

Abstract Submitted
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Dynamically bi-orthonormal formulation for stochastic partial differential equations¹ PRERNA PATIL, HESSAM BABAEE, University of Pittsburgh — A new method is presented for a real-time reduced-order modeling of transient stochastic systems for the purpose of uncertainty propagation. We present a closed-form evolution equation for a low-rank time-dependent basis that evolves with the dynamics. An on-the-fly reduction of the dynamical system is then obtained by projecting the full-dimensional system onto to the low-rank basis. The presented method is compared against the state of the art Dynamically Orthogonal (DO) method and Bi-Orthogonal (BO) method for highly ill-conditioned cases. In particular, we demonstrate that the presented method preserves the accuracy of the solution and the shape of the modes as the system passes through a low eigenvalue phase. The results for several demonstration cases are presented, including linear advection equation, stochastic Burgers' equation and stochastic flow in a channel.

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Perna Patil
University of Pittsburgh

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