class

Usage

```
HeatmapList(...)
```

Arguments

`...`	arguments

Details

There is no public constructor method for the `HeatmapList-class`.

Value

No value is returned.

Author(s)

Zuguang Gu <z.gu@dkfz.de>

Examples

```
# There is no example
NULL
```

HeatmapList-class *Class for a list of heatmaps*

Description

Class for a list of heatmaps

Details

A heatmap list is defined as a list of heatmaps and annotations.

Methods

The HeatmapList-class provides following methods:

- draw,HeatmapList-method: draw the list of heatmaps and row annotations.
- add_heatmap,HeatmapList-method: add heatmaps to the list of heatmaps.
- row_order,HeatmapList-method: get order of rows
- column_order,HeatmapList-method: get order of columns
- row_dend,HeatmapList-method: get row dendrograms
- column_dend,HeatmapList-method: get column dendrograms

Author(s)

Zuguang Gu <z.gu@dkfz.de>

Examples

```
# There is no example
NULL
```

heatmap_legend_size-HeatmapList-method *Size of the Heatmap Legends*

Description

Size of the Heatmap Legends

Usage

```
## S4 method for signature 'HeatmapList'
heatmap_legend_size(object, legend_list = list(), ...)
```

Arguments

object	A HeatmapList-class object.
legend_list	A list of self-defined legend, should be wrapped into grob objects. It is normally constructed by Legend.
...	Other arguments.

Details

Internally, all heatmap legends are packed by packLegend as a single grob object.

This function is only for internal use.

Value

A unit object.

Author(s)

Zuguang Gu <z.gu@dkfz.de>

Examples

```
# There is no example
NULL
```

---

height.AnnotationFunction

Height of the AnnotationFunction Object

Description

Height of the AnnotationFunction Object

Usage

```
## S3 method for class 'AnnotationFunction'
height(x, ...)
```

Arguments

x	The AnnotationFunction-class object.
...	Other arguments.

Details

Internally used.

Examples

```
anno = anno_points(1:10)
ComplexHeatmap:::height(anno)
anno = anno_points(1:10, which = "row")
ComplexHeatmap:::height(anno)
```

---

height.Heatmap *Height of the Heatmap*

Description

Height of the Heatmap

Usage

```
## S3 method for class 'Heatmap'
height(x, ...)
```

Arguments

x	The HeatmapList-class object returned by draw,Heatmap-method.
...	Other arguments.

Examples

```
# There is no example
NULL
```

---

height.HeatmapAnnotation *Height of the HeatmapAnnotation Object*

Description

Height of the HeatmapAnnotation Object

Usage

```
## S3 method for class 'HeatmapAnnotation'
height(x, ...)
```

Arguments

x	The HeatmapAnnotation-class object.
...	Other arguments.

Details

Internally used.

Examples

```
# There is no example
NULL
```

`height.HeatmapList` *Height of the Heatmap List*

Description

Height of the Heatmap List

Usage

```
## S3 method for class 'HeatmapList'
height(x, ...)
```

Arguments

`x`	The `HeatmapList-class` object returned by `draw,HeatmapList-method`.
`...`	Other arguments.

Examples

```
# There is no example
NULL
```

`height.Legends` *Height of the Legends*

Description

Height of the Legends

Usage

```
## S3 method for class 'Legends'
height(x, ...)
```

Arguments

x	The grob object returned by Legend or packLegend.
...	Other arguments.

Value

The returned unit x is always in mm.

Examples

```
lgd = Legend(labels = 1:10, title = "foo", legend_gp = gpar(fill = "red"))
ComplexHeatmap:::height(lgd)
```

---

height.SingleAnnotation

Height of the SingleAnnotation object

Description

Height of the SingleAnnotation object

Usage

```
## S3 method for class 'SingleAnnotation'
height(x, ...)
```

Arguments

x	The SingleAnnotation-class object.
...	Other arguments.

Details

Internally used.

Examples

```
# There is no example
NULL
```

heightAssign.AnnotationFunction

Assign the Height to the AnnotationFunction Object

Description

Assign the Height to the AnnotationFunction Object

Usage

```
## S3 replacement method for class 'AnnotationFunction'
height(x, ...) <- value
```

Arguments

x	The AnnotationFunction-class object.
value	A unit object.
...	Other arguments.

Details

Internally used.

Examples

```
# There is no example
NULL
```

heightAssign.HeatmapAnnotation

Assign the Height to the HeatmapAnnotation Object

Description

Assign the Height to the HeatmapAnnotation Object

Usage

```
## S3 replacement method for class 'HeatmapAnnotation'
height(x, ...) <- value
```

Arguments

x	The HeatmapAnnotation-class object.
value	A unit object.
...	Other arguments.

Details

Internally used.

Examples

```
# There is no example
NULL
```

---

heightAssign.SingleAnnotation

Assign the Height to the SingleAnnotation Object

Description

Assign the Height to the SingleAnnotation Object

Usage

```
## S3 replacement method for class 'SingleAnnotation'
height(x, ...) <- value
```

Arguments

x	The SingleAnnotation-class object.
value	A unit object.
...	Other arguments.

Details

Internally used.

Examples

```
# There is no example
NULL
```

heightDetails.annotation_axis *Height for annotation_axis Grob*

Description

Height for annotation_axis Grob

Usage

```
## S3 method for class 'annotation_axis'
heightDetails(x)
```

Arguments

x	The annotation_axis grob returned by annotation_axis_grob.

Details

The physical height of the grob can be get by convertWidth(grobHeight(axis_grob), "mm").

Examples

```
# There is no example
NULL
```

heightDetails.legend *Grob height for packed_legends*

Description

Grob height for packed_legends

Usage

```
## S3 method for class 'legend'
heightDetails(x)
```

Arguments

x	A legend object.

Examples

```
# There is no example
NULL
```

heightDetails.legend_body *Grob height for legend_body*

Description

Grob height for legend_body

Usage

```
## S3 method for class 'legend_body'
heightDetails(x)
```

Arguments

x	A legend_body object.

Examples

```
# There is no example
NULL
```

heightDetails.packed_legends *Grob height for packed_legends*

Description

Grob height for packed_legends

Usage

```
## S3 method for class 'packed_legends'
heightDetails(x)
```

Arguments

x	A packed_legends object.

Examples

```
# There is no example
NULL
```

heightDetails.textbox *Height for textbox grob*

Description

Height for textbox grob

Usage

```
## S3 method for class 'textbox'
heightDetails(x)
```

Arguments

x	The textbox grob returned by textbox_grob.

Value

A unit object.

Examples

```
# There is no example
NULL
```

ht_global_opt *Global Options for Heatmaps*

Description

Global Options for Heatmaps

Usage

```
ht_global_opt(..., RESET = FALSE, READ.ONLY = NULL, LOCAL = FALSE, ADD = FALSE)
```

Arguments

...	Options.
RESET	Reset all the option values.
READ.ONLY	TRUE means only to return read-only values, FALSE means only to return non-read-only values, NULL means to return both.
LOCAL	Wwitch to local mode.
ADD	Add new options.

Details

This function is deprecated. Please use ht_opt instead. However, changes by this function will also be sychronized in ht_opt.

Examples

```
# There is no example
NULL
```

---

ht_opt *Global Options for Heatmaps*

Description

Global Options for Heatmaps

Usage

```
ht_opt(..., RESET = FALSE, READ.ONLY = NULL, LOCAL = FALSE, ADD = FALSE)
```

Arguments

...	Options, see 'Details' section.
RESET	Reset all the option values.
READ.ONLY	Please ignore this argument.
LOCAL	Please ignore this argument.
ADD	Please ignore this argument.

Details

You can set some parameters for all heatmaps/annotations simultaneously by this global function. Pleast note you should put it before your heatmap code and reset all option values after drawing the heatmaps to get rid of affecting next heatmap.

There are following parameters to control all heatmaps:

heatmap_row_names_gp set row_names_gp in all Heatmap.

heatmap_column_names_gp set column_names_gp in all Heatmap.

heatmap_row_title_gp set row_title_gp in all Heatmap.

heatmap_column_title_gp set column_title_gp in all Heatmap.

heatmap_border set border in all Heatmap.

Following parameters control the legends:

legend_title_gp set title_gp in all heatmap legends and annotation legends.

legend_title_position set `title_position` in all heatmap legends and annotation legends.

legend_labels_gp set `labels_gp` in all heatmap legends and annotation legends.

legend_grid_width set `grid_width` in all heatmap legends and annotation legends.

legend_grid_height set `grid_height` in all heatmap legends and annotation legends.

legend_border set `border` in all heatmap legends and annotation legends.

legend_gap Gap between legends. The value should be a vector of two units. One for gaps between vertical legends and one for the horizontal legends. If only one single unit is specified, the same gap set for the vertical and horizontal legends.

merge_legend wether merge heatmap and annotation legends.

Following parameters control heatmap annotations:

annotation_border `border` in all `HeatmapAnnotation`.

simple_anno_size size for the simple annotation.

Following parameters control the space between heatmap components:

DENDROGRAM_PADDING space bewteen dendrograms and heatmap body.

DIMNAME_PADDING space between row/column names and heatmap body.

TITLE_PADDING space between row/column titles and heatmap body. The value can have length of two which corresponds to the botton and top padding.

COLUMN_ANNO_PADDING space between column annotations and heatmap body.

ROW_ANNO_PADDING space between row annotations and heatmap body.

HEATMAP_LEGEND_PADDING space between heatmap legends and heatmaps

ANNOTATION_LEGEND_PADDING space between annotation legends and heatmaps

Other parameters:

fast_hclust whether use `hclust` to speed up clustering?

show_parent_dend_line when heatmap is split, whether to add a dashed line to mark parent dendrogram and children dendrograms?

COLOR default colors for continuous color mapping.

You can get or set option values by the traditional way (like `options`) or by `$` operator:

```
# to get option values
ht_opt("heatmap_row_names_gp")
ht_opt$heatmap_row_names_gp

# to set option values
ht_opt("heatmap_row_names_gp" = gpar(fontsize = 8))
ht_opt$heatmap_row_names_gp = gpar(fontsize = 8)
```

Reset to the default values by `ht_opt(RESET = TRUE)`.

Author(s)

Zuguang Gu <z.gu@dkfz.de>

Examples

```
ht_opt
```

---

ht_size *Calculate the width and height of the heatmaps*

Description

Calculate the width and height of the heatmaps

Usage

```
ht_size(ht)
```

Arguments

ht	A Heatmap-class or HeatmapList-class object.

Value

A list of two elements: width and height.

Examples

```
# There is no example
NULL
```

---

is_abs_unit *Test Whether it is an Absolute Unit*

Description

Test Whether it is an Absolute Unit

Usage

```
is_abs_unit(u)
```

Arguments

u	A unit object.

Details

Besides the normal absolute units (e.g. "mm", "inches"), this function simply assumes grob objects as absolute units.

For a complex unit which is combination of different units, it is absolute only if all units included are absolute units.

Value

A logical value.

Author(s)

Zuguang Gu <z.gu@dkfz.de>

Examples

```
is_abs_unit(unit(1, "mm"))
is_abs_unit(unit(1, "npc"))
is_abs_unit(grobWidth(textGrob("foo")))
is_abs_unit(unit(1, "mm") + unit(1, "npc"))
```

Legend *Make a Single Legend*

Description

Make a Single Legend

Usage

```
Legend(at, labels = at, col_fun, name = NULL, grob = NULL,
    break_dist = NULL, nrow = NULL, ncol = 1, by_row = FALSE,
    grid_height = unit(4, "mm"),
    grid_width = unit(4, "mm"), tick_length = unit(0.8, "mm"),
    gap = unit(2, "mm"), column_gap = gap, row_gap = unit(0, "mm"),
    labels_gp = gpar(fontsize = 10), labels_rot = 0,
    border = NULL, background = "#EEEEEE",
    type = "grid", graphics = NULL, legend_gp = gpar(),
    pch = 16, size = unit(2, "mm"),
    legend_height = NULL, legend_width = NULL,
    direction = c("vertical", "horizontal"),
    title = "", title_gp = gpar(fontsize = 10, fontface = "bold"),
   title_position = c("topleft", "topcenter", "leftcenter", "lefttop", "leftcenter-rot", "lefttop-rot"
    title_gap = unit(2, "mm"))
```

Arguments

at	Breaks of the legend. The values can be either numeric or character. If it is not specified, the values of labels are taken as labels.
labels	Labels corresponding to at. If it is not specified, the values of at are taken as labels.
col_fun	A color mapping function which is used to make a continuous legend. Use colorRamp2 to generate the color mapping function. If at is missing, the breaks recorded in the color mapping function are used for at.
name	Name of the legend, internally used.
grob	The legend body can be specified by a pre-constructed grob object.
break_dist	A zooming factor to control relative distance of two neighbouring break values.The length of it should be length(at) - 1 or a scalar.
nrow	For legend which is represented as grids, nrow controls number of rows of the grids if the grids are arranged into multiple rows.
ncol	Similar as nrow, ncol controls number of columns of the grids if the grids are arranged into multiple columns. Note at a same time only one of nrow and ncol can be specified.
by_row	Are the legend grids arranged by rows or by columns?
grid_height	The height of legend grid. It can also control the height of the continuous legend if it is horizontal.
grid_width	The width of legend grid. It can also control the width of the continuous legend if it is vertical.
tick_length	Length of the ticks on the continuous legends. Value should be a unit object.
gap	If legend grids are put into multiple rows or columns, this controls the gap between neighbouring rows or columns, measured as a unit object.
column_gap	The same as gap.
row_gap	Space between legend rows.
labels_gp	Graphic parameters for labels.
labels_rot	Text rotation for labels. It should only be used for horizontal continuous legend.
border	Color of legend grid borders. It also works for the ticks in the continuous legend.
background	Background colors for the grids. It is used when points and lines are the legend graphics.
type	Type of legends. The value can be one of grid, points, lines and boxplot.
graphics	Self-defined graphics for legends. The value should be a list of functions. Each function should accept four argumets: x and y: positions of the legend grid (center point), w and h: width and height of the legend grid.
legend_gp	Graphic parameters for the legend grids. You should control the filled color of the legend grids by gpar(fill = ...).
pch	Type of points if points are used as legend. Note you can use single-letter as pch, e.g. pch = 'A'. There are three additional integers that are valid for pch: 26 and 27 for single diagonal lines and 28 for double diagonal lines.

size	Size of points.
legend_height	Height of the whole legend body. It is only used for vertical continous legend.
legend_width	Width of the whole legend body. It is only used for horizontal continous legend.
direction	Direction of the legend, vertical or horizontal?
title	Title of the legend.
title_gp	Graphic parameters of the title.
title_position	Position of title relative to the legend. topleft, topcenter, leftcenter-rot and lefttop-rot are only for vertical legend and leftcenter, lefttop are only for horizontal legend.
title_gap	Gap between title and the legend body.

