Package: spEcula (via r-universe)

June 28, 2024

Title Spatial Prediction Methods In R

Version 0.1.3.9900

Description Advanced spatial prediction methods based on various spatial relationships.

License GPL-3

URL https://github.com/SpatLyu/spEcula, https://spatlyu.github.io/spEcula/

Encoding UTF-8

Roxygen list(markdown = TRUE)

RoxygenNote 7.3.2

Imports stats, parallel, tibble, dplyr (>= 1.1.0), purrr, tidyr, ggplot2, magrittr, sf, ggrepel

Depends R (>= 4.1.0)

LazyData true

Suggests knitr, terra, tidyverse, tidyterra, rmarkdown, skimr, car, ggpubr, moments, cowplot, viridis, mapview, readxl, writexl, DescTools, PerformanceAnalytics, tictoc

VignetteBuilder knitr

Repository https://spatlyu.r-universe.dev

RemoteUrl https://github.com/SpatLyu/spEcula

RemoteRef HEAD

RemoteSha a1ed0828d622df6b4f7cca1a8fb19c13e138a231

Contents

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gos *geographically optimal similarity*

Description

Computationally optimized function for geographically optimal similarity (GOS) model

Usage

```
gos(formula, data = NULL, newdata = NULL, kappa = 0.25, cores = 1)
```

Arguments

formula	A formula of GOS model.
data	A data.frame or tibble of observation data.
newdata	A data.frame or tibble of prediction variables data.
kappa	A numeric value of the percentage of observation locations with high similarity to a prediction location. kappa = 1 - tau, where tau is the probability parameter in quantile operator. The default kappa is 0.25, meaning that 25% of observations with high similarity to a prediction location are used for modelling.
cores	positive integer(default is 1). If cores > 1, a 'parallel' package cluster with that many cores is created and used. You can also supply a cluster object.

Value

A tibble made up of predictions and uncertainties.

Author(s)

Wenbo Lv <lyu.geosocial@gmail.com>

References

Song, Y. (2022). Geographically Optimal Similarity. Mathematical Geosciences. doi: 10.1007/s11004-022-10036-8.

Examples

```
## Not run:
data(zn)
data(grid)
g = gos(Zn ~ Slope + Water + NDVI  + SOC + pH + Road + Mine,
data = zn, newdata = grid, kappa = 0.08,cores = 6)
g

## End(Not run)
```

gos_bestkappa *function for the best kappa parameter*

Description

Computationally optimized function for determining the best kappa parameter for the optimal similarity

Usage

```
gos_bestkappa(formula,data = NULL,kappa=seq(0.05,1,0.05),
              nrepeat = 10,nsplit = 0.5,cores = 1)
```

Arguments

formula	A formula of GOS model
data	A data.frame or tible of observation data
kappa	(optional)A numeric vector of the optional percentages of observation locations with high similarity to a prediction location. kappa = 1 - tau, where tau is the probability parameter in quantile operator. kappa = 0.25 means that 25% of observations with high similarity to a prediction location are used for modelling.
nrepeat	(optional)A numeric value of the number of cross-validation training times. The default value is 10.
nsplit	(optional)The sample training set segmentation ratio,which in (0,1), default is 0.5.
cores	positive integer(default is 1). If cores > 1, a 'parallel' package cluster with that many cores is created and used. You can also supply a cluster object.

Value

A list of the result of the best kappa and the computation process curve.

Author(s)

Wenbo Lv <lyu.geosocial@gmail.com>

References

Song, Y. (2022). Geographically Optimal Similarity. Mathematical Geosciences. doi: 10.1007/s11004-022-10036-8.

Examples

```
## Not run:
library(dplyr)
library(ggplot2)
library(ggrepel)
data(zn)
data(grid)
system.time({
  b1 = gos_bestkappa(Zn ~ Slope + Water + NDVI  + SOC + pH + Road + Mine,
                     data = zn,kappa = c(0.01, 0.05, 0.1, 0.2, 0.5, 1),
                     nrepeat = 2,cores = 1)
})
b1$bestkappa
b1$plot

## End(Not run)
```

`grid` *spatial grid data of explanatory variables*

Description

Spatial grid data of explanatory variables,modified from `geosimilarity` package.

Usage

```
grid
```

Format

`grid`: A tibble of grided trace element explanatory variables with 13132 rows and 12 variables, where the first column is GridID.

`inverse_bcPower` *Inverse transform of* `car::bcPower`

Description

Inverse transform of `car::bcPower`

Usage

```
inverse_bcPower(z, alpha)
```

Arguments

z	A numeric vector to be inverse transformed.
alpha	Power transformation parameter,which can be got from car::powerTransform().

Value

A numeric vector.

Author(s)

Wenbo Lv <lyu.geosocial@gmail.com>

Examples

```
library(car)
library(moments)
turbidity = c(1.0, 1.2, 1.1, 1.1, 2.4, 2.2, 2.6, 4.1, 5.0, 10.0, 4.0, 4.1, 4.2, 4.1,
              5.1, 4.5, 5.0, 15.2, 10.0, 20.0, 1.1, 1.1, 1.2, 1.6, 2.2, 3.0, 4.0, 10.5)
moments::skewness(turbidity)
shapiro.test(turbidity)
lambdapt = car::powerTransform(turbidity)
ttur = car::bcPower(turbidity,lambdapt$lambda)
moments::skewness(ttur)
shapiro.test(ttur)
inverse_bcPower(ttur,lambdapt$lambda)
```

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sandwich *sandwich mapping model*

Description

Spatial prediction based on spatial stratified heterogeneity using sandwich mapping model.

Usage

```
sandwich(
  sampling,
  stratification,
  reporting,
  sampling_attr,
  ssh_zone,
  reporting_id,
  weight_type = "area"
)
```

Arguments

sampling	Sampling layer, spatial point vector object which is sf or can be converted to sf object.
stratification	Stratification layer, spatial polygon vector object which is sf or can be converted to sf object.
reporting	Reporting layer, spatial polygon vector object which is sf or can be converted to sf object.
sampling_attr	The attribute column for the sampling point in sampling layer.
ssh_zone	The zone column for the stratification layer.
reporting_id	The id column for the reporting layer.
weight_type	(optional) Geographic area based on weight(area) or indicate human population size(population) , Default is area.

Value

A sf object with estimated mean sandwichest_mean and standard error sandwichest_standarderror.

Author(s)

Wenbo Lv <lyu.geosocial@gmail.com>

References

Lin, Y., Xu, C., & Wang, J. (2023). sandwichr: Spatial prediction in R based on spatial stratified heterogeneity. Transactions in GIS: TG, 27(5), 1579–1598. https://doi.org/10.1111/tgis.13088

Examples

```
library(sf)
simpath = system.file("extdata", "sim.gpkg", package="spEcula")
sampling = read_sf(simpath,layer = 'sim_sampling')
ssh = read_sf(simpath,layer = 'sim_ssh')
reporting = read_sf(simpath,layer = 'sim_reporting')
sandwich(sampling = sampling,stratification = ssh,reporting = reporting,
        sampling_attr = 'Value',ssh_zone = 'X',reporting_id = 'Y',
        weight_type = 'population')
sandwich(sampling = sampling,stratification = ssh,reporting = reporting,
        sampling_attr = 'Value',ssh_zone = 'X',reporting_id = 'Y',
        weight_type = 'area')
```

zn *spatial datasets of trace element Zn*

Description

Spatial datasets of trace element Zn,modified from `geosimilarity` package.

Usage

```
zn
```

Format

`zn`: A tibble of trace element Zn with 885 rows and 12 variables

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