MAE Seminar Series

Model reduction via aggregation: An information theoretic interpretation of spectral cut

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Abstract

This talk is concerned with an information theoretic approach for control-oriented modeling and model reduction of nonlinear systems.

The background is the spectral theory of Markov models that continues to serve as an important tool for understanding multi-scale phenomenon. For a stationary Markov chain on a finite dimensional state space, the second eigenvector is often used to obtain intuition regarding dynamics, as well as methods for aggregation. The spectral method has close connections to both the classical notion of nearly completely decomposable Markov chain (NCDMC) and the notion of *cut* in spectral graph theory.

The objective of this talk will be to examine decomposition, aggregation and model reduction issues for Markov chains in information theoretic terms. We will outline some ideas for both interpreting classical and more recent spectral methods, and deriving new error bounds and algorithms for model reduction of Markov chains. In particular, we will discuss the significance of second eigenvector in these terms. Connections to prediction based approaches will also be made.

Speaker Biography

Prashant G. Mehta is an Assistant Professor at the Department of Mechanical Science & Engineering, University of Illinois at Urbana-Champaign. He received his Ph.D. in Applied Mathematics from Cornell University in 2004. Prior to joining UIUC, he was a research engineer at the United Technologies Research Center (UTRC). At UTRC, he was recognized with an outstanding achievement award for his contributions in developing dynamical systems methods to obtain practical solutions to problems in aero-engines. His research interests are in development of stochastic methods for modeling and control of nonlinear systems, with applications to biology, integrated building systems and communication networks.

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Please contact Dr. Puneet Singla (psingla@eng.buffalo.edu) for additional information