

**Abstract for GR-TR Conference on Statistical Mechanics
and Dynamical Systems**

Plenary Invited

Invited Talk

Nonlinear Model Reduction for Complex/Multiscale Systems

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We present and illustrate the use of data mining/manifold learning techniques for the coarse-graining and reduction of microscopic (atomistic, stochastic, agent based) simulations of complex systems. In particular, we show how the reduced representations obtained through such approaches can be linked with scientific computation to accelerate the extraction of coarse-grained information from such multiscale simulations. Our method of choice is the Diffusion Map approach pioneered by R. R. Coifman, and the illustrative examples come from equilibrium and nonequilibrium thermodynamic simulations, agent based modeling as well as from network dynamic simulations.