

## **Bayesian Calibration of Simulators with Structured Discretization Uncertainty**

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When computational constraints prohibit model evaluation at all but a small number of parameter settings, a dimension-reduced emulator of the system can be constructed and interrogated at arbitrary parameter regimes. Existing approaches to emulation consider models with deterministic output. However, in many cases the underlying mathematical model, or the simulator approximating the mathematical model, are stochastic. In this paper, we propose a Bayesian calibration approach for stochastic simulators. The approach is motivated by two applied problems: a deterministic mathematical model of intra-cellular signaling with unknown closed-form solution, and a stochastic model of river water temperature commonly used in hydrology.