Package ‘animalcules’

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Title Interactive microbiome analysis toolkit

Version 1.4.0

Description animalcules is an R package for utilizing up-to-date data analytics, visualization methods, and machine learning models to provide users an easy-to-use interactive microbiome analysis framework. It can be used as a standalone software package or users can explore their data with the accompanying interactive R Shiny application. Traditional microbiome analysis such as alpha/beta diversity and differential abundance analysis are enhanced, while new methods like biomarker identification are introduced by animalcules. Powerful interactive and dynamic figures generated by animalcules enable users to understand their data better and discover new insights.

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LazyData false

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Author Yue Zhao [aut, cre] (<https://orcid.org/0000-0001-5257-5103>),
Anthony Federico [aut] (<https://orcid.org/0000-0002-9200-1689>),
W. Evan Johnson [aut] (<https://orcid.org/0000-0002-6247-6595>)

Maintainer Yue Zhao <`yuezh@bu.edu`>

R topics documented:

`alpha_div_boxplot` *Alpha diversity boxplot*

Description

Alpha diversity boxplot

Usage

```
alpha_div_boxplot(
  MAE,
  tax_level,
  condition,
 alpha_metric = c("inverse_simpson", "gini_simpson", "shannon", "fisher", "coverage")
)
```

Arguments

`MAE`	A multi-assay experiment object
`tax_level`	The taxon level used for organisms
`condition`	Which condition to group samples
`alpha_metric`	Which alpha diversity metric to use

Value

A plotly object

Examples

```
data_dir = system.file('extdata/MAE.rds', package = 'animalcules')
toy_data <- readRDS(data_dir)
p <- alpha_div_boxplot(toy_data,
                       tax_level = 'genus',
                       condition = 'DISEASE',
                       alpha_metric = 'shannon')
p
```

`alpha_div_test` *Get alpha diversity*

Description

Get alpha diversity

Usage

```
alpha_div_test(sam_table, alpha_stat)
```

Arguments

`sam_table`	A dataframe with 2 cols, richness and condition
`alpha_stat`	Wilcoxon rank sum test or T-test for the test

Value

A dataframe

Examples

```
df_test <- data.frame(richness = seq_len(10),
condition = c(rep(1,5), rep(0,5)))
alpha_div_test(df_test,alpha_stat='Wilcoxon rank sum test')
```

`counts_to_logcpm` *Covert a counts table to a relative abundances table*

Description

Covert a counts table to a relative abundances table

Usage

```
counts_to_logcpm(counts_table)
```

Arguments

`counts_table`	A organism x sample data frame of counts

Value

A organism x sample data frame of logcpm counts

Examples

```
logcpm <- counts_to_logcpm(as.data.frame(matrix(seq_len(12),4)))
```

`counts_to_relabu` *Covert a counts table to a relative abundances table*

Description

Covert a counts table to a relative abundances table

Usage

```
counts_to_relabu(counts_table)
```

Arguments

`counts_table`	A organism x sample data frame of counts

Value

A organism x sample data frame of relative abundances

Examples

```
counts_to_relabu(matrix(seq_len(12),4))
```

`df_char_to_factor` *Factorize all categorical columns*

Description

Factorize all categorical columns

Usage

```
df_char_to_factor(df)
```

Arguments

`df`	A sample x condition data frame

Value

A sample x condition data frame

Examples

```
df_char_to_factor(matrix(seq_len(12)))
```

`differential_abundance` *Differential abundance analysis*

Description

Differential abundance analysis

Usage

```
differential_abundance(
  MAE,
  tax_level,
  input_da_condition = c(),
  input_da_condition_covariate = NULL,
  min_num_filter = 5,
  input_da_padj_cutoff = 0.05,
  method = "DESeq2"
)
```

Arguments

`MAE`	A multi-assay experiment object
`tax_level`	The taxon level used for organisms
`input_da_condition`	Which condition is the target condition
`input_da_condition_covariate`	Covariates added to linear function
`min_num_filter`	Minimum number reads mapped to this microbe
`input_da_padj_cutoff`	adjusted pValue cutoff
`method`	choose between DESeq2 and limma

Value

A output dataframe

Examples

```
data_dir = system.file("extdata/MAE.rds", package = "animalcules")
toy_data <- readRDS(data_dir)
differential_abundance(toy_data,
tax_level="phylum",
input_da_condition=c("DISEASE"),
min_num_filter = 2,
input_da_padj_cutoff = 0.5,
method = "DESeq2")
```

