

Stochastic Filtering of Partially Observed Reaction Networks

Muruhan Rathinam

University of Maryland Baltimore County

`muruhan@umbc.edu`

Coauthor(s): Mingkai Yu

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Intra-cellular chemical reactions are best modeled as continuous time Markov chains with a multi-dimensional non-negative integer lattice as state space. Here an integer vector in the state space represents the vector copy number of all the molecular species present in the system. Inference of state as well as parameters of such systems from partial state observations is of importance in the modeling and control of such systems. We describe recently developed sequential Monte Carlo methods for the computation of the conditional distribution of the state and/or parameters from the observations of the molecular copy numbers of a subset of the species either in continuous time or in discrete snapshots in time. In addition to presenting theoretical justification, we also provide numerical examples.

- [1] Rathinam, Muruhan & Yu, Mingkai (2021). *State and parameter estimation from exact partial state observation in stochastic reaction networks*. The Journal of Chemical Physics. 154(3).
- [2] Rathinam, Muruhan & Yu, Mingkai (2023). Stochastic Filtering of Reaction Networks Partially Observed in Time Snapshots. *arXiv preprint arXiv:2307.16734*.