Package ‘spatialClust’

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Type Package

Title Spatial Clustering using Fuzzy Geographically Weighted Clustering

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Description Perform Spatial Clustering Analysis using Fuzzy Geographically Weighted Clustering. Provide optimization using Gravitational Search Algorithm.

Depends rgeos (>= 0.3-15), sp (>= 1.1-0), ggplot2 (>= 2.0.0), maptools (>= 0.8-37), R (>= 2.10.0)

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dist  

**distance data.**

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**Description**

Contains distance matrix all region in Central Java Data take from Central Java shapefile source: bps.go.id

**Usage**

dist

**Format**

An object of class `matrix` with 35 rows and 35 columns.

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**Description**

Educational Data of Central Java in 2014 source: jateng.bps.go.id - educational data publication

**Usage**

example

**Format**

A data frame with twelve variables
fgwc

Fuzzy Geographically Weighted Clustering (FGWC)

Description

This function used to perform Fuzzy Geographically Weighted Clustering of X dataset.

Usage

fgwc(X, population, distance, k = 2, m = 2, beta = 0.5, a = 1, b = 1,
max.iteration = 100, threshold = 10^-5, RandomNumber = 0)

Arguments

X data frame n x p
population dataset 1 x n number of population each region (row)
distance shapefile or distance matrix n x n
k specific number of cluster (must be >1)
m fuzzifier / degree of fuzziness
beta proportion of geographically effect (if 0 equal Fuzzy C-Means)
a power for increase population effect
b power for increase distance effect
max.iteration maximum iteration to convergence
threshold threshold of convergence
RandomNumber specific seed

Details

This function perform Fuzzy Geographically Weighted Clustering by G.A Mason and R.Jacobson (2007). Fuzzy Geographically Weighted Clustering is one of fuzzy clustering methods to clustering dataset become K cluster. Number of cluster (K) must be greater than 1. To control the overlapping or fuzziness of clustering, parameter m must be specified. Maximum iteration and threshold is specific number for convergencing the cluster. Random Number is number that will be used for seeding to firstly generate fuzzy membership matrix. population dataset, shapefile or distance matrix is used to give geographically weighted for membership matrix.

Clustering will produce fuzzy membership matrix (U) and fuzzy cluster centroid (V). The greatest value of membership on data point will determine cluster label. Centroid or cluster center can be use to interpret the cluster. Both membership and centroid produced by calculating mathematical distance. Fuzzy Geographically Weighted Clustering calculate distance with Euclidean norm. So it can be said that cluster will have sperichal shape of geometry.
Value

`func.obj` objective function that calculated.

- `U` matrix $n \times K$ consist fuzzy membership matrix
- `V` matrix $K \times p$ consist fuzzy centroid
- `D` matrix $n \times K$ consist distance of data to centroid that calculated
- `Clust.desc` cluster description (dataset with additional column of cluster label)

References


See Also

- `fgwc.gsa` for optimize using Gravitational Search Algorithm, `spClustIndex` for cluster validation, `visualize` for cluster visualization

Examples

```r
# load data example
X <- example

# if using matrix distance
distance <- dist

# if using shapefile
# library(rgdal) for call readOGR
# distance <- readOGR(dsn = 'folder/','shapefile name')

# load population data
pop <- population

clust <- fgwc(X, pop, distance, K=2, m=1.5, beta=0.5)
```

---

fgwc.gsa  
Fuzzy Geographically Weighted Clustering (FGWC) optimized by Gravitational Search Algorithm

Description

This function used to perform Fuzzy Geographically Weighted Clustering of X dataset. by using this function the initialization phase of FGWC will be optimized using Gravitational Search Algorithm.
Usage

fgwc.gsa(x, population, distance, K = 2, m = 2, beta = 0.5, a = 1, b = 1, max.iteration = 100, threshold = 10^-5, RandomNumber = 0)

Arguments

X data frame n x p
population dataset 1 x n number of population each region (row)
distance shapefile or distance matrix n x n
K specific number of cluster (must be >1)
m fuzzifier / degree of fuzziness
beta proportion of geographically effect (if 0 equal Fuzzy C-Means)
a power for increase population effect
b power for increase distance effect
max.iteration maximum iteration to convergence
threshold threshold of convergence
RandomNumber specific seed