`dimred_pca` *Dimensionality reduction through PCA*

Description

Dimensionality reduction through PCA

Usage

```
dimred_pca(
  MAE,
  tax_level,
  color,
  shape = NULL,
  pcx = 1,
  pcy = 2,
  pcz = NULL,
  datatype = c("logcpm", "relabu", "counts")
)
```

Arguments

`MAE`	A multi-assay experiment object
`tax_level`	The taxon level used for organisms
`color`	A condition to color data points by e.g. "AGE"
`shape`	A condition to shape data points by e.g. "SEX"
`pcx`	Principal component on the x-axis e.g. 1
`pcy`	Principal component on the y-axis e.g. 2
`pcz`	Principal component on the z-axis e.g. 3
`datatype`	Datatype to use e.g. c("logcpm", "relabu", "counts")

Value

A list with a plotly object and summary table

Examples

```
data_dir = system.file("extdata/MAE.rds", package = "animalcules")
toy_data <- readRDS(data_dir)
result <- dimred_pca(toy_data,
                     tax_level="genus",
                     color="AGE",
                     shape="DISEASE",
                     pcx=1,
                     pcy=2,
                     datatype="logcpm")
result$plot
result$table
```

`dimred_pcoa` *Dimensionality reduction through PCoA*

Description

Dimensionality reduction through PCoA

Usage

```
dimred_pcoa(
  MAE,
  tax_level,
  color,
  shape = NULL,
  axx = 1,
  axy = 2,
  axz = NULL,
  method = c("bray", "jaccard")
)
```

Arguments

`MAE`	A multi-assay experiment object
`tax_level`	The taxon level used for organisms
`color`	A condition to color data points by e.g. "AGE"
`shape`	A condition to shape data points by e.g. "SEX"
`axx`	Principle coordinate on the x-axis e.g. 1
`axy`	Principle coordinate on the y-axis e.g. 2
`axz`	Principle coordinate on the z-axis e.g. 2
`method`	Method to use e.g. c("bray", "jaccard")

Value

A list with a plotly object and summary table

Examples

```
data_dir = system.file("extdata/MAE.rds", package = "animalcules")
toy_data <- readRDS(data_dir)
result <- dimred_pcoa(toy_data,
                      tax_level="genus",
                      color="AGE",
                      shape="DISEASE",
                      axx=1,
                      axy=2,
                      method="bray")
result$plot
result$table
```

`dimred_tsne` *Dimensionality reduction through t-SNE*

Description

Dimensionality reduction through t-SNE

Usage

```
dimred_tsne(
  MAE,
  tax_level,
  color,
  shape = NULL,
  k = c("2D", "3D"),
  initial_dims = 30,
  perplexity = 10,
  datatype = c("logcpm", "relabu", "counts"),
  tsne_cache = NULL
)
```

Arguments

`MAE`	A multi-assay experiment object
`tax_level`	The taxon level used for organisms
`color`	A condition to color data points by e.g. "AGE"
`shape`	A condition to shape data points by e.g. "SEX"
`k`	Plot dimensions e.g. c("2D","3D")
`initial_dims`	The number of dimensions to use in reduction method
`perplexity`	Optimal number of neighbors
`datatype`	Datatype to use e.g. c("logcpm", "relabu", "counts")
`tsne_cache`	Pass the cached data back into the function

Value

A list with a plotly object and cached data

Examples

```
data_dir = system.file("extdata/MAE.rds", package = "animalcules")
toy_data <- readRDS(data_dir)
results <- dimred_tsne(toy_data,
                       tax_level="phylum",
                       color="AGE",
                       shape="GROUP",
                       k="3D",
                       initial_dims=30,
                       perplexity=10,
                       datatype="logcpm")
results$plot
```

`dimred_umap` *Dimensionality reduction through PCA*

Description

Dimensionality reduction through PCA

Usage

```
dimred_umap(
  MAE,
  tax_level,
  color,
  shape = NULL,
  cx = 1,
  cy = 2,
  cz = NULL,
  n_neighbors = 15,
  metric = c("euclidean", "manhattan"),
  n_epochs = 200,
  init = c("spectral", "random"),
  min_dist = 0.1,
  datatype = c("logcpm", "relabu", "counts")
)
```

