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Associate Editor, Jason Ingham, has selected a review article on machine learning for structural engineering as the 'Featured Article' from this issue. The article will be available free of charge for six months.

Editor's Featured Article

Machine learning for structural engineering: A state-of-the-art review

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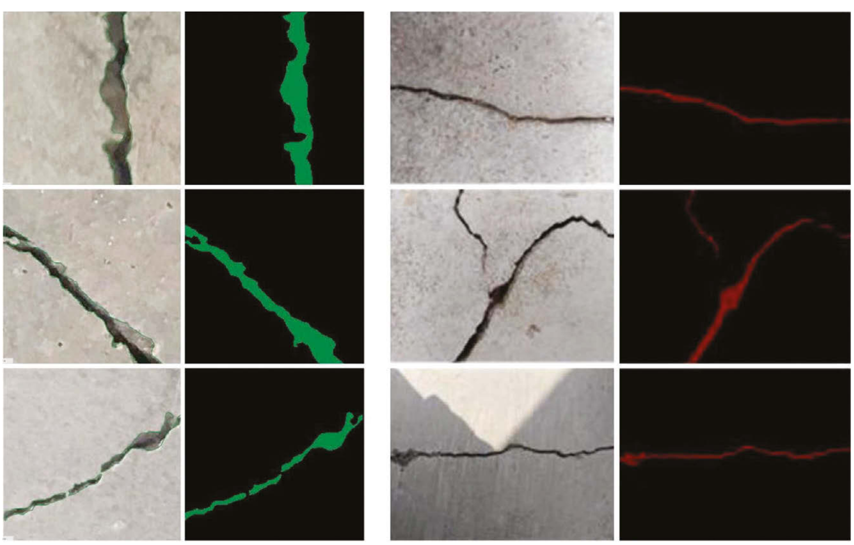
Machine learning (ML) has become the most successful branch of artificial intelligence (AI). It provides a unique opportunity to make structural engineering more predictable due to its ability in handling complex nonlinear structural systems under extreme actions. Currently, there is a boom in implementing ML in structural engineering, especially over the last five years thanks to recent advances in ML techniques and computational capabilities as well as the availability of large datasets. This paper provides an ambitious and comprehensive review on the growing applications of ML algorithms for structural engineering. An overview of ML techniques for structural engineering is presented with a particular focus on basic ML concepts, ML libraries, open-source Python codes, and structural engineering datasets. The review covers a wide range of structural engineering applications of ML including: (1) structural analysis and design, (2) structural health monitoring and damage detection, (3) fire resistance of structures; (4) resistance of structural members under various actions, and (5) mechanical properties and mix design of concrete. Both isolated members and whole systems made from steel, concrete and composite materials are explored. Findings from the reviewed literature, challenges and future commendations are highlighted and discussed. With available databases and ML codes provided, this review paper serves as a useful reference for structural engineering practitioners and researchers who are not familiar with ML but wish to enter this field of research.



(a) (b)

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What is the most popular research published in *Structures*? Here, we highlight the five most downloaded articles of the past three months.

1) Machine learning for structural engineering: A state-of-the-art review

Huu-Tai Thai
Department of Infrastructure Engineering, The University of Melbourne, Australia

See overleaf for abstract.

→| Read the full paper at **https://doi.org/10.1016/j.istruc.2022.02.003**

2) Collapse probability of code-based design of a seismically isolated reinforced concrete building

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In this study, the collapse probability of a Reinforced Concrete (RC) seismically isolated building designed according to ASCE 7-16 is given using the Incremental Dynamic Analysis (IDA) and Adaptive Incremental Dynamic Analysis (AIDA) methods. In a region where spectral demands of different intensity levels are known, thirty ground motions are selected and gradually changed from first to last seismic intensity level to match hazard-consistent properties in the extreme events, as given in the AIDA procedure. The analysis results reveal that the collapse probability of isolators is sensitive to ground motion suites. Despite the isolator displacement capacity, the fragility curves of the superstructure drift demands, beam plastic rotations, and column tensile strains provide sufficient exceedance probabilities at the MCE_R level.

→| Read the full paper at **https://doi.org/10.1016/j.istruc.2021.06.010**

3) Study the impact of the COVID-19 pandemic on the construction industry in Egypt

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This paper attempts to quantify the impact of the COVID-19 pandemic on the construction industry under different investment and economic scenarios in Egypt. The survey was conducted to assess the cost impact of the ongoing COVID-19 pandemic on the construction industry, considering essential aspects, such as manpower, plant and machinery, and material, and their net effect on overall construction cost. The recommendations covered in this paper address many such measures under short, medium, and long-term categories. These measures underline the need to improve systems and processes for adequately responding to the current changing environment and effectively confronting such disruptions in the future. In addition, the paper serves as a start to thinking about the study of procedures during a future pandemic to inhibit any impact on the project timeline or personnel health.

→| Read the full paper at **https://doi.org/10.1016/j.istruc.2021.09.028**

4) Optimization-driven conceptual design of truss structures in a parametric modelling environment

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[d] Arup, London, UK
[e] LimitState Ltd, Sheffield, UK

Structural optimization methods can be extremely powerful when used at the initial, conceptual, design stage of a building or bridge structure, potentially identifying materially efficient forms that are beyond the imagination of a human designer. This is particularly important at present, given the pressing need to reduce the carbon footprint associated with the built environment in the face of the current climate emergency. In this contribution, a computationally efficient global–local optimization framework is proposed, in which a linear programming-based truss layout optimization step is employed to generate initial (near-)optimal designs, with a non-linear optimization step then used to generate designs that take account of real-world complexity. To facilitate rapid exploration of design concepts, the proposed global–local optimization framework has been made available in the Peregrine plug-in for the popular Rhino-Grasshopper parametric modelling environment. The efficacy of the approach is demonstrated through its application to a range of case study problems.

→| Read the full paper at **https://doi.org/10.1016/j.istruc.2021.12.048**

5) A review on modular construction for high-rise buildings

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This paper presents a critical review of recent innovations in modular construction technology for high-rise buildings with an emphasis on structural systems, joining techniques, progressive collapse and structural robustness. The developments of design codes for modular construction are also discussed. The paper concludes by highlighting the technical challenges that hinder the widespread adoption of modular construction, and proposing potential solutions for future research. This review paper is expected to be a complete reference for experts, researchers and professionals in this field of study.

→| Read the full paper at **https://doi.org/10.1016/j.istruc.2020.09.070**