Package 'miaViz'

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Title Microbiome Analysis Plotting and Visualization

Version 1.14.0

Description The miaViz package implements functions to visualize TreeSummarizedExperiment objects especially in the context of microbiome analysis. Part of the mia family of R/Bioconductor packages.

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Contents

`miaViz-package` *miaViz - Microbiome Analysis Plotting and Visualization*

Description

The scope of this package is the plotting and visualization of microbiome data. The main class for interfacing is the `TreeSummarizedExperiment` class.

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See Also

mia class

`getNeatOrder` *Sorting by radial theta angle*

Description

`getNeatOrder` sorts already ordinated data by the radial theta angle. This method is useful for organizing data points based on their angular position in a 2D space, typically after an ordination technique such as PCA or NMDS has been applied.

The function takes in a matrix of ordinated data, optionally centers the data using specified methods (`mean`, `median`, or `NULL`), and then calculates the angle (theta) for each point relative to the centroid. The data points are then sorted based on these theta values in ascending order.

One significant application of this sorting method is in plotting heatmaps. By using radial theta sorting, the relationships between data points can be preserved according to the ordination method's spatial configuration, rather than relying on hierarchical clustering, which may distort these relationships. This approach allows for a more faithful representation of the data's intrinsic structure as captured by the ordination process.

Usage

```
getNeatOrder(x, centering = "mean", ...)

## S4 method for signature 'matrix'
getNeatOrder(x, centering = "mean", ...)
```

Arguments

`x`	A matrix containing the ordinated data to be sorted. Columns should represent the principal components (PCs) and rows should represent the entities being analyzed (e.g. features or samples). There should be 2 columns only representing 2 PCs.
`centering`	`Character scalar`. Specifies the method to center the data. Options are `"mean"`, `"median"`, or `NULL` if your data is already centered. (Default: `"mean"`)
`...`	Additional arguments passed to other methods.

Details

It's important to note that the **sechm** package does actually have the functionality for plotting a heatmap using this radial theta angle ordering, though only by using an MDS ordination.

That being said, the `getNeatOrder` function is more modular and separate to the plotting, and can be applied to any kind of ordinated data which can be valuable depending on the use case.

Rajaram & Oono (2010) NeatMap - non-clustering heat map alternatives in R outlines this in more detail.

Value

A `character` vector of row indices in the sorted order.

Examples

```
# Load the required libraries and dataset
library(mia)
library(scater)
library(ComplexHeatmap)
library(circlize)
data(peerj13075)

# Group data by taxonomic order
tse <- agglomerateByRank(peerj13075, rank = "order", onRankOnly = TRUE)

# Transform the samples into relative abundances using CLR
tse <- transformAssay(
    tse, assay.type = "counts", method="clr", MARGIN = "cols",
    name="clr", pseudocount = TRUE)

# Transform the features (taxa) into zero mean, unit variance
# (standardize transformation)
tse <- transformAssay(
    tse, assay.type="clr", method="standardize", MARGIN = "rows")

# Perform PCA using calculatePCA
res <- calculatePCA(tse, assay.type = "standardize", ncomponents = 10)

# Sort by radial theta and sort the original assay data
sorted_order <- getNeatOrder(res[, c(1,2)], centering = "mean")
tse <- tse[, sorted_order]

# Define the color function and cap the colors at [-5, 5]
col_fun <- colorRamp2(c(-5, 0, 5), c("blue", "white", "red"))

# Create the heatmap
heatmap <- Heatmap(assay(tse, "standardize"),
              name = "NeatMap",
              col = col_fun,
              cluster_rows = FALSE,  # Do not cluster rows
              cluster_columns = FALSE,  # Do not cluster columns
              show_row_dend = FALSE,
              show_column_dend = FALSE,
              row_names_gp = gpar(fontsize = 4),
              column_names_gp = gpar(fontsize = 6),
              heatmap_width = unit(20, "cm"),
```

```
                heatmap_height = unit(15, "cm")
)
```

---

mia-datasets *miaViz example data*

Description

These example data objects were prepared to serve as examples. See the details for more information.

Usage

```
data(col_graph)

data(row_graph)

data(row_graph_order)
```

Format

An object of class tbl_graph (inherits from igraph) of length 26.

An object of class tbl_graph (inherits from igraph) of length 996.

An object of class tbl_graph (inherits from igraph) of length 110.

Details

For *_graph data:

1. "Jaccard" distances were calculated via calculateDistance(genus, FUN = vegan::vegdist, method = "jaccard",exprs_values = "relabundance"), either using transposed assay data or not to calculate distances for samples or features. NOTE: the function mia::calculateDistance is now deprecated.
2. "Jaccard" dissimilarites were converted to similarities and values above a threshold were used to construct a graph via graph.adjacency(mode = "lower", weighted = TRUE).
3. The igraph object was converted to tbl_graph via as_tbl_graph from the tidygraph package.

mia-plot-args *Additional arguments for plotting*

Description

To be able to fine tune plotting, several additional plotting arguments are available. These are described on this page.

Tree plotting

`line.alpha`: `Numeric scalar` in `[0, 1]`, Specifies the transparency of the tree edges. (Default: `1`)

`line.width`: `Numeric scalar`. Specifies the default width of an edge. (Default: `NULL`) to use default of the `ggtree` package.

`line.width.range`: `Numeric vector`. The range for plotting dynamic edge widths in. (Default: `c(0.5,3)`)

`point.alpha`: `Numeric scalar` in `[0, 1]`. Specifies the transparency of the tips. (Defaults: `1`)

`point.size`: `Numeric scalar`. Specifies the default size of tips. (Defaults: `2.`)

`point.size.range`: `Numeric vector`. Specifies the range for plotting dynamic tip sizes in. (Defaults: `c(1,4)`)

`label.font.size`: `Numeric scalar`. Font size for the tip and node labels. (Default: `3`)

`highlight.font.size`: `Numeric scalar`. Font size for the highlight labels. (Default: `3`)

Graph plotting

`line.alpha`: `Numeric scalar` in `[0, 1]`. Specifies the transparency of the tree edges. (Default: `1`)

`line.width`: `Numeric scalar`. Specifies the default width of an edge. (Default: `NULL`) to use default of the `ggtree` package.

`line.width.range`: `Numeric vector`. The range for plotting dynamic edge widths in. (Default: `c(0.5,3)`)

`point.alpha`: `Numeric scalar` in `[0, 1]`. Specifies the transparency of the tips. (Default: `1`)

`point.size`: `Numeric scalar`. Specifies the default size of tips. (Default: `2.`)

`point.size.range`: `Numeric vector`. The range for plotting dynamic tip sizes in. (Default: `c(1,4)`)

Abundance plotting

`flipped`: `Logical scalar`. Should the plot be flipped? (Default: `FALSE`)

`add.legend`: `Logical scalar`. Should legends be plotted? (Default: `TRUE`)

`add.x.text`: `Logical scalar`. Should x tick labels be plotted? (Default: `FALSE`)

`add.border`: `Logical scalar`. Should border of bars be plotted? (Default: `FALSE`)

`bar.alpha`: `Numeric scalar` in `[0, 1]`. Specifies the transparency of the bars. (Default: `1`)

`point.alpha`: `Numeric scalar` in `[0, 1]`. Specifies the transparency of the points. (Default: `1`)

`point.size`: `Numeric scalar`. Specifies the default size of points. (Default: `2.`)

Abundance density plotting

`add.legend`: `Logical scalar`. Should legends be plotted? (Defaults: `TRUE`)

`point.shape`: `Numeric scalar`. Sets the shape of points. (Default: `21`)

`point.colour`: `Character scalar`. Specifies the default colour of points. (Default: `2.`)

`point.size`: `Numeric scalar`. Specifies the default size of points. (Default: `2.`)

`point.alpha`: `Numeric scalar` in `[0, 1]`. Specifies the transparency of the points. (Default: `1`)

`flipped`: `Logical scalar`. Should the plot be flipped? (Default: `FALSE`)

`scales.free`: `Logical scalar`. Should `scales = "free"` be set for faceted plots? (Default: `TRUE`)

`angle.x.text`: `Logical scalar`. Should x tick labels be plotted? (Default: `FALSE`)

Prevalence plotting

`flipped`: `Logical scalar`. Specifies whether the plot should be flipped. (Default: `FALSE`)

`add.legend`: `Logical scalar`. Should legends be plotted? (Default: `TRUE`)

`point.alpha`: `Numeric scalar` in `[0, 1]`. Specifies the transparency of the tips. (Default: `1`)

`point.size`: `Numeric scalar`. Specifies the default size of tips. (Default: `2.`)

`line.alpha`: `Numeric scalar` in `[0, 1]`. Specifies the transparency of the tree edges. (Default: `1`)

`line.type`: `Numeric scalar`. Specifies the default line type. (Default: `NULL`) to use default of the `ggplot2` package.

