

Package ‘sdsfun’

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Title Spatial Data Science Complementary Features

Version 0.2.1

Description Wrapping and supplementing commonly used functions in the R ecosystem related to spatial data science, while serving as a basis for other packages maintained by Wenbo Lv.

License GPL-3

Encoding UTF-8

URL <https://stsc1.github.io/sdsfun/>, <https://github.com/stsc1/sdsfun>

BugReports <https://github.com/stsc1/sdsfun/issues>

RoxygenNote 7.3.2

Depends R (>= 4.1.0)

Imports dplyr, geosphere, magrittr, sf, spdep, stats, tibble

Suggests ggplot2, testthat (>= 3.0.0)

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inverse_distance_swm *construct inverse distance weight*

Description

Function for constructing inverse distance weight.

Usage

```
inverse_distance_swm(sfj, power = 1, bandwidth = NULL)
```

Arguments

sfj	Vector object that can be converted to sf by <code>sf::st_as_sf()</code> .
power	(optional) Default is 1. Set to 2 for gravity weights.
bandwidth	(optional) When the distance is bigger than bandwidth, the corresponding part of the weight matrix is set to 0. Default is NULL, which means not use the bandwidth.

Details

The inverse distance weight formula is $w_{ij} = 1/d_{ij}^\alpha$

Value

A inverse distance weight matrices with class of `matrix`.

Examples

```
library(sf)
pts = read_sf(system.file('extdata/pts.gpkg', package = 'sdsfun'))
wt = inverse_distance_swm(pts)
wt[1:5,1:5]
```

normalize_vector	<i>normalization</i>
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Description

normalization

Usage

```
normalize_vector(x, to_left = 0, to_right = 1)
```

Arguments

x	A continuous numeric vector.
to_left	(optional) Specified minimum. Default is 0.
to_right	(optional) Specified maximum. Default is 1.

Value

A continuous vector which has normalized.

Examples

```
normalize_vector(c(-5,1,5,0.01,0.99))
```

sf_distance_matrix	<i>generates distance matrix</i>
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Description

Generates distance matrix for sf object

Usage

```
sf_distance_matrix(sfj)
```

Arguments

sfj	An sf object or can be converted to sf by <code>sf::st_as_sf()</code> .
-----	---

Value

A matrix.

Examples

```
library(sf)
pts = read_sf(system.file('extdata/pts.gpkg',package = 'sdsfun'))
pts_distm = sf_distance_matrix(pts)
pts_distm[1:5,1:5]
```

sf_geometry_name	<i>sf object geometry column name</i>
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Description

Get the geometry column name of an sf object

Usage

```
sf_geometry_name(sfj)
```

Arguments

sfj An sf object.

Value

A character.

Examples

```
library(sf)
snnu = read_sf(system.file('extdata/snnu.geojson',package = 'sdsfun'))
sf_geometry_name(snnu)
```

sf_geometry_type	<i>sf object geometry type</i>
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Description

Get the geometry type of an sf object

Usage

```
sf_geometry_type(sfj)
```

Arguments

sfj An sf object.

Value

A lowercase character vector

Examples

```
library(sf)
snnu = read_sf(system.file('extdata/snnu.geojson', package = 'sdsfun'))
sf_geometry_type(snnu)
```

sf_utm_proj_wgs84	<i>generates wgs84 utm projection epsg coding character</i>
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Description

Generates a utm projection epsg coding character corresponding to an sf j object under the WGS84 spatial reference.

Usage

```
sf_utm_proj_wgs84(sfj)
```

Arguments

sfj An sf object or can be converted to sf by sf::st_as_sf().

Details

For more details, please refer to <https://zhuanlan.zhihu.com/p/670055831>.

Value

A character.

Examples

```
library(sf)
snnu = read_sf(system.file('extdata/snnu.geojson', package = 'sdsfun'))
sf_utm_proj_wgs84(snnu)
```

`sf_voronoi_diagram` *generates voronoi diagram*

Description

Generates Voronoi diagram (Thiessen polygons) for sf object

Usage

```
sf_voronoi_diagram(sfj)
```

Arguments

`sfj` An sf object.

Value

An sf object of polygon geometry type or can be converted to this by `sf::st_as_sf()`.

Note

Only sf objects of (multi-)point type are supported to generate voronoi diagram and the returned result includes only the geometry column.

Examples

```
library(sf)
pts = read_sf(system.file('extdata/pts.gpkg',package = 'sdsfun'))
pts_v = sf_voronoi_diagram(pts)

library(ggplot2)
ggplot() +
  geom_sf(data = pts_v, color = 'red',
          fill = 'transparent') +
  geom_sf(data = pts, color = 'blue', size = 1.25) +
  theme_void()
```

`spdep_contiguity_swm` *constructs spatial weight matrices based on contiguity*

Description

Constructs spatial weight matrices based on contiguity via spdep package.