Details

Most of the argument can also be set in heatmap_legend_param argument in Heatmap or annotation_legend_param argument in HeatmapAnnotation to configure legend styles for heatmap and annotations.

Value

A Legends-class object.

See Also

packLegend packs multiple legends into one Legends-class object.

See examples of configuring legends: https://jokergoo.github.io/ComplexHeatmap-reference/book/legends.html

Examples

```
lgd = Legend(labels = month.name[1:6], title = "foo", legend_gp = gpar(fill = 1:6))
draw(lgd, test = "add labels and title")

require(circlize)
col_fun = colorRamp2(c(0, 0.5, 1), c("blue", "white", "red"))
lgd = Legend(col_fun = col_fun, title = "foo")
draw(lgd, test = "only col_fun")

col_fun = colorRamp2(c(0, 0.5, 1), c("blue", "white", "red"))
lgd = Legend(col_fun = col_fun, title = "foo", at = c(0, 0.1, 0.15, 0.5, 0.9, 0.95, 1))
draw(lgd, test = "unequal interval breaks")
```

Legends *Constructor method for Legends class*

Description

Constructor method for Legends class

Usage

```
Legends(...)
```

Arguments

...	arguments.

Details

There is no public constructor method for the Legends-class.

Value

No value is returned.

Author(s)

Zuguang Gu <z.gu@dkfz.de>

Examples

```
# There is no example
NULL
```

Legends-class *The Class for Legends*

Description

The Class for Legends

Details

This is a very simple class for legends that it only has one slot which is the real grob of the legends.

Construct a single legend by Legend and a group of legends by packLegend.

Examples

```
lgd = Legend(at = 1:4)
lgd
lgd@grob
```

`length.HeatmapAnnotation` *Number of Annotations*

Description

Number of Annotations

Usage

```
## S3 method for class 'HeatmapAnnotation'
length(x)
```

Arguments

x	A HeatmapAnnotation-class object.

Examples

```
# There is no example
NULL
```

`length.HeatmapList` *Length of the HeatmapList object*

Description

Length of the HeatmapList object

Usage

```
## S3 method for class 'HeatmapList'
length(x)
```

Arguments

x	A HeatmapList-class object

Examples

```
# There is no example
NULL
```

list_components *List All Heatmap Components*

Description

List All Heatmap Components

Usage

```
list_components(pattern = NULL)
```

Arguments

pattern	A regular expression.

Value

A vector of viewport names.

Examples

```
# There is no example
NULL
```

list_to_matrix *Convert a List of Sets to a Binary Matrix*

Description

Convert a List of Sets to a Binary Matrix

Usage

```
list_to_matrix(lt, universal_set = NULL)
```

Arguments

lt	A list of vectors.
universal_set	The universal set.

Details

It converts the list which have m sets to a binary matrix with n rows and m columns where n is the size of universal set.

Examples

```
set.seed(123)
lt = list(a = sample(letters, 5),
          b = sample(letters, 10),
          c = sample(letters, 15))
list_to_matrix(lt)
list_to_matrix(lt, universal_set = letters)
```

`make_column_cluster-Heatmap-method`
Make Cluster on Columns

Description

Make Cluster on Columns

Usage

```
## S4 method for signature 'Heatmap'
make_column_cluster(object)
```

Arguments

`object`	A `Heatmap-class` object.

Details

The function will fill or adjust `column_dend_list`, `column_order_list`, `column_title` and `matrix_param` slots.

If `order` is defined, no clustering will be applied.

This function is only for internal use.

Value

A `Heatmap-class` object.

Author(s)

Zuguang Gu <z.gu@dkfz.de>

Examples

```
# There is no example
NULL
```

make_comb_mat *Make a Combination Matrix for UpSet Plot*

Description

Make a Combination Matrix for UpSet Plot

Usage

```
make_comb_mat(..., mode = c("distinct", "intersect", "union"),
    top_n_sets = Inf, min_set_size = -Inf,
    universal_set = NULL, complement_size = NULL,
    value_fun = NULL, set_on_rows = TRUE)
```

Arguments

`...`	The input sets. If it is represented as a single variable, it should be a matrix/data frame or a list. If it is multiple variables, it should be name-value pairs, see Input section for explanation.
`mode`	The mode for forming the combination set, see Mode section.
`top_n_sets`	Number of sets with largest size.
`min_set_size`	Ths minimal set size that is used for generating the combination matrix.
`universal_set`	The universal set. If it is set, the size of the complement set of all sets is also calculated. It if is specified, `complement_size` is ignored.
`complement_size`	The size for the complement of all sets. If it is specified, the combination set name will be like "00...".
`value_fun`	For each combination set, how to calculate the size? If it is a scalar set, the length of the vector is the size of the set, while if it is a region-based set, (i.e. `GRanges` or `IRanges` object), the sum of widths of regions in the set is calculated as the size of the set.
`set_on_rows`	Used internally.

Value

A matrix also in a class of `comb_mat`.

Following functions can be applied to it: `set_name`, `comb_name`, `set_size`, `comb_size`, `comb_degree`, `extract_comb` and `t.comb_mat`.

Input

To represent multiple sets, the variable can be represented as:

1. A list of sets where each set is a vector, e.g.:

```
list(set1 = c("a", "b", "c"),
     set2 = c("b", "c", "d", "e"),
     ...)
```

2. A binary matrix/data frame where rows are elements and columns are sets, e.g.:

```
  a b c
h 1 1 1
t 1 0 1
j 1 0 0
u 1 0 1
w 1 0 0
...
```

If the variable is a data frame, the binary columns (only contain 0 and 1) and the logical columns are only kept.

The set can be genomic regions, then it can only be represented as a list of `GRanges` objects.

Mode

E.g. for three sets (A, B, C), the UpSet approach splits the combination of selecting elements in the set or not in the set and calculates the sizes of the combination sets. For three sets, all possible combinations are:

```
A B C
1 1 1
1 1 0
1 0 1
0 1 1
1 0 0
0 1 0
0 0 1
```

A value of 1 means to select that set and 0 means not to select that set. E.g., "1 1 0" means to select set A, B while not set C. Note there is no "0 0 0", because the background size is not of interest here. With the code of selecting and not selecting the sets, next we need to define how to calculate the size of that combination set. There are three modes:

1. `distinct` mode: 1 means in that set and 0 means not in that set, then "1 1 0" means a set of elements also in set A and B, while not in C (i.e. `setdiff(intersect(A, B), C)`). Under this mode, the seven combination sets are the seven partitions in the Venn diagram and they are mutually exclusive.

2. `intersect` mode: 1 means in that set and 0 is not taken into account, then, "1 1 0" means a set of elements in set A and B, and they can also in C or not in C (i.e. `intersect(A, B)`). Under this mode, the seven combination sets can overlap.

3. `union` mode: 1 means in that set and 0 is not taken into account. When there are multiple 1, the relationship is OR. Then, "1 1 0" means a set of elements in set A or B, and they can also in C or not in C (i.e. `union(A, B)`). Under this mode, the seven combination sets can overlap.

Examples

```
set.seed(123)
lt = list(a = sample(letters, 10),
          b = sample(letters, 15),
          c = sample(letters, 20))
m = make_comb_mat(lt)

mat = list_to_matrix(lt)
mat
m = make_comb_mat(mat)

## Not run:
require(circlize)
require(GenomicRanges)
lt = lapply(1:4, function(i) generateRandomBed())
lt = lapply(lt, function(df) GRanges(seqnames = df[, 1],
    ranges = IRanges(df[, 2], df[, 3])))
names(lt) = letters[1:4]
m = make_comb_mat(lt)

## End(Not run)
```

---

make_layout-dispatch *Method dispatch page for make_layout*

Description

Method dispatch page for `make_layout`.

Dispatch

`make_layout` can be dispatched on following classes:

- `make_layout,Heatmap-method`, `Heatmap-class` class method
- `make_layout,HeatmapList-method`, `HeatmapList-class` class method

Examples

```
# no example
NULL
```

make_layout-Heatmap-method *Make the Layout of a Single Heatmap*

Description

Make the Layout of a Single Heatmap

Usage

```
## S4 method for signature 'Heatmap'
make_layout(object)
```

Arguments

object	A Heatmap-class object.

Details

The layout of the single heatmap will be established by setting the size of each heatmap component. Also how to make graphics for heatmap components will be recorded by saving as functions.

Whether to apply row clustering or column clustering affects the layout, so clustering should be applied first by prepare,Heatmap-method before making the layout.

This function is only for internal use.

Value

A Heatmap-class object.

Author(s)

Zuguang Gu <z.gu@dkfz.de>

Examples

```
# There is no example
NULL
```

make_layout-HeatmapList-method
Make Layout for the Heatmap List

Description

Make Layout for the Heatmap List

Usage

```
## S4 method for signature 'HeatmapList'
make_layout(object,

    row_title = character(0),
    row_title_side = c("left", "right"),
    row_title_gp = gpar(fontsize = 14),
    column_title = character(0),
    column_title_side = c("top", "bottom"),
    column_title_gp = gpar(fontsize = 14),

    heatmap_legend_side = c("right", "left", "bottom", "top"),
    merge_legends = FALSE,
    show_heatmap_legend = TRUE,
    heatmap_legend_list = list(),
    annotation_legend_side = c("right", "left", "bottom", "top"),
    show_annotation_legend = TRUE,
    annotation_legend_list = list(),
    align_heatmap_legend = NULL,
    align_annotation_legend = NULL,
    legend_grouping = c("adjusted", "original"),

    ht_gap = unit(2, "mm"),

    main_heatmap = which(sapply(object@ht_list, inherits, "Heatmap"))[1],
    padding = GLOBAL_PADDING,

    auto_adjust = TRUE,
    row_dend_side = c("original", "left", "right"),
    row_sub_title_side = c("original", "left", "right"),
    column_dend_side = c("original", "top", "bottom"),
    column_sub_title_side = c("original", "top", "bottom"),

    row_gap = NULL,
    cluster_rows = NULL,
    cluster_row_slices = NULL,
    clustering_distance_rows = NULL,
    clustering_method_rows = NULL,
```

```
    row_dend_width = NULL,
    show_row_dend = NULL,
    row_dend_reorder = NULL,
    row_dend_gp = NULL,
    row_order = NULL,
    row_km = NULL,
    row_km_repeats = NULL,
    row_split = NULL,
    height = NULL,
    heatmap_height = NULL,

    column_gap = NULL,
    cluster_columns = NULL,
    cluster_column_slices = NULL,
    clustering_distance_columns = NULL,
    clustering_method_columns = NULL,
    column_dend_width = NULL,
    show_column_dend = NULL,
    column_dend_reorder = NULL,
    column_dend_gp = NULL,
    column_order = NULL,
    column_km = NULL,
    column_km_repeats = NULL,
    column_split = NULL,
    width = NULL,
    heatmap_width = NULL,

    use_raster = NULL,
    raster_device = NULL,
    raster_quality = NULL,
    raster_device_param = NULL,
    raster_resize = NULL)
```

Arguments

`object`	A `HeatmapList-class` object.
`row_title`	Title on the row.
`row_title_side`	Will the title be put on the left or right of the heatmap list?
`row_title_gp`	Graphic parameters for the row title.
`column_title`	Title on the column.
`column_title_side`	Will the title be put on the top or bottom of the heatmap?
`column_title_gp`	Graphic parameters for the column title.
`heatmap_legend_side`	Side of the heatmap legends.

`merge_legends` Whether to put heatmap legends and annotation legends together. By default they are put in different viewports.

`show_heatmap_legend`
Whether show heatmap legends.

`heatmap_legend_list`
A list of self-defined legends, should be wrapped into a list of `grob` objects. Normally they are constructed by `Legend`.

`annotation_legend_side`
Side of annotation legends.

`show_annotation_legend`
Whether show annotation legends.

`annotation_legend_list`
A list of self-defined legends, should be wrapped into a list of `grob` objects. Normally they are constructed by `Legend`.

`align_heatmap_legend`
How to align the legends to heatmap. Possible values are "heatmap_center", "heatmap_top" and "global_center". If the value is `NULL`, it automatically picks the proper value from the three options.

`align_annotation_legend`
How to align the legends to heatmap. Possible values are "heatmap_center", "heatmap_top" and "global_center".

`legend_grouping`
How the legends are grouped. Values should be "adjusted" or "original".

`ht_gap` Gap between heatmaps, should be a `unit` object. It can be a vector of length 1 or the number of heamtaps/annotations.

`main_heatmap` Name or index for the main heatmap.

`padding` Padding of the whole plot. The four values correspond to the bottom, left, top and right paddings.

`auto_adjust` whether apply automatic adjustment? The auto-adjustment includes turning off dendrograms, titles and row/columns for non-main heatmaps.

`row_dend_side` If auto-adjustment is on, to put the row dendrograms of the main heatmap to the most left side of the heatmap list or the most right side?

`row_sub_title_side`
There can be sub titles generated by the splitting of heatmaps. Similar setting as `row_dend_side`.