`line.size`: `Numeric scalar`. Specifies the default width of a line. (Default: `NULL`) to use default of the `ggplot2` package.

Series plotting

`add.legend`: `Logical scalar`. Should legends be plotted? (Default: `TRUE`)

`line.alpha`: `Numeric scalar` in `[0, 1]`. Specifies the transparency of the tree edges. (Default: `1`)

`line.type`: `Numeric scalar`. Specifies the default line type. (Default: `NULL`) to use default of the `ggplot2` package.

`line.width`: `Numeric scalar`. Specifies the default width of a line. (Default: `NULL`) to use default of the `ggplot2` package.

`line.width.range`: `Numeric vector`. The range for plotting dynamic line widths in. (Default: `c(0.5,3)`)

`ribbon.alpha`: `Numeric scalar` in `[0, 1]`. Specifies the transparency of the ribbon. (Default: `0.3`)

Tile plotting

`add.legend`: `Logical scalar`. Should legends be plotted? (Default: `TRUE`)

`rect.alpha`: `Numeric scalar` in `[0, 1]`. Specifies the transparency of the areas. (Default: `1`)

`rect.colour`: `Character scalar`. Specifies the colour to use for colouring the borders of the areas. (Default: `"black"`)

`na.value`: `Character scalar`. Specifies the colour to use for `NA` values. (Default: `"grey80"`)

plotAbundance *Plotting abundance data*

Description

plotAbundance() creates a barplot of feature abundances, typically used to visualize the relative abundance of features at a specific taxonomy rank.

Usage

```
plotAbundance(x, ...)

## S4 method for signature 'SummarizedExperiment'
plotAbundance(
  x,
  col.var = features,
  features = NULL,
  order.row.by = order_rank_by,
  order_rank_by = c("name", "abund", "revabund"),
  order.col.by = order_sample_by,
  order_sample_by = NULL,
  decreasing = TRUE,
  layout = c("bar", "point"),
  one.facet = one_facet,
  one_facet = TRUE,
  ncol = 2,
  scales = "fixed",
  assay.type = assay_name,
  assay_name = "counts",
  ...
)
```

Arguments

x	a SummarizedExperiment object.
...	additional parameters for plotting. • group Character scalar. Specifies the group for agglomeration. Must be a value from colnames(rowData(x)). If NULL, agglomeration is not applied. (Default: NULL) • as.relative Character scalar. Should the relative values be calculated? (Default: FALSE) See mia-plot-args for more details i.e. call help("mia-plot-args")
col.var	Character scalar. Selects a column from colData to be plotted below the abundance plot. Continuous numeric values will be plotted as point, whereas factors and character will be plotted as colour-code bar. (Default: NULL)
features	Deprecated. Use col.var instead.
order.row.by	Character scalar. How to order abundance value: By name ("name") for sorting the taxonomic labels alphabetically, by abundance ("abund") to sort by abundance values or by a reverse order of abundance values ("revabund"). (Default: "name")

order_rank_by	Deprecated. Use order.row.by instead.
order.col.by	Character scalar. from the chosen rank of abundance data or from colData to select values to order the abundance plot by. (Default: NULL)
order_sample_by	Deprecated. Use order.col.by instead.
decreasing	Logical scalar. If the order.col.by is defined and the values are numeric, should the values used to order in decreasing or increasing fashion? (Default: FALSE)
layout	Character scalar. Either "bar" or "point".
one.facet	Logical scalar. Should the plot be returned in on facet or split into different facet, one facet per different value detect in group. If col.var or order.col.by is not NULL, this setting will be disregarded. (Default: TRUE)
one_facet	Deprecated. Use one.facet instead.
ncol	Numeric scalar. if one.facet = FALSE, ncol defines many columns should be for plotting the different facets. (Default: 2)
scales	Character scalar. Defines the behavior of the scales of each facet. Both values are passed onto facet_wrap. (Default: "fixed")
assay.type	Character scalar value defining which assay data to use. (Default: "relabundance")
assay_name	Deprecate. Use assay.type instead.

Details

It is recommended to handle subsetting, agglomeration, and transformation outside this function. However, agglomeration and relative transformation can be applied using the group and as.relative parameters, respectively. If one of the TAXONOMY_RANKS is selected via group, mia::agglomerateByRank() is used, otherwise agglomerateByVariable() is applied.

Value

a ggplot object or list of two ggplot objects, if col.var are added to the plot.

Examples

```
data(GlobalPatterns, package="mia")
tse <- GlobalPatterns

# If rank is set to NULL (default), agglomeration is not done. However, note
# that there is maximum number of rows that can be plotted. That is why
# we take sample from the data.
set.seed(26348)
sample <- sample(rownames(tse), 20)
tse_sub <- tse[sample, ]
# Apply relative transformation
tse_sub <- transformAssay(tse_sub, method = "relabundance")
plotAbundance(tse_sub, assay.type = "relabundance")

# Plotting counts using the first taxonomic rank as default
plotAbundance(
    tse, assay.type="counts", group = "Phylum") +
    labs(y="Counts")

# Using "Phylum" as rank. Apply relative transformation to "counts" assay.
```

```
plotAbundance(
    tse, assay.type="counts", group = "Phylum", add_legend = FALSE,
    as.relative = TRUE)

# Apply relative transform
tse <- transformAssay(tse, method = "relabundance")

# A feature from colData or taxon from chosen rank can be used for ordering
# samples.
plotAbundance(
    tse, assay.type="relabundance", group = "Phylum",
    order.col.by = "Bacteroidetes")

# col.var from colData can be plotted together with abundance plot.
# Returned object is a list that includes two plot; other visualizes
## abundance other col.var.
plot <- plotAbundance(
    tse, assay.type = "relabundance", group = "Phylum",
    col.var = "SampleType")

# These two plots can be combined with wrap_plots function from patchwork
# package
library(patchwork)
wrap_plots(plot, ncol = 1)


# Same plot as above but showing sample IDs as labels for the x axis on the
# top plot
plot[[1]] <- plotAbundance(
    tse, assay.type = "relabundance",
    group = "Phylum", col.var = "SampleType", add.legend = FALSE,
    add.x.text = TRUE)[[1]] +
    theme(axis.text.x = element_text(angle = 90))

wrap_plots(plot, ncol = 1, heights = c(0.8,0.2))


# Compositional barplot with top 5 taxa and samples sorted by
# "Bacteroidetes"

# Getting top taxa on a Phylum level
tse <- transformAssay(tse, method = "relabundance")
tse_phylum <- agglomerateByRank(tse, rank = "Phylum")
top_taxa <- getTop(tse_phylum, top = 5, assay.type = "relabundance")

# Renaming the "Phylum" rank to keep only top taxa and the rest to "Other"
phylum_renamed <- lapply(rowData(tse)$Phylum, function(x){
    if (x %in% top_taxa) {x} else {"Other"}})
rowData(tse)$Phylum <- as.character(phylum_renamed)

# Compositional barplot
plotAbundance(
    tse, assay.type="relabundance", group = "Phylum",
    order.row.by="abund", order.col.by = "Bacteroidetes")
```

plotAbundanceDensity *Plot abundance density*

Description

This function plots abundance of the most abundant taxa.

