Package 'sandwich'

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Title sandwich: Spatial Interpolation based on Spatial Stratified Heterogeneity

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Depends R (>= 3.5.0), sf, ggplot2, gridExtra, geodetector, dplyr

Suggests rmarkdown,
knitr,
MASS

Description This package enables the implementation of Sandwich model-based mapping in R.
It provides functions to output the summarized statistics, the interpolated surface,
and the standard error and confidence interval maps.

License GPL (>= 2)

URL http://www.sssampling.cn/, https:
//github.com/linyuehzzz/sandwich_spatial_interpolator

BugReports https://github.com/linyuehzzz/sandwich_spatial_interpolator/issues

LazyData false

RoxygenNote 7.1.1

VignetteBuilder knitr

Encoding UTF-8

R topics documented:

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geodetector.data	*Prepare data for Geodetector*

Description

geodetector.data joins a candidate SSH layer to an existing layer.

Usage

```
geodetector.data(object, ssh.lyr, ssh.id, ssh.name=NULL)
```

Arguments

object	A POINT sf object to be joint. Its geometry should be consistent with the sampling layer, but it may have additional attributes from the SSH layer(s).
ssh.lyr	A POLYGON sf object used as the candidate SSH layer. Its strata ID will be linked to object.
ssh.id	A string denoting the attribute name of strata ID in the SSH layer.
ssh.name	A string denoting the new attribute name assigned to the strata ID in the output object. If NULL, the attribute name will be the same as that in the old SSH layer.

See Also

[geodetector R package](#)

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geodetector.factor	*Calculate Geodetector factor detector* q-*statistic*

Description

geodetector.factor calculates the factor detector q-statistic in the geographical detector model described by Wang et al. (2010). The q-statistic measures the SSH of the sampling attribute in terms of a given stratification, which can be used for the selection of an SSH layer for Sandwich model-based mapping.

Usage

```
geodetector.factor(object, y, x)
```

Arguments

object	A POINT sf object linking the attributes of the sampling layer and the strata ID in the SSH layer(s) generated from geodetector.data.
y	A string denoting the name of the explained variable (sampling attribute) in object.
x	A string denoting the name(s) of the explanatory variable(s) (stratification(s)) in object.

References

Wang, J. F., Li, X. H., Christakos, G., Liao, Y. L., Zhang, T., Gu, X., & Zheng, X. Y. (2010). Geographical detectors-based health risk assessment and its application in the neural tube defects study of the Heshun Region, China. *International Journal of Geographical Information Science*, 24(1), 107-127. doi:10.1080/13658810802443457

See Also

geodetector R package

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geodetector.interaction

Calculate Geodetector interaction detector

Description

`geodetector.interaction` calculates the factor detector in the geographical detector model described by Wang et al. (2010). The interactive effects indicate whether a combination of two stratifications enhances the SSH of the sampling attribute.

Usage

```
geodetector.interaction(object, y, x)
```

Arguments

object	A POINT `sf` object linking the attributes of the sampling layer and the strata ID in the SSH layer(s) generated from `geodetector.data`.
y	A `string` denoting the name of the explained variable in `object`.
x	A `string` denoting the name(s) of the explanatory variable(s) in `object`.

References

Wang, J. F., Li, X. H., Christakos, G., Liao, Y. L., Zhang, T., Gu, X., & Zheng, X. Y. (2010). Geographical detectors-based health risk assessment and its application in the neural tube defects study of the Heshun Region, China. *International Journal of Geographical Information Science*, 24(1), 107-127. doi:10.1080/13658810802443457

See Also

geodetector R package

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hs   *Heshun human population dataset*

Description

The hs dataset consists of three sf objects:

- hs.sampling: Human population of 326 sampling villages within the Heshun region, China, which serves as the sampling layer.

- hs.ssh: A zonation map with 5 strata that serves as a candidate SSH layer.

- hs.ssh2: A zonation map with 6 strata that serves as another candidate SSH layer.