`column_dend_side`
Similar setting as `row_dend_side`.

`column_sub_title_side`
Similar setting as `row_sub_title_side`.

`row_gap` Overwrite the corresponding setting in the main heatmap.

`cluster_rows` Overwrite the corresponding setting in the main heatmap.

`cluster_row_slices`
Overwrite the corresponding setting in the main heatmap.

clustering_distance_rows
: Overwrite the corresponding setting in the main heatmap.

clustering_method_rows
: Overwrite the corresponding setting in the main heatmap.same setting as in Heatmap, if it is specified, clustering_method_rows in main heatmap is ignored.

row_dend_width
: Overwrite the corresponding setting in the main heatmap.

show_row_dend
: same Overwrite the corresponding setting in the main heatmap.

row_dend_reorder
: Overwrite the corresponding setting in the main heatmap.

row_dend_gp
: Overwrite the corresponding setting in the main heatmap.

row_order
: Overwrite the corresponding setting in the main heatmap.

row_km
: Overwrite the corresponding setting in the main heatmap.

row_km_repeats
: Overwrite the corresponding setting in the main heatmap.

row_split
: Overwrite the corresponding setting in the main heatmap.

height
: Overwrite the corresponding setting in the main heatmap.

heatmap_height
: Overwrite the corresponding setting in the main heatmap.

column_gap
: Overwrite the corresponding setting in the main heatmap.

cluster_columns
: Overwrite the corresponding setting in the main heatmap.

cluster_column_slices
: Overwrite the corresponding setting in the main heatmap.

clustering_distance_columns
: Overwrite the corresponding setting in the main heatmap.

clustering_method_columns
: Overwrite the corresponding setting in the main heatmap.

column_dend_width
: column Overwrite the corresponding setting in the main heatmap.

show_column_dend
: Overwrite the corresponding setting in the main heatmap.

column_dend_reorder
: Overwrite the corresponding setting in the main heatmap.

column_dend_gp
: Overwrite the corresponding setting in the main heatmap.

column_order
: Overwrite the corresponding setting in the main heatmap.

column_km
: Overwrite the corresponding setting in the main heatmap.

column_km_repeats
: Overwrite the corresponding setting in the main heatmap.

column_split
: Overwrite the corresponding setting in the main heatmap.

width
: Overwrite the corresponding setting in the main heatmap.

heatmap_width
: Overwrite the corresponding setting in the main heatmap.

use_raster
: Overwrite the corresponding setting in every heatmap.

raster_device Overwrite the corresponding setting in every heatmap.

raster_quality Overwrite the corresponding setting in every heatmap.

raster_device_param
Overwrite the corresponding setting in every heatmap.

raster_resize Overwrite the corresponding setting in every heatmap.

Details

It sets the size of each component of the heatmap list and adjusts graphic parameters for each heatmap if necessary.

This function is only for internal use.

Value

A HeatmapList-class object in which settings for all heatmap are adjusted.

Author(s)

Zuguang Gu <z.gu@dkfz.de>

Examples

```
# There is no example
NULL
```

---

make_row_cluster-Heatmap-method
Make Cluster on Rows

Description

Make Cluster on Rows

Usage

```
## S4 method for signature 'Heatmap'
make_row_cluster(object)
```

Arguments

object A Heatmap-class object.

Details

The function will fill or adjust row_dend_list, row_order_list, row_title and matrix_param slots.

If order is defined, no clustering will be applied.

This function is only for internal use.

Value

A Heatmap-class object.

Author(s)

Zuguang Gu <z.gu@dkfz.de>

Examples

```
# There is no example
NULL
```

`map_to_colors-ColorMapping-method`
Map Values to Colors

Description

Map Values to Colors

Usage

```
## S4 method for signature 'ColorMapping'
map_to_colors(object, x)
```

Arguments

`object`	A ColorMapping-class object.
`x`	Input values.

Details

It maps a vector of values to a vector of colors.

This function provides a uniform way for discrete and continuous color mapping.

Value

A vector of colors.

Author(s)

Zuguang Gu <z.gu@dkfz.de>

Examples

```
cm = ColorMapping(colors = c("A" = "red", "B" = "black"))
map_to_colors(cm, sample(c("A", "B"), 10, replace = TRUE))
require(circlize)
col_fun = colorRamp2(c(0, 1), c("white", "red"))
cm = ColorMapping(col_fun = col_fun)
map_to_colors(cm, runif(10))
```

---

max_text_height *Maximum Height of Text*

Description

Maximum Height of Text

Usage

```
max_text_height(text, gp = gpar(), rot = 0)
```

Arguments

text	A vector of text.
gp	Graphic parameters for text.
rot	Rotation of the text, scalar.

Details

It simply calculates maximum height of a list of textGrob objects.

Note it ignores the text rotation.

Value

A unit object.

Author(s)

Zuguang Gu <z.gu@dkfz.de>

See Also

max_text_width calculates the maximum width of a text vector.

Examples

```
x = c("a", "b\nb", "c\nc\nc")
max_text_height(x, gp = gpar(fontsize = 10))
```

max_text_width *Maximum Width of Text*

Description

Maximum Width of Text

Usage

```
max_text_width(text, gp = gpar(), rot = 0)
```

Arguments

text	A vector of text.
gp	Graphic parameters for text.
rot	Rotation of the text, scalar.

Details

It simply calculates maximum width of a list of textGrob objects.

Note it ignores the text rotation.

Value

A unit object which is in "mm".

Author(s)

Zuguang Gu <z.gu@dkfz.de>

See Also

max_text_height calculates the maximum height of a text vector.

Examples

```
x = c("a", "bb", "ccc")
max_text_width(x, gp = gpar(fontsize = 10))
```

merge_dendrogram *Merge Dendrograms*

Description

Merge Dendrograms

Usage

```
merge_dendrogram(x, y, only_parent = FALSE, ...)
```

Arguments

x	The parent dendrogram.
y	The children dendrograms. They are connected to the leaves of the parent dendrogram. So the length of y should be as same as the number of leaves of the parent dendrogram.
only_parent	Whether only returns the parent dendrogram where the height and node positions have been adjusted by children dendrograms.
...	Other arguments.

Details

Do not retrieve the order of the merged dendrogram. It is not reliable.

Examples

```
m1 = matrix(rnorm(100), nr = 10)
m2 = matrix(rnorm(80), nr = 8)
m3 = matrix(rnorm(50), nr = 5)
dend1 = as.dendrogram(hclust(dist(m1)))
dend2 = as.dendrogram(hclust(dist(m2)))
dend3 = as.dendrogram(hclust(dist(m3)))
dend_p = as.dendrogram(hclust(dist(rbind(colMeans(m1), colMeans(m2), colMeans(m3)))))
dend_m = merge_dendrogram(dend_p, list(dend1, dend2, dend3))
grid.dendrogram(dend_m, test = TRUE)

dend_m = merge_dendrogram(dend_p, list(dend1, dend2, dend3), only_parent = TRUE)
grid.dendrogram(dend_m, test = TRUE)

require(dendextend)
dend1 = color_branches(dend1, k = 1, col = "red")
dend2 = color_branches(dend2, k = 1, col = "blue")
dend3 = color_branches(dend3, k = 1, col = "green")
dend_p = color_branches(dend_p, k = 1, col = "orange")
dend_m = merge_dendrogram(dend_p, list(dend1, dend2, dend3))
grid.dendrogram(dend_m, test = TRUE)
```

names.HeatmapAnnotation *Annotation Names*

Description

Annotation Names

Usage

```
## S3 method for class 'HeatmapAnnotation'
names(x)
```

Arguments

x	A HeatmapAnnotation-class object.

Examples

```
ha = HeatmapAnnotation(foo = 1:10, bar = anno_points(10:1))
names(ha)
```

names.HeatmapList *Names of the heatmaps/annotations*

Description

Names of the heatmaps/annotations

Usage

```
## S3 method for class 'HeatmapList'
names(x)
```

Arguments

x	A HeatmapList-class object

Examples

```
# There is no example
NULL
```

namesAssign.HeatmapAnnotation *Assign Annotation Names*

Description

Assign Annotation Names

Usage

```
## S3 replacement method for class 'HeatmapAnnotation'
names(x) <- value
```

Arguments

x	A HeatmapAnnotation-class object.
value	A vector of new names.

Examples

```
ha = HeatmapAnnotation(foo = 1:10, bar = anno_points(10:1))
names(ha) = c("A", "B")
names(ha)
```

ncol.Heatmap *Number of Columns in the Heatmap*

Description

Number of Columns in the Heatmap

Usage

```
## S3 method for class 'Heatmap'
ncol(x)
```

Arguments

x	A Heatmap-class object.

Examples

```
# There is no example
NULL
```

---

nobs.AnnotationFunction

Number of Observations

Description

Number of Observations

Usage

```
## S3 method for class 'AnnotationFunction'
nobs(object, ...)
```

Arguments

object	The AnnotationFunction-class object.
...	Other arguments.

Details

returns NA.

Examples

```
anno = anno_points(1:10)
nobs(anno)
```

---

nobs.HeatmapAnnotation

Number of Observations

Description

Number of Observations

Usage

```
## S3 method for class 'HeatmapAnnotation'
nobs(object, ...)
```

Arguments

object	The HeatmapAnnotation-class object.
...	other arguments.

Value

If there is no nobs information for any of its SingleAnnotation-class object, it returns NA.

Examples

```
# There is no example
NULL
```

---

nobs.SingleAnnotation *Number of Observations*

Description

Number of Observations

Usage

```
## S3 method for class 'SingleAnnotation'
nobs(object, ...)
```

Arguments

object	The SingleAnnotation-class object.
...	Other arguments.

Details

It returns the n slot of the annotaton function. If it does not exist, it returns NA.

Examples

```
# There is no example
NULL
```

normalize_comb_mat *Normalize a list of combination matrice*

Description

Normalize a list of combination matrice

Usage

```
normalize_comb_mat(..., full_comb_sets = FALSE, complement_set = FALSE)
```

Arguments

...	Combination matrices.
full_comb_sets	Whether the combination matrices contain the full sets of combination sets?
complement_set	Whether the combination matrices also contain the complement set?

Details

It normalizes a list of combination matrice to make them have same number and order of sets and combination sets.

The sets (by set_name) from all combination matrice should be the same.

Examples

```
# There is no example
NULL
```

normalize_genomic_signals_to_bins *Overlap genomic signals to the genomic bins*

Description

Overlap genomic signals to the genomic bins

Usage

```
normalize_genomic_signals_to_bins(gr, value, value_column = NULL, method = "weighted",
    empty_value = NA, window = GHEATMAP_ENV$chr_window)
```

Arguments

gr	A GRanges object.
value	The corresponding signals corresponding to gr.
value_column	If value is not set and the values are in the meta-columns in gr, you can specify the column indices for these value columns, better to use name indices.
method	One of "weighted", "w0" and "absolute". For the three different methods, please refer to https://bioconductor.org/packages/release/bioc/vignettes/EnrichedHeatmap/inst/doc/EnrichedHeatmap.html#toc_7 .
empty_value	The value for the bins where no signal is overlapped.
window	The genomic bins generated from bin_genome.

Details

The genomic bins should be generated by bin_genome in advance. The genomic bins are saved internally, so that multiple uses of bin_genome ensure they all return the matrices with the same rows.

It supports following values.

- When neither value nor value_column is set, it simply overlap gr to the genomic bins and returns a one-column logical matrix which represents whether the current genomic bin overlaps to any signal.
- When the signals are numeric, value can be a numeric vector or a matrix, or value_column can contain multiple columns. The function returns a numeric matrix where the values are properly averaged depending on what method was used.
- When the signals are character, value can only be a vector or value_column can only contain one single column. The function returns a one-column character matrix.

Value

A matrix with the same row as the genomic bins.

