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Modal Spatial Statistics for Investigating the Contingencies of Autocorrelation in Quantitative Social Science

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Abstract

Social theorists and historians have increasingly emphasized the role of contingency in the realized trajectories of social change. Yet quantitative social science lacks a well-developed framework for distinguishing patterns that appear necessary across relevant alternatives from those that are contingent on the particular spatial and temporal configuration that happened to occur. I introduce modal spatial statistics as a research programme designed to address this problem. The approach combines Kripkean possible-worlds semantics, especially the specification of relevant alternative worlds through accessibility relations, with geographical and econometric methods for modelling spatial and temporal dependence. Its aim is not to replace established measures of autocorrelation, but to extend their interpretation by asking how observed dependence would vary across explicitly defined counterfactual configurations. I outline the programme's broader theoretical and methodological parameters and explain why it is well suited to transdisciplinary collaboration. A formal vocabulary of accessible alternatives may also help qualitative and quantitative researchers meet halfway by making claims about contingency, necessity, and path dependence more explicit and comparable across research designs. Throughout the presentation, I use spatio-temporal autocorrelation as a focused example, showing how modal assumptions can supplement existing autocorrelation analysis by distinguishing dependence that is robust across relevant alternatives from dependence that is specific to the realized arrangement of observations.

Keywords: Modal Logic; Spatial Statistics; Autocorrelation; Contingency