Arguments

`MAE`	A multi-assay experiment object
`tax_level`	The taxon level used for organisms
`color`	A condition to color data points by e.g. "AGE"
`shape`	A condition to shape data points by e.g. "SEX"
`cx`	Component on the x-axis e.g. 1
`cy`	Component on the y-axis e.g. 2
`cz`	Component on the z-axis e.g. 3
`n_neighbors`	Number of nearest neighbors
`metric`	Distance function e.g. c("euclidean", "manhattan")
`n_epochs`	Number of iterations
`init`	Initial embedding using eigenvector e.g c("spectral", "random")
`min_dist`	Determines how close points appear in the final layout
`datatype`	Datatype to use e.g. c("logcpm", "relabu", "counts")

Value

A list with a plotly object and summary table

Examples

```
data_dir = system.file("extdata/MAE.rds", package = "animalcules")
toy_data <- readRDS(data_dir)
result <- dimred_umap(toy_data,
                      tax_level="genus",
                      color="AGE",
                      shape="DISEASE",
                      cx=1,
                      cy=2,
                      datatype="logcpm")
result$plot
```

`diversities` *Get alpha diversity*

Description

Get alpha diversity

Usage

```
diversities(counts_table, index = "all", zeroes = TRUE)
```

Arguments

`counts_table`	A dataframe with organism x sample
`index`	One of inverse_simpson,gini_simpson,shannon,fisher,coverage
`zeroes`	A boolean for whether to ignore zero values

Value

A list of alpha diversity

Examples

```
diversities(matrix(seq_len(12), nrow = 3),index="shannon")
```

`diversities_help` *Get alpha diversity*

Description

Get alpha diversity

Usage

```
diversities_help(counts_table, index = "all", zeroes = TRUE)
```

Arguments

`counts_table`	A dataframe with organism x sample
`index`	one of inverse_simpson,gini_simpson,shannon,fisher,coverage
`zeroes`	A boolean for whether to ignore zero values

Value

A list of alpha diversity

Examples

```
diversities_help(matrix(seq_len(12), nrow = 3),index='shannon')
```

`diversity_beta_boxplot` *Beta diversity boxplot*

Description

Beta diversity boxplot

Usage

```
diversity_beta_boxplot(
  MAE,
  tax_level,
  input_beta_method,
  input_select_beta_condition
)
```

Arguments

`MAE`	A multi-assay experiment object
`tax_level`	The taxon level used for organisms
`input_beta_method`	bray, jaccard
`input_select_beta_condition`	Which condition to group samples

Value

A plotly object

Examples

```
data_dir = system.file('extdata/MAE.rds', package = 'animalcules')
toy_data <- readRDS(data_dir)
p <- diversity_beta_boxplot(toy_data,
                            tax_level = 'genus',
                            input_beta_method = 'bray',
                            input_select_beta_condition = 'DISEASE')
p
```

`diversity_beta_heatmap` *Beta diversity heatmap*

Description

Beta diversity heatmap

Usage

```
diversity_beta_heatmap(
  MAE,
  tax_level,
  input_beta_method,
  input_bdhm_select_conditions,
  input_bdhm_sort_by = c("nosort", "conditions")
)
```

Arguments

`MAE`	A multi-assay experiment object
`tax_level`	The taxon level used for organisms
`input_beta_method`	bray, jaccard
`input_bdhm_select_conditions`	Which condition to group samples
`input_bdhm_sort_by`	Sorting option e.g. "nosort", "conditions"

Value

A plotly object

Examples

```
data_dir = system.file("extdata/MAE.rds", package = "animalcules")
toy_data <- readRDS(data_dir)
p <- diversity_beta_heatmap(toy_data,
                            tax_level = "genus",
                            input_beta_method = "bray",
                            input_bdhm_select_conditions = "DISEASE",
```

```
                              input_bdhm_sort_by = "conditions")
p
```

`diversity_beta_test` *Beta diversity test (by default we use bray-curtis distance)*

Description

Beta diversity test (by default we use bray-curtis distance)

Usage

```
diversity_beta_test(
  MAE,
  tax_level,
  input_beta_method,
  input_select_beta_condition,
  input_select_beta_stat_method,
  input_num_permutation_permanova = 999
)
```

