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Non-mechanistic Learning of PDEs from Discrete Spatial Data in Biology

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Stochastic models of biological phenomena are often favored over their continuous ODE and PDE counterparts as they are able to incorporate more relevant biological phenomena and better represent the inherent randomness in real biological systems. Differential Equation models, however, may be analyzed to make inferences about both the transient and long-term behavior of the system. We will discuss an approach to non-mechanistically learn PDEs from discrete data that are generated from stochastic models. We will investigate the learning of PDEs both from stochastic processes that are classically known to upscale to PDEs such as biased random walks as well as more complex Cellular Automata models that are not known to have a continuum limit, with an eye towards learning PDEs from noisy experimental data.