

Package ‘spnaf’

June 12, 2024

Type Package

Title Spatial Network Autocorrelation for Flow Data

Version 1.0.0

Description Identify statistically significant flow clusters using the local spatial network autocorrelation statistic G_{ij}^* proposed by 'Berglund' and 'Karlström' (1999) <[doi:10.1007/s101090050013](https://doi.org/10.1007/s101090050013)>. The metric, an extended statistic of 'Getis/Ord' G ('Getis' and 'Ord' 1992) <[doi:10.1111/j.1538-4632.1992.tb00261.x](https://doi.org/10.1111/j.1538-4632.1992.tb00261.x)>, detects a group of flows having similar traits in terms of directionality. You provide OD data and the associated polygon to get results with several parameters, some of which are defined by spdep package.

Depends R (>= 3.5.0)

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Encoding UTF-8

LazyData true

RoxygenNote 7.3.1

Imports dplyr, magrittr, sf, spdep, tidyr, rlang, deldir

Suggests knitr, rmarkdown, tmap

VignetteBuilder knitr

NeedsCompilation no

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Repository CRAN

Date/Publication 2024-06-12 13:30:02 UTC

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CA	<i>Sample migration data by counties in California.</i>
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Description

A dataframe containing migration of CA counties with origins and destinations from US Census

Usage

CA

Format

A data.frame object with 2580 rows and 12 variables

State.Code.of.Geography.A Destinations' State code

FIPS.County.Code.of.Geography.A Destinations' FIPS County code

State.U.S..Island.Area.Foreign.Region.Code.of.Geography.B Destinations' State U.S. Island Area Foreign Region Code

FIPS.County.Code.of.Geography.B Origins' FIPS County code

State.Name.of.Geography.A Destinations' State name

County.Name.of.Geography.A Destinations' County name

State.U.S..Island.Area.Foreign.Region.of.Geography.B Origins' State U.S. Island Area Foreign Region Code

County.Name.of.Geography.B Origins' County name

Flow.from.Geography.B.to.Geography.A Flow count from the origin to the destination

Counterflow.from.Geography.A.to.Geography.B Counterflow count from the destination to the origin

Net.Migration.from.Geography.B.to.Geography.A Net migration count from the origin to the destination

Gross.Migration.between.Geography.A.and.Geography.B Gross migration count between counties

Source

Census.gov > Population > Migration/Geographic Mobility > Guidance for Data Users > County-to-County Migration Flows <https://www.census.gov/topics/population/migration/guidance/county-to-county-migration-flows.html>

Examples

CA

`CA_polygon`*Sample polygon data of California counties.*

Description

A sf(simple feature) containing geometric boundaries of CA counties with their codes.

Usage`CA_polygon`**Format**

A sf object with 58 rows and 2 variables

id FIPS County code of geography

geometry the geometry column for counties(CRS: NAD83)

`Gij.flow`*Calculate spatial autocorrelation with OD data and corresponding flows.*

Description

Calculate spatial autocorrelation with OD data and corresponding flows.

Usage

```
Gij.flow(  
  df,  
  shape,  
  method = "queen",  
  k = NULL,  
  d = NULL,  
  idw = FALSE,  
  row_standardized = FALSE,  
  snap = 1,  
  OD = "t",  
  R = 1000  
)
```

Arguments

df	A data.frame that contains your Origin-Destination data. The df must consist of "oid" (origin id), "did" (destination id), and "n" (flow weight).
shape	A shapefile (in a polygon type) that matches your OD dataframe. The shape must have an "id" column to match your ids in df.
method	A string value among "queen" (spatial contiguity), "KNN" (k-nearest neighbors), and "fixed_distance" (fixed distance).
k	An integer value to define the number of nearest neighbors for the K-nearest neighbors method.
d	An integer value to define the distance for the fixed distance spatial weight matrix.
idw	A logical value indicating whether to use inverse distance weighting.
row_standardized	A logical value indicating whether to row-standardize the spatial weights.
snap	A parameter used to calculate spdep's spatial contiguity (please refer to the poly2nb documentation for more information).
OD	A string value among "o" (origin-based), "d" (destination-based), and "t" (both ways), which determines how to generate spatial weights. The default value is "t".
R	An integer value to define how many times you want to execute bootstrapping.

Value

The result is a list containing a dataframe and an *sf* object. Both contain Gij statistics and p-value columns merged with your input df. The geometry type of the latter is linestring.

References

Berglund, S., & Karlström, A. (1999). Identifying local spatial association in flow data. *Journal of Geographical Systems*, 1(3), 219-236. <https://doi.org/10.1007/s101090050013>

Examples

```
# Data manipulation
CA <- sfnaf::CA
OD <- cbind(CA$FIPS.County.Code.of.Geography.B, CA$FIPS.County.Code.of.Geography.A)
OD <- cbind(OD, CA$Flow.from.Geography.B.to.Geography.A)
OD <- data.frame(OD)
names(OD) <- c("oid", "did", "n")
OD$n <- as.numeric(OD$n)
OD <- OD[order(OD[,1], OD[,2]),]
head(OD) # check the input df's format

# Load sf polygon
CA_polygon <- sfnaf::CA_polygon
head(CA_polygon) # it has a geometry column
```

```

# Execution of Gij.flow with data above and given parameters
## Not run:
result <- Gij.flow(df = OD, shape = CA_polygon, method = 'queen', snap = 1, OD = 't', R = 1000)

## End(Not run)

# check the results
## Not run:
head(result[[1]])
head(result[[2]])

## End(Not run)

```

Networknb

Calculate spatial weights for networks based on input polygons.

Description

Calculate spatial weights for networks based on input polygons.

Usage

```
Networknb(shape, snap = 1, queen = TRUE, method = "t")
```

Arguments

shape	A shapefile (in a polygon type) that matches to your OD dataframe. The shape must have an "id" column to match your ids in df.
snap	A parameter that is also used to calculate spdep's spatial contingency (Please view documents of poly2nb for more information).
queen	A TRUE/FALSE input that is used to calculate spdep's spatial contingency (Please view documents of poly2nb for more information).
method	A string value among "o" (origin based), "d" (destination based), and "t" (both way) which determines the way to generate Spatial Weights. The default value is "t".

Value

The result is in the form of a list which includes combinations of origin ids and destination ids.

Examples

```

# Data manipulation
# Load sf polygon

CA_polygon <- sfnaf::CA_polygon

# Execution of Networknb with data above and given parameters

```

```
nbn <- Networknb(shape = CA_polygon, queen = TRUE, snap = 1, method = 'o')  
  
# check the results  
  
head(nbn)
```

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