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Reconstructing Systems of Nonlinear Differential Equations from Time Series KEITH H. WARNICK, Utah State University, CHARLES R. TOLLE, Idaho National Laboratories — Appropriately modeling a dynamical system by the construction of differential equations is a vital and common task in computational physics. However, generating an acceptable model of the underlying dynamics may be a complex problem in systems which exhibit high-order or nonlinear behavior. This poster details the reproduction and performance of a trajectory method proposed by Perona et al. for the construction of a system of nonlinear differential equations from time series data. By numerically integrating a given set of basis functions, the method uses an iterative algorithm to fit a polynomial in the chosen basis functions to the time series. By this method, time series data from any sufficiently connected and observable system may potentially be used to numerically approximate the equations which give rise to the system dynamics. The demonstrated generality and effectiveness of this method make it a potentially powerful tool for the study of dynamical systems.

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