Arguments

`MAE`	A multi-assay experiment object
`tax_level`	The taxon level used for organisms
`input_beta_method`	bray, jaccard
`input_select_beta_condition`	Which condition to group samples
`input_select_beta_stat_method`	PERMANOVA,Kruskal-Wallis,Wilcoxon test
`input_num_permutation_permanova`	number of permutations

Value

A plotly object

Examples

```
data_dir = system.file('extdata/MAE.rds', package = 'animalcules')
toy_data <- readRDS(data_dir)
p <- diversity_beta_test(toy_data,
                         tax_level = 'genus',
                         input_beta_method = 'bray',
                         input_select_beta_condition = 'DISEASE',
                         input_select_beta_stat_method = 'PERMANOVA',
                         input_num_permutation_permanova = 999)
p
```

`do_alpha_div_test` *Alpha diversity statistical test*

Description

Alpha diversity statistical test

Usage

```
do_alpha_div_test(
  MAE,
  tax_level,
  condition,
 alpha_metric = c("inverse_simpson", "gini_simpson", "shannon", "fisher", "coverage"),
  alpha_stat = c("Wilcoxon rank sum test", "T-test", "Kruskal-Wallis")
)
```

Arguments

`MAE`	A multi-assay experiment object
`tax_level`	The taxon level used for organisms
`condition`	Which condition to group samples
`alpha_metric`	Which alpha diversity metric to use
`alpha_stat`	Which stat test to use

Value

A dataframe

Examples

```
data_dir = system.file("extdata/MAE.rds", package = "animalcules")
toy_data <- readRDS(data_dir)
p <- do_alpha_div_test(toy_data,
                       tax_level = "genus",
                       condition = "DISEASE",
                       alpha_metric = "shannon",
                       alpha_stat = "Wilcoxon rank sum test")
p
```

`filter_categorize` *Categorize continuous variables*

Description

Categorize continuous variables

Usage

```
filter_categorize(
  sam_table,
  sample_condition,
  new_label,
  nbins = NULL,
  bin_breaks = c(),
  bin_labels = c()
)
```

Arguments

`sam_table`	A sample x condition dataframe
`sample_condition`	Continuous variable to categorize
`new_label`	Column name for categorized variable
`nbins`	Auto select ranges for n bins/categories
`bin_breaks`	Manually select ranges for bins/categories
`bin_labels`	Manually label bins/categories

Value

A list with an updated sample table and before/after plots

Examples

```
library(SummarizedExperiment)
data_dir = system.file('extdata/MAE.rds', package = 'animalcules')
toy_data <- readRDS(data_dir)
microbe <- MultiAssayExperiment::experiments(toy_data)[[1]]
samples <- as.data.frame(colData(microbe))
result <- filter_categorize(samples,
                            sample_condition = 'AGE',
                            new_label='AGE_GROUP',
                            bin_breaks=c(0,55,75,100),
                            bin_labels=c('Young','Adult','Elderly'))
result$sam_table
result$plot.unbinned
result$plot.binned
```

`filter_summary_bar_density` *Data visualization by bar plot / density plot*

Description

Data visualization by bar plot / density plot

Usage

```
filter_summary_bar_density(MAE, samples_discard, filter_type, sample_condition)
```

Arguments

`MAE`	A multi-assay experiment object
`samples_discard`	The list of samples to filter
`filter_type`	Either 'By Microbes' or 'By Metadata'
`sample_condition`	Which condition to check e.g. 'SEX'

Value

A plotly object

Examples

```
data_dir = system.file('extdata/MAE.rds', package = 'animalcules')
toy_data <- readRDS(data_dir)
result <- filter_summary_bar_density(toy_data,
                                     samples_discard = c('subject_2', 'subject_4'),
                                     filter_type = 'By Metadata',
                                     sample_condition = 'SEX')
result
```

`filter_summary_pie_box` *Data visualization by pie chart / box plot*

Description

Data visualization by pie chart / box plot

Usage

```
filter_summary_pie_box(MAE, samples_discard, filter_type, sample_condition)
```

Arguments

`MAE`	A multi-assay experiment object
`samples_discard`	The list of samples to filter
`filter_type`	Either 'By Microbes' or 'By Metadata'
`sample_condition`	Which condition to check e.g. 'SEX'

