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GILLESPIE ALGORITHMS FOR STOCHASTIC MULTIAGENT DYNAMICS IN POPULATIONS AND NETWORKS

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Gillespie Algorithms for Stochastic Multiagent Dynamics in Populations and Networks

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Abstract: Many multiagent dynamics can be modeled as a stochastic process in which the agents in the system change their state over time in interaction with each other. The Gillespie algorithms are popular algorithms that exactly simulate such stochastic multiagent dynamics when each state change is driven by a discrete event, the dynamics are defined in continuous time, and the stochastic law of event occurrence is governed by independent Poisson processes. The first main part of this Element provides a tutorial on the Gillespie algorithms focusing on simulation of social multiagent dynamics occurring in populations and networks. The authors clarify why one should use the continuous-time models and the Gillespie algorithms in many cases instead of easier-to-understand discrete-time models. The remainder of the Element reviews recent extensions of the Gillespie algorithms aiming to add more reality to the model (i.e., non-Poissonian cases) or to speed up the simulations. This title is also available as open access on Cambridge Core.

Keywords: numerical simulations, jump processes, Poisson processes, renewal processes, complex systems

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