Usage

```
plotAbundanceDensity(x, ...)

## S4 method for signature 'SummarizedExperiment'
plotAbundanceDensity(
  x,
  layout = c("jitter", "density", "point"),
  assay.type = assay_name,
  assay_name = "counts",
  n = min(nrow(x), 25L),
  colour.by = colour_by,
  colour_by = NULL,
  shape.by = shape_by,
  shape_by = NULL,
  size.by = size_by,
  size_by = NULL,
  decreasing = order_descending,
  order_descending = TRUE,
  ...
)
```

Arguments

x	a SummarizedExperiment object.
...	additional parameters for plotting. • xlab Character scalar. Selects the x-axis label. (Default: assay.type) • ylab Character scalar. Selects the y-axis label. ylab is disabled when layout = "density". (Default: "Taxa") • point.alpha Numeric scalar. From range 0 to 1. Selects the transparency of colour in jitter and point plot. (Default: 0.6) • point.shape Positive integer scalar. Value selecting the shape of point in jitter and point plot. (Default: 21) • point.size Positive integer scalar. Selects the size of point in jitter and point plot. (Default: 2) • add_legend Logical scalar. Determines if legend is added. (Default: TRUE) • flipped: Logical scalar. Determines if the orientation of plot is changed so that x-axis and y-axis are swapped. (Default: FALSE) • add_x_text Logical scalar. Determines if text that represents values is included in x-axis. (Default: TRUE) See mia-plot-args for more details i.e. call help("mia-plot-args")

layout	Character scalar. Selects the layout of the plot. There are three different options: jitter, density, and point plot. (default: layout = "jitter")
assay.type	Character scalar value defining which assay data to use. (Default: "relabundance")
assay_name	Deprecate. Use assay.type instead.
n	Integer scalar. Specifies the number of the most abundant taxa to show. (Default: min(nrow(x), 25L))
colour.by	Character scalar. Defines a column from colData, that is used to color plot. Must be a value of colData() function. (Default: NULL)
colour_by	Deprecated. Use colour.by instead.
shape.by	Character scalar. Defines a column from colData, that is used to group observations to different point shape groups. Must be a value of colData() function. shape.by is disabled when layout = "density". (Default: NULL)
shape_by	Deprecated. Use shape.by instead.
size.by	Character scalar. Defines a column from colData, that is used to group observations to different point size groups. Must be a value of colData() function. size.by is disabled when layout = "density". (Default: NULL)
size_by	Deprecated. Use size.by instead.
decreasing	Logical scalar. Indicates whether the results should be ordered in a descending order or not. If NA is given the order as found in x for the n most abundant taxa is used. (Default: TRUE)
order_descending	Deprecated. Use order.descending instead.

Details

This function plots abundance of the most abundant taxa. Abundance can be plotted as a jitter plot, a density plot, or a point plot. By default, x-axis represents abundance and y-axis taxa. In a jitter and point plot, each point represents abundance of individual taxa in individual sample. Most common abundances are shown as a higher density.

A density plot can be seen as a smoothened bar plot. It visualized distribution of abundances where peaks represent most common abundances.

Value

A ggplot2 object

Author(s)

Leo Lahti and Tuomas Borman. Contact: microbiome.github.io

See Also

scater::plotExpression

Examples

```
data("peerj13075", package = "mia")
tse <- peerj13075

# Plots the abundances of 25 most abundant taxa. Jitter plot is the default option.
```

```
plotAbundanceDensity(tse, assay.type = "counts")

# Counts relative abundances
tse <- transformAssay(tse, method = "relabundance")

# Plots the relative abundance of 10 most abundant taxa.
# "nationality" information is used to color the points. X-axis is log-scaled.
plotAbundanceDensity(
    tse, layout = "jitter", assay.type = "relabundance", n = 10,
    colour.by = "Geographical_location") +
    scale_x_log10()

# Plots the relative abundance of 10 most abundant taxa as a density plot.
# X-axis is log-scaled
plotAbundanceDensity(
    tse, layout = "density", assay.type = "relabundance", n = 10 ) +
    scale_x_log10()

# Plots the relative abundance of 10 most abundant taxa as a point plot.
# Point shape is changed from default (21) to 41.
plotAbundanceDensity(
    tse, layout = "point", assay.type = "relabundance", n = 10,
    point.shape = 41)

# Plots the relative abundance of 10 most abundant taxa as a point plot.
# In addition to colour, groups can be visualized by size and shape in point plots,
# and adjusted for point size
plotAbundanceDensity(
    tse, layout = "point", assay.type = "relabundance", n = 10,
    shape.by = "Geographical_location", size.by = "Age", point.size=1)

# Ordering via decreasing
plotAbundanceDensity(
    tse, assay.type = "relabundance", decreasing = FALSE)

# for custom ordering set decreasing = NA and order the input object
# to your wishes
plotAbundanceDensity(
    tse, assay.type = "relabundance", decreasing = NA)

# Box plots and violin plots are supported by scater::plotExpression.
# Plots the relative abundance of 5 most abundant taxa as a violin plot.
library(scater)
top <- getTop(tse, top = 5)
plotExpression(tse, features = top, assay.type = "relabundance") + ggplot2::coord_flip()

# Plots the relative abundance of 5 most abundant taxa as a box plot.
plotExpression(tse, features = top, assay.type = "relabundance",
    show_violin = FALSE, show_box = TRUE) + ggplot2::coord_flip()
```

---

plotCCA *Plot RDA or CCA object*

Description

plotRDA and plotCCA create an RDA/CCA plot starting from the output of CCA and RDA functions, two common methods for supervised ordination of microbiome data.

Usage

```
plotCCA(x, ...)

## S4 method for signature 'SingleCellExperiment'
plotCCA(x, dimred, ...)

## S4 method for signature 'matrix'
plotCCA(x, ...)

plotRDA(x, ...)

## S4 method for signature 'SingleCellExperiment'
plotRDA(x, dimred, ...)

## S4 method for signature 'matrix'
plotRDA(x, ...)
```

Arguments

x	a TreeSummarizedExperiment or a matrix of weights. The latter is returned as output from getRDA.
...	additional parameters for plotting, inherited from plotReducedDim, geom_label and geom_label_repel.

