

Package ‘spatgeom’

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Type Package

Title Geometric Spatial Point Analysis

Version 0.1.0

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Description The implementation to perform the geometric spatial point analysis developed in Hernández & Solís (2022) <[doi:10.1007/s00180-022-01244-1](https://doi.org/10.1007/s00180-022-01244-1)>. It estimates the geometric goodness-of-fit index for a set of variables against a response one based on the 'sf' package. The package has methods to print and plot the results.

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URL <https://github.com/maikol-solis/spatgeom>

BugReports <https://github.com/maikol-solis/spatgeom/issues>

Encoding UTF-8

Imports ggplot2, scales, sf, dplyr, lwgeom, cowplot, purrr

RoxygenNote 7.2.0

Depends R (>= 3.6.0)

Suggests rmarkdown, knitr, testthat (>= 2.1.0)

NeedsCompilation no

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Description

Function to estimate the geometric correlation between variables.

Usage

```
alphastats(x, y, scale = FALSE, nalphas = 100, envelope = FALSE, mc_cores = 1)
```

Arguments

<code>x</code>	numeric matrix or data.frame of covariables.
<code>y</code>	numeric vector of responses in a model.
<code>scale</code>	boolean to make the estimations with scaled variables. Default FALSE.
<code>nalphas</code>	a single number for the number of alphas generated between the minimum and maximum edge distance on the Delanauy triangulation.
<code>envelope</code>	boolean to determine if the Monte-Carlo is estimated. Default FALSE.
<code>mc_cores</code>	an integer to determine how many parallel process should be run. Default mc_core=1.

Value

A list of class spatgeom with the following elements:

call The function call.

x x input.

y y output.

results A list of size `ncol(x)` corresponding to each column of x. Each element of the list has:

triangles a data frame of class `sfc` (see `sf::st_sf()`) with columns `geometry`, `segments`, `max_length` and `alpha`. The data.frame contains the whole Delanauy triangulation for the corresponding column of x and y. The `segments` column are the segments of each individual triangle and `max_length` is the maximum length of them.

data_frame_triangles a data frame with columns `alpha` and `geom_corr`. The `alpha` column is a numeric vector of size `nalphas` from the minimum to the maximum distance between points estimated in the data. The `geom_corr` column is the value $1 - (\text{alpha shape Area}) / (\text{containing box Area})$.

intensity the intensity estimated for the corresponding column of x and y.

mean_n the mean number of points in the point process.

envelope_data a data frame in tidy format with 40 runs of a CSR process, if `envelope=TRUE`, The CSR is created by generating `n` uniform points in the plane, where `n` is drawn from Poisson distribution with parameter `mean_n`.

References

Hernández, A.J., Solís, M. Geometric goodness of fit measure to detect patterns in data point clouds. *Comput Stat* (2022). <https://doi.org/10.1007/s00180-022-01244-1>

Examples

```
n <- 30
a <- -1
b <- 1
theta <- runif(n, 0, 2 * pi)
r <- (sqrt(runif(n))) * (0.5) + 0.5
X1 <- r * cos(theta)
X2 <- runif(n, a, b)
Y <- data.frame(Y = r * sin(theta))
X <- data.frame(X1, X2)

estimation <- alphastats(y = Y, x = X)
```

plot_alpha_shape *Plot alpha-shape for spatgeom objects*

Description

Plot alpha-shape for spatgeom objects.

Usage

```
plot_alpha_shape(x, alpha, font_size = 12)
```

Arguments

x	an object of class spatgeom.
alpha	value of alpha determining the maximum length between points to build the alpha-shape.
font_size	a integer that increases the font size in the plot.

Value

a [ggplot](#) object with the raw alpha-shape for the original data at resolution alpha

Examples

```
n <- 30
a <- -1
b <- 1
theta <- runif(n, 0, 2 * pi)
r <- (sqrt(runif(n))) * (0.5) + 0.5
X1 <- r * cos(theta)
```

```

X2 <- runif(n, a, b)
Y <- data.frame(Y = r * sin(theta))
X <- data.frame(X1, X2)

estimation <- alphastats(y = Y, x = X)

plot_alpha_shape(estimation, alpha = c(0.9, 1.2))

```

plot_curve

plot spatgeom objects

Description

Plot method for objects of class spatgeom.

Usage

```
plot_curve(x, type = c("curve", "deriv"), font_size = 12)
```

Arguments

x	an object of class spatgeom
type	a string that could be curve or deriv. The option curve plots the curve of alpha against geom_corr from the function alphastats() . The deriv option plots the numerical derivative.
font_size	a integer that increases the font size in the plot.

Value

a [ggplot](#) object with the geometric indices (or its derivative). The plot is generated with the nalphas point of alpha and geom_corr from the function [alphastats](#).

In each panel, the theoretical CSR process is drawn using $\exp(-\text{intensity} * \pi * x^2)$. where the intensity depends on each panel.

Examples

```

n <- 30
a <- -1
b <- 1
theta <- runif(n, 0, 2 * pi)
r <- (sqrt(runif(n))) * (0.5) + 0.5
X1 <- r * cos(theta)
X2 <- runif(n, a, b)
Y <- data.frame(Y = r * sin(theta))
X <- data.frame(X1, X2)

estimation <- alphastats(y = Y, x = X)

```

```
plot_curve(estimation, type = "curve")  
plot_curve(estimation, type = "deriv")
```

```
print.spatgeom      print a spatgeom object
```

Description

Print method for objects of class spatgeom.

Usage

```
## S3 method for class 'spatgeom'  
print(x, return_table = FALSE, ...)
```

Arguments

x	an object of class spatgeom
return_table	if TRUE, returns a data frame with the estimated values. Otherwise, print the data frame in console. Defaults to FALSE
...	further arguments passed to the plot function

Value

Print the estimate given by [alphastats](#).

Examples

```
n <- 30  
a <- -1  
b <- 1  
theta <- runif(n, 0, 2 * pi)  
r <- (sqrt(runif(n))) * (0.5) + 0.5  
X1 <- r * cos(theta)  
X2 <- runif(n, a, b)  
Y <- data.frame(Y = r * sin(theta))  
X <- data.frame(X1, X2)  
  
estimation <- alphastats(y = Y, x = X)  
  
print(estimation)
```

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