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will speak on

Intrinsic Sparse Mode Decomposition of High Dimensional Random Fields with Application to Stochastic Elliptic PDEs

ABSTRACT: Inspired by the recent developments in data sciences, we introduce an intrinsic sparse mode decomposition method for high dimensional random fields. This sparse representation of the random field allows us to break a high dimensional stochastic field into many spatially localized modes with low stochastic dimension locally. Such decomposition enables us to break the curse of dimensionality in our local solvers. To obtain such representation, we first decompose the covariance function into low part plus sparse parts. We then extract the spatially localized modes from the sparse part by solving a L^0 minimization. We further relax this L^0 minimization problem into a L^1 minimization and prove rigorously the equivalence of the two formulations. Moreover, we provide an efficient algorithm to solve it. As an application, we apply our method to solve elliptic PDEs with random media having high stochastic dimension. Using this localized representation, we propose various combinations of local and global solver that achieve different level of accuracy and efficiency. At the end of the talk, I will also discuss other applications of the intrinsic sparse mode extraction. This work is in collaboration with Thomas Y. Hou and Pengchuan Zhang.

THURSDAY, DECEMBER 4

LECTURE AT 2:00 PM

COFFEE, TEA, AND REFRESHMENTS FROM 3:40 PM

ROOM 617, WACHMAN HALL

DEPARTMENT OF MATHEMATICS