Details

This function perform Fuzzy Geographically Weighted Clustering optimized using Gravitational Search Algorithm(GSA). using this method the initialization phase will be handle by GSA to get optimal result. Number of cluster (K) must be greater than 1. To control the overlapping or fuzziness of clustering, parameter m must be specified. Maximum iteration and threshold is specific number for convergencing the cluster. Random Number is number that will be used for seeding to firstly generate fuzzy membership matrix. population dataset, shapefile or distance matrix is used to give geographically weighted for membership matrix.

Clustering will produce fuzzy membership matrix (U) and fuzzy cluster centroid (V). The greatest value of membership on data point will determine cluster label. Centroid or cluster center can be use to interpret the cluster. Both membership and centroid produced by calculating mathematical distance. Fuzzy Geographically Weighted Clustering calculate distance with Euclidean norm. So it can be said that cluster will have sperichal shape of geometry.

Value

func.obj objective function that calculated.
U matrix n x K consist fuzzy membership matrix
V matrix K x p consist fuzzy centroid
D matrix n x K consist distance of data to centroid that calculated
Clust.desc cluster description (dataset with additional column of cluster label)
References


See Also

fgwc for standard Fuzzy Geographically Weighted Clustering, spClustIndex for cluster validation, visualize for cluster visualization, scale for data scaling

Examples

```r
# Load data example
X <- example

# If using matrix distance
distance <- dist

# If using shapefile
#library(rgdal) for call readOGR
#distance <- readOGR(dsn = 'folder/','shapefile name')

# Load population data
pop <- population

clust <- fgwc(X,pop,distance,K=2,m=1.5,beta=0.5)
```

Description

Central Java shapefile source: bps.go.id

Usage

map

Format

A data frame with one variables: Populasi
population data.

Description

Contains population data example source: jateng.bps.go.id

Usage

population

Format

A data frame with one variables: Populas

scale

Data Scalling

Description

Provide data scaling using z-transform, zero to one scaling and minus one to one scaling

Usage

scale(data, method = "zerotoone")

Arguments

data matrix data
method scaling technique use "z" for z-transform, "zerotoone" for zero to one scaling and "oneminuseone" minus one to one scaling

Value

scalled matrix data

See Also

fgwc for standard Fuzzy Geographically Weighted Clustering, fgwc.gsa for optimize using Gravitational Search Algorithm, spClustIndex for cluster validation, visualize for cluster visualization
Examples

# load data
data <- example

data <- scale(data)
data <- scale(data, method="zero to one")

# z-transform
data <- scale(data, method="z")

# minus one to one scaling
data <- scale(data, method="one minus one")

Description

This function used to validate the clustering result

Usage

spClustIndex(fgwc)

Arguments

fgwc result(object) from fgwc clustering

Value

validity indeks

See Also

visualize for cluster visualization scale for data scaling

Examples

# load data example
x <- example

# if using matrix distance
distance <- dist

# if using shapefile
# library(rgdal) for call readOGR
# distance <- readOGR(dsn = 'folder/', "shapefile name")
# load population data
cpy <- population

clust <- fgwc(x, pop, distance, K=2, m=1.5, beta=0.5)

# show cluster validation
spClustIndex(clust)

---

## visualize

### Cluster Visualization

**Description**

This function visualize the clustering result

**Usage**

```r
visualize(fgwc)
```

**Arguments**

- `fgwc` result(object) from fgwc clustering

**Value**

- `biPlot`
- `radarPlot`
- `clusterMap`

**See Also**

- `spClustIndex` for cluser validation, `scale` for data scalling

**Examples**

```r
# load data example
x <- example

#if using matrix distance
#distance <- dist

#if using shapefile
#library(rgdal) for call readOGR
#distance <- readOGR(dsn = 'folder/','.','shapefile name')
distance <- map
#load population data
pop <- population

clust <- fgwc(X, pop, distance, K=2, m=1.5, beta=0.5)

#cluster visualization
visualize(clust)
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