

Mini-Symposium 20

Reliability analysis in the presence of deep uncertainties

Hao Zhang, Michael Beer, Edoardo Patelli, Wei Gao, Scott Ferson

Reliability and performance analyses of complex systems become increasingly complicated due to limited, vague and imprecise information. These epistemic uncertainties, in many practical cases, may overshadow the effects of aleatory uncertainties. This problem has generated significant developments on generalized approaches for uncertainty quantification with the key question of how to model these "deep uncertainties". In many practical cases only ranges or bounds are available for some parameters so that set-theoretical descriptors provide an appropriate model. In combination with probabilistic information this leads to imprecise probabilities as the theme of this Mini Symposium. Whilst previous developments were heavily focused on modelling with often simple applications to demonstrate basic features, the approaches have more recently reached a stage of sophistication that enables the solution of real-size problems. This step has been achieved by combining imprecise probabilities with established and emerging concepts and techniques from the traditional probabilistic field, specifically, with advanced stochastic modelling and Monte Carlo simulation. This mini-symposium aims at bundling the most recent developments in the area of imprecise probabilities, including strategies for bounding probabilities, in the context of challenging geotechnical and structural engineering problems. The models may include all variants of imprecise probabilities such as interval probabilities, p-box approach, evidence theory, fuzzy probabilities and so forth.