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Call for Papers

Special Collection on Machine Learning Enabled Modeling and Discovery for Engineering Mechanics



Aims & Scope

Driven by the demonstrated success of machine learning (ML) in many scientific domains and the demands to efficiently handle a wide spectrum of data types, sources, and dimensions, ML and data-driven techniques have become pervasive throughout the computational physics and mechanics literature. The ability of ML models to approximate functions, solve differential equations, analyze high-dimensional data, and handle repetitive tasks, have made them an attractive option to augment or replace existing paradigms for computational mechanics. However, unlike the conventional modeling and simulation tools where interpretability and compatibility of known physics principles are guaranteed, machine learning techniques for mechanics and multiscale modeling can be difficult to interpret, difficult to train, and the learned models may violate physics principles, such as invariance and equivariance, and therefore are not always trustworthy for high-consequence engineering applications. This special issue welcomes novel contributions that measurably advance the state-of-the-art in engineering mechanics. Possible contributions may include but are not limited to innovations on

- ML techniques specialized for limited data,
- Intelligent data generation, exploration, and curation,
- Causality-based interpretability and casual discovery,
- Meta-learning and transfer learning methods that enable discovery of equations or phenomenological laws difficult to deduce manually,
- Extraction of closures or constitutive models, and the use of parameterized models in solving inverse/UQ/design optimization problems, and
- Other reliable ways to integrate the knowledge of mechanics and physics with machine learning approaches for engineering applications.

We are particularly interested in soliciting works which provide either advancements in foundational algorithms or apply AI/ML in a novel manner which enables meaningful scientific discovery, rather than applications of “off-the-shelf” AI/ML.

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Submission Guidelines

We invite Forum articles, Technical Notes, Technical Papers, and Case Studies. Article type descriptions (including length limits) and preparation guidelines can be found in “Publishing in ASCE Journals: A Guide for Authors” (<https://ascelibrary.org/doi/book/10.1061/9780784479018>). The submission deadline for this special collection is August 31st, 2022.

Authors should follow the guidelines for ASCE journal submission and submit manuscripts electronically through the journal’s Editorial Manager website: <https://www.editorialmanager.com/jrnemeng/>

When submitting, authors should indicate in the submission questions that the paper is being submitted in response to this call for papers (“Machine learning enabled modeling and discovery for engineering mechanics”) and the Guest Editors’ names (Garikipati, Perdikaris, Tootkaboni, Trask, Sun).

Please note that this is an invitation to submit papers for peer review and does not imply acceptance for publication. Acceptance of submitted papers depends on the results of the normal refereed peer review process of the journal.

All accepted papers submitted through this solicitation will be published in regular issues of the journal as they are accepted, and they will be added to a special online collection (which is similar to a print version of a special issue) and will be indexed for citations like other regular journal papers).