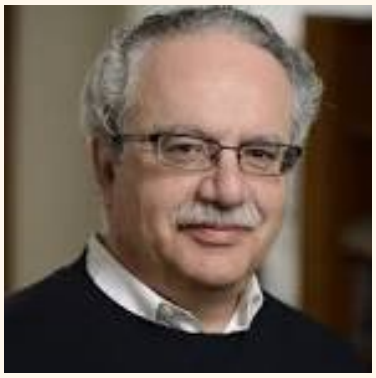
Nov 22, 2024

1.30 p.m.-2.30 p.m.
AERB 100

No Equations, No Variables, No Space and No Time: Data and the Modeling of Complex Systems



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ABSTRACT:

I will give an overview of a research path in data driven modeling of complex systems over the last 30 or so years – from the early days of shallow neural networks and autoencoders for nonlinear dynamical system identification, to the more recent derivation of data driven "emergent" spaces in which to better learn generative PDE laws. In all illustrations presented, I will try to point out connections between the "traditional" numerical analysis we know and love, and the more modern data-driven tools and techniques we now have – and some mathematical questions they hopefully make possible for us to answer.

BIOGRAPHY:

Yannis Kevrekidis studied Chemical Engineering at the National Technical University in Athens. He then followed the steps of many alumni of that department to the University of Minnesota, where he studied with Rutherford Aris and Lanny Schmidt (as well as Don Aronson and Dick McGehee in Math). He was a Director's Fellow at the Center for Nonlinear Studies in Los Alamos in 1985-86 (when the Soviet Union still existed and research funds were plentiful). He then had the good fortune of joining the faculty at Princeton, where he taught Chemical Engineering and also Applied and Computational Mathematics for 31 years; seven years ago he became Emeritus and started fresh at Johns Hopkins (where he somehow is also Professor of Urology). His work always had to do with nonlinear dynamics (from instabilities and bifurcation algorithms to spatiotemporal patterns to data science in the 90s, nonlinear identification, multiscale modeling, and back to data science/ML); and he had the additional good fortune to work with several truly talented experimentalists, like G. Ertl's group in Berlin. Currently -on leave from Hopkins- he works with the Defense Sciences Office at DARPA. When young and promising he was a Packard Fellow, a Presidential Young Investigator and the Ulam Scholar at Los Alamos National Laboratory. He holds the Colburn, CAST Wilhelm and Walker awards of the AIChE, the Crawford and the Reid prizes of SIAM, he is a member of the NAE, the American Academy of Arts and Sciences, and the Academy of Athens.