Package ‘somspace’

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Type Package

Title Spatial Analysis with Self-Organizing Maps

Version 1.2.4

Description Application of the Self-Organizing Maps technique for spatial classification of time series. The package uses spatial data, point or gridded, to create clusters with similar characteristics. The clusters can be further refined to a smaller number of regions by hierarchical clustering and their spatial dependencies can be presented as complex networks. Thus, meaningful maps can be created, representing the regional heterogeneity of a single variable. More information and an example of implementation can be found in Markonis and Strnad (2020, <doi:10.1177/0959683620913924>).

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Depends R (>= 3.5.0), ggplot2, data.table, kohonen

Imports maps, reshape2

Encoding UTF-8

LazyData true

RoxygenNote 7.2.3

Suggests knitr, rmarkdown, testthat

VignetteBuilder knitr

NeedsCompilation no

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R topics documented:

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cnet

Complex network analysis

Description

cnet plots the canonical network map of a single classification scheme.

Usage

cnet(x, n, thres)

Arguments

x \hspace{1cm} \text{regs object.}

n \hspace{1cm} \text{number of regions.}

thres \hspace{1cm} \text{the cross-correlation threshold of the network.}

Details

The cnet function estimates the cross-correlation matrix of the average time series of each region and plots a map linking the regions with cross-correlations above the selected threshold.

Value

plot object

Examples

dummy <- owda[Time <= 1600]
inp_som <- sominp(dummy)
my_som <- somspa(inp_som, rlen = 100, grid = somgrid(3, 3, "hexagonal"))
my_regions <- somregs(my_som, nregions = 6)
cnet(my_regions, n = 5, thres = 0.2)
Description

Reconstruction of European hydroclimate derived from tree-rings. The variable used is self-calibrated Palmer Drought Severity Index (scPDSI) at annual time step.

Usage

data(owda)

Format

An object of class data.table (inherits from data.frame) with 1355264 rows and 4 columns.

Source

FZP archive

References


Examples

str(owda)

plot_ts

Plot time series

Description

Plots the time series of SOM nodes or regions mean

Usage

plot_ts(x, n)

Arguments

x is either a somsp or a regs object

n is either the set of nodes for somsp or the number of regions for regs

Details

In case of regs, all the regions are plotted.
Value

plot object

See Also

somspa

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| regs | Regions class |

Description

Regions class

Usage

regs

Format

An object of class regs of length 0.

Details

The regs class contains:

- A summary data.table which updates the somsp object with the region ids of all classification schemes up to nregions. Each different classification scheme is stored as an individual region, e.g. regions.2, regions.3, etc.
- A data.table with the original data set, as in somsp.

It can be plotted by plot and plot_ts. If plot is used, three additional arguments are needed: a set with the classification schemes that will be plotted, number of rows and number of columns of the plotted panels. plot_ts plots all the time series of a given classification scheme.

See Also

somsp

somregs
sominp

Create sominp object

Description
sominp transforms the data set from data.table to somsp format, which can be used as argument in the somspa function.

Usage
sominp(x)

Arguments
x The data.table object which will be transformed to somsp object.

Details
x should be in tidy format with four columns: time, latitude, longitude and variable.

Value
A sominp object. It contains:

- a matrix that can be used as input for the som function of the kohonen package.
- a data.table with the with spatial point coordinates and a corresponding id.
- a data.table with the original dataset.

See Also
somspa

Examples

dummy <- owda[Time <= 1510]
inp_som <- sominp(dummy)
somregs

Classify SOM into regions

Description

somregs applies hierarchical cluster analysis to the Self-Organizing Map to form regions with homogeneous characteristics (classification scheme).

Usage

somregs(x, nregions, ...)

Arguments

x A somsp object.
nregions The maximum number of classifications schemes to be determined starting from 2.
... Other arguments passed to methods from hclust function which is used to determine the regions.

Details

nregions must be at least two, i.e., a classification scheme with two regions, and smaller than the number of SOM nodes. In the latter case, each SOM node corresponds to a region. The resulting regs object can be plotted by plot and plot_ts. If plot is used, three additional arguments are needed: a set with the classification schemes that will be plotted, number of rows and number of columns of the plotted panels. plot_ts plots all the time series of a given classification scheme.

Value

A regs object, which contains:

- A summary data.table which updates the somsp object with the region ids of all classification schemes up to nregions. Each different classification scheme is stored as an individual region, e.g., regions.2, regions.3, etc. to their corresponding winning unit, the number of points of each node, as well as the median latitude and longitude of each node coordinates and their standard deviation.
- The original time series which created the SOM as a data.table, as in somsp.

See Also

somsp
somspa
Examples

dummy <- owda[Time <= 1600]
inp_som <- sominp(dummy)
my_som <- somspa(inp_som, rlen = 100, grid = somgrid(4, 4, "hexagonal"))
my_regions <- somregs(my_som, nregions = 9)
plot(my_regions, regions = c(2, 4, 6, 8), nrow = 2, ncol = 2)
plot_ts(my_regions, n = 4)

somsp  
Spatial SOM class

Description

Spatial SOM class

Usage

somsp

Format

An object of class somsp of length 0.

Details

The somsp objects are created by somspa function and contain:

- A summary data.table with the coordinates of each SOM node, the distances of objects to their corresponding winning unit, the number of points of each node, as well as the median latitude and longitude of each node coordinates and their standard deviation.
- A Self-Organizing Map object (see also kohonen).
- The sominp object used as input for the SOM, with an id number corresponding to location and a node number to the classification group of SOM.

They can be plotted by plot and plot_ts functions or summarized by summary.

See Also

somspa
plot_ts
somspa  

Spatial SOM

Description

somspa creates a Self-Organizing Map from spatial data.

Usage

somspa(x, ...)

Arguments

x 
A sominp object.

... 
Other arguments passed to methods from kohonen::som function which is used to create the SOM.

Details

x should be created by sominp. The output somsp objects can be plotted by plot and plot_ts functions or summarized by summary.

Value

A somsp object, which contains:

- A summary data.table with the coordinates of each SOM node, the distances of objects to their corresponding winning unit, the number of points of each node, as well as the median latitude and longitude of each node coordinates and their standard deviation.
- A Self-Organizing Map object (see also kohonen).
- The sominp object used as input for the SOM, with an id number corresponding to location and a node number to the classification group of SOM.

See Also

som

sominp

Examples

dummy <- owda[Time <= 1600] #toy example
inp_som <- sominp(dummy)

my_som <- somspa(inp_som, rlen = 100, grid = somgrid(3, 3, "hexagonal"))
my_som$summary
my_som$som
plot(my_som)
plot_ts(my_som, n = 3)
plot_ts(my_som, n = c(1, 2, 4, 9))
plot_ts(my_som, n = 1:max(my_som$summary$node)) #plots all soms
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