Examples

```
## Not run:
require(circlize)
require(GenomicRanges)

chr_window = bin_genome("hg19")

#### the first is a numeric matrix #######
bed1 = generateRandomBed(nr = 1000, nc = 10)
gr1 = GRanges(seqnames = bed1[, 1], ranges = IRanges(bed1[, 2], bed1[, 3]))

num_mat = normalize_genomic_signals_to_bins(gr1, bed1[, -(1:3)])

#### the second is a character matrix ######
bed_list = lapply(1:10, function(i) {
```

```
    generateRandomBed(nr = 1000, nc = 1,
        fun = function(n) sample(c("gain", "loss"), n, replace = TRUE))
})
char_mat = NULL
for(i in 1:10) {
    bed = bed_list[[i]]
    bed = bed[sample(nrow(bed), 20), , drop = FALSE]
    gr_cnv = GRanges(seqnames = bed[, 1], ranges = IRanges(bed[, 2], bed[, 3]))

    char_mat = cbind(char_mat, normalize_genomic_signals_to_bins(gr_cnv, bed[, 4]))
}

#### two numeric columns ##########
bed2 = generateRandomBed(nr = 100, nc = 2)
gr2 = GRanges(seqnames = bed2[, 1], ranges = IRanges(bed2[, 2], bed2[, 3]))

v = normalize_genomic_signals_to_bins(gr2, bed2[, 4:5])

##### a list of genes need to be highlighted
bed3 = generateRandomBed(nr = 40, nc = 0)
gr3 = GRanges(seqnames = bed3[, 1], ranges = IRanges(bed3[, 2], bed3[, 2]))
gr3$gene = paste0("gene_", 1:length(gr3))

mtch = as.matrix(findOverlaps(chr_window, gr3))
at = mtch[, 1]
labels = mcols(gr3)[mtch[, 2], 1]

##### order of the chromosomes ########
chr = as.vector(seqnames(chr_window))
chr_level = paste0("chr", c(1:22, "X", "Y"))
chr = factor(chr, levels = chr_level)

#### make the heatmap #######
subgroup = rep(c("A", "B"), each = 5)

ht_opt$TITLE_PADDING = unit(c(4, 4), "points")
ht_list = Heatmap(num_mat, name = "mat", col = colorRamp2(c(-1, 0, 1), c("green", "white", "red")),
    row_split = chr, cluster_rows = FALSE, show_column_dend = FALSE,
    column_split = subgroup, cluster_column_slices = FALSE,
    column_title = "numeric matrix",
   top_annotation = HeatmapAnnotation(subgroup = subgroup, annotation_name_side = "left"),
    row_title_rot = 0, row_title_gp = gpar(fontsize = 10), border = TRUE,
    row_gap = unit(0, "points")) +
Heatmap(char_mat, name = "CNV", col = c("gain" = "red", "loss" = "blue"),
    border = TRUE, column_title = "character matrix") +
rowAnnotation(label = anno_mark(at = at, labels = labels)) +
rowAnnotation(pt = anno_points(v, gp = gpar(col = 4:5), pch = c(1, 16)),
    width = unit(2, "cm")) +
rowAnnotation(bar = anno_barplot(v[, 1], gp = gpar(col = ifelse(v[ ,1] > 0, 2, 3))),
    width = unit(2, "cm"))
draw(ht_list, merge_legend = TRUE)

##### or horizontally ###
```

```
ht_list = Heatmap(t(num_mat), name = "mat", col = colorRamp2(c(-1, 0, 1), c("green", "white", "red")),
    column_split = chr, cluster_columns = FALSE, show_row_dend = FALSE,
    row_split = subgroup, cluster_row_slices = FALSE,
    row_title = "numeric matrix",
    left_annotation = rowAnnotation(subgroup = subgroup, show_annotation_name = FALSE,
        annotation_legend_param = list(
         subgroup = list(direction = "horizontal", title_position = "lefttop", nrow = 1))),
    column_title_gp = gpar(fontsize = 10), border = TRUE,
    column_gap = unit(0, "points"),
   column_title = ifelse(seq_along(chr_level) %% 2 == 0, paste0("\n", chr_level), paste0(chr_level, "\n")),
    heatmap_legend_param = list(direction = "horizontal", title_position = "lefttop")) %v%
Heatmap(t(char_mat), name = "CNV", col = c("gain" = "red", "loss" = "blue"),
    border = TRUE, row_title = "character matrix",
   heatmap_legend_param = list(direction = "horizontal", title_position = "lefttop", nrow = 1)) %v%
HeatmapAnnotation(label = anno_mark(at = at, labels = labels, side = "bottom")) %v%
HeatmapAnnotation(pt = anno_points(v, gp = gpar(col = 4:5), pch = c(1, 16)),
    annotation_name_side = "left", height = unit(2, "cm")) %v%
HeatmapAnnotation(bar = anno_barplot(v[, 1], gp = gpar(col = ifelse(v[ ,1] > 0, 2, 3))),
    annotation_name_side = "left", height = unit(2, "cm"))
draw(ht_list, heatmap_legend_side = "bottom", merge_legend = TRUE)

## End(Not run)
```

`nrow.Heatmap` *Number of Rows in the Heatmap*

Description

Number of Rows in the Heatmap

Usage

```
## S3 method for class 'Heatmap'
nrow(x)
```

Arguments

x	A Heatmap-class object.

Examples

```
# There is no example
NULL
```

oncoPrint *Make oncoPrint*

Description

Make oncoPrint

Usage

```
oncoPrint(mat, name,
    get_type = default_get_type,
    alter_fun,
    alter_fun_is_vectorized = NULL,
    col = NULL,

    top_annotation = HeatmapAnnotation(cbar = anno_oncoprint_barplot()),
    right_annotation = rowAnnotation(rbar = anno_oncoprint_barplot()),
    left_annotation = NULL,
    bottom_annotation = NULL,

    show_pct = TRUE,
    pct_gp = gpar(fontsize = 10),
    pct_digits = 0,
    pct_side = "left",
    pct_include = NULL,

    row_labels = NULL,
    show_row_names = TRUE,
    row_names_side = "right",
    row_names_gp = pct_gp,
    row_split = NULL,

    column_labels = NULL,
    column_names_gp = gpar(fontsize = 10),
    column_split = NULL,

    row_order = NULL,
    column_order = NULL,
    cluster_rows = FALSE,
    cluster_columns = FALSE,

    remove_empty_columns = FALSE,
    remove_empty_rows = FALSE,
    show_column_names = FALSE,
    heatmap_legend_param = NULL,
    ...)
```

Arguments

mat	The value should be a character matrix which encodes mulitple alterations or a list of matrices for which every matrix contains binary value representing whether the alteration is present or absent. When the value is a list, the names of the list represent alteration types. You can use unify_mat_list to make all matrix having same row names and column names.
name	Name of the oncoPrint. Not necessary to specify.
get_type	If different alterations are encoded in the matrix as complex strings, this self-defined function determines how to extract them. It only works when mat is a matrix. The default value is default_get_type.
alter_fun	A single function or a list of functions which defines how to add graphics for different alterations. You can use alter_graphic to automatically generate for rectangles and points.
alter_fun_is_vectorized	Whether alter_fun is implemented vectorized. Internally the function will guess.
col	A vector of color for which names correspond to alteration types.
top_annotation	Annotation put on top of the oncoPrint. By default it is barplot which shows the number of genes with a certain alteration in each sample.
right_annotation	Annotation put on the right of the oncoPrint. By default it is barplot which shows the number of samples with a certain alteration in each gene.
left_annotation	Annotation put on the left of the oncoPrint.
bottom_annotation	Annotation put at the bottom of the oncoPrint.
show_pct	whether show percent values on the left of the oncoprint?
pct_gp	Graphic paramters for percent values
pct_digits	Digits for the percent values.
pct_side	Side of the percent values to the oncoPrint. This argument is currently disabled.
pct_include	Alteration types that are included for the calculation of percent values.
row_labels	Labels as the row names of the oncoPrint.
show_row_names	Whether show row names?
row_names_side	Side of the row names to the oncoPrint. This argument is currently disabled.
row_names_gp	Graphic parameters for the row names.
row_split	Pass to Heatmap.
column_labels	Pass to Heatmap.
column_names_gp	Pass to Heatmap.
column_split	Pass to Heatmap.
row_order	Order of rows. By default rows are sorted by the number of occurence of the alterations.

`cluster_rows` If it is set, it must be a dendrogram/hclust object.

`cluster_columns`
If it is set, it must be a dendrogram/hclust object.

`column_order` Order of columns. By default the columns are sorted to show the mutual exclusivity of alterations.

`remove_empty_columns`
If there is no alteration in some samples, whether remove them on the oncoPrint?

`remove_empty_rows`
If there is no alteration in some samples, whether remove them on the oncoPrint?

`show_column_names`
Whether show column names?

`heatmap_legend_param`
pass to `Heatmap`.

`...` Pass to `Heatmap`.

Details

The 'memo sort' method is from https://gist.github.com/armish/564a65ab874a770e2c26 . Thanks to B. Arman Aksoy for contributing the code.

https://jokergoo.github.io/ComplexHeatmap-reference/book/oncoprint.html gives details for configuring a oncoPrint.

Value

A `Heatmap-class` object which means you can add other heatmaps or annotations to it.

Author(s)

Zuguang Gu <z.gu@dkfz.de>

Examples

```
# There is no example
NULL
```

---

order.comb_mat *Order of the Combination Sets*

Description

Order of the Combination Sets

Usage

```
order.comb_mat(m, decreasing = TRUE, on = "comb_set")
```

Arguments

m	A combination matrix returned by make_comb_mat.
on	On sets or on combination sets?
decreasing	Whether the ordering is applied decreasingly.

Details

It first sorts by the degree of the combination sets then by the combination matrix.

Examples

```
# There is no example
NULL
```

---

packLegend *Pack Legends*

Description

Pack Legends

Usage

```
packLegend(..., gap = unit(4, "mm"), row_gap = unit(4, "mm"), column_gap = unit(4, "mm"),
    direction = c("vertical", "horizontal"),
    max_width = NULL, max_height = NULL, list = NULL)
```

Arguments

...	A list of objects returned by Legend.
gap	Gap between two neighbouring legends. The value is a unit object with length of one. It is the same as row_gap if the direction if vertial and the same as column_gap if the direction is horizontal.
row_gap	Horizontal gaps between legends.
column_gap	Vertical gaps between legends.
direction	The direction to arrange legends.
max_width	The maximal width of the total packed legends. It only works for horizontal arrangement. If the total width of the legends exceeds it, the legends will be arranged into multiple rows.
max_height	Similar as max_width, but for the vertical arrangment of legends.
list	The list of legends can be specified as a list.

Value

A Legends-class object.

See Also

https://jokergoo.github.io/ComplexHeatmap-reference/book/legends.html#a-list-of-legends

Examples

```
require(circlize)
col_fun = colorRamp2(c(0, 0.5, 1), c("blue", "white", "red"))
lgd1 = Legend(at = 1:6, legend_gp = gpar(fill = 1:6), title = "legend1")
lgd2 = Legend(col_fun = col_fun, title = "legend2", at = c(0, 0.25, 0.5, 0.75, 1))
pd = packLegend(lgd1, lgd2)
draw(pd, test = "two legends")
pd = packLegend(lgd1, lgd2, direction = "horizontal")
draw(pd, test = "two legends packed horizontally")
```

---

pheatmap *Translate pheatmap::pheatmap to ComplexHeatmap::Heatmap*

Description

Translate pheatmap::pheatmap to ComplexHeatmap::Heatmap

Usage

```
pheatmap(mat,
    color = colorRampPalette(rev(brewer.pal(n = 7, name = "RdYlBu")))(100),
    kmeans_k = NA,
    breaks = NA,
    border_color = ifelse(nrow(mat) < 100 & ncol(mat) < 100, "grey60", NA),
    cellwidth = NA,
    cellheight = NA,
    scale = "none",
    cluster_rows = TRUE,
    cluster_cols = TRUE,
    clustering_distance_rows = "euclidean",
    clustering_distance_cols = "euclidean",
    clustering_method = "complete",
    clustering_callback = NA,
    cutree_rows = NA,
    cutree_cols = NA,
   treeheight_row = ifelse(class(cluster_rows) == "hclust" || cluster_rows, 50, 0),
   treeheight_col = ifelse(class(cluster_cols) == "hclust" || cluster_cols, 50, 0),
    legend = TRUE,
    legend_breaks = NA,
```

```
    legend_labels = NA,
    annotation_row = NA,
    annotation_col = NA,
    annotation = NA,
    annotation_colors = NA,
    annotation_legend = TRUE,
    annotation_names_row = TRUE,
    annotation_names_col = TRUE,
    drop_levels = TRUE,
    show_rownames = TRUE,
    show_colnames = TRUE,
    main = NA,
    fontsize = 10,
    fontsize_row = fontsize,
    fontsize_col = fontsize,
    angle_col = c("270", "0", "45", "90", "315"),
    display_numbers = FALSE,
    number_format = "%.2f",
    number_color = "grey30",
    fontsize_number = 0.8 * fontsize,
    gaps_row = NULL,
    gaps_col = NULL,
    labels_row = NULL,
    labels_col = NULL,
    filename = NA,
    width = NA,
    height = NA,
    silent = FALSE,
    na_col = "#DDDDDD",
    name = NULL,

    # other graphic parameters for fonts
    fontfamily = "",
    fontfamily_row = fontfamily,
    fontfamily_col = fontfamily,
    fontface = 1,
    fontface_row = fontface,
    fontface_col = fontface,

    # argument specific for Heatmap()
    heatmap_legend_param = list(),
    ...,
    run_draw = FALSE)
```

Arguments

mat	The input matrix.
color	The same as in pheatmap. Here you don't necessarily need to generate a long

color vector. The discrete colors sent to colorRampPalette are also OK here. E.g. colorRampPalette(rev(brewer.pal(n = 7, name = "RdYlBu")))(100) can be simply replaced as rev(brewer.pal(n = 7, name = "RdYlBu")).

kmeans_k The same as in pheatmap.

breaks The same as in pheatmap.

border_color The same as in pheatmap.

cellwidth The same as in pheatmap.

cellheight The same as in pheatmap.

scale The same as in pheatmap.

cluster_rows The same as in pheatmap.

cluster_cols The same as in pheatmap.

clustering_distance_rows
The same as in pheatmap.

clustering_distance_cols
The same as in pheatmap.

clustering_method
The same as in pheatmap.

clustering_callback
The same as in pheatmap.

cutree_rows The same as in pheatmap.

cutree_cols The same as in pheatmap.

treeheight_row The same as in pheatmap.

treeheight_col The same as in pheatmap.

legend The same as in pheatmap.

legend_breaks The same as in pheatmap.

legend_labels The same as in pheatmap.

annotation_row The same as in pheatmap.

annotation_col The same as in pheatmap.

annotation The same as in pheatmap.

annotation_colors
The same as in pheatmap.

annotation_legend
The same as in pheatmap.

annotation_names_row
The same as in pheatmap.

annotation_names_col
The same as in pheatmap.

drop_levels Enforced to be TRUE.

show_rownames The same as in pheatmap.

show_colnames The same as in pheatmap.

main	The same as in pheatmap.
fontsize	The same as in pheatmap.
fontsize_row	The same as in pheatmap.
fontsize_col	The same as in pheatmap.
angle_col	The same as in pheatmap.
display_numbers	The same as in pheatmap.
number_format	The same as in pheatmap.
number_color	The same as in pheatmap.
fontsize_number	The same as in pheatmap.
gaps_row	The same as in pheatmap.
gaps_col	The same as in pheatmap.
labels_row	The same as in pheatmap.
labels_col	The same as in pheatmap.
filename	Not supported.
width	Not supported.
height	Not supported.
silent	Not supported.
na_col	The same as in pheatmap.
name	Name of the heatmap. This argument is passed to Heatmap.
fontfamily	Font family for row and column names.
fontfamily_row	Font family for row names.
fontfamily_col	Font family for column names.
fontface	Font face for row and column names.
fontface_row	Font face for row names.
fontface_col	Font face for column names.
heatmap_legend_param	Pass to Heatmap.
...	Other arguments passed to Heatmap.
run_draw	Whether to run draw() function to the heatmap object.

