Drawing conclusions from spatial coincidences: a cumulative clustering account

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Abstract

Spatial coincidences allow us to infer the presence of latent causes in the world. For instance, an unusually large cluster of ants allows us to infer the presence of a food source. The leading cognitive model for such inferences is Bayesian, but the Bayesian algorithm is computationally taxing. Humans likely employ a more efficient, approximative algorithm. To characterize the cognitive algorithms used, we had subjects judge whether a set of dots was drawn from a uniform distribution or from a mixture of a uniform and a gaussian source (tending to produce clusters). Responses systematically deviate from Bayesian optimality: as the number of dots increase, subjects more often report a latent cause where none exists. The bias is accounted for by a Bayesian clustering algorithm that cumulatively considers the next-nearest dot to a putative source. This finding helps characterize our tendency to perceive causal patterns where none exist.