

Stochastic polynomial chaos expansions for emulating stochastic simulators

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Due to the random nature of stochastic simulators, conventional surrogate modelling approaches that have been successfully developed for deterministic simulators are not directly applicable. In this talk, we present an extension of polynomial chaos expansions (PCE) to approximating the response distribution of stochastic simulators. In this approach, we introduce both a latent- and an additional noise variable, on top of the well-defined input parameters to represent the randomness in the model output. More precisely, the surrogate is the sum of the noise term and a PCE that depends on both the input parameters and the newly introduced latent variable. We propose an algorithm that adaptively finds an appropriate truncation scheme for the PCE. Most importantly, no replications are needed in the experimental design (of the simulator's data) to compute the PCE coefficients. The performance of the proposed methods is illustrated on various examples.

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