Advances in Civil Engineering

Hindawi

Special Issue on

Smart Earthquake Engineering: Machine Learning for Seismic Risk Reduction

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In earthquake engineering, seismic vulnerability assessments guide engineers and policymakers in strategizing reinforcements and risk mitigation. Seismic vulnerability assessments can typically follow three approaches: (1) damage probability matrices, (2) vulnerability indicators, and (3) capacity curve-based techniques. These methods are used to estimate fragility curves, especially in large-scale evaluations. Additionally, two prevalent types of vulnerability indexes can be considered: hazard-based and physical. The hazard-based indexes relate seismic risk factors (such as peak ground acceleration and spectral acceleration) to anticipated damage or losses. In contrast, the physical ones evaluate a structure's susceptibility to damage based on attributes such as height, age, construction materials, structural design, and build quality.

Mechanics-based seismic vulnerability analysis is increasingly employed to determine priorities for seismic strengthening efforts. This analytical process involves several phases, from data collection and progressing through structural modelling and analysis to calculating vulnerability indices that represent the ratio of structural capacity to demand.

Moreover, data-driven strategies, especially those that leverage machine learning, are becoming essential to improve mechanics-based methods at all stages of seismic risk management, from initial assessments to retrofitting.

This Special Issue compiles original research and review articles on the most recent developments in earthquake engineering, emphasizing machine learning-aided research.

Potential topics include but are not limited to the following:

- Earthquake engineering
- Machine learning
- Seismic risk reduction
- Structural retrofitting
- Seismic vulnerability assessment
- Data-driven approaches
- Fragility curves
- Capacity curve

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