



May 18th, 5:00 PM - 7:00 PM

Parameter Estimation Using Nudging on the Logistic Growth Equation

Susan Rogowski
Florida State University, sr19a@my.fsu.edu

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It is a common problem in biomathematics that, given a noisy set of observations or data, one must estimate parameters for some mathematical model. Here, we consider the scenario of predicting the growth rate of a bacteria population from noisy data. Using the logistic growth equation as a simple model, we develop an algorithm to dynamically learn the growth rate from the given noisy data. Under proper assumptions, and in the case of noise free data, we provide an analytical proof of convergence of our algorithm to the correct rate of growth. We support our analysis by demonstrating computationally the convergence of the algorithm, including the case of noisy observations. Lastly, we will discuss expanding this algorithm when bacteria growth is modeled on a water distribution network.