Details

This function aims to execute pheatmap::pheatmap code purely with ComplexHeatmap.

Value

A Heatmap-class object.

See Also

See https://jokergoo.github.io/2020/05/06/translate-from-pheatmap-to-complexheatmap/

compare_pheatmap that compares heatmaps between `pheatmap::pheatmap()` and `ComplexHeatmap::pheatmap()`.

Examples

```
# There is no example
NULL
```

`pindex` *Get Values in a Matrix by Pair-wise Indices*

Description

Get Values in a Matrix by Pair-wise Indices

Usage

```
pindex(m, i, j)
```

Arguments

`m`	A matrix or a 3-dimension array.
`i`	Row indices or the indices in the first dimension.
`j`	Column indicies or the indices in the second dimension.

Value

If `m` is a matrix, the value returned is a vector `c(m[i1, j1], m[i2, j2], ...)`.

If `m` is an array, the value returned is a matrix `rbind(m[i1, j1, ], m[i2, j2, ], ...)`.

Examples

```
m = matrix(rnorm(100), 10)
m2 = m[m > 0]
ind = do.call("rbind", lapply(1:10, function(ci) {
    i = which(m[, ci] > 0)
    cbind(i = i, j = rep(ci, length(i)))
}))
pindex(m, ind[, 1], ind[, 2])
identical(pindex(m, ind[, 1], ind[, 2]), m[m > 0])

# 3d array
arr = array(1:27, dim = c(3, 3, 3))
pindex(arr, 1:2, 2:3)
identical(pindex(arr, 1:2, 2:3),
   rbind(arr[1, 2, ], arr[2, 3, ]))
```

plot.Heatmap *Draw heatmap*

Description

Draw heatmap

Usage

```
## S3 method for class 'Heatmap'
plot(x, ...)
```

Arguments

x	A Heatmap-class object.
...	All pass to draw,Heatmap-method.

Examples

```
# There is no example
NULL
```

plot.HeatmapAnnotation *Draw heatmap annotations*

Description

Draw heatmap annotations

Usage

```
## S3 method for class 'HeatmapAnnotation'
plot(x, ...)
```

Arguments

x	A HeatmapAnnotation-class object.
...	All pass to draw,HeatmapList-method.

Examples

```
# There is no example
NULL
```

plot.HeatmapList *Draw heatmap*

Description

Draw heatmap

Usage

```
## S3 method for class 'HeatmapList'
plot(x, ...)
```

Arguments

x	A HeatmapList-class object.
...	All pass to draw,HeatmapList-method.

Examples

```
# There is no example
NULL
```

prepare-Heatmap-method *Prepare the Heatmap*

Description

Prepare the Heatmap

Usage

```
## S4 method for signature 'Heatmap'
prepare(object, process_rows = TRUE, process_columns = TRUE)
```

Arguments

object	A Heatmap-class object.
process_rows	Whether to process rows of the heatmap.
process_columns	Whether to process columns of the heatmap.

Details

The preparation of the heatmap includes following steps:

- making clustering on rows (by calling make_row_cluster,Heatmap-method)
- making clustering on columns (by calling make_column_cluster,Heatmap-method)
- making the layout of the heatmap (by calling make_layout,Heatmap-method)

This function is only for internal use.

Value

The Heatmap-class object.

Author(s)

Zuguang Gu <z.gu@dkfz.de>

Examples

```
# There is no example
NULL
```

---

print.comb_mat *Print the comb_mat Object*

Description

Print the comb_mat Object

Usage

```
## S3 method for class 'comb_mat'
print(x, ...)
```

Arguments

x	A combination matrix returned by make_comb_mat.
...	Other arguments

Examples

```
# There is no example
NULL
```

`restore_matrix` *Restore the index vector to index matrix in layer_fun*

Description

Restore the index vector to index matrix in layer_fun

Usage

```
restore_matrix(j, i, x, y)
```

Arguments

`j`	Column indices directly from `layer_fun`.
`i`	Row indices directly from `layer_fun`.
`x`	Position on x-direction directly from `layer_fun`.
`y`	Position on y-direction directly from `layer_fun`.

Details

The values that are sent to `layer_fun` are all vectors (for the vectorization of the grid graphic functions), however, the heatmap slice where `layer_fun` is applied to, is still represented by a matrix, thus, it would be very convinient if all the arguments in `layer_fun` can be converted to the sub-matrix for the current slice. Here, as shown in above example, `restore_matrix` does the job. `restore_matrix` directly accepts the first four argument in `layer_fun` and returns an index matrix, where rows and columns correspond to the rows and columns in the current slice, from top to bottom and from left to right. The values in the matrix are the natural order of e.g. vector `j` in current slice.

For following code:

```
Heatmap(small_mat, name = "mat", col = col_fun,
    row_km = 2, column_km = 2,
    layer_fun = function(j, i, x, y, w, h, fill) {
        ind_mat = restore_matrix(j, i, x, y)
        print(ind_mat)
    }
)
```

The first output which is for the top-left slice:

```
     [,1] [,2] [,3] [,4] [,5]
[1,]    1    4    7   10   13
[2,]    2    5    8   11   14
[3,]    3    6    9   12   15
```

As you see, this is a three-row and five-column index matrix where the first row corresponds to the top row in the slice. The values in the matrix correspond to the natural index (i.e. 1, 2, ...) in `j`, `i`, `x`, `y`, ... in `layer_fun`. Now, if we want to add values on the second column in the top-left slice, the code which is put inside `layer_fun` would look like:

```
for(ind in ind_mat[, 2]) {
    grid.text(small_mat[i[ind], j[ind]], x[ind], y[ind], ...)
}
```

Examples

```
set.seed(123)
mat = matrix(rnorm(81), nr = 9)
Heatmap(mat, row_km = 2, column_km = 2,
    layer_fun = function(j, i, x, y, width, height, fill) {
       ind_mat = restore_matrix(j, i, x, y)
       print(ind_mat)
})

set.seed(123)
mat = matrix(round(rnorm(81), 2), nr = 9)
Heatmap(mat, row_km = 2, column_km = 2,
    layer_fun = function(j, i, x, y, width, height, fill) {
       ind_mat = restore_matrix(j, i, x, y)
       ind = unique(c(ind_mat[2, ], ind_mat[, 3]))
       grid.text(pindex(mat, i[ind], j[ind]), x[ind], y[ind])
})
```

---

re_size-HeatmapAnnotation-method

Resize the Width or Height of Heatmap Annotations

Description

Resize the Width or Height of Heatmap Annotations

Usage

```
## S4 method for signature 'HeatmapAnnotation'
re_size(object,
    annotation_height = NULL,
    annotation_width = NULL,
    height = NULL,
    width = NULL,
    simple_anno_size = object@param$simple_anno_size,
    simple_anno_size_adjust = object@param$simple_anno_size_adjust)
```

Arguments

object	A HeatmapAnnotation-class object.
annotation_height	A vector of of annotation heights in unit class.
annotation_width	A vector of of annotation widths in unit class.
height	The height of the complete heatmap annotation.
width	The width of the complete heatmap annotation.
simple_anno_size	The size of one line of the simple annotation.
simple_anno_size_adjust	Whether adjust the size of the simple annotation?

Details

The function only adjust height for column annotations and width for row annotations.

The basic rules are (take height and annotation_height for example:

1. If annotation_height is set and all annotation_height are absolute units, height is ignored. 2. If annotation_height contains non-absolute units, height also need to be set and the non-absolute units should be set in a simple form such as 1:10 or unit(1, "null"). 3. simple_anno_size is only used when annotation_height is NULL. 4. If only height is set, non-simple annotation is adjusted while keeps simple anntation unchanged. 5. If only height is set and all annotations are simple annotations, all anntations are adjusted, and simple_anno_size is disabled. 6. If simple_anno_size_adjust is FALSE, the size of the simple annotations will not change.

Examples

```
# There is no example
NULL
```

---

rowAnnotation *Construct Row Annotations*

Description

Construct Row Annotations

Usage

```
rowAnnotation(...)
```

Arguments

...	Pass to HeatmapAnnotation.

Details

The function is identical to

```
HeatmapAnnotation(..., which = "row")
```

Value

A HeatmapAnnotation-class object.

Author(s)

Zuguang Gu <z.gu@dkfz.de>

Examples

```
# There is no example
NULL
```

`row_anno_barplot` *Barplots as Row Annotation*

Description

Barplots as Row Annotation

Usage

```
row_anno_barplot(...)
```

Arguments

...	pass to anno_barplot.

Details

A wrapper of anno_barplot with pre-defined `which` to `row`.

You can directly use anno_barplot for row annotation if you call it in rowAnnotation.

Value

See help page of anno_barplot.

Examples

```
# There is no example
NULL
```

row_anno_boxplot *Boxplots as Row Annotation*

Description

Boxplots as Row Annotation

Usage

```
row_anno_boxplot(...)
```

Arguments

...	pass to anno_boxplot.

Details

A wrapper of anno_boxplot with pre-defined which to row.

You can directly use anno_boxplot for row annotation if you call it in rowAnnotation.

Value

See help page of anno_boxplot.

Examples

```
# There is no example
NULL
```

row_anno_density *Density as Row Annotation*

Description

Density as Row Annotation

Usage

```
row_anno_density(...)
```

Arguments

...	pass to anno_density.

Details

A wrapper of anno_density with pre-defined which to row.

You can directly use anno_density for row annotation if you call it in rowAnnotation.

Value

See help page of anno_density.

Examples

```
# There is no example
NULL
```

---

row_anno_histogram *Histograms as Row Annotation*

Description

Histograms as Row Annotation

Usage

```
row_anno_histogram(...)
```

Arguments

...	pass to anno_histogram.

Details

A wrapper of anno_histogram with pre-defined which to row.

You can directly use anno_histogram for row annotation if you call it in rowAnnotation.

Value

See help page of anno_histogram.

Examples

```
# There is no example
NULL
```

row_anno_points *Points as Row Annotation*

Description

Points as Row Annotation

Usage

```
row_anno_points(...)
```

Arguments

...	pass to anno_points.

Details

A wrapper of anno_points with pre-defined which to row.

You can directly use anno_points for row annotation if you call it in rowAnnotation.

Value

See help page of anno_points.

Examples

```
# There is no example
NULL
```

row_anno_text *Text as Row Annotation*

Description

Text as Row Annotation

Usage

```
row_anno_text(...)
```

Arguments

...	pass to anno_text.

Details

A wrapper of anno_text with pre-defined which to row.

You can directly use anno_text for row annotation if you call it in rowAnnotation.

Value

See help page of anno_text.

Examples

```
# There is no example
NULL
```

---

row_dend-dispatch *Method dispatch page for row_dend*

Description

Method dispatch page for row_dend.

Dispatch

row_dend can be dispatched on following classes:

- row_dend,HeatmapList-method, HeatmapList-class class method
- row_dend,Heatmap-method, Heatmap-class class method

Examples

```
# no example
NULL
```

row_dend-Heatmap-method

Get Row Dendrograms from a Heatmap

Description

Get Row Dendrograms from a Heatmap

Usage

```
## S4 method for signature 'Heatmap'
row_dend(object, on_slice = FALSE)
```

Arguments

object	A Heatmap-class object.
on_slice	If the value is TRUE, it returns the dendrogram on the slice level.

Value

The format of the returned object depends on whether rows/columns of the heatmaps are split.

Author(s)

Zuguang Gu <z.gu@dkfz.de>

Examples

```
mat = matrix(rnorm(100), 10)
ht = Heatmap(mat)
ht = draw(ht)
row_dend(ht)
ht = Heatmap(mat, row_km = 2)
ht = draw(ht)
row_dend(ht)
```

row_dend-HeatmapList-method

Get Row Dendrograms from a Heatmap List

Description

Get Row Dendrograms from a Heatmap List

Usage

```
## S4 method for signature 'HeatmapList'
row_dend(object, name = NULL, on_slice = FALSE)
```

Arguments

object	A HeatmapList-class object.
name	Name of a specific heatmap.
on_slice	If the value is TRUE, it returns the dendrogram on the slice level.

Value

The format of the returned object depends on whether rows/columns of the heatmaps are split.

Author(s)

Zuguang Gu <z.gu@dkfz.de>

Examples

```
mat = matrix(rnorm(100), 10)
ht_list = Heatmap(mat) + Heatmap(mat)
ht_list = draw(ht_list)
row_dend(ht_list)
ht_list = Heatmap(mat, row_km = 2) + Heatmap(mat)
ht_list = draw(ht_list)
row_dend(ht_list)
row_dend(ht_list, on_slice = TRUE)
ht_list = Heatmap(mat, row_km = 2) %v% Heatmap(mat)
ht_list = draw(ht_list)
row_dend(ht_list)
```

---

row_order-dispatch *Method dispatch page for row_order*

Description

Method dispatch page for row_order.

Dispatch

row_order can be dispatched on following classes:

- row_order,HeatmapList-method, HeatmapList-class class method
- row_order,Heatmap-method, Heatmap-class class method

Examples

```
# no example
NULL
```

---

row_order-Heatmap-method

Get Row Order from a Heatmap

Description

Get Row Order from a Heatmap

Usage

```
## S4 method for signature 'Heatmap'
row_order(object)
```

Arguments

object	A Heatmap-class object.

Value

The format of the returned object depends on whether rows/columns of the heatmaps are split.

Author(s)

Zuguang Gu <z.gu@dkfz.de>

Examples

```
mat = matrix(rnorm(100), 10)
ht = Heatmap(mat)
ht = draw(ht)
row_order(ht)
ht = Heatmap(mat, row_km = 2)
ht = draw(ht)
row_order(ht)
```

row_order-HeatmapList-method
Get Row Order from a Heatmap List

Description

Get Row Order from a Heatmap List

Usage

```
## S4 method for signature 'HeatmapList'
row_order(object, name = NULL)
```

Arguments

object	A HeatmapList-class object.
name	Name of a specific heatmap.

