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ACCELERATING SCIENTIFIC DISCOVERY FOR DYNAMICAL SYSTEMS WITH PHYSICS-INFORMED MACHINE LEARNING

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ABSTRACT

Machine learning (ML) algorithms continue to see increased prominence in the domain of scientific computing. Such algorithms are particularly promising in that they seek to extract useful models from large data sets while bypassing the classical challenges of the curse of dimensionality[1]. Physics-based machine learning provides added benefits in the matter of applying such algorithms to computational science problems, by virtue of preserving or imposing desirable qualities in an algorithm to avoid non-physical behavior, enhanced interpretability, stability, data-efficiency, etc.

This minisymposium focuses on the development and utilization of novel physics-based machine learning strategies to accelerate scientific discovery for, and enhanced understanding of complex dynamical systems. Examples of adjacent topics include the use of reduced-order modeling techniques to effectively capture the essential dynamics of high-dimensional systems, strategies that leverage data-driven approaches to enhance our understanding of complex dynamics, the fusion of physics-based knowledge with machine learning algorithms, and efficient optimization or control of dynamical systems using machine learning algorithms. We welcome investigations of novel techniques, such as state-of-the-art deep learning architectures, reinforcement learning, and generative models, to accelerate scientific discovery and extract hidden patterns in dynamical systems. We also welcome submissions from researchers utilizing such techniques for various applications and envision interdisciplinary collaboration through their presentations.

REFERENCES

[1] - WEINAN, E. "MACHINE LEARNING AND COMPUTATIONAL MATHEMATICS." ARXIV PREPRINT ARXIV:2009.14596 (2020).