- add.ellipse: One of c(TRUE, FALSE, "fill", "colour"), indicating whether ellipses should be present, absent, filled or colored. (default: ellipse.fill = TRUE)
- ellipse.alpha: Numeric scalar. Between 0 and 1. Adjusts the opacity of ellipses. (Default: 0.2)
- ellipse.linewidth: Numeric scalar. Specifies the size of ellipses. (Default: 0.1)
- ellipse.linetype: Integer scalar. Specifies the style of ellipses. (Default: 1)
- confidence.level: Numeric scalar. Between 0 and 1. Adjusts confidence level. (Default: 0.95)
- add.vectors: Logical scalar. Should vectors appear in the plot. (Default: TRUE)
- vec.size: Numeric scalar. Specifies the size of vectors. (Default: 0.5)
- vec.colour: Character scalar. Specifies the colour of vectors. (Default: "black")
- vec.linetype: Integer scalar. Specifies the style of vector lines. (Default: 1)
- arrow.size: Numeric scalar. Specifies the size of arrows. (Default: arrow.size = 0.25)
- label.size: Numeric scalar. Specifies the size of text and labels. (Default: 4)

- label.colour: Character scalar. Specifies the colour of text and labels. (Default: "black")
- sep.group: Character scalar. Specifies the separator used in the labels. (Default: "\U2014")
- repl.underscore: Character scalar. Used to replace underscores in the labels. (Default: " ")
- vec.text: Logical scalar. Should text instead of labels be used to label vectors. (Default: TRUE)
- repel.labels: Logical scalar. Should labels be repelled. (Default: TRUE)
- parse.labels: Logical scalar. Should labels be parsed. (Default: TRUE)
- add.significance: Logical scalar. Should explained variance and p-value appear in the labels. (Default: TRUE)
- add.expl.var: Logical scalar. Should explained variance appear on the coordinate axes. (Default: TRUE)
- add.centroids: Logical scalar. Should centroids of variables be added. (Default: FALSE)
- add.species: Logical scalar. Should species scores be added. (Default: FALSE)

dimred — Character scalar or integer scalar. Determines the reduced dimension to plot. This is the output of addRDA and resides in reducedDim(tse, dimred).

Details

plotRDA and plotCCA create an RDA/CCA plot starting from the output of CCA and RDA functions, two common methods for supervised ordination of microbiome data. Either a TreeSummarizedExperiment or a matrix object is supported as input. When the input is a TreeSummarizedExperiment, this should contain the output of addRDA in the reducedDim slot and the argument dimred needs to be defined. When the input is a matrix, this should be returned as output from getRDA. However, the first method is recommended because it provides the option to adjust aesthetics to the colData variables through the arguments inherited from plotReducedDim.

Value

A ggplot2 object

Examples

```
# Load dataset
library(miaViz)
data("enterotype", package = "mia")
tse <- enterotype

# Run RDA and store results into TreeSE
tse <- addRDA(
    tse,
    formula = assay ~ ClinicalStatus + Gender + Age,
    FUN = getDissimilarity,
    distance = "bray",
    na.action = na.exclude
    )

# Create RDA plot coloured by variable
```

```
plotRDA(tse, "RDA", colour.by = "ClinicalStatus")

# Create RDA plot with empty ellipses
plotRDA(tse, "RDA", colour.by = "ClinicalStatus", add.ellipse = "colour")

# Create RDA plot with text encased in labels
plotRDA(tse, "RDA", colour.by = "ClinicalStatus", vec.text = FALSE)

# Create RDA plot without repelling text
plotRDA(tse, "RDA", colour.by = "ClinicalStatus", repel.labels = FALSE)

# Create RDA plot without vectors
plotRDA(tse, "RDA", colour.by = "ClinicalStatus", add.vectors = FALSE)

# Calculate RDA as a separate object
rda_mat <- getRDA(
    tse,
    formula = assay ~ ClinicalStatus + Gender + Age,
    FUN = getDissimilarity,
    distance = "bray",
    na.action = na.exclude
    )

# Create RDA plot from RDA matrix
plotRDA(rda_mat)
```

`plotColTile` *Plot factor data as tiles*

Description

Relative relations of two grouping can be visualized by plotting tiles with relative sizes. `plotColTile` and `plotRowTile` can be used for this.

Usage

```
plotColTile(object, x, y, ...)

plotRowTile(object, x, y, ...)

## S4 method for signature 'SummarizedExperiment'
plotColTile(object, x, y, ...)

## S4 method for signature 'SummarizedExperiment'
plotRowTile(object, x, y, ...)
```

Arguments

`object`	a `SummarizedExperiment` object.
`x`	`Character scalar`. Specifies the column-level metadata field to show on the x-axis. Alternatively, an AsIs vector or data.frame, see ?`retrieveFeatureInfo` or ?`retrieveCellInfo`. Must result in a returned `character` or `factor` vector.

y	Character scalar. Specifies the column-level metadata to show on the y-axis. Alternatively, an AsIs vector or data.frame, see ?retrieveFeatureInfo or ?retrieveCellInfo. Must result in a returned character or factor vector.
...	additional arguments for plotting. See mia-plot-args for more details i.e. call help("mia-plot-args")

Value

A ggplot2 object or plotly object, if more than one prevalences was defined.

Examples

```
data(GlobalPatterns)
se <- GlobalPatterns
plotColTile(se,"SampleType","Primer")
```

---

plotDMN *Plotting Dirichlet-Multinomial Mixture Model data*

Description

To plot DMN fits generated with mia use plotDMNFit.

Usage

```
plotDMNFit(x, name = "DMN", type = c("laplace", "AIC", "BIC"), ...)

## S4 method for signature 'SummarizedExperiment'
plotDMNFit(x, name = "DMN", type = c("laplace", "AIC", "BIC"))
```

Arguments

x	a SummarizedExperiment object contain the DMN data in metadata.
name	Character scalar. The name to store the result in metadata (Default: "DMN")
type	Character scalar. The type of measure for access the goodness of fit. One of 'laplace', 'AIC' or 'BIC'.
...	optional arguments not used.

Value

plotDMNFit returns a ggplot2 plot.

See Also

calculateDMN

Examples

```
library(mia)
library(bluster)

# Get dataset
data("peerj13075", package = "mia")
tse <- peerj13075

# Cluster the samples
tse <- addCluster(tse, DmmParam(k = 1:4), name = "DMM", full = TRUE)

# Plot the fit
plotDMNFit(tse, name = "DMM", type = "laplace")
```

---

plotGraph *Plotting igraph objects with information from a* SummarizedExperiment

---

Description

plotGraph plots an igraph object with additional information matched from a SummarizedExperiment object for the nodes only. Information on the edges have to provided manually.

Usage

```
plotColGraph(x, y, ...)

plotRowGraph(x, y, ...)

## S4 method for signature 'ANY,SummarizedExperiment'
plotColGraph(
  x,
  y,
  show.label = show_label,
  show_label = FALSE,
  add.legend = add_legend,
  add_legend = TRUE,
  layout = "kk",
  edge.type = edge_type,
  edge_type = c("fan", "link", "arc", "parallel"),
  edge.colour.by = edge_colour_by,
  edge_colour_by = NULL,
  edge.width.by = edge_width_by,
  edge_width_by = NULL,
  colour.by = colour_by,
  colour_by = NULL,
  shape.by = shape_by,
  shape_by = NULL,
  size.by = size_by,
  size_by = NULL,
  assay.type = by_exprs_values,
```

```
  by_exprs_values = "counts",
  other.fields = other_fields,
  other_fields = list(),
  ...
)

## S4 method for signature 'SummarizedExperiment,missing'
plotColGraph(x, y, name = "graph", ...)

## S4 method for signature 'ANY,SummarizedExperiment'
plotRowGraph(
  x,
  y,
  show.label = show_label,
  show_label = FALSE,
  add.legend = add_legend,
  add_legend = TRUE,
  layout = "kk",
  edge.type = edge_type,
  edge_type = c("fan", "link", "arc", "parallel"),
  edge.colour.by = edge_colour_by,
  edge_colour_by = NULL,
  edge.width.by = edge_width_by,
  edge_width_by = NULL,
  colour.by = colour_by,
  colour_by = NULL,
  shape.by = shape_by,
  shape_by = NULL,
  size.by = NULL,
  assay.type = by_exprs_values,
  by_exprs_values = "counts",
  other.fields = other_fields,
  other_fields = list(),
  ...
)

## S4 method for signature 'SummarizedExperiment,missing'
plotRowGraph(x, y, name = "graph", ...)
```

