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# Surrogate models and active learning for reliability analysis

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## Abstract

Computational models are used in virtually all fields of engineering to predict the behavior of complex natural or man-made systems. Also known as *simulators*, they allow the analyst to assess the performance of a system *in-silico*, and then optimize its design or operating. Reliability analysis (a.k.a. *rare event simulation*) aims at quantifying the level of safety of systems through the computation of probabilities of failure. In this talk we review methods that combine surrogate models (such as Gaussian processes) and active learning techniques to estimate probabilities of failure at low cost. We will introduce a versatile framework for surrogate-based reliability analysis, and its implementation in the uncertainty quantification software UQLab. Various application examples will be showcased, including a recent international benchmark on reliability methods.

**Keywords:** Reliability, Gaussian processes, active learning

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