

# Adapting Reduced Models in the Cross-Entropy Method

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This work deals with the estimation of rare event probabilities using importance sampling (IS), where an *optimal* proposal distribution is computed with the cross-entropy (CE) method. Although, IS optimized with the CE method leads to an efficient reduction of the estimator variance, this approach remains unaffordable for problems where the repeated evaluation of the score function represents a too intensive computational effort. This is often the case for score functions related to the solution of a partial differential equation (PDE) with random inputs. This work proposes to alleviate computation by adapting a score function approximation along the CE optimization process. The score function approximation is obtained by selecting the surrogate of lowest dimensionality, whose accuracy guarantees to pass the current CE optimization stage. The adaptation of the surrogate relies on certified upper bounds on the error norm. An asymptotic analysis provides some theoretical guarantees on the efficiency and convergence of the proposed algorithm. Numerical results demonstrate the gain brought by the adaptive method in the context of pollution alerts and a system modeled by a PDE.

## Références

- [1] P. HÉAS, *Adapting Reduced Models in the Cross-Entropy Method*, arXiv preprint arXiv:1806.01916, 2018.