Arguments

x, y	a graph object and a SummarizedExperiment object or just a SummarizedExperiment. For the latter object a graph object must be stored in metadata(x)$name.
...	additional arguments for plotting. See mia-plot-args for more details i.e. call help("mia-plot-args")
show.label	Logical scalar, integer vector or character vector If a logical scalar is given, should tip labels be plotted or if a logical vector is provided, which labels should be shown? If an integer or character vector is provided, it will be converted to a logical vector. The integer values must be in the range of 1 and number of nodes, whereas the values of a character vector must match values of a label or name column in the node data. In case of a character vector only values corresponding to actual labels will be plotted and if no labels are

	provided no labels will be shown. (Default: FALSE)
show_label	Deprecated. Use show.label instead.
add.legend	Logical scalar. Should legends be plotted? (Default: TRUE)
add_legend	Deprecated. Use add.legend instead.
layout	Character scalar. Layout for the plotted graph. See ggraph for details. (Default: "kk")
edge.type	Character scalar. Type of edge plotted on the graph. See geom_edge_fan for details and other available geoms. (Default: "fan")
edge_type	Deprecated. Use edge.type instead.
edge.colour.by	Character scalar. Specification of an edge metadata field to use for setting colours of the edges. (Default: NULL)
edge_colour_by	Deprecated. Use edge.colour.by instead.
edge.width.by	Character scalar. Specification of an edge metadata field to use for setting width of the edges. (Default: NULL)
edge_width_by	Deprecated. Use edge.width.by instead.
colour.by	Character scalar. Specification of a column metadata field or a feature to colour graph nodes by, see the by argument in ?retrieveCellInfo for possible values. (Default: NULL)
colour_by	Deprecated. Use colour.by instead.
shape.by	Character scalar. Specification of a column metadata field or a feature to shape graph nodes by, see the by argument in ?retrieveCellInfo for possible values. (Default: NULL)
shape_by	Deprecated. Use shape.by instead.
size.by	Character scalar. Specification of a column metadata field or a feature to size graph nodes by, see the by argument in ?retrieveCellInfo for possible values. (Default: NULL)
size_by	Deprecated. Use size.by instead.
assay.type	Character scalar. or integer scalar. Specifies which assay to obtain expression values from, for use in point aesthetics - see the exprs_values argument in ?retrieveCellInfo. (Default: "counts")
by_exprs_values	Deprecated. Use assay.type instead.
other.fields	Additional fields to include in the node information without plotting them.
other_fields	Deprecated. Use other.fields instead.
name	Character scalar. If x is a SummarizedExperiment the key for subsetting the metadata(x) to a graph object. (Default: "graph")

Details

Internally tidygraph and ggraph are used. Therefore, all graph types which can be converted by tidygraph::as_tbl_graph can be used.

Value

a ggtree plot

Examples

```
# data setup
library(mia)
data(GlobalPatterns)
data(col_graph)
data(row_graph)
data(row_graph_order)
metadata(GlobalPatterns)$col_graph <- col_graph

genus <- agglomerateByRank(GlobalPatterns,"Genus",na.rm=TRUE)
metadata(genus)$row_graph <- row_graph
order <- agglomerateByRank(genus,"Order",na.rm=TRUE)
metadata(order)$row_graph <- row_graph_order

# plot a graph independently
plotColGraph(col_graph,
             genus,
             colour.by = "SampleType",
             edge.colour.by = "weight",
             edge.width.by = "weight",
             show.label = TRUE)

# plot the graph stored in the object
plotColGraph(genus,
             name = "col_graph",
             colour.by = "SampleType",
             edge.colour.by = "weight",
             edge.width.by = "weight")


# plot a graph independently
plotRowGraph(row_graph,
             genus,
             colour.by = "Kingdom",
             edge.colour.by = "weight",
             edge.width.by = "weight")

# plot the graph stored in the object
plotRowGraph(genus,
             name = "row_graph",
             colour.by = "Phylum",
             edge.colour.by = "weight",
             edge.width.by = "weight")


# plot a graph independently
plotRowGraph(row_graph_order,
             order,
             colour.by = "Kingdom",
             edge.colour.by = "weight",
             edge.width.by = "weight")

# plot the graph stored in the object and include some labels
plotRowGraph(order,
             name = "row_graph",
             colour.by = "Phylum",
```

```
              edge.colour.by = "weight",
              edge.width.by = "weight",
              show.label = c("Sulfolobales","Spirochaetales",
                             "Verrucomicrobiales"))

# labels can also be included via selecting specific rownames of x/y
plotRowGraph(order,
              name = "row_graph",
              colour.by = "Phylum",
              edge.colour.by = "weight",
              edge.width.by = "weight",
              show.label = c(1,10,50))

# labels can also be included via a logical vector, which has the same length
# as nodes are present
label_select <- rep(FALSE,nrow(order))
label_select[c(1,10,50)] <-  TRUE
plotRowGraph(order,
              name = "row_graph",
              colour.by = "Phylum",
              edge.colour.by = "weight",
              edge.width.by = "weight",
              show.label = label_select)
```

`plotLoadings` *Plot feature loadings for TreeSummarizedExperiment objects or feature loadings numeric matrix.*

Description

This function is used after performing a reduction method. If `TreeSE` is given it retrieves the feature loadings matrix to plot values. A tree from `rowTree` can be added to heatmap layout.

Usage

```
plotLoadings(x, ...)

## S4 method for signature 'TreeSummarizedExperiment'
plotLoadings(
  x,
  dimred,
  layout = "barplot",
  ncomponents = 5,
  tree.name = "phylo",
  row.var = NULL,
  add.tree = FALSE,
  ...
)

## S4 method for signature 'SingleCellExperiment'
plotLoadings(x, dimred, layout = "barplot", ncomponents = 5, ...)
```

```
## S4 method for signature 'matrix'
plotLoadings(x, layout = "barplot", ncomponents = 5, ...)
```

Arguments

x	a TreeSummarizedExperiment x.
...	additional parameters for plotting. • n: Integer scalar. Number of features to be plotted. Applicable when layout="barplot". (Default: 10)) • absolute.scale: ("barplot", "lollipop") Logical scalar. Specifies whether a barplot or a lollipop plot should be visualized in absolute scale. (Default: TRUE)
dimred	Character scalar. Determines the reduced dimension to plot.
layout	Character scalar. Determines the layout of plot. Must be either "barplot", "heatmap", or "lollipop". (Default: "barplot")
ncomponents	Numeric scalar. Number of components must be lower or equal to the number of components chosen in the reduction method. (Default: 5)
tree.name	Character scalar. Specifies a rowTree/colTree from x. (Default: tree.name = "phylo")
row.var	NULL or Character scalar. Specifies a variable from rowData to plot with tree heatmap layout. (Default: NULL)
add.tree	Logical scalar. Whether to add tree to heatmap layout. (Default: FALSE)

Details

These method visualize feature loadings of dimension reduction results. Inspired by the plotASVcircular method using phyloseq. TreeSummarizedExperiment object is expected to have content in reducedDim slot calculated with standardized methods from mia or scater package.

Value

A ggplot2 object.