- hs.reporting: The administrative division of 10 towns in Heshun county that served as the reporting layer

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References

Li, L., Wang, J., & Wu, J. (2012). A spatial model to predict the incidence of neural tube defects. *BMC Public Health*, 12(1), 951. doi:10.1186/1471-2458-12-951

Examples

```
library(sf)
library(ggplot2)
data("hs.sampling")
summary(hs.sampling$Population)
ggplot(data=hs.sampling) + geom_sf(aes(color=Population))
```

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load.shp   *Load shapefile into* sf

Description

load.shp converts a shapefile into a sf object.

Usage

```
load.shp(path, file)
```

Arguments

path	Directory of the shapefile.
file	Name of the shapefile, minus extension (.shp).

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plot.ci *Plot confidence interval of the Sandwich estimates*

Description

`plot.ci` plots the lower and upper bounds of the confidence interval of estimated mean value for each reporting unit.

Usage

```
plot.ci(object)
```

Arguments

object   An sf object generated from the `sandwich.confint` function.

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plot.mean *Plot Sandwich estimates*

Description

`plot.mean` plots the mean value of an attribute for each reporting unit estimated by the Sandwich model.

Usage

```
plot.mean(object)
```

Arguments

object   An sf object generated from the `sandwich` function.

References

Wang, J. F., Haining, R., Liu, T. J., Li, L. F., & Jiang, C. S. (2013). Sandwich estimation for multi-unit reporting on a stratified heterogeneous surface. *Environment and Planning A*, 45(10), 2515-2534. doi:10.1068/a44710

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plot.se   *Plot standard error of the Sandwich estimates*

Description

`plot.se` plots the standard error of estimated mean value for each reporting unit.

Usage

```
plot.se(object)
```

Arguments

object   An `sf` object generated from the `sandwich` function.

References

Wang, J. F., Haining, R., Liu, T. J., Li, L. F., & Jiang, C. S. (2013). Sandwich estimation for multi-unit reporting on a stratified heterogeneous surface. *Environment and Planning A*, 45(10), 2515-2534. doi:10.1068/a44710

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sandwich   sandwich*: Spatial Interpolation based on Spatial Stratified Hetero-geneity*

Description

The package `sandwich` provides tools to interpolate a spatially stratified heterogeneous population with high accuracy, even when its spatial autocorrelation is weak. These tools allow the calculation of critical summarized statistics such as Geodetector q. They also enable the visualization of the interpolated surface as well as the standard error and confidence interval maps.

Author(s)

Yue Lin, Chengdong Xu, and Jinfeng Wang

References

Wang, J. F., Haining, R., Liu, T. J., Li, L. F., & Jiang, C. S. (2013). Sandwich estimation for multi-unit reporting on a stratified heterogeneous surface. *Environment and Planning A*, 45(10), 2515-2534. doi:10.1068/a44710

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sandwich.confint *Calculate confidence interval of the Sandwich estimates*

Description

sandwich.confint calculates the confidence interval of estimated mean value for each reporting unit.

Usage

```
sandwich.confint(object, level=.95)
```

Arguments

object	An sf object generated from the sandwich.model function.
level	The confidence level required.

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sandwich.model *Perform Sandwich model-based mapping*

Description

sandwich.model estimate the mean value of an attribute and its standard error for each reporting unit using the Sandwich method documented by Wang et al. (2013).

Usage

```
sandwich(sampling.lyr, ssh.lyr, reporting.lyr, sampling.attr)
```

Arguments

sampling.lyr	A POINT sf object used as the sampling layer. It should contain an attribute that is to be interpolated.
ssh.lyr	A POLYGON sf object used as the SSH layer.
reporting.lyr	A POLYGON sf object used as the reporting layer.
sampling.attr	A string denoting the name of the attribute in the sampling layer to be interpolated.

References

Wang, J. F., Haining, R., Liu, T. J., Li, L. F., & Jiang, C. S. (2013). Sandwich estimation for multi-unit reporting on a stratified heterogeneous surface. *Environment and Planning A*, 45(10), 2515-2534. doi:10.1068/a44710

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