

# **Machine Learning Assisted Nondeterministic Structural Analysis and Safety Assessment**

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## **Abstract**

It is vital to address properly the effects of inevitable uncertainties, due to constructional defects, imprecise knowledge of design parameters and aging process, in the analysis, reliability assessment and design of engineering structures. Although considerable attempts have been made at solving structural engineering problems involving uncertainty, the progress has been slow worldwide, which is mainly due to these two reasons: establishing through experimental investigations an adequate statistical database of structural behaviour, cannot be created exclusively for a practical structure due to the unaffordable financial costs and its extremely time-consuming process. As for computational analysis which is an attractive option when such experimental databases are not available, any stochastic nonlinear analysis of a large-size structure is very time consuming, which entails typically a large computational expense and is often intractable for large-size practical structures. This talk presents an advanced machine learning assisted stochastic analysis and safety assessment framework to harness the full potential of virtual reality modelling technologies and computational structural mechanics to enhance largely the efficiency of implementing stochastic structural analyses and safety assessments. The performance and applicability of the developed machine learning assisted framework is demonstrated through a variety of engineering problems.