Package 'EntropicStatistics'

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Type Package

Title Functions Based on Entropic Statistics

Version 0.1.3

Depends R (>= 4.1.0)

Description Methods for data analysis from an entropic perspective. These methods are nonparametric and perform well on non-ordinal data. Currently includes 'HeatMap()' for visualizing distributional characteristics among multiple populations (groups).

License GPL-3

Encoding UTF-8

Imports ggplot2, dplyr, tidyr, tibble, rlang

Suggests testthat (>= 3.0.0)

Config/testthat/edition 3

RoxygenNote 7.3.3

NeedsCompilation no

Author Jialin Zhang [aut, cph, cre]

Maintainer Jialin Zhang <jzhang@math.msstate.edu>

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HeatMap *Heat Map for Distribution Visualization*

Description

Return a heat map that displays distributional characteristics for selected groups.

Usage

```
HeatMap(
  data_frequency_list,
  orders = seq(0.5, 3, by = 0.01),
  selection = 1:length(data_frequency_list),
  plot_order = selection,
  RowNames = names(data_frequency_list)[plot_order],
  title = "HeatMap",
  x_ticks = round(stats::quantile(orders, c(0, 0.25, 0.5, 0.75, 1)), 2),
  plot_margin = ggplot2::margin(0.5, 0.2, 0.2, 1, "cm"),
  text_face = 1,
  fill_colors = c("blue4", "white", "red3"),
  title_text_size = 25,
  label_text_size = 25
)
```

Arguments

`data_frequency_list`	A `list` of nonnegative frequency/count vectors (e.g., from `table()`). Element names (if present) are used as row labels.
`orders`	Numeric vector of generalized Shannon entropy orders to evaluate.
`selection`	Integer indices selecting which elements of `data_frequency_list` to include.
`plot_order`	Integer indices giving the order (bottom to top) of the selected groups.
`RowNames`	Character vector of row labels for the selected groups (default: `names(data_frequency_list)[plot_or`
`title`	Character string, plot title.
`x_ticks`	Numeric vector of x-axis tick locations; values must be present in `orders`.
`plot_margin`	Plot margin, a `ggplot2::margin()` object.
`text_face`	Integer font face in the plot: `1` = "plain", `2` = "italic", `3` = "bold", `4` = "bold.italic".
`fill_colors`	Character vector of three colors for low, mid, and high values.
`title_text_size`	Numeric size of the title text.
`label_text_size`	Numeric size of axis text.

Details

Provides a quick, nonparametric view of distributional differences across multiple groups simultaneously, using generalized Shannon entropy over a range of orders. Input vectors should be nonnegative counts. Zero-probability categories are handled internally.

Value

A `ggplot` object representing the heat map.

References

Zhang, J. and Shi, J. (2024). Nonparametric clustering of discrete probability distributions with generalized Shannon's entropy and heatmap. *Statistics & Probability Letters*. doi:10.1016/j.spl.2024.110070

See Also

`ggplot`, `geom_tile`

Examples

```
set.seed(1)
binom_n <- 10
sample_size <- 400
sample_1 <- table(stats::rbinom(n = sample_size, size = binom_n, prob = 0.1))
sample_2 <- table(stats::rbinom(n = sample_size, size = binom_n, prob = 0.2))
sample_3 <- table(stats::rbinom(n = sample_size, size = binom_n, prob = 0.3))
sample_4 <- table(stats::rbinom(n = sample_size, size = binom_n, prob = 0.4))
sample_5 <- table(stats::rbinom(n = sample_size, size = binom_n, prob = 0.5))
sample_6 <- table(stats::rbinom(n = sample_size, size = binom_n, prob = 0.6))
sample_7 <- table(stats::rbinom(n = sample_size, size = binom_n, prob = 0.7))
sample_8 <- table(stats::rbinom(n = sample_size, size = binom_n, prob = 0.8))
sample_9 <- table(stats::rbinom(n = sample_size, size = binom_n, prob = 0.9))
poisson_1 <- table(stats::rpois(n = sample_size, lambda = 1))
poisson_2 <- table(stats::rpois(n = sample_size, lambda = 2))
poisson_3 <- table(stats::rpois(n = sample_size, lambda = 3))
poisson_4 <- table(stats::rpois(n = sample_size, lambda = 4))
poisson_5 <- table(stats::rpois(n = sample_size, lambda = 5))
poisson_6 <- table(stats::rpois(n = sample_size, lambda = 6))
poisson_7 <- table(stats::rpois(n = sample_size, lambda = 7))
poisson_8 <- table(stats::rpois(n = sample_size, lambda = 8))
poisson_9 <- table(stats::rpois(n = sample_size, lambda = 9))
data_samples <- list(
  binom_0.1 = sample_1, binom_0.2 = sample_2, binom_0.3 = sample_3,
  binom_0.4 = sample_4, binom_0.5 = sample_5, binom_0.6 = sample_6,
  binom_0.7 = sample_7, binom_0.8 = sample_8, binom_0.9 = sample_9,
  Poisson_1 = poisson_1, Poisson_2 = poisson_2, Poisson_3 = poisson_3,
  Poisson_4 = poisson_4, Poisson_5 = poisson_5, Poisson_6 = poisson_6,
  Poisson_7 = poisson_7, Poisson_8 = poisson_8, Poisson_9 = poisson_9
)
HeatMap(data_samples)
HeatMap(data_samples, selection = sample(seq_along(data_samples), 6))
```

```
HeatMap(data_samples, selection = 1:9)
HeatMap(data_samples, selection = 10:13)
HeatMap(data_samples, selection = 14:18)
```

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