

C3S2

The Clarkson Center for Complex Systems Science

Ying-Cheng Lai, Professor Arizona State University

Will present a talk entitled:

Predicting Tipping Point With Machine Learning

Abstract: There has been a growing interest in exploiting machine learning to predict the behaviors of complex and nonlinear dynamical systems. A challenging problem is to predict the occurrence of a tipping point at which the system undergoes a transition from a functioning steady state to a collapsing steady state. From the dynamical point of view, a tipping point is typically triggered by an inverse saddle-node bifurcation, at which a healthy steady state is destroyed, leaving a catastrophic or an extinction steady state as the only attractor of the system. Compared with the existing works on model-free prediction of chaotic systems, to predict a tipping point is significantly more challenging, because the training data are from the system when it is in a steady state. The speaker will describe the tipping-point mechanism, discuss how dynamical noise can be exploited in a machine learning scheme to predict the future occurrence of tipping points, and present benchmark examples as well as a real-world application.

Bio: Ying-Cheng Lai is a Regents Professor, the ISS Endowed Professor of Electrical Engineering, and a Professor of Physics at Arizona State University. He received the PECASE award in 1997 from the White House and has been a Fellow of the American Physical Society since 1999. In 2016, he was selected by the Department of Defense for the Vannevar Bush Faculty Fellowship. In 2018, he was elected as a Foreign Member of National Academy of Science and Letters of Scotland. In 2020, he was elected as a Foreign Member of Academia Europaea (The Academy of Europe) and as a Fellow of the American Association for the Advancement of Science (AAAS). As of October 2022, Y.-C. Lai has published 530 refereed-journal papers with over 28,000 citations (H-index: 79; i-10 index: 426).

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Friday, December 9, 2022

12:00 pm