Title: A Novel Algorithm for Quantifying Point-Pattern Disorder with Applications to Geospatial Analysis

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**Abstract:**

In any dataset the relationships between data points often contain information beyond the simple values associated with single data point. For geographic data this idea is most commonly demonstrated with the concept of spatial autocorrelation, but many other techniques have been developed to quantify different conceptualizations of self-interaction and patterns within spatial data. We propose a new metric and related algorithm that describes the visual spatial disorder of geographic point sets, the “Index of Disorder”. The IoD was applied to multiple synthetic and two natural datasets and was shown to be able to differentiate between areas of high spatial disorder (randomly placed points) and low spatial disorder (e.g., grids and other repeating patterns). Because the IoD is a quantitative value, it can be used either as an aid for identifying areas of unusually high or low spatial disorder, or as enrichment for machine learning classification algorithms.

**One Sentence Summary:**

The spatial disorder of a given point of data can be quantified by comparing the relative positions of that point’s neighbors to the relative positions of its neighbors’ neighbors.

**Main Text:**

**Introduction**

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**Related Work**

XX

**Methods**

XX

**Results**

XX

**Discussion**

XX

**Conclusion**

XX

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Equations can be included. We do not recommend using the native Word 2007, 2008, 2010, or 2011 equation editor. This can in some cases produce less reliable MathML, the online markup language we use, which may result in display errors. Instead, use the legacy equation editor in Word (Chose Insert > Insert Object > Word Equation) or use Mathtype (recommended). If you enter equations in simple LaTeX, check that they will convert accurately (Word 2007 and higher can convert simple LaTeX equations).

References and Notes:

1. Jiang, Bin, and Junjun Yin. “Ht-Index for Quantifying the Fractal or Scaling Structure of Geographic Features.” *Annals of the Association of American Geographers*, vol. 104, no. 3, Mar. 2013, pp. 530–540., doi:10.1080/00045608.2013.834239.

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