

Efficient Rare Event Simulation for Failure Problems in Random Media

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We study rare events associated to solutions of elliptic partial differential equations with spatially varying random coefficients. The random coefficients follow the lognormal distribution, which is determined by a Gaussian process. This model is employed to study the failure problem of elastic materials in random media in which the failure is characterized by that the strain field exceeds a high threshold. We propose an efficient importance sampling scheme to compute small failure probabilities in the high threshold limit. The change of measure in our scheme is parametrized by two density functions. The efficiency of the importance sampling scheme is validated by numerical examples.