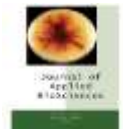

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Practical considerations on data patterns in Bayesian Maximum Entropy Estimation: A systematic and critical review

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ABSTRACT

Objective: It is well known that some data features (sample size, skewness, among others) may determine method performance. The choice of those features depends on the researcher's level of awareness on the statistical method. In this study, the level of awareness on the influence of spatial data key characteristics (sample size, skewness, spatial dependency and variogram model) in Bayesian Maximum Entropy (BME) was analyzed.

Methodology: A systematic review was conducted that covers the period from 1990 (year of BME introduction) to 2019. Two main keywords "Bayesian Maximum Entropy" and "BME" were used for literature search. Publications which only mentioned the keywords without applying BME were excluded while those with application and/or BME theory discussion were considered. Six of the world's leading Open Access sources of scientific literature were considered, namely: Science Direct, African Journals Online, Springer, Google Scholar, MPDI and Academic Journals. A total of 118 research articles from 62 journals were identified. The sample sizes screened shows that 25.4% of the published articles used few samples (less than 100), which implies the variogram might not yield accurate results. The analysis of the use of skewness showed that most researchers do not apply transformation on skewed data (82.2%) nor consider skewness in their descriptive statistics (90.7%). Even though 11% of theoretical papers have mentioned about spatial dependency level, 92.4% of them failed to consider it. Most researchers (68.64%) do not specify the variogram models but when they do, they mostly use exponential model (12.7%). It clearly appears in this review that most researchers do not consider the effect of sample size, skewness, and spatial dependency level when applying BME. Yet very few research works have focused on these aspects. This therefore calls for more in-depth studies on the effect of data characteristics on BME's performance.

Keywords: Bayesian Maximum Entropy, sample size, skewness, spatial dependency.