Value

A plotly object

Examples

```
data_dir = system.file('extdata/MAE.rds', package = 'animalcules')
toy_data <- readRDS(data_dir)
result <- filter_summary_pie_box(toy_data,
                                 samples_discard = c('subject_2', 'subject_4'),
                                 filter_type = 'By Microbes',
                                 sample_condition = 'SEX')
result
```

`find_biomarker` *Identify biomarkers*

Description

Identify biomarkers

Usage

```
find_biomarker(
  MAE,
  tax_level,
  input_select_target_biomarker,
  nfolds = 3,
  nrepeats = 3,
  seed = 99,
  percent_top_biomarker = 0.2,
  model_name = c("logistic regression", "random forest")
)
```

Arguments

`MAE`	A multi-assay experiment object
`tax_level`	The taxon level used for organisms
`input_select_target_biomarker`	Which condition is the target condition
`nfolds`	number of splits in CV

`nrepeats`	number of CVs with different random splits
`seed`	for repeatable research
`percent_top_biomarker`	Top importance percentage to pick biomarker
`model_name`	one of 'logistic regression', 'random forest'

Value

A list

Examples

```
data_dir = system.file('extdata/MAE.rds', package = 'animalcules')
toy_data <- readRDS(data_dir)
p <- find_biomarker(toy_data,
                    tax_level='genus',
                    input_select_target_biomarker=c('DISEASE'),
                    nfolds = 3,
                    nrepeats = 3,
                    seed = 99,
                    percent_top_biomarker = 0.2,
                    model_name = 'logistic regression')
p
```

`find_taxonomy` *Find the taxonomy for unlimited tids*

Description

Find the taxonomy for unlimited tids

Usage

```
find_taxonomy(tids)
```

Arguments

`tids`	Given taxonomy ids

Value

A list of taxon levels with information

Examples

```
taxonLevels <- find_taxonomy(tids=1200)
```

`find_taxonomy_300` *Find the taxonomy for maximum 300 tids*

Description

Find the taxonomy for maximum 300 tids

Usage

```
find_taxonomy_300(tids)
```

Arguments

`tids`	Given taxonomy ids

Value

taxondata Data with the taxonomy information

Examples

```
taxonLevels <- find_taxonomy_300(tids=1200)
```

`find_taxon_mat` *Find the Taxonomy Information Matrix*

Description

Find the Taxonomy Information Matrix

Usage

```
find_taxon_mat(names, taxonLevels)
```

Arguments

`names`	Row names of the taxonomy matrix
`taxonLevels`	Taxon Levels of all tids

Value

taxmat Taxonomy Information Matrix

Examples

```
ids <- c("ti|54005", "ti|73001", "ti|573", "ti|228277", "ti|53458")
tids <- c("54005", "73001", "573", "228277", "53458")
taxonLevels <- find_taxonomy(tids)
tax_table <- find_taxon_mat(ids, taxonLevels)
```

`gini_simpson` *Get alpha diversity using gini*

Description

Get alpha diversity using gini

Usage

```
gini_simpson(x)
```

Arguments

`x`	A list of counts

Value

A single value

Examples

```
gini_simpson(seq_len(10))
```

`grep_tid` *Greps the tid from the given identifier string*

Description

Greps the tid from the given identifier string

Usage

```
grep_tid(id)
```

Arguments

`id`	Given identifier string

Value

tid string

Examples

```
grep_tid("ti|700015|org|Coriobacterium_glomerans_PW2")
```

`inverse_simpson` *Get alpha diversity using inverse simpson*

Description

Get alpha diversity using inverse simpson

Usage

```
inverse_simpson(x)
```

Arguments

`x`	A list of counts

Value

A single value

Examples

```
inverse_simpson(seq_len(10))
```

`is_categorical` *Check if object is categorical*

Description

Check if object is categorical

Usage

```
is_categorical(v)
```

Arguments

`v`	A single value

Value

Boolean

Examples

```
nums <- 2
is_categorical(nums)
```

`is_integer0` *check if integer(0)*

Description

check if integer(0)

Usage

```
is_integer0(x)
```

Arguments

`x`	A single value

Value

Boolean

Examples

```
nums <- 2
is_integer0(nums)
```

`is_integer1` *check if integer(1)*

Description

check if integer(1)