Examples

```
library(mia)
library(scater)
data("GlobalPatterns", package = "mia")
tse <- GlobalPatterns

# Calculate PCA
tse <- agglomerateByPrevalence(tse, rank="Phylum", update.tree = TRUE)
tse <- transformAssay(tse, method = "clr", pseudocount = 1)
tse <- runPCA(tse, ncomponents = 5, assay.type = "clr")

#' # Plotting feature loadings with tree
plotLoadings(tse, dimred = "PCA", layout = "heatmap", add.tree = TRUE)

# Plotting matrix as a barplot
loadings_matrix <- attr(reducedDim(tse, "PCA"), "rotation")
plotLoadings(loadings_matrix)
```

```
# Plotting more features but less components
plotLoadings(tse, dimred = "PCA", ncomponents = 2, n = 12)

# Plotting matrix as heatmap without tree
plotLoadings(loadings_matrix, layout = "heatmap")

# Plot with less components
plotLoadings(tse, "PCA", layout = "heatmap", ncomponents = 2)
```

`plotNMDS` *Wrapper for scater::plotReducedDim()*

Description

Wrapper for scater::plotReducedDim()

Usage

```
plotNMDS(x, ..., ncomponents = 2)
```

Arguments

`x`	a `SummarizedExperiment` object.
`...`	additional arguments passed to scater::plotReducedDim().
`ncomponents`	`Numeric scalar.` indicating the number of dimensions to plot, starting from the first dimension. Alternatively, a numeric vector specifying the dimensions to be plotted. (Default: 2)

`plotPrevalence` *Plot prevalence information*

Description

`plotPrevalence` and `plotRowPrevalence` visualize prevalence information.

Usage

```
plotPrevalence(x, ...)

## S4 method for signature 'SummarizedExperiment'
plotPrevalence(
  x,
  detection = detections,
  detections = c(0.01, 0.1, 1, 2, 5, 10, 20),
  prevalence = prevalences,
  prevalences = seq(0.1, 1, 0.1),
  assay.type = assay_name,
  assay_name = "counts",
  rank = NULL,
```

```
  BPPARAM = BiocParallel::SerialParam(),
  ...
)

plotPrevalentAbundance(x, ...)

## S4 method for signature 'SummarizedExperiment'
plotPrevalentAbundance(
  x,
  rank = NULL,
  assay.type = assay_name,
  assay_name = "counts",
  colour.by = colour_by,
  colour_by = NULL,
  size.by = size_by,
  size_by = NULL,
  shape.by = shape_by,
  shape_by = NULL,
  show.label = label,
  label = NULL,
  facet.by = facet_by,
  facet_by = NULL,
  ...
)

plotRowPrevalence(x, ...)

## S4 method for signature 'SummarizedExperiment'
plotRowPrevalence(
  x,
  rank = NULL,
  assay.type = assay_name,
  assay_name = "counts",
  detection = detections,
  detections = c(0.01, 0.1, 1, 2, 5, 10, 20),
  min.prevalence = min_prevalence,
  min_prevalence = 0,
  BPPARAM = BiocParallel::SerialParam(),
  ...
)

plotTaxaPrevalence(x, ...)

## S4 method for signature 'ANY'
plotTaxaPrevalence(x, ...)

plotFeaturePrevalence(x, ...)

## S4 method for signature 'ANY'
plotFeaturePrevalence(x, ...)
```

Arguments

x	a SummarizedExperiment object.
detection	Numeric scalar. Detection thresholds for absence/presence. Either an absolutes value compared directly to the values of x or a relative value between 0 and 1, if TRUE.
detections	Deprecated. Use detection instead.
prevalence	Numeric scalar. Prevalence thresholds (in 0 to 1). The required prevalence is strictly greater by default. To include the limit, set include.lowest to TRUE.
prevalences	Deprecated. Use prevalence instead.
assay.type	Character scalar. Defines which assay data to use. (Default: "relabundance")
assay_name	Deprecated. Use assay.type instead.
rank, ...	additional arguments • as.relative Logical scalar. Should the relative values be calculated? (Default: FALSE) • ndetection Integer scalar. Determines the number of breaks calculated detection thresholds when detection=NULL. When TRUE, as_relative is then also regarded as TRUE. (Default: 20) • If !is.null(rank) matching arguments are passed on to agglomerateByRank. See ?agglomerateByRank for more details. • additional arguments for plotting. See mia-plot-args for more details i.e. call help("mia-plot-args")
BPPARAM	A BiocParallelParam object specifying whether the UniFrac calculation should be parallelized.
colour.by	Character scalar. Specification of a feature to colour points by, see the by argument in ?retrieveFeatureInfo for possible values. Only used with layout = "point". (Default: NULL)
colour_by	Deprecated. Use colour.by instead.
size.by	Character scalar. Specification of a feature to size points by, see the by argument in ?retrieveFeatureInfo for possible values. Only used with layout = "point". (Default: NULL)
size_by	Deprecated. Use size.by instead.
shape.by	Character scalar. Specification of a feature to shape points by, see the by argument in ?retrieveFeatureInfo for possible values. Only used with layout = "point". (Default: NULL)
shape_by	Deprecated. Use shape.by instead.
show.label	Logical scalar, character scalar or integer vector for selecting labels from the rownames of x. If rank is not NULL the rownames might change. (Default: NULL)
label	Deprecated. Use show.label instead.
facet.by	Character scalar. Taxonomic rank to facet the plot by. Value must be of taxonomyRanks(x) Argument can only be used in function plotPrevalentAbundance.
facet_by	Deprecated. Use facet.by instead.
min.prevalence	Numeric scalar. Applied as a threshold for plotting. The threshold is applied per row and column. (Default: 0)
min_prevalence	Deprecated. Use min.prevalence instead.

Details

Whereas `plotPrevalence` produces a line plot, `plotRowPrevalence` returns a heatmap.

Agglomeration on different taxonomic levels is available through the `rank` argument.

To exclude certain taxa, preprocess `x` to your liking, for example with subsetting via `getPrevalent` or `agglomerateByPrevalence`.

Value

A `ggplot2` object or `plotly` object, if more than one `prevalence` was defined.

See Also

`getPrevalence`, `agglomerateByPrevalence`, `agglomerateByRank`

Examples

```
data(GlobalPatterns, package = "mia")

# Apply relative transformation
GlobalPatterns <- transformAssay(GlobalPatterns, method = "relabundance")

# plotting N of prevalence exceeding taxa on the Phylum level
plotPrevalence(GlobalPatterns, rank = "Phylum")
plotPrevalence(GlobalPatterns, rank = "Phylum") + scale_x_log10()

# plotting prevalence per taxa for different detection thresholds as heatmap
plotRowPrevalence(GlobalPatterns, rank = "Phylum")

# by default a continuous scale is used for different detection levels,
# but this can be adjusted
plotRowPrevalence(
    GlobalPatterns, rank = "Phylum", assay.type = "relabundance",
    detection = c(0, 0.001, 0.01, 0.1, 0.2))

# point layout for plotRowPrevalence can be used to visualize by additional
# information
plotPrevalentAbundance(
    GlobalPatterns, rank = "Family", colour.by = "Phylum") +
    scale_x_log10()

# When using function plotPrevalentAbundace, it is possible to create facets
# with 'facet.by'.
plotPrevalentAbundance(
    GlobalPatterns, rank = "Family",
    colour.by = "Phylum", facet.by = "Kingdom") +
    scale_x_log10()
```

---

plotSeries *Plot Series*

Description

This function plots series data.

