

Locating unknown steady states: When machine learning meet time series dataset

Wei Lin

Abstract: With tremendous development of data collections, processing, and mining, data-driven and model-free methods and algorithms are highly expected in various communities of science, engineering, and even social science. Those complex data, experimentally collected along with the time evolution, are usually supposed to be produced by the hidden complex dynamical systems, whose explicit models are often unknown partially or even completely. In order to depict the skeleton of such complex data and make accurate prediction without any explicit models, advanced technologies of machine learning have been invited and applied successfully. In this talk, we propose an integrated framework connecting the machine learning technique with the adaptive delayed feedback control, and demonstrate the effectiveness of the proposed framework in locating and controlling the unobservable and unstable steady states based merely on the collected data of chaotic time series produced by complex systems. It is anticipated that our works including the machine learning techniques are able to meet the requirements arising in the research of complex systems, and also that the theory of complex dynamical systems can inversely contribute to illustrating and complementing the principles of machine learning techniques.

¹⁾ Wei Lin, Professor: Fudan University, 220 Handan Road, Shanghai 200433, China (CN), wlin@fudan.edu.cn, the author presented this contribution at the conference in the special session "A special session dedicated to Prof. Miguel A.F. Sanjuán on the occasion of the celebration of his 60th anniversary" organized by J. Awrejcewicz.