BOSTON UNIVERSITY STATISTICS

AND PROBABILITY SEMINAR SERIES

Parameter Estimation for Differential Equations: A Generalized Smoothing Approach

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Mathematics and Computer Science (MCS) Building, Room 149

111 Cummington Street, Boston

Tea and Cookies at 3:30pm in MCS 153

Abstract: We propose a new method for estimating parameters in models defined by a system of non-linear differential equations. Such equations represent changes in system outputs by linking the behavior of derivatives of a process to the behavior of the process itself. Current methods for estimating parameters in differential equations from noisy data are computationally intensive and often poorly suited to the realization of statistical objectives such as inference and interval estimation. This paper describes a new method that uses noisy measurements on a subset of variables to estimate the parameters defining a system of nonlinear differential equations. The approach is based on a modification of data smoothing methods along with a generalization of profiled estimation. We derive estimates and confidence intervals, and show that these have low bias and good coverage properties, respectively, for data simulated from models in chemical engineering and neurobiology. The performance of the method is demonstrated using real-world data from chemistry and from the progress of the auto-immune disease lupus.

For directions and maps, please see *http://math.bu.edu/research/statistics/statseminar.html.*