

LARGE-SCALE APPLICATIONS IN SCIENTIFIC MACHINE LEARNING

600 - DATA SCIENCE, MACHINE LEARNING AND ARTIFICIAL INTELLIGENCE

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Keywords: Neural Operators, Surrogate Models, Large-