Equation-free techniques for infectious disease data

Equation-free methods have become increasingly prevalent in the analysis of high-dimensional, complex systems. These methods have a number of advantageous characteristics for facing the modern challenges of complex systems including the ability to handle high-dimensional measurement data, discover reduced-order models, and analyze systems that do not have a set of well-defined governing equations. As a motivating example, equation-free methods can be applied to data collected by public health surveillance systems focused around the eradication of infectious diseases. The increased awareness for gathering high-quality data and the advent of new monitoring tools is beginning to generate large sets of data describing the spread of infectious disease. In this presentation, I will discuss how data-driven, equation-free methods, such as Koopman operator theory, Dynamic Mode Decomposition (DMD), and Sparse Identification of Nonlinear Dynamics (SINDy), can help analyze time-series data. This presentation will also include a discussion on how these methods can be theoretically generalized to handle data related to inputs and control of the system, e.g. vaccination rates and bednet usage, and to help in the design of surveillance programs.

4:00 p.m.
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