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>. 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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Repository CRAN

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R topics documented:

alphastats *Geometric Spatial Point Pattern Analysis*

Description

Function to estimate the geometric correlation between variables.

Usage

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

Arguments

x	numeric matrix or data.frame of covariables.
y	numeric vector of responses in a model.
scale	boolean to make the estimations with scaled variables. Default FALSE.
nalphas	a single number for the number of alphas generated between the minimum and maximum edge distance on the Delanauy triangulation.
envelope	boolean to determine if the Monte-Carlo is estimated. Default FALSE.
mc_cores	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 - (alpha shape Area)/(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(-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)
```

Index