**Effects of Noise in Nonlinear Dynamical Systems**

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**ABSTRACT**: Noise in nonlinear dynamical systems can lead to significant changes in their dynamical behavior and has the potential to alter the boundaries of regimes of different attractors, characteristics of their flow field and their bifurcations, especially in multi-stable systems. A distinctive dynamical feature in noisy systems is the presence of intermittency, when the response exhibits qualitatively distinct behavioral states in an aperiodic and irregular manner. This talk focuses on investigating a special class of intermittency, referred to in the literature as noise-induced intermittency, that arise due to noise. An approach for analyzing intermittency in maps due to aperiodic fluctuations of the system bifurcation parameter will be presented along with generic conditions for their onset and disappearance. The role of correlations in the noise will be discussed. The phenomenon of noise-induced intermittency will be interpreted in terms of stochastic bifurcations as well and newly developed quantitative measures to identify the dynamical regimes will be presented. Numerical results for both maps and flows will be presented. Finally, the noise-induced behavior will be shown to lead to a suite of precursors that serve as early warning measures of impending change in the dynamical stability of the system.

**Biography**

Sayan Gupta is a Professor in the Department of Applied Mechanics, Indian Institute of Technology Madras. After graduating with a degree in Civil engineering from Jadavpur University, Calcutta, he obtained his MS and PhD from Indian Institute of Science Bangalore. After a post-doctoral stint at the Technical University of Delft, The Netherlands, he joined IIT Madras as a faculty member. He has held visiting researcher/faculty positions at the Department of Mathematics in University of Lund and Chalmers University, Sweden. His current research interests are primarily in stochastic mechanics and nonlinear dynamics, with applications to fluid-structure interaction problems and energy harvesting. His other interests are in uncertainty quantification, time variant reliability analyses, system identification using dynamic Bayesian techniques, random fatigue and life estimation. His research group at IIT Madras is named The Uncertainty Lab.

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