Short Paper

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Abstract

This is the abstract.

It consists of two paragraphs.

Keywords: keyword1, keyword2

1. Methods

1.1. Spatial Autocorrelation and Map Pattern

Spatial autocorrelation is a condition whereby the value of a variable at one location is correlated with the value(s) of the same variable at one or more proximal locations. A tool widely used to measure spatial autocorrelation is Moran's coefficient of autocorrelation, or MC for short. In matrix form, MC can be formulated as follows:

$$MC = \frac{n}{\sum_i \sum_j w_{ij}} \frac{x'Wx}{x'x} \tag{1}$$

where x is a vector $(n \times 1)$ of mean-centered values of a georeferenced variable, and W is a spatial weights matrix of dimensions $(n \times n)$ with elements w_{ij}. The elements of the spatial weights matrix take non-zero values if locations i and j are deemed to be spatially proximate in some sense, and 0 otherwise. It can be appreciated that the coefficient is composed to two elements: the variance of the random variable (i.e., $(x'x)/n$) and its spatial autocovariance $\frac{(x'Wx)}{\sum_i \sum_j w_{ij}}$. As an alternative, the numerator of the right-hand term of Equation 1 can be expressed as follows:

$$x'\Big(I - \frac{11'}{n}\Big)W\Big(I - \frac{11'}{n}\Big)x \tag{2}$$

with I as the identity matrix of size $n \times n$ and 1 a conformable vector of ones.

One possible interpretation of spatial autocorrelation is as map pattern. More concretely, the eigenvalues of the following matrix represent the range of possible values of MC given a spatial weights matrix W, and the extreme eigenvalues are in fact associated with the minimum and maximum values of MC for the system of relationships represented by W:

$$\Big(I - \frac{11'}{n}\Big)W\Big(I - \frac{11'}{n}\Big) \tag{3}$$

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A remarkable discovery is that the eigenvectors associated with the eigenvalues of the matrix in Expression 3 represent a catalogue of latent map patterns, each with a level of autocorrelation (as measured by MC) given by its corresponding eigenvalue. Furthermore, the patterns represented by the eigenvectors are orthogonal by design, and so they furnish n maps that are independent from each other. Since these map patterns depend only on the spatial weights matrix – and not the spatial random variable – they constitute an extensive set of latent map patterns that can be used in regression analysis as filters. This is explained next.

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2. Bibliography styles

Here are two sample references: Feynman and Vernon Jr. (1963; Dirac, 1953).

By default, natbib will be used with the `authoryear` style, set in `classoption` variable in YAML and with `elsearticle-harv.bst` which is among provided style by `elsarticle` documentclass. Other available style are `elsarticle-num.bst` and `elsarticle-num-names.bst` — the first one can be used for the numbered scheme, second one for numbered with new options of natbib.sty.

You can sets extra options with `natbiboptions` variable in YAML header. Example

```
natbiboptions: longnamesfirst,angle,semicolon
```

There are various more specific bibliography styles available at `https://support.stmdocs.in/wiki/index.php?title=Model-wise_bibliographic_style_files`. To use one of these, add it in the header using, for example, `biblio-style: model1-num-names`.

2.1. Using CSL

If `citation_package` is set to `default` in `elsevier_article()`, then pandoc is used for citations instead of `natbib`. In this case, the `csl` option is used to format the references. Alternative `csl` files are available from `https://www.zotero.org/styles?q=elsevier`. These can be downloaded and stored locally, or the url can be used as in the example header.

3. Equations

Here is an equation:

$$f_X(x) = \left(\frac{\alpha}{\beta}\right)\left(\frac{x}{\beta}\right)^{\alpha-1} e^{-\left(\frac{x}{\beta}\right)^{\alpha}}; \alpha, \beta, x > 0.$$

Here is another:

$$a^2 + b^2 = c^2. \tag{4}$$

Inline equations: $\sum_{i=2}^{\infty}\{\alpha_i^{\beta}\}$

4. Figures and tables

Figure 1 is generated using an R chunk.

5. Tables coming from R

Tables can also be generated using R chunks, as shown in Table 1 for example.

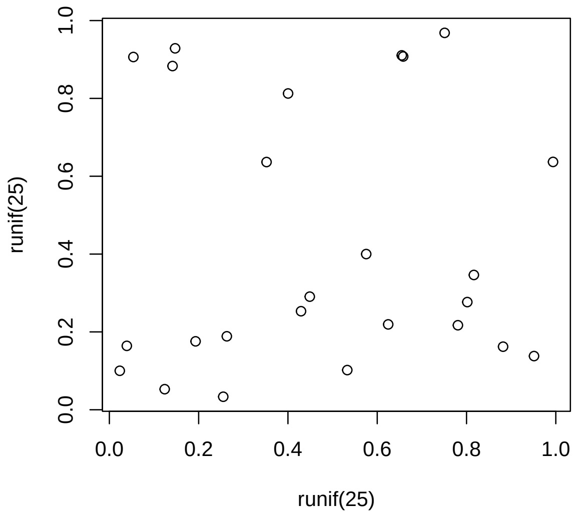

Figure 1: A meaningless scatterplot.

```r
knitr::kable(head(mtcars)[,1:4],
    caption = "\\label{tab1}Caption centered above table"
)
```

Table 1: Caption centered above table

	mpg	cyl	disp	hp
Mazda RX4	21.0	6	160	110
Mazda RX4 Wag	21.0	6	160	110
Datsun 710	22.8	4	108	93
Hornet 4 Drive	21.4	6	258	110
Hornet Sportabout	18.7	8	360	175
Valiant	18.1	6	225	105

References

Dirac, P.A.M., 1953. The Lorentz transformation and absolute time. Physica 19, 888–896. doi:10.1016/S0031-8914(53)80099-6.

Feynman, R.P., Vernon Jr., F.L., 1963. The theory of a general quantum system interacting with a linear dissipative system. Annals of Physics 24, 118–173. doi:10.1016/0003-4916(63)90068-X.