Usage

```
plotSeries(
  object,
  x,
  y = NULL,
  rank = NULL,
  colour.by = colour_by,
  colour_by = NULL,
  size.by = size_by,
  size_by = NULL,
  linetype.by = linetype_by,
  linetype_by = NULL,
  assay.type = assay_name,
  assay_name = "counts",
  ...
)

## S4 method for signature 'SummarizedExperiment'
plotSeries(
  object,
  x,
  y = NULL,
  rank = NULL,
  colour.by = colour_by,
  colour_by = NULL,
  size.by = size_by,
  size_by = NULL,
  linetype.by = linetype_by,
  linetype_by = NULL,
  assay.type = assay_name,
  assay_name = "counts",
  ...
)
```

Arguments

object	a SummarizedExperiment object.
x	Character scalar. selecting the column from ColData that will specify values of x-axis.
y	Character scalar. Selects the taxa from rownames. This parameter specifies taxa whose abundances will be plotted.
rank	Character scalar. A taxonomic rank, that is used to agglomerate the data. Must be a value of taxonomicRanks() function. (Default: NULL)
colour.by	Character scalar. A taxonomic rank, that is used to color plot. Must be a value of taxonomicRanks() function. (Default: NULL)
colour_by	Deprecated. Use colour.by instead.
size.by	Character scalar. A taxonomic rank, that is used to divide taxa to different line size types. Must be a value of taxonomicRanks() function. (Default: NULL)
size_by	Deprecated. Use size.by instead.

linetype.by	Character scalar. A taxonomic rank, that is used to divide taxa to different line types. Must be a value of taxonomicRanks() function. (Default: NULL)
linetype_by	Deprecated. Use linetype.by instead.
assay.type	Character scalar. selecting the assay to be plotted. (Default: "counts")
assay_name	Deprecated. Use assay.type instead.
...	additional parameters for plotting. See mia-plot-args for more details i.e. call help("mia-plot-args")

Details

This function creates series plot, where x-axis includes e.g. time points, and y-axis abundances of selected taxa.

Value

A ggplot2 object

Author(s)

Leo Lahti and Tuomas Borman. Contact: microbiome.github.io

Examples

```
## Not run:
library(mia)
# Load data from miaTime package
library("miaTime")
data(SilvermanAGutData)
object <- SilvermanAGutData

# Plots 2 most abundant taxa, which are colored by their family
plotSeries(object,
           x = "DAY_ORDER",
           y = getTop(object, 2),
           colour.by = "Family")

# Counts relative abundances
object <- transformAssay(object, method = "relabundance")

# Selects taxa
taxa <- c("seq_1", "seq_2", "seq_3", "seq_4", "seq_5")

# Plots relative abundances of phylums
plotSeries(object[taxa,],
           x = "DAY_ORDER",
           colour.by = "Family",
           linetype.by = "Phylum",
           assay.type = "relabundance")

# In addition to 'colour.by' and 'linetype.by', 'size.by' can also be used to group taxa.
plotSeries(object,
           x = "DAY_ORDER",
           y = getTop(object, 5),
           colour.by = "Family",
           size.by = "Phylum",
```

```
            assay.type = "counts")

## End(Not run)
```

---

plotTree *Plotting tree information enriched with information*

Description

Based on the stored data in a TreeSummarizedExperiment a tree can be plotted. From the rowData, the assays as well as the colData information can be taken for enriching the tree plots with additional information.

Usage

```
plotRowTree(x, ...)

plotColTree(x, ...)

## S4 method for signature 'TreeSummarizedExperiment'
plotColTree(
  x,
  tree.name = tree_name,
  tree_name = "phylo",
  relabel.tree = relabel_tree,
  relabel_tree = FALSE,
  order.tree = order_tree,
  order_tree = FALSE,
  levels.rm = remove_levels,
  remove_levels = FALSE,
  show.label = show_label,
  show_label = FALSE,
  show.highlights = show_highlights,
  show_highlights = FALSE,
  show.highlight.label = show_highlight_label,
  show_highlight_label = FALSE,
  abbr.label = abbr_label,
  abbr_label = FALSE,
  add.legend = add_legend,
  add_legend = TRUE,
  layout = "circular",
  edge.colour.by = edge.colour.by,
  edge_colour_by = NULL,
  edge.size.by = edge_size_by,
  edge_size_by = NULL,
  tip.colour.by = tip_colour_by,
  tip_colour_by = NULL,
  tip.shape.by = tip_shape_by,
  tip_shape_by = NULL,
  tip.size.by = tip_size_by,
  tip_size_by = NULL,
```

```
  node.colour.by = node_colour_by,
  node_colour_by = NULL,
  node.shape.by = node_shape_by,
  node_shape_by = NULL,
  node.size.by = node_size_by,
  node_size_by = NULL,
  colour.highlights.by = colour_highlights_by,
  colour_highlights_by = NULL,
  assay.type = by_exprs_values,
  by_exprs_values = "counts",
  other.fields = other_fields,
  other_fields = list(),
  ...
)

## S4 method for signature 'TreeSummarizedExperiment'
plotRowTree(
  x,
  tree.name = tree_name,
  tree_name = "phylo",
  relabel.tree = relabel_tree,
  relabel_tree = FALSE,
  order.tree = order_tree,
  order_tree = FALSE,
  levels.rm = remove_levels,
  remove_levels = FALSE,
  show.label = show_label,
  show_label = FALSE,
  show.highlights = show_highlights,
  show_highlights = FALSE,
  show.highlight.label = show_highlight_label,
  show_highlight_label = FALSE,
  abbr.label = abbr_label,
  abbr_label = FALSE,
  add.legend = add_legend,
  add_legend = TRUE,
  layout = "circular",
  edge.colour.by = edge_colour_by,
  edge_colour_by = NULL,
  edge.size.by = edge_size_by,
  edge_size_by = NULL,
  tip.colour.by = tip_colour_by,
  tip_colour_by = NULL,
  tip.shape.by = tip_shape_by,
  tip_shape_by = NULL,
  tip.size.by = tip_size_by,
  tip_size_by = NULL,
  node.colour.by = node_colour_by,
  node_colour_by = NULL,
  node.shape.by = node_shape_by,
  node_shape_by = NULL,
  node.size.by = node_size_by,
```

```
  node_size_by = NULL,
  colour.highlights.by = colour_highlights_by,
  colour_highlights_by = NULL,
  assay.type = by_exprs_values,
  by_exprs_values = "counts",
  other.fields = other_fields,
  other_fields = list(),
  ...
)
```

Arguments

x	a TreeSummarizedExperiment x.
...	additional arguments for plotting. See mia-plot-args for more details i.e. call help("mia-plot-args")
tree.name	Character scalar. Specifies a rowTree/colTree from x. (Default: tree.name = "phylo")
tree_name	Deprecated. Use tree.name instead.
relabel.tree	Logical scalar. Should the tip labels be relabeled using the output of getTaxonomyLabels(x, with_rank = TRUE)? (Default: FALSE)
relabel_tree	Deprecated. Use relavel.tree instead.
order.tree	Logical scalar. Should the tree be ordered based on alphabetic order of taxonomic levels? (Default: FALSE)
order_tree	Deprecated. Use order.tree instead.
levels.rm	Logical scalar. Should taxonomic level information be removed from labels? (Default: FALSE)
remove_levels	Deprecated. Use levels.rm instead.
show.label, show.highlights, show.highlight.label, abbr.label	logical (scalar), integer or character vector. If a logical scalar is given, should tip labels be plotted or if a logical vector is provided, which labels should be shown? If an integer or character vector is provided, it will be converted to a logical vector. The integer values must be in the range of 1 and number of nodes, whereas the values of a character vector must match values of the label column in the node data. In case of a character vector only values corresponding to actual labels will be plotted and if no labels are provided no labels will be shown. (default: FALSE)
show_label, show_highlights, show_highlight_label, abbr_label	Deprecated. Use show.label, show.highlights, show.highlight.label, abbr_label instead.
add.legend	Logical scalar. Should legends be plotted? (Default: TRUE)
add_legend	Deprecated. Use add.legend instead.
layout	layout for the plotted tree. See ggtree for details.
edge.colour.by	Character scalar. Specification of a column metadata field or a feature to colour tree edges by, see the by argument in ?retrieveCellInfo for possible values.
edge_colour_by	Deprecated. Use edge.colour.by instead.
edge.size.by	Character scalar. Specification of a column metadata field or a feature to size tree edges by, see the by argument in ?retrieveCellInfo for possible values. (Default: NULL)

edge_size_by Deprecated. Use edge.size.by instead.

