

Antoine Ajenjo, Emmanuel Ardillon, Vincent Chabridon, Bertrand Iooss, Scott Cogan, Emeline Sadoulet-Reboul, 2022, An info-gap framework for robustness assessment of epistemic uncertainty models in hybrid structural reliability analysis, *Structural Safety*, Vol. 96, May 2022, 102196.

## Highlights

- Robustness evaluation of hybrid reliability analysis is performed.
- The effect of several epistemic uncertainty models on the robustness is analyzed.
- Info-gap and random set theory are jointly applied in the proposed methodology.
- Robustness/opportuneness curves and a value of information metric are provided.
- The methodology is illustrated on two toy-cases and one industrial use-case.

**Abstract** The main objective of this work is to study the impact of the choice of input uncertainty models on robustness evaluations for probabilities of failure. Aleatory and epistemic uncertainties are jointly propagated by considering hybrid models and applying random set theory. The notion of horizon of uncertainty found in the info-gap method, which is usually used to assess the robustness of a model to uncertainty, allows to compare the bounds on the probability of failure obtained from different epistemic uncertainty models at increasing levels of uncertainty. Info-gap robustness and opportuneness curves are obtained and compared for the interval model, the triangular and trapezoidal possibility distributions, the probabilistic uniform distribution and the parallelepiped convex model on two academic examples and one industrial use-case. A specific demand value, as introduced in the info-gap method, is used as a value of information metric to quantify the gain of information on the probability of failure between less informative uncertainty models and a more informative ones.

**Keywords** Hybrid structural reliability, Epistemic uncertainty, Robustness, Info-gap, Random sets.