



Karlstad Applied Analysis Seminar (2024)

Sara Hamis, Department of Information Technology,
Uppsala University, Sweden.

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Studying cell ecology with spatial cumulant models

Abstract

Spatial cumulant models (SCMs) are spatially resolved population models, formulated by differential equations. SCMs approximate the dynamics of two summary statistics generated by spatio-temporal point processes (STPPs): first-order spatial cumulants (densities), and second-order spatial cumulants (spatial covariances). In this talk, I'll exemplify how SCMs can be used to predict and control STPP-generated population dynamics. With a worked example, I'll demonstrate that (1) SCMs can capture STPP-generated density dynamics, even when mean-field population models (MFPMs) fail to do so, and (2) SCM-informed treatment strategies outperform MFPM-informed strategies in terms of inhibiting population growths. Overall, our work demonstrates that SCMs provide a new framework in which to study cell-to-cell interactions and treatments that take cell-to-cell interactions into account.