Usage

```
is_integer1(x)
```

Arguments

`x`	A single value

Value

Boolean

Examples

```
nums <- 2
is_integer1(nums)
```

`mae_pick_organisms` *Modify organisms of multi-assay experiment object*

Description

Modify organisms of multi-assay experiment object

Usage

```
mae_pick_organisms(MAE, isolate_organisms = NULL, discard_organisms = NULL)
```

Arguments

<table>
<tr><th></th><th></th></tr>
<tr><td><code>MAE</code></td><td>A multi-assay experiment object</td></tr>
<tr><td><code>isolate_organisms</code></td><td>Isolate specific organisms e.g. ti|001, ti|002</td></tr>
<tr><td><code>discard_organisms</code></td><td>Discard specific organisms e.g. ti|001, ti|002</td></tr>
</table>

Value

A multi-assay experiment object

Examples

```
data_dir = system.file('extdata/MAE.rds', package = 'animalcules')
toy_data <- readRDS(data_dir)
subset <- mae_pick_organisms(toy_data,
isolate_organisms=c('ti|001', 'ti|002'))
```

`mae_pick_samples` *Modify samples of multi-assay experiment object*

Description

Modify samples of multi-assay experiment object

Usage

```
mae_pick_samples(MAE, isolate_samples = NULL, discard_samples = NULL)
```

Arguments

`MAE`	A multi-assay experiment object
`isolate_samples`	Isolate specific samples e.g. c('SAM_01', 'SAM_02')
`discard_samples`	Discard specific samples e.g. c('SAM_01', 'SAM_02')

Value

A multi-assay experiment object

Examples

```
data_dir = system.file('extdata/MAE.rds', package = 'animalcules')
toy_data <- readRDS(data_dir)
subset <- mae_pick_samples(toy_data,
isolate_samples=c('subject_9',
'subject_14'))
```

`pct2str` *Converts decimal percentage to string with specified digits*

Description

Converts decimal percentage to string with specified digits

Usage

```
pct2str(v, digits = 2)
```

Arguments

`v`	A single value
`digits`	number of digits

Value

Boolean

Examples

```
nums <- 0.23
pct2str(nums)
```

`percent` *Format decimals to percentages*

Description

Format decimals to percentages

Usage

```
percent(x, digits = 2, format = "f")
```

Arguments

`x`	An array of decimals
`digits`	number of digits
`format`	f

Value

An array of formatted strings

Examples

```
nums <- c(0.42, 0.15, 0.4, 0.563, 0.2)
percent(nums)
```

`read_pathoscope_data` *Reads the data from PathoScope reports and returns a list of final guess relative abundance and count data*

Description

Reads the data from PathoScope reports and returns a list of final guess relative abundance and count data

Usage

```
read_pathoscope_data(
  input_dir = ".",
  pathoreport_file_suffix = "-sam-report.tsv",
  use.input.files = FALSE,
  input.files.path.vec = NULL,
  input.files.name.vec = NULL
)
```

Arguments

`input_dir`	Directory where the tsv files from PathoScope are located
`pathoreport_file_suffix`	PathoScope report files suffix
`use.input.files`	whether input dir to pathoscope files or directly pathoscope files
`input.files.path.vec`	vector of pathoscope file paths
`input.files.name.vec`	vector of pathoscope file names

Value

List of final guess relative abundance and count data

`relabu_barplot` *Plot bar plots of sample and group level relative abundance*

Description

Plot bar plots of sample and group level relative abundance

Usage

```
relabu_barplot(
  MAE,
  tax_level,
  order_organisms = c(),
  sort_by = c("nosort", "conditions", "organisms"),
  group_samples = FALSE,
  group_conditions = "ALL",
  sample_conditions = c(),
  isolate_samples = c(),
  discard_samples = c(),
  show_legend = TRUE
)
```

Arguments

`MAE`	A multi-assay experiment object
`tax_level`	The taxon level used for organisms
`order_organisms`	A character list of organisms to send to top
`sort_by`	Sort bars by one of c("nosort", "conditions", "organisms")
`group_samples`	A bool specifying whether to group samples
`group_conditions`	Group by one or more conditions e.g. "ALL" or "SEX"
`sample_conditions`	Plot associatied conditions with samples.
`isolate_samples`	Isolate specific samples e.g. c("SAM_01", "SAM_02")
`discard_samples`	Discard specific samples e.g. c("SAM_01", "SAM_02")
`show_legend`	A bool specifying whether or not to show organisms legend

