Package 'ArchipelagoEngine'

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Title Spatial Weight Construction for Archipelagic Geographies

Version 0.1.1

Description Implements specialized K-Nearest Neighbor (KNN) logic to address the unique challenges of spatial modeling in archipelagic environments. Standard contiguity models often leave significant portions of island nations (e.g., 20% of the Philippines) mathematically isolated. This package provides tools to ensure 100% network connectivity, neutralizing spatial bias and enabling robust econometric inference. Methodology follows Anselin (1988, ISBN:9024737354) and LeSage and Pace (2009) <doi:10.1201/9781420064254>.

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Encoding UTF-8

LazyData true

RoxygenNote 7.3.3

Imports sf, spdep, magrittr

Suggests splm, spatialreg, knitr, rmarkdown, testthat (>= 3.0.0)

Config/testthat/edition 3

Depends R (>= 3.5)

NeedsCompilation no

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`build_archipelago_weight` *Build Archipelagic Spatial Weights*

Description

Bridges fragmented island networks using K-Nearest Neighbors (KNN) to ensure 100% connectivity (nc=1). This prevents the "orphaning" of island units common in standard Queen-contiguity models.

Usage

```
build_archipelago_weight(p_map, k = 5)
```

Arguments

`p_map`	An `sf` object containing the geographic boundaries.
`k`	Integer. Number of neighbors. Default is 5, optimized for Philippine archipelagic connectivity.

Details

Standard Queen-contiguity models inherently fail in archipelagic settings. In the Philippine context, Queen logic leaves 16 provinces (approx. 20%) mathematically isolated, resulting in a fragmented network with only 80.2% connectivity.

This fragmentation introduces systematic predictive bias, evidenced by significant Residual Spatial Autocorrelation (Moran's I = 0.024, $p < 0.05$) and a higher AIC (201.896).

By enforcing a unified grid (k=5), this function achieves:

- 100% Network Connectivity (nc=1)
- Neutralized Spatial Bias (Moran's I approx. 0, $p > 0.10$)
- Robust Spatial Spillovers (Lambda stable at ~0.26)

While the Queen model may appear to have a "tighter" fit (Log-Likelihood: -96.948), the KNN (k=5) specification (Log-Likelihood: -97.472) is prioritized for structural robustness and randomized residuals.

Value

A `listw` object compatible with spatial regression models.

Examples

```
# Example: Ensuring 100% connectivity for 81 provinces
weights <- build_archipelago_weight(raw_data, k = 5)
spdep::n.comp.nb(weights$neighbours)$nc
```

raw_data *Philippine Provincial Map (81 Provinces)*

Description

A processed `sf` object of the Philippines used to validate archipelagic spatial weights. This dataset serves as the benchmark for bridging fragmented maritime networks.

Usage

```
raw_data
```

Format

An `sf` object with 81 rows and geographic boundaries:

- **Standard Queen Connectivity**: 80.2% (16 isolated units)
- **ArchipelagoEngine (k=5) Connectivity**: 100.0% (0 isolated units)

Source

https://gadm.org/ and research by Nino Jay Talingting.

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