Value

The format of the returned object depends on whether rows/columns of the heatmaps are split.

Author(s)

Zuguang Gu <z.gu@dkfz.de>

Examples

```
mat = matrix(rnorm(100), 10)
ht_list = Heatmap(mat) + Heatmap(mat)
ht_list = draw(ht_list)
row_order(ht_list)
ht_list = Heatmap(mat, row_km = 2) + Heatmap(mat)
ht_list = draw(ht_list)
row_order(ht_list)
ht_list = Heatmap(mat, row_km = 2) %v% Heatmap(mat)
ht_list = draw(ht_list)
row_order(ht_list)
```

set_component_height-Heatmap-method
Set Height of Heatmap Component

Description

Set Height of Heatmap Component

Usage

```
## S4 method for signature 'Heatmap'
set_component_height(object, k, v)
```

Arguments

object	A Heatmap-class object.
k	Which column component? The value should a numeric index or the name of the corresponding column component. See **Detials**.
v	Height of the component, a unit object.

Details

All column components are: column_title_top, column_dend_top, column_names_top, column_anno_top, heatmap_body, column_anno_bottom, column_names_bottom, column_dend_bottom, column_title_bottom.

This function is only for internal use.

Value

The Heatmap-class object.

Author(s)

Zuguang Gu <z.gu@dkfz.de>

Examples

```
# There is no example
NULL
```

set_component_width-Heatmap-method
Set Width of Heatmap Component

Description

Set Width of Heatmap Component

Usage

```
## S4 method for signature 'Heatmap'
set_component_width(object, k, v)
```

Arguments

object	A Heatmap-class object.
k	Which row component? The value should a numeric index or the name of the corresponding row component. See **Detials**.
v	width of the component, a unit object.

Details

All row components are: row_title_left, row_dend_left, row_names_left, row_anno_left, heatmap_body, row_anno_right, row_names_right, row_dend_right, row_title_right.

This function is only for internal use.

Value

The Heatmap-class object.

Author(s)

Zuguang Gu <z.gu@dkfz.de>

Examples

```
# There is no example
NULL
```

set_name *Set Names*

Description

Set Names

Usage

```
set_name(m)
```

Arguments

m	A combination matrix returned by make_comb_mat.

Value

A vector of set names.

Examples

```
set.seed(123)
lt = list(a = sample(letters, 10),
          b = sample(letters, 15),
          c = sample(letters, 20))
m = make_comb_mat(lt)
set_name(m)
```

set_nameAssign *Modify Set Names*

Description

Modify Set Names

Usage

```
set_name(x, ...) <- value
```

Arguments

x	A combination matrix returned by make_comb_mat.
value	New set names.
...	Other arguments.

Examples

```
set.seed(123)
lt = list(a = sample(letters, 10),
          b = sample(letters, 15),
          c = sample(letters, 20))
m = make_comb_mat(lt)
set_name(m) = c("A", "B", "C")
m
```

`set_size` *Set Sizes*

Description

Set Sizes

Usage

```
set_size(m)
```

Arguments

`m`	A combination matrix returned by `make_comb_mat`.

Value

A vector of set sizes.

Examples

```
set.seed(123)
lt = list(a = sample(letters, 10),
          b = sample(letters, 15),
          c = sample(letters, 20))
m = make_comb_mat(lt)
set_size(m)
```

---

show-AnnotationFunction-method
Print the AnnotationFunction Object

Description

Print the AnnotationFunction Object

Usage

```
## S4 method for signature 'AnnotationFunction'
show(object)
```

Arguments

object	The AnnotationFunction-class object.

Examples

```
# There is no example
NULL
```

---

show-ColorMapping-method
Print the ColorMapping Object

Description

Print the ColorMapping Object

Usage

```
## S4 method for signature 'ColorMapping'
show(object)
```

Arguments

object	A ColorMapping-class object.

Value

This function returns no value.

Author(s)

Zuguang Gu <z.gu@dkfz.de>

Examples

```
# There is no example
NULL
```

---

show-dispatch *Method dispatch page for show*

Description

Method dispatch page for show.

Dispatch

show can be dispatched on following classes:

- show,AnnotationFunction-method, AnnotationFunction-class class method
- show,Heatmap-method, Heatmap-class class method
- show,HeatmapList-method, HeatmapList-class class method
- show,ColorMapping-method, ColorMapping-class class method
- show,HeatmapAnnotation-method, HeatmapAnnotation-class class method
- show,SingleAnnotation-method, SingleAnnotation-class class method

Examples

```
# no example
NULL
```

---

show-Heatmap-method *Draw the Single Heatmap with Defaults*

Description

Draw the Single Heatmap with Defaults

Usage

```
## S4 method for signature 'Heatmap'
show(object)
```

Arguments

object	A Heatmap-class object.

Details

It actually calls draw,Heatmap-method, but only with default parameters. If users want to customize the heatmap, they can pass parameters directly to draw,Heatmap-method.

Value

The HeatmapList-class object.

Author(s)

Zuguang Gu <z.gu@dkfz.de>

Examples

```
# There is no example
NULL
```

---

show-HeatmapAnnotation-method

Print the HeatmapAnnotation object

Description

Print the HeatmapAnnotation object

Usage

```
## S4 method for signature 'HeatmapAnnotation'
show(object)
```

Arguments

object	A HeatmapAnnotation-class object.

Value

No value is returned.

Author(s)

Zuguang Gu <z.gu@dkfz.de>

Examples

```
# There is no example
NULL
```

show-HeatmapList-method

Draw a list of heatmaps with default parameters

Description

Draw a list of heatmaps with default parameters

Usage

```
## S4 method for signature 'HeatmapList'
show(object)
```

Arguments

object	a HeatmapList-class object.

Details

Actually it calls draw,HeatmapList-method, but only with default parameters. If users want to customize the heatmap, they can pass parameters directly to draw,HeatmapList-method.

Value

This function returns no value.

Examples

```
# There is no example
NULL
```

show-SingleAnnotation-method

Print the SingleAnnotation object

Description

Print the SingleAnnotation object

Usage

```
## S4 method for signature 'SingleAnnotation'
show(object)
```

Arguments

object	A SingleAnnotation-class object.

Value

No value is returned.

Author(s)

Zuguang Gu <z.gu@dkfz.de>

Examples

```
# There is no example
NULL
```

SingleAnnotation *Constructor Method for SingleAnnotation Class*

Description

Constructor Method for SingleAnnotation Class

Usage

```
SingleAnnotation(name, value, col, fun,
    label = NULL,
    na_col = "grey",
    which = c("column", "row"),
    show_legend = TRUE,
    gp = gpar(col = NA),
    border = FALSE,
    legend_param = list(),
    show_name = TRUE,
    name_gp = gpar(fontsize = 12),
    name_offset = NULL,
    name_side = ifelse(which == "column", "right", "bottom"),
    name_rot = NULL,
    simple_anno_size = ht_opt$simple_anno_size,
    width = NULL, height = NULL)
```

Arguments

name	Name for the annotation. If it is not specified, an internal name is assigned.
value	A vector or a matrix of discrete or continuous values.
col	Colors corresponding to value. If the mapping is discrete, the value of col should be a named vector; If the mapping is continuous, the value of col should be a color mapping function.
fun	A user-defined function to add annotation graphics. The argument of this function should be at least a vector of index that corresponds to rows or columns. Normally the function should be constructed by AnnotationFunction if you want the annotation supports splitting. See **Details** for more explanation.
label	Label for the annotation. By default is the annotation name.
na_col	Color for NA values in the simple annotations.
which	Whether the annotation is a row annotation or a column annotation?
show_legend	If it is a simple annotation, whether show legend in the final heatmap?
gp	Since simple annotation is represented as rows of grids. This argument controls graphic parameters for the simple annotation. The fill parameter is ignored here.
border	border, only work for simple annotation
legend_param	Parameters for the legend. See color_mapping_legend,ColorMapping-method for all possible options.
show_name	Whether show annotation name?
name_gp	Graphic parameters for annotation name.
name_offset	Offset to the annotation, a unit object.
name_side	'right' and 'left' for column annotations and 'top' and 'bottom' for row annotations
name_rot	Rotation of the annotation name.
simple_anno_size	size of the simple annotation.
width	The width of the plotting region (the viewport) that the annotation is drawn. If it is a row annotation, the width must be an absolute unit.
height	The height of the plotting region (the viewport) that the annotation is drawn. If it is a column annotation, the width must be an absolute unit.

Details

A single annotation is a basic unit of complex heatmap annotations where the heamtap annotations are always a list of single annotations. An annotation can be simply heatmap-like (here we call it simple annotation) or more complex like points, lines, boxes (for which we call it complex annotation).

In the SingleAnnotation constructor, value, col, na_col are used to construct a anno_simple annotation funciton which is generated internally by AnnotationFunction. The legend of the simple annotation can be automatcally generated,

For construcing a complex annotation, users need to use fun which is a user-defind function. Normally it is constucted by AnnotationFunction. One big advantage for using AnnotationFunction is the annotation function or the graphics drawn by the annotation function can be split according to row splitting or column splitting of the heatmap. Users can also provide a "pure" function which is a normal R function for the fun argument. The function only needs one argument which is a vector of index for rows or columns depending whether it is a row annotation or column annotation. The other two optional arguments are the current slice index and total number of slices. See **Examples** section for an example. If it is a normal R function, it will be constructed into the AnnotationFunction-class object internally.

The SingleAnnotation-class is a simple wrapper on top of AnnotationFunction-class only with annotation name added.

The class also stored the "extended area" relative to the area for the annotation graphics. The extended areas are those created by annotation names and axes.

Value

A SingleAnnotation-class object.

Author(s)

Zuguang Gu <z.gu@dkfz.de>

See Also

There are following built-in annotation functions that can be directly used to generate complex annotations: anno_simple, anno_points, anno_lines, anno_barplot, anno_histogram, anno_boxplot, anno_density, anno_text, anno_joyplot, anno_horizon, anno_image, anno_block, anno_summary and anno_mark.

Examples

```
ha = SingleAnnotation(value = 1:10)
draw(ha, test = "single column annotation")

m = cbind(1:10, 10:1)
colnames(m) = c("a", "b")
ha = SingleAnnotation(value = m)
draw(ha, test = "matrix as column annotation")

anno = anno_barplot(matrix(nc = 2, c(1:10, 10:1)))
ha = SingleAnnotation(fun = anno)
draw(ha, test = "anno_barplot as input")

fun = local({
    # because there variables outside the function for use, we put it a local environment
    value = 1:10
    function(index, k = 1, n = 1) {
      pushViewport(viewport(xscale = c(0.5, length(index) + 0.5), yscale = range(value)))
        grid.points(seq_along(index), value[index])
        grid.rect()
```

```
        if(k == 1) grid.yaxis()
        popViewport()
    }
})
ha = SingleAnnotation(fun = fun, height = unit(4, "cm"))
draw(ha, index = 1:10, test = "self-defined function")
```

SingleAnnotation-class

Class for a Single Annotation

Description

Class for a Single Annotation

Details

The SingleAnnotation-class is used for storing data for a single annotation and provides methods for drawing annotation graphics.

Methods

The SingleAnnotation-class provides following methods:

- SingleAnnotation: constructor method
- draw,SingleAnnotation-method: draw the single annotation.

Author(s)

Zuguang Gu <z.gu@dkfz.de>

See Also

The SingleAnnotation-class is always used internally. The public HeatmapAnnotation-class contains a list of SingleAnnotation-class objects and is used to add annotation graphics on heatmaps.

Examples

```
# There is no example
NULL
```

`size.AnnotationFunction` *Size of the AnnotationFunction Object*

Description

Size of the AnnotationFunction Object

Usage

```
## S3 method for class 'AnnotationFunction'
size(x, ...)
```

Arguments

`x`	The `AnnotationFunction-class` object.
`...`	Other arguments.

Details

It returns the width if it is a row annotation and the height if it is a column annotation.

Internally used.

Examples

```
anno = anno_points(1:10)
ComplexHeatmap:::size(anno)
anno = anno_points(1:10, which = "row")
ComplexHeatmap:::size(anno)
```

`size.HeatmapAnnotation` *Size of the HeatmapAnnotation Object*

Description

Size of the HeatmapAnnotation Object

Usage

```
## S3 method for class 'HeatmapAnnotation'
size(x, ...)
```

Arguments

x	The HeatmapAnnotation-class object.
...	Other arguments.

Details

It returns the width if it is a row annotation and the height if it is a column annotation.

Internally used.

Examples

```
# There is no example
NULL
```

---

size.SingleAnnotation *Size of the SingleAnnotation Object*

Description

Size of the SingleAnnotation Object

Usage

```
## S3 method for class 'SingleAnnotation'
size(x, ...)
```

Arguments

x	The SingleAnnotation-class object.
...	Other arguments.

Details

It returns the width if it is a row annotation and the height if it is a column annotation.

Internally used.

Examples

```
# There is no example
NULL
```

sizeAssign.AnnotationFunction

Assign the Size to the AnnotationFunction Object

Description

Assign the Size to the AnnotationFunction Object

Usage

```
## S3 replacement method for class 'AnnotationFunction'
size(x, ...) <- value
```

Arguments

x	The AnnotationFunction-class object.
value	A unit object.
...	Other arguments.

Details

It assigns to the width if it is a row annotation and the height if it is a column annotation.

Internally used.

Examples

```
anno = anno_points(1:10)
ComplexHeatmap:::size(anno) = unit(4, "cm")
ComplexHeatmap:::size(anno)
```

sizeAssign.HeatmapAnnotation

Assign the Size to the HeatmapAnnotation Object

Description

Assign the Size to the HeatmapAnnotation Object

Usage

```
## S3 replacement method for class 'HeatmapAnnotation'
size(x, ...) <- value
```

Arguments

x	The HeatmapAnnotation-class object.
value	A unit object.
...	Other arguments.