Value

A plotly object

Examples

```
data_dir = system.file("extdata/MAE.rds", package = "animalcules")
toy_data <- readRDS(data_dir)
p <- relabu_barplot(toy_data,
                    tax_level="family",
                    order_organisms=c('Retroviridae'),
                    sort_by="organisms",
                    sample_conditions=c('SEX', 'AGE'),
                    show_legend=TRUE)
p
```

`relabu_boxplot` *Plot boxplots comparing different organism prevalence across conditions*

Description

Plot boxplots comparing different organism prevalence across conditions

Usage

```
relabu_boxplot(
  MAE,
  tax_level,
  condition,
  organisms = c(),
  datatype = c("counts", "relative abundance", "logcpm")
)
```

Arguments

`MAE`	A multi-assay experiment object
`tax_level`	The taxon level used for organisms
`condition`	Compare groups by condition e.g. 'SEX'
`organisms`	Include organisms for plotting.
`datatype`	counts, relative abundance,logcpm

Value

A plotly object

Examples

```
data_dir = system.file('extdata/MAE.rds', package = 'animalcules')
toy_data <- readRDS(data_dir)
p <- relabu_boxplot(toy_data,
                    tax_level='genus',
                    organisms=c('Escherichia', 'Actinomyces'),
                    condition='SEX',
                    datatype='logcpm')
p
```

---

relabu_heatmap *Plot heatmap of sample level counts in logcpm*

Description

Plot heatmap of sample level counts in logcpm

Usage

```
relabu_heatmap(
  MAE,
  tax_level,
  sort_by = c("nosort", "conditions", "organisms"),
  sample_conditions = c(),
  isolate_organisms = c(),
  isolate_samples = c(),
  discard_samples = c(),
  log_cpm = TRUE
)
```

Arguments

`MAE`	A multi-assay experiment object
`tax_level`	The taxon level used for organisms
`sort_by`	Sort bars by one of c('nosort', 'conditions', 'organisms')
`sample_conditions`	Plot conditions e.g. c('SEX', 'AGE')
`isolate_organisms`	Isolate specific organisms e.g. c('Hepacivirus')
`isolate_samples`	Isolate specific samples e.g. c('SAM_01', 'SAM_02')
`discard_samples`	Discard specific samples e.g. c('SAM_01', 'SAM_02')
`log_cpm`	Convert counts to logcpm

Value

A plotly object

Examples

```
data_dir = system.file('extdata/MAE.rds', package = 'animalcules')
toy_data <- readRDS(data_dir)
p <- relabu_heatmap(toy_data,
                  tax_level='genus',
                  sort_by='conditions',
                  sample_conditions=c('SEX', 'AGE'))
p
```

`run_animalcules` *Run animalcules shiny app*

Description

Run animalcules shiny app

Usage

```
run_animalcules()
```

Value

The shiny app will open

Examples

```
## Not run:
run_animalcules()

## End(Not run)
```

`shannon` *Get alpha diversity using shannon*

Description

Get alpha diversity using shannon

Usage

```
shannon(x)
```

Arguments

`x`	A list of counts

Value

A single value

Examples

```
shannon(seq_len(10))
```

`simpson_index` *Get alpha diversity using simpson*

Description

Get alpha diversity using simpson

Usage

```
simpson_index(x)
```

Arguments

`x`	A list of counts

Value

A single value

Examples

```
simpson_index(seq_len(10))
```

`upsample_counts` *Upsample a counts table to a higher taxon level*

Description

Upsample a counts table to a higher taxon level

Usage

```
upsample_counts(counts_table, tax_table, higher_level)
```

Arguments

`counts_table`	A organism x sample data frame of counts
`tax_table`	A organism x taxlev data frame of labels
`higher_level`	Higher taxon level to upsample to

Value

A organism x sample data frame of counts

Examples

```
toy_data <- readRDS(system.file("extdata/toy_data.rds", package = "animalcules"))
tax_table <- toy_data$tax_table
sam_table <- toy_data$sam_table
counts_table <- toy_data$counts_table
counts_table <- upsample_counts(counts_table, tax_table, "phylum")
```

`write_to_biom` *Output biom*

Description

Output biom

Usage

```
write_to_biom(MAE, path_to_output)
```

Arguments

`MAE`	A multi-assay experiment object
`path_to_output`	The folder to output biom file

Value

A message

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