

Exploiting structure to decrease the cost of uncertainty quantification

Scientific Achievement

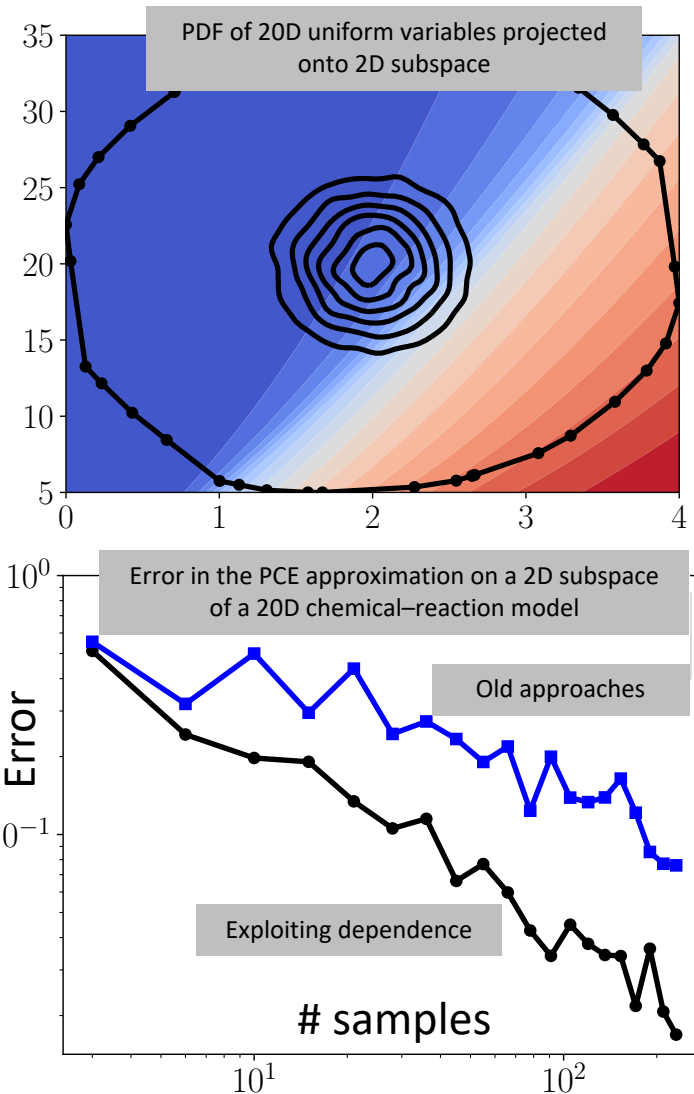
Developed a method for building approximations of models parameterized by dependent variables.

Significance and Impact

Variable dependence significantly degrades the performance of existing methods. Our method increases scalability of forward and inverse UQ by sampling in regions of high-probability whilst maintaining stability.

Research Details

- Numerically generate multivariate polynomials which are orthogonal to the joint PDF of the random variables
- Exploit orthogonality to construct sampling sets for interpolation that maximizes the determinant of the interpolation matrix.



J.D. Jakeman, F. Franzelin, A. Narayan, M. Eldred, & D. Pflueger, "Polynomial chaos expansions for dependent random variables," submitted, 2018