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Uncertainty-aware surrogate modeling via conformal prediction

Abstract: Industrial applications routinely employ surrogate / reduced-order models, for example, to accelerate design studies such as optimization and uncertainty quantification, or to enable model-based estimation in real-time. On the one hand, most surrogate models produce point estimates that lack metrics regarding the uncertainty in their predictions. On the other hand, models that do provide predictive uncertainty metrics, such as Gaussian processes or Bayesian neural nets, impose strict modeling assumptions. In this talk, we will present a framework that integrates the conformal prediction method within specific low-complexity surrogate models, thus equipping them with predictive uncertainty intervals without prior assumptions regarding data distribution or model form. The framework is validated on several benchmark models.