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Special Session Title:

Machine Learning Techniques in Uncertainty Quantification in Structural Engineering

Organizers

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Abstract

Uncertainty quantification in structural engineering is an emerging field, particularly for structural reliability analysis (SRA), reliability-based design and optimisation (RBDO) and structural health monitoring (SHM) in Civil, Mechanical and Aerospace Engineering. However, ensuring acceptable accuracy in SRA, RBDO, and SHM mostly leads to the requirement of repeated solutions of complex numerical problems modelled by the finite element method or other numerical techniques. A multitude of Machine Learning (ML) algorithms are being used to develop predictive models for uncertainty quantification in SRA, RBDO, and SHM applications. These predictive models reduce the computational cost by ensuring the required accuracy. Developments in this direction are gaining increasing momentum. ML is a key application area of Artificial Intelligence (AI) for automatically creating predictive models. With this backdrop, the proposed mini-symposium attempts to serve as a platform for exchanging ideas and sharing current research on various ML algorithms in uncertainty quantification for SRA, RBDO and SHM applications. More specifically, the topic of interest encompasses the applications of artificial neural networks (ANN), support vector regression (SVR), Kriging and Gaussian Process Regression (GPR), Bayesian methods, etc., with active learning perspective in the context of the aforementioned applications.

The contents of interest include, but are not limited to, the following topics:

- ML techniques in uncertainty quantification for SRA applications.
- ML techniques in uncertainty quantification for RBDO applications.
- ML techniques in uncertainty quantification for SHM applications.
- Active Learning Algorithms in ML techniques for uncertainty quantification in structural engineering.



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