Details

It assigns the width if it is a row annotation and the height if it is a column annotation.

Internally used.

Examples

```
# There is no example
NULL
```

---

sizeAssign.SingleAnnotation

Assign the Size to the SingleAnnotation Object

Description

Assign the Size to the SingleAnnotation Object

Usage

```
## S3 replacement method for class 'SingleAnnotation'
size(x, ...) <- value
```

Arguments

x	The SingleAnnotation-class object.
value	A unit object.
...	Other arguments.

Details

It assigns to the width if it is a row annotation and the height if it is a column annotation.

Internally used.

Examples

```
# There is no example
NULL
```

`smartAlign2` *Adjust positions of rectanglar shapes*

Description

Adjust positions of rectanglar shapes

Usage

```
smartAlign2(start, end, range, plot = FALSE)
```

Arguments

`start`	position which corresponds to the start (bottom or left) of the rectangle-shapes.
`end`	position which corresponds to the end (top or right) of the rectanglar shapes.
`range`	data ranges (the minimal and maximal values)
`plot`	Whether plot the correspondance between the original positions and the adjusted positions. Only for testing.

Details

This is an improved version of the `smartAlign`.

It adjusts the positions of the rectangular shapes to make them do not overlap

Examples

```
range = c(0, 10)
pos1 = rbind(c(1, 2), c(5, 7))
smartAlign2(pos1, range = range, plot = TRUE)

range = c(0, 10)
pos1 = rbind(c(-0.5, 2), c(5, 7))
smartAlign2(pos1, range = range, plot = TRUE)

pos1 = rbind(c(-1, 2), c(3, 4), c(5, 6), c(7, 11))
pos1 = pos1 + runif(length(pos1), max = 0.3, min = -0.3)
omfrow = par("mfrow")
par(mfrow = c(3, 3))
for(i in 1:9) {
    ind = sample(4, 4)
    smartAlign2(pos1[ind, ], range = range, plot = TRUE)
}
par(mfrow = omfrow)

pos1 = rbind(c(3, 6), c(4, 7))
smartAlign2(pos1, range = range, plot = TRUE)

pos1 = rbind(c(1, 8), c(3, 10))
smartAlign2(pos1, range = range, plot = TRUE)
```

str.comb_mat *str method*

Description

str method

Usage

```
## S3 method for class 'comb_mat'
str(object, ...)
```

Arguments

object	A combination matrix returned by make_comb_mat.
...	Other arguments.

Examples

```
# There is no example
NULL
```

subset_gp *Subset a gpar Object*

Description

Subset a gpar Object

Usage

```
subset_gp(gp, i)
```

Arguments

gp	A gpar object.
i	A vector of indices.

Value

A gpar object.

Examples

```
gp = gpar(col = 1:10, fill = 1)
subset_gp(gp, 1:5)
```

subset_matrix_by_row *Subset the Matrix by Rows*

Description

Subset the Matrix by Rows

Usage

```
subset_matrix_by_row(x, i)
```

Arguments

x	A matrix.
i	The row indices.

Details

Mainly used for constructing the AnnotationFunction-class object.

Examples

```
# There is no example
NULL
```

subset_no *Do not do subseting*

Description

Do not do subseting

Usage

```
subset_no(x, i)
```

Arguments

x	A vector.
i	The indices.

Details

Mainly used for constructing the AnnotationFunction-class object.

Examples

```
# There is no example
NULL
```

`subset_vector` *Subset the vector*

Description

Subset the vector

Usage

```
subset_vector(x, i)
```

Arguments

`x`	A vector.
`i`	The indices.

Details

Mainly used for constructing the `AnnotationFunction-class` object.

Examples

```
# There is no example
NULL
```

`summary.Heatmap` *Print the Summary of a Heatmap*

Description

Print the Summary of a Heatmap

Usage

```
## S3 method for class 'Heatmap'
summary(object, ...)
```

Arguments

`object`	A `Heatmap-class` object.
`...`	Other arguments.

Examples

```
# There is no example
NULL
```

`summary.HeatmapList` *Summary of a Heatmap List*

Description

Summary of a Heatmap List

Usage

```
## S3 method for class 'HeatmapList'
summary(object, ...)
```

Arguments

`object`	A `HeatmapList-class` object.
`...`	Other arguments.

Examples

```
# There is no example
NULL
```

`t.comb_mat` *Transpost the Combination Matrix*

Description

Transpost the Combination Matrix

Usage

```
## S3 method for class 'comb_mat'
t(x)
```

Arguments

`x`	A combination matrix returned by `make_comb_mat`.

Examples

```
set.seed(123)
lt = list(a = sample(letters, 10),
          b = sample(letters, 15),
          c = sample(letters, 20))
m = make_comb_mat(lt)
t(m)
```

`test_alter_fun` *Test alter_fun for oncoPrint()*

Description

Test alter_fun for oncoPrint()

Usage

```
test_alter_fun(fun, type, asp_ratio = 1)
```

Arguments

`fun`	The `alter_fun` for `oncoPrint`. The value can be a list of functions or a single function. See https://jokergoo.github.io/ComplexHeatmap-reference/book/oncoprint.html#define-the-alter-fun
`type`	A vector of alteration types. It is only used when `fun` is a single function.
`asp_ratio`	The aspect ratio (width/height) for the small rectangles.

Details

This function helps you to have a quick view of how the graphics for each alteration type and combinations look like.

Examples

```
alter_fun = list(
mut1 = function(x, y, w, h) grid.rect(x, y, w, h, gp = gpar(fill = "red", col = NA)),
mut2 = function(x, y, w, h) grid.rect(x, y, w, h, gp = gpar(fill = "blue", col = NA)),
mut3 = function(x, y, w, h) grid.rect(x, y, w, h, gp = gpar(fill = "yellow", col = NA)),
mut4 = function(x, y, w, h) grid.rect(x, y, w, h, gp = gpar(fill = "purple", col = NA)),
mut5 = function(x, y, w, h) grid.rect(x, y, w, h, gp = gpar(lwd = 2)),
mut6 = function(x, y, w, h) grid.points(x, y, pch = 16),
mut7 = function(x, y, w, h) grid.segments(x - w*0.5, y - h*0.5, x + w*0.5, y + h*0.5, gp = gpar(lwd = 2))
)
test_alter_fun(alter_fun)
```

textbox_grob *A simple grob for the word cloud*

Description

A simple grob for the word cloud

Usage

```
textbox_grob(text, x = unit(0.5, "npc"), y = unit(0.5, "npc"), just = "centre",
  gp = gpar(), background_gp = gpar(col = "black", fill = "transparent"), round_corners = FALSE, r = uni
  line_space = unit(4, "pt"), text_space = unit(4, "pt"), max_width = unit(100, "mm"),
  padding = unit(4, "pt"), first_text_from = "top", add_new_line = FALSE, word_wrap = FALSE)
```

Arguments

text	A vector of texts. The value can be single words or phrases/sentenses.
x	X position.
y	Y position.
just	Justification of the box in the viewport.
gp	Graphics parameters of texts.
background_gp	Graphics parameters for the box.
round_corners	Whether to draw round corners for the box.
r	Radius of the round corners.
line_space	Space between lines. The value can be a unit object or a numeric scalar which is measured in mm.
text_space	Space between texts The value can be a unit object or a numeric scalar which is measured in mm.
max_width	The maximal width of the viewport to put the word cloud. The value can be a unit object or a numeric scalar which is measured in mm. Note this might be larger than the final width of the returned grob object.
padding	Padding of the box, i.e. space between text and the four box borders. The value should be a unit object with length 1, 2 or 4. If length of the input unit is 2, the first value is the padding both to the top and to the bottom, and the second value is the padding to the left and right. If length of the input unit is 4, the four values correspond to paddings to the bottom, left, top and right of the box.
first_text_from	Should the texts be added from the top of the box or from the bottom? Value should be either "top" or "bottom".
add_new_line	Whether to add new line after every text? If TRUE, each text will be in a separated line.
word_wrap	Whether to apply word wrap for phrases/sentenses.

Value

A grob object. The width and height of the grob can be get by grobWidth and grobHeight.

Examples

```
words = sapply(1:30, function(x) strrep(sample(letters, 1), sample(3:10, 1)))
grid.newpage()
grid.textbox(words, gp = gpar(fontsize = runif(30, min = 5, max = 30)))

sentenses = c("This is sentense 1", "This is a long long long long long long long sentense.")
grid.newpage()
grid.textbox(sentenses)
grid.textbox(sentenses, word_wrap = TRUE)
grid.textbox(sentenses, word_wrap = TRUE, add_new_line = TRUE)
```

---

unify_mat_list *Unify a List of Matrix*

Description

Unify a List of Matrix

Usage

```
unify_mat_list(mat_list, default = 0)
```

Arguments

mat_list	A list of matrix. All of them should have dimension names.
default	Default values for the newly added rows and columns.

Details

All matrix will be unified to have same row names and column names.

Value

A list of matrix

Author(s)

Zuguang Gu <z.gu@dkfz.de>

Examples

```
# There is no example
NULL
```

UpSet *Make the UpSet plot*

Description

Make the UpSet plot

Usage

```
UpSet(m,
    comb_col = "black",
    pt_size = unit(3, "mm"), lwd = 2,
    bg_col = "#F0F0F0", bg_pt_col = "#CCCCCC",
    set_order = order(set_size(m), decreasing = TRUE),
    comb_order = if(attr(m, "param")$set_on_rows) {
    order.comb_mat(m[set_order, ], decreasing = TRUE)
    } else {
    order.comb_mat(m[, set_order], decreasing = TRUE)
    },
    top_annotation = upset_top_annotation(m),
    right_annotation = upset_right_annotation(m),
    left_annotation = NULL,
    row_names_side = "left",
    ...)
```

Arguments

m	A combination matrix returned by make_comb_mat. The matrix can be transposed to switch the position of sets and combination sets.
comb_col	The color for the dots representing combination sets.
pt_size	The point size for the dots representing combination sets.
lwd	The line width for the combination sets.
bg_col	Color for the background rectangles.
bg_pt_col	Color for the dots representing the set is not selected.
set_order	The order of sets.
comb_order	The order of combination sets.
top_annotation	A HeatmapAnnotation object on top of the combination matrix.
left_annotation	A HeatmapAnnotation object on top of the combination matrix.
right_annotation	A HeatmapAnnotation object on the right of the combination matrix.
row_names_side	The side of row names.
...	Other arguments passed to Heatmap.

Details

By default, the sets are on rows and combination sets are on columns. The positions of the two types of sets can be switched by transposing the matrix.

When sets are on rows, the default top annotation is the barplot showing the size of each combination sets and the default right annotation is the barplot showing the size of the sets. The annotations are simply constructed by HeatmapAnnotation and anno_barplot with some parameters pre-set. Users can check the source code of upset_top_annotation and upset_right_annotation to find out how the annotations are defined.

To change or to add annotations, users just need to define a new HeatmapAnnotation object. E.g. if we want to change the side of the axis and name on top annotation:

```
Upset(..., top_annotation =
    HeatmapAnnotation(
       "Intersection size" = anno_barplot(
           comb_size(m),
           border = FALSE,
           gp = gpar(fill = "black"),
           height = unit(2, "cm"),
           axis_param = list(side = "right")
       ),
       annotation_name_side = "right",
       annotation_name_rot = 0)
)
```

To add more annotations on top, users just add it in HeatmapAnnotation:

```
Upset(..., top_annotation =
    HeatmapAnnotation(
       "Intersection size" = anno_barplot(
           comb_size(m),
           border = FALSE,
           gp = gpar(fill = "black"),
           height = unit(2, "cm"),
           axis_param = list(side = "right")
       ),
       "anno1" = anno_points(...),
       "anno2" = some_vector,
       annotation_name_side = "right",
       annotation_name_rot = 0)
)
```

And so is for the right annotations.

UpSet returns a Heatmap-class object, which means, you can add it with other heatmaps and annotations by + or %v%.

Examples

```
set.seed(123)
lt = list(a = sample(letters, 10),
          b = sample(letters, 15),
          c = sample(letters, 20))
m = make_comb_mat(lt)
UpSet(m)
UpSet(t(m))

m = make_comb_mat(lt, mode = "union")
UpSet(m)
UpSet(m, comb_col = c(rep(2, 3), rep(3, 3), 1))

# compare two UpSet plots
set.seed(123)
lt1 = list(a = sample(letters, 10),
          b = sample(letters, 15),
          c = sample(letters, 20))
m1 = make_comb_mat(lt1)
set.seed(456)
lt2 = list(a = sample(letters, 10),
          b = sample(letters, 15),
          c = sample(letters, 20))
m2 = make_comb_mat(lt2)

max1 = max(c(set_size(m1), set_size(m2)))
max2 = max(c(comb_size(m1), comb_size(m2)))

UpSet(m1, top_annotation = upset_top_annotation(m1, ylim = c(0, max2)),
    right_annotation = upset_right_annotation(m1, ylim = c(0, max1)),
    column_title = "UpSet1") +
UpSet(m2, top_annotation = upset_top_annotation(m2, ylim = c(0, max2)),
    right_annotation = upset_right_annotation(m2, ylim = c(0, max1)),
    column_title = "UpSet2")
```

---

upset_left_annotation *UpSet Left Annotation*

Description

UpSet Left Annotation

Usage

```
upset_left_annotation(m,
    gp = gpar(fill = "black"),
    axis_param = list(direction = "reverse"),
    width = unit(ifelse(set_on_rows, 2, 3), "cm"),
    show_annotation_name = TRUE,
```

```
    annotation_name_gp = gpar(),
    annotation_name_offset = NULL,
    annotation_name_side = "bottom",
    annotation_name_rot = NULL,
    ...)
```

Arguments

m	A combination matrix which is as same as the one for UpSet.
gp	Graphic parameters for bars.
axis_param	Parameters for axis.
width	Width of the left annotation.
show_annotation_name	Whether show annotation names?
annotation_name_gp	Graphic parameters for anntation names.
annotation_name_offset	Offset to the annotation name, a unit object.
annotation_name_side	Side of the annotation name.
annotation_name_rot	Rotation of the annotation name, it can only take values in c(00, 90, 180, 270).
...	Passed to anno_barplot, e.g. to set add_numbers.

