Reconstructing Deterministic System Dynamics from Volatile Time Series Data

FIU FLORIDA INTERNATIONAL UNIVERSITY
Earth and Environment Seminar

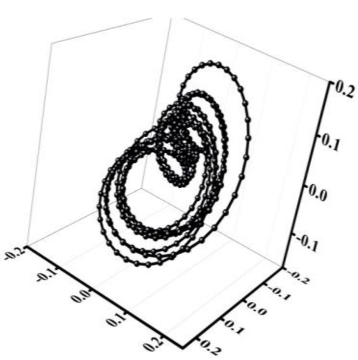
Featuring
Dr. Ray Huffaker
Professor

Department of Biological and Agricultural Engineering
University of Florida.

Dr. Huffaker specializes in modeling complex bio-economic, hydrological and ecological dynamics, using cutting-edge mathematical modeling techniques. He is a natural resource economist and a legal scholar by training. He earned his Ph.D. and J.D. degrees from the University of California, Davis, specializing in water, environmental, and natural resource law and policy.

September 29, 2017
3:00 – 4:15 pm, WC 130

In the process of data analysis, we often observe irregular, volatile, and random-appearing data. A common presumption is that observed complexity is generated by stochastic behavior beyond the capacity of deterministic modeling. This is not necessarily true—breakthroughs in nonlinear dynamics demonstrate that surprisingly irregular and complex behavior can emerge from relatively simple deterministic nonlinear dynamic systems. Correctly diagnosing whether observed volatility in time series data is generated by stochastic or deterministic dynamics has important implications for public policy. Stable systems generating volatile output in response to external stochastic shocks are self-correcting, and thus support the adoption of non-interfering laissez-faire policies. Alternatively, intrinsically unstable deterministic systems do not provide a self-correcting mechanism, and thus support government intervention designed to reduce volatility and/or mitigate its negative impacts. How can we diagnose the ‘true nature’ of unobservable real-world system dynamics from available time series data?



The seminar introduces Nonlinear time series analysis (NLTS)—a collection of empirical tools developed in the mathematical physics literature—that researchers in the applied biophysical and social sciences can use to make this diagnosis. NLTS diagnostics, along with scientific principles and other expert information, guide the specification of decision-support models generating ‘groundtruth’ dynamics corresponding to real-world behavior that policy-makers are charged to regulate. The seminar provides examples of how NLTS has been used in recent research to incorporate more complex wind-speed dynamics into wind-power project evaluation, investigate the impact of sea-level rise on water and salinity levels of wells in the Everglades, assess the performance of water-treatment wetlands in removing phosphorus from irrigation water flowing into the Everglades, and characterize volatile food price dynamics threatening food security.

Dr. Huffaker will be available to meet with graduate students and faculty on Friday, Sept. 29, 2017, from 11:00AM-12:30PM in the **Conference Room at AHC5-300.** Also, all are invited to join Dr. Huffaker at lunch in the Faculty Club (12:30 pm to 2:00 pm). If you plan to meet in person and/or join him for lunch, please contact Anteneh Abiy (aabiy001@fiu.edu) and Carlos Herdocia (cherd002@fiu.edu).

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