tip.colour.by Character scalar. Specification of a column metadata field or a feature to colour tree tips by, see the by argument in ?retrieveCellInfo for possible values. (Default: NULL)

tip_colour_by Deprecated. Use tip.colour.by instead.

tip.shape.by Character scalar. Specification of a column metadata field or a feature to shape tree tips by, see the by argument in ?retrieveCellInfo for possible values. (Default: NULL)

tip_shape_by Deprecated. Use tip.shape.by isntead.

tip.size.by Character scalar. Specification of a column metadata field or a feature to size tree tips by, see the by argument in ?retrieveCellInfo for possible values. (Default: NULL)

tip_size_by Deprecated. Use tip.size.by instead.

node.colour.by Character scalar. Specification of a column metadata field or a feature to colour tree nodes by. Must be a field from other.fields. (Default: NULL)

node_colour_by Deprecated. Use node.colour.by instead.

node.shape.by Character scalar. Specification of a column metadata field or a feature to shape tree nodes by. Must be a field from other.fields. (Default: NULL)

node_shape_by Deprecated. Use node.shape.by instead.

node.size.by Character scalar. Specification of a column metadata field or a feature to size tree nodes by. Must be a field from other.fields. (Default: NULL)

node_size_by Deprecated. Use node.size.by instead.

colour.highlights.by Logical scalar. Should the highlights be colour differently? If show.highlights = TRUE, colour_highlights will be set to TRUE as default. (Default: FALSE)

colour_highlights_by Deprecated. Use colour.highlights.by instead.

assay.type Character scalar. or integer scalar. Specifies which assay to obtain expression values from, for use in point aesthetics - see the exprs_values argument in ?retrieveCellInfo. (Default: "counts")

by_exprs_values Deprecated. Use assay.type instead.

other.fields Character vector. Additional fields to include in the node information without plotting them. (Default: list())

other_fields Deprecated. Use other.fields instead.

Details

If show.label or show.highlight.label have the same length as the number of nodes, the vector will be used to relabel the nodes.

Value

a ggtree plot

See Also

agglomerateByRanks

Examples

```
library(scater)
library(mia)
# preparation of some data
data(GlobalPatterns)
GlobalPatterns <- agglomerateByRanks(GlobalPatterns)
altExp(GlobalPatterns,"Genus") <- addPerFeatureQC(altExp(GlobalPatterns,"Genus"))
rowData(altExp(GlobalPatterns,"Genus"))$log_mean <-
  log(rowData(altExp(GlobalPatterns,"Genus"))$mean)
rowData(altExp(GlobalPatterns,"Genus"))$detected <-
   rowData(altExp(GlobalPatterns,"Genus"))$detected / 100
top_genus <- getTop(altExp(GlobalPatterns,"Genus"),
                        method="mean",
                        top=100L,
                        assay.type="counts")
#
x <- altExp(GlobalPatterns,"Genus")
plotRowTree(x[rownames(x) %in% top_genus,],
            tip.colour.by = "log_mean",
            tip.size.by = "detected")

# plot with tip labels
plotRowTree(x[rownames(x) %in% top_genus,],
            tip.colour.by = "log_mean",
            tip.size.by = "detected",
            show.label = TRUE)
# plot with selected labels
labels <- c("Genus:Providencia", "Genus:Morganella", "0.961.60")
plotRowTree(x[rownames(x) %in% top_genus,],
            tip.colour.by = "log_mean",
            tip.size.by = "detected",
            show.label = labels,
            layout="rectangular")

# plot with labeled edges
plotRowTree(x[rownames(x) %in% top_genus,],
            edge.colour.by = "Phylum",
            tip.colour.by = "log_mean")
# if edges are sized, colours might disappear depending on plotting device
plotRowTree(x[rownames(x) %in% top_genus,],
            edge.colour.by = "Phylum",
            edge.size.by = "detected",
            tip.colour.by = "log_mean")

# aggregating data over the taxonomic levels for plotting a taxonomic tree
# please note that the original tree of GlobalPatterns is dropped by
# unsplitByRanks
altExps(GlobalPatterns) <- splitByRanks(GlobalPatterns)
top_phyla <- getTop(altExp(GlobalPatterns,"Phylum"),
                        method="mean",
                        top=10L,
                        assay.type="counts")
altExps(GlobalPatterns) <- lapply(altExps(GlobalPatterns), addPerFeatureQC)
altExps(GlobalPatterns) <-
   lapply(altExps(GlobalPatterns),
          function(y){
```

```
            rowData(y)$log_mean <- log(rowData(y)$mean)
            rowData(y)$detected <- rowData(y)$detected / 100
            y
        })
x <- unsplitByRanks(GlobalPatterns)
x <- addHierarchyTree(x)

highlights <- c("Phylum:Firmicutes","Phylum:Bacteroidetes",
              "Family:Pseudomonadaceae","Order:Bifidobacteriales")
plotRowTree(x[rowData(x)$Phylum %in% top_phyla,],
            tip.colour.by = "log_mean",
            node.colour.by = "log_mean",
            show.highlights = highlights,
            show.highlight.label = highlights,
            colour.highlights.by = "Phylum")

plotRowTree(x[rowData(x)$Phylum %in% top_phyla,],
            edge.colour.by = "Phylum",
            edge.size.by = "detected",
            tip.colour.by = "log_mean",
            node.colour.by = "log_mean")
```

`treeData` *Adding information to tree data in* `TreeSummarizedExperiment`

Description

To facilitate the dressing of the tree data stored in a `TreeSummarizedExperiment` object, `rowTreeData` and `colTreeData` can be used.

Usage

```
rowTreeData(x, ...)

colTreeData(x, ...)

rowTreeData(x, tree.name = tree_name, tree_name = "phylo") <- value

colTreeData(x, tree.name = tree_name, tree_name = "phylo") <- value

combineTreeData(x, other.fields = other_fields, other_fields = list())

combineTreeData(x, other.fields = other_fields, other_fields = list())

## S4 method for signature 'TreeSummarizedExperiment'
colTreeData(x, tree.name = tree_name, tree_name = "phylo")

## S4 method for signature 'TreeSummarizedExperiment'
rowTreeData(x, tree.name = tree_name, tree_name = "phylo")

## S4 replacement method for signature 'TreeSummarizedExperiment'
colTreeData(x, tree.name = tree_name, tree_name = "phylo") <- value
```

```
## S4 replacement method for signature 'TreeSummarizedExperiment'
rowTreeData(x, tree.name = tree_name, tree_name = "phylo") <- value

## S4 method for signature 'phylo'
combineTreeData(x, other.fields = other_fields, other_fields = list())

## S4 method for signature 'treedata'
combineTreeData(x, other.fields = other_fields, other_fields = list())
```

Arguments

x	a TreeSummarizedExperiment object.
...	additional arguments, currently not used.
tree.name	Character scalar. Specifies a rowTree/colTree from x. (Default: "phylo")
tree_name	Deprecated. Use tree.name instead.
other.fields, value	a data.frame or coercible to one, with at least one type of id information. See details.(Default: list())
other_fields	Deprecated. Use other.fields instead.

Details

To match information to nodes, the id information in other.fields are used. These can either be a column, named 'node' or 'label' ('node' taking precedent), or rownames. If all rownames can be coerced to integer, they are considered as 'node' values, otherwise as 'label' values. The id information must be unique and match available values of rowTreeData(c)

The result of the accessors, rowTreeData and colTreeData, contain at least a 'node' and 'label' column.

Value

a data.frame for the accessor and the modified TreeSummarizedExperiment object

Examples

```
data(GlobalPatterns)
td <- rowTreeData(GlobalPatterns)
td
td$test <- rnorm(nrow(td))
rowTreeData(GlobalPatterns) <- td
rowTreeData(GlobalPatterns)
combineTreeData(rowTree(GlobalPatterns), td)
```

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