Modeling Spatial Overdispersion with the Generalized Waring Process

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Abstract

Modeling spatial overdispersion requires point processes models with finite dimensional distributions that are overdispersed relative to the Poisson. Fitting such models usually heavily relies on the properties of stationarity, ergodicity, and orderedness. And, though processes based on negative binomial finite dimensional distributions have been widely considered, they typically fail to simultaneously satisfy the three required properties for fitting. Indeed, it has been conjectured by Diggle & Milne that no negative binomial model can satisfy all three properties. In light of this, we change perspective, and construct a new process based on a different overdispersed count model, the Generalized Waring Distribution. While comparably tractable and flexible to negative binomial processes, the Generalized Waring process is shown to possess all required properties, and additionally span the negative binomial and Poisson processes as limiting cases. In this sense, the GW process provides an approximate resolution to the conundrum highlighted by Diggle & Milne.

Keywords and Phrases: additivity; stationarity; ergodicity; orderedness; overdispersion; Poisson process; negative binomial process; generalized Waring process; complete separable metric space

Running Head: Spatial Overdispersion and the GWP