Examples

```
# There is no example
NULL
```

---

upset_right_annotation

Default UpSet Right Annotation

Description

Default UpSet Right Annotation

Usage

```
upset_right_annotation(m,
    gp = gpar(fill = "black"),
    width = unit(ifelse(set_on_rows, 2, 3), "cm"),
    show_annotation_name = TRUE,
    annotation_name_gp = gpar(),
```

```
    annotation_name_offset = NULL,
    annotation_name_side = "bottom",
    annotation_name_rot = NULL,
    ...)
```

Arguments

m	A combination matrix which is as same as the one for UpSet.
gp	Graphic parameters for bars.
width	Width of the right annotation.
show_annotation_name	Whether show annotation names?
annotation_name_gp	Graphic parameters for anntation names.
annotation_name_offset	Offset to the annotation name, a unit object.
annotation_name_side	Side of the annotation name.
annotation_name_rot	Rotation of the annotation name, it can only take values in c(00, 90, 180, 270).
...	Passed to anno_barplot, e.g. to set add_numbers.

Details

The default right annotation is actually barplot implemented by anno_barplot. For how to set the right annotation or left annotation in UpSet, please refer to UpSet.

If you want to use decorate_annotation function, the annotation name for the "sets" is set_size and the annotation name for the "intersection sets" are intersection_size and if under the union mode, it is union_size.

Examples

```
# There is no example
NULL
```

---

upset_top_annotation *Default UpSet Top Annotation*

Description

Default UpSet Top Annotation

Usage

```
upset_top_annotation(m,
    gp = gpar(fill = "black"),
    height = unit(ifelse(set_on_rows, 3, 2), "cm"),
    show_annotation_name = TRUE,
    annotation_name_gp = gpar(),
    annotation_name_offset = NULL,
    annotation_name_side = "left",
    annotation_name_rot = 0,
    ...)
```

Arguments

m	A combination matrix which is as same as the one for UpSet.
gp	Graphic parameters for bars.
height	The height of the top annotation.
show_annotation_name	Whether show annotation names?
annotation_name_gp	Graphic parameters for anntation names.
annotation_name_offset	Offset to the annotation name, a unit object.
annotation_name_side	Side of the annotation name.
annotation_name_rot	Rotation of the annotation name, it can only take values in c(00, 90, 180, 270).
...	Passed to anno_barplot.

Details

The default top annotation is actually barplot implemented by anno_barplot. For how to set the top annotation or bottom annotation in UpSet, please refer to UpSet.

If you want to use decorate_annotation function, the annotation name for the "sets" is set_size and the annotation name for the "intersection sets" are intersection_size and if under the union mode, it is union_size.

Examples

```
# There is no example
NULL
```

width.AnnotationFunction *Width of the AnnotationFunction Object*

Description

Width of the AnnotationFunction Object

Usage

```
## S3 method for class 'AnnotationFunction'
width(x, ...)
```

Arguments

x	A AnnotationFunction-class object.
...	Other arguments.

Details

Internally used.

Examples

```
anno = anno_points(1:10)
ComplexHeatmap:::width(anno)
anno = anno_points(1:10, which = "row")
ComplexHeatmap:::width(anno)
```

width.Heatmap *Width of the Heatmap*

Description

Width of the Heatmap

Usage

```
## S3 method for class 'Heatmap'
width(x, ...)
```

Arguments

x	The HeatmapList-class object returned by draw,Heatmap-method.
...	Other arguments.

Examples

```
# There is no example
NULL
```

`width.HeatmapAnnotation` *Width of the HeatmapAnnotation Object*

Description

Width of the HeatmapAnnotation Object

Usage

```
## S3 method for class 'HeatmapAnnotation'
width(x, ...)
```

Arguments

`x`	The `HeatmapAnnotation-class` object.
`...`	Other arguments.

Details

Internally used.

Examples

```
# There is no example
NULL
```

`width.HeatmapList` *Width of the Heatmap List*

Description

Width of the Heatmap List

Usage

```
## S3 method for class 'HeatmapList'
width(x, ...)
```

Arguments

x	The HeatmapList-class object returned by draw,HeatmapList-method.
...	Other arguments.

Examples

```
# There is no example
NULL
```

`width.Legends` *Width of the Legends*

Description

Width of the Legends

Usage

```
## S3 method for class 'Legends'
width(x, ...)
```

Arguments

x	The grob object returned by Legend or packLegend.
...	Other arguments.

Value

The returned unit x is always in mm.

Examples

```
lgd = Legend(labels = 1:10, title = "foo", legend_gp = gpar(fill = "red"))
ComplexHeatmap:::width(lgd)
```

width.SingleAnnotation *Width of the SingleAnnotation Object*

Description

Width of the SingleAnnotation Object

Usage

```
## S3 method for class 'SingleAnnotation'
width(x, ...)
```

Arguments

x	The SingleAnnotation-class object.
...	Other arguments.

Details

Internally used.

Examples

```
# There is no example
NULL
```

widthAssign.AnnotationFunction *Assign the Width to the AnnotationFunction Object*

Description

Assign the Width to the AnnotationFunction Object

Usage

```
## S3 replacement method for class 'AnnotationFunction'
width(x, ...) <- value
```

Arguments

x	The AnnotationFunction-class object.
...	Other arguments.
value	A unit object.

Details

Internally used.

Examples

```
# There is no example
NULL
```

`widthAssign.HeatmapAnnotation` *Assign the Width to the HeatmapAnnotation Object*

Description

Assign the Width to the HeatmapAnnotation Object

Usage

```
## S3 replacement method for class 'HeatmapAnnotation'
width(x, ...) <- value
```

Arguments

`x`	The `HeatmapAnnotation-class` object.
`value`	A `unit` object.
`...`	Other arguments.

Details

Internally used.

Examples

```
# There is no example
NULL
```

widthAssign.SingleAnnotation *Assign the Width to the SingleAnnotation Object*

Description

Assign the Width to the SingleAnnotation Object

Usage

```
## S3 replacement method for class 'SingleAnnotation'
width(x, ...) <- value
```

Arguments

x	The SingleAnnotation-class object.
value	A unit object.
...	Other arguments.

Details

Internally used.

Examples

```
# There is no example
NULL
```

widthDetails.annotation_axis *Width for annotation_axis Grob*

Description

Width for annotation_axis Grob

Usage

```
## S3 method for class 'annotation_axis'
widthDetails(x)
```

Arguments

x	The annotation_axis grob returned by annotation_axis_grob.

Details

The physical width of the grob can be get by `convertWidth(grobWidth(axis_grob), "mm")`.

Examples

```
# There is no example
NULL
```

`widthDetails.legend` *Grob width for packed_legends*

Description

Grob width for packed_legends

Usage

```
## S3 method for class 'legend'
widthDetails(x)
```

Arguments

`x`	A legend object.

Examples

```
# There is no example
NULL
```

`widthDetails.legend_body`
Grob width for legend_body

Description

Grob width for legend_body

Usage

```
## S3 method for class 'legend_body'
widthDetails(x)
```

Arguments

`x`	A legend_body object.

Examples

```
# There is no example
NULL
```

`widthDetails.packed_legends` *Grob width for packed_legends*

Description

Grob width for packed_legends

Usage

```
## S3 method for class 'packed_legends'
widthDetails(x)
```

Arguments

x	A packed_legends object.

Examples

```
# There is no example
NULL
```

`widthDetails.textbox` *Width for textbox grob*

Description

Width for textbox grob

Usage

```
## S3 method for class 'textbox'
widthDetails(x)
```

Arguments

x	The textbox grob returned by textbox_grob.

Value

A unit object.

Examples

```
# There is no example
NULL
```

`[.AnnotationFunction` *Subset an AnnotationFunction Object*

Description

Subset an AnnotationFunction Object

Usage

```
## S3 method for class 'AnnotationFunction'
x[i]
```

Arguments

`x`	An `AnnotationFunction-class` object.
`i`	A vector of indices.

Details

One good thing for designing the `AnnotationFunction-class` is it can be subsetted, and this is the base for the splitting of the annotations.

Examples

```
anno = anno_simple(1:10)
anno[1:5]
draw(anno[1:5], test = "subset of column annotation")
```

`[.comb_mat` *Subset the Combination Matrix*

Description

Subset the Combination Matrix

Usage

```
## S3 method for class 'comb_mat'
x[i, j, drop = FALSE]
```

Arguments

x	A combination matrix returned by make_comb_mat.
i	Indices on rows.
j	Indices on columns.
drop	It is always reset to FALSE internally.

Details

If sets are on rows of the combination matrix, the row indices correspond to sets and column indices correspond to combination sets, and if sets are on columns of the combination matrix, rows correspond to the combination sets.

If the index is one-dimension, e.g. x[i], the index always corresponds to the combination sets.

You should not subset by the sets. It will give you wrong combination set size. The subsetting on sets are only used internally.

This subsetting method is mainly for subsetting combination sets, i.e., users can first use comb_size to get the size of each combination set, and filter them by the size.

Examples

```
set.seed(123)
lt = list(a = sample(letters, 10),
          b = sample(letters, 15),
          c = sample(letters, 20))
m = make_comb_mat(lt)
m2 = m[, comb_size(m) >= 3]
comb_size(m2)
m[comb_size(m) >= 3]
```

[.gridtext *Subset method of gridtext class*

Description

Subset method of gridtext class

Usage

```
## S3 method for class 'gridtext'
x[index]
```

Arguments

x	A vector of labels generated by gt_render.
index	Index

Details

Internally used.

Examples

```
# There is no example
NULL
```

`[.Heatmap` *Subset a Heatmap*

Description

Subset a Heatmap

Usage

```
## S3 method for class 'Heatmap'
x[i, j]
```

Arguments

`x`	A `Heatmap-class` object.
`i`	Row indices.
`j`	Column indices.

Details

This functionality is quite experimental. It should be applied before the layout is initialized.

Examples

```
m = matrix(rnorm(100), nrow = 10)
rownames(m) = letters[1:10]
colnames(m) = LETTERS[1:10]
ht = Heatmap(m)
ht[1:5, ]
ht[1:5]
ht[, 1:5]
ht[1:5, 1:5]
```

[.HeatmapAnnotation *Subset the HeatmapAnnotation object*

Description

Subset the HeatmapAnnotation object

Usage

```
## S3 method for class 'HeatmapAnnotation'
x[i, j]
```

Arguments

x	A HeatmapAnnotation-class object.
i	Index of observations.
j	Index of annotations.

Examples

```
ha = HeatmapAnnotation(foo = 1:10, bar = anno_points(10:1),
sth = cbind(1:10, 10:1))
ha[1:5, ]
ha[, c("foo", "bar")]
ha[, 1:2]
ha[1:5, c("foo", "sth")]
```

[.HeatmapList *Subset a HeatmapList object*

Description

Subset a HeatmapList object

Usage

```
## S3 method for class 'HeatmapList'
x[i, j]
```

Arguments

x	A HeatmapList-class object
i	row indices
j	column indices

Details

If the heatmap list is horizontal, `i` is the row indices and `j` corresponds to heatmap names and single annotation names. and if the heatlist is vertical, `i` corresponds to heatmap/annotation names and `j` is the column indices.

Examples

```
ht_list = Heatmap(matrix(rnorm(100), 10), name = "rnorm") +
  rowAnnotation(foo = 1:10, bar = anno_points(10:1)) +
  Heatmap(matrix(runif(100), 10), name = "runif")
summary(ht_list[1:5, ])
summary(ht_list[1:5, 1])
summary(ht_list[1:5, "rnorm"])
summary(ht_list[1:5, c("rnorm", "foo")])

ht_list = Heatmap(matrix(rnorm(100), 10), name = "rnorm") %v%
  columnAnnotation(foo = 1:10, bar = anno_points(10:1)) %v%
  Heatmap(matrix(runif(100), 10), name = "runif")
summary(ht_list[, 1:5])
summary(ht_list[1, 1:5])
summary(ht_list["rnorm", 1:5])
summary(ht_list[c("rnorm", "foo"), 1:5])
```

`[.SingleAnnotation` *Subset an SingleAnnotation Object*

Description

Subset an SingleAnnotation Object

Usage

```
## S3 method for class 'SingleAnnotation'
x[i]
```

Arguments

`x`	An `SingleAnnotation-class` object.
`i`	A vector of indices.

Details

The SingleAnnotation class object is subsettable only if the containing `AnnotationFunction-class` object is subsettable. All the `anno_*` functions are subsettable, so if the SingleAnnotation object is constructed by one of these functions, it is also subsettable.

Examples

```
ha = SingleAnnotation(value = 1:10)
ha[1:5]
draw(ha[1:5], test = "ha[1:5]")
```

%v% *Vertically Add Heatmaps or Annotations to a Heatmap List*

Description

Vertically Add Heatmaps or Annotations to a Heatmap List

Usage

```
x %v% y
```

Arguments

x	A Heatmap-class object, a HeatmapAnnotation-class object or a HeatmapList-class object.
y	A Heatmap-class object, a HeatmapAnnotation-class object or a HeatmapList-class object.

Details

It is only a helper function. It actually calls add_heatmap,Heatmap-method, add_heatmap,HeatmapList-method or add_heatmap,HeatmapAnnotation-method depending on the class of the input objects.

The HeatmapAnnotation-class object to be added should only be column annotations.

x and y can also be NULL.

Value

A HeatmapList-class object.

Author(s)

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See Also

+.AdditiveUnit operator is used for horizontal heatmap list.

Examples

```
# There is no example
NULL
```

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