Usage

```
spdep_contiguity_swm(
  sfj,
  queen = TRUE,
  k = NULL,
  order = 1L,
  cumulate = TRUE,
  style = "W",
  zero.policy = TRUE
)
```

Arguments

sfj	An sf object or can be converted to sf by <code>sf::st_as_sf()</code> .
queen	(optional) if TRUE, using queen contiguity, otherwise rook contiguity. Default is TRUE.
k	(optional) The number of nearest neighbours. Ignore this parameter when not using distance based neighbours to construct spatial weight matrices.
order	(optional) The order of the adjacency object. Default is 1.
cumulate	(optional) Whether to accumulate adjacency objects. Default is TRUE.
style	(optional) style can take values W, B, C, and S. More to see <code>spdep::nb2mat()</code> . Default is W.
zero.policy	(optional) if FALSE stop with error for any empty neighbour sets, if TRUE permit the weights list to be formed with zero-length weights vectors. Default is TRUE.

Value

A matrix

Note

When k is set to a positive value, using K-Nearest Neighbor Weights.

Examples

```
library(sf)
pts = read_sf(system.file('extdata/pts.gpkg', package = 'sdsfun'))

wt1 = spdep_contiguity_swm(pts, k = 6, style = 'B')
wt2 = spdep_contiguity_swm(pts, queen = TRUE, style = 'B')
wt3 = spdep_contiguity_swm(pts, queen = FALSE, order = 2, style = 'B')
```

spdep_distance_swm *constructs spatial weight matrices based on distance*

Description

Constructs spatial weight matrices based on distance via spdep package.

Usage

```
spdep_distance_swm(
  sfj,
  kernel = NULL,
  k = NULL,
  bandwidth = NULL,
  power = 1,
  style = "W",
  zero.policy = TRUE
)
```

Arguments

sfj	An sf object or can be converted to sf by <code>sf::st_as_sf()</code> .
kernel	(optional) The kernel function, can be one of uniform, triangular,quadratic(epanechnikov),quartic and gaussian. Default is NULL.
k	(optional) The number of nearest neighbours. Default is NULL. Only useful when kernel is provided.
bandwidth	(optional) The bandwidth, default is NULL. When the spatial reference of sf object is the geographical coordinate system, the unit of bandwidth is km. The unit used in the projection coordinate system are consistent with those used in the sf object coordinate system.
power	(optional) Default is 1. Useful when kernel is not provided.
style	(optional) style can take values W, B, C, and S. More to see <code>spdep::nb2mat()</code> . Default is W. For spatial weights based on distance functions, a style of B means using the original value of the calculated distance function.
zero.policy	(optional) if FALSE stop with error for any empty neighbour sets, if TRUE permit the weights list to be formed with zero-length weights vectors. Default is TRUE.

Details

five different kernel weight functions:

- uniform: $K_{(z)} = 1/2, \text{for } |z| < 1$
- triangular $K_{(z)} = 1 - |z|, \text{for } |z| < 1$
- quadratic (epanechnikov) $K_{(z)} = \frac{3}{4} (1 - z^2), \text{for } |z| < 1$

- quartic $K(z) = \frac{15}{16}(1 - z^2)^2$, for $|z| < 1$
- gaussian $K(z) = \frac{1}{\sqrt{2\pi}}e^{-\frac{z^2}{2}}$

For the equation above, $z = d_{ij}/h_i$ where h_i is the bandwidth

Value

A matrix

Note

When kernel is setting, using distance weight based on kernel function, Otherwise the inverse distance weight will be used.

Examples

```
library(sf)
pts = read_sf(system.file('extdata/pts.gpkg',package = 'sdsfun'))

wt1 = spdep_distance_swm(pts, style = 'B')
wt2 = spdep_distance_swm(pts, kernel = 'gaussian')
wt3 = spdep_distance_swm(pts, k = 3, kernel = 'gaussian')
wt4 = spdep_distance_swm(pts, k = 3, kernel = 'gaussian', bandwidth = 10000)
```

standardize_vector *standardization*

Description

To calculate the Z-score using variance normalization, the formula is as follows:

$$Z = \frac{(x - \text{mean}(x))}{sd(x)}$$

Usage

```
standardize_vector(x)
```

Arguments

x A numeric vector

Value

A standardized numeric vector

Examples

```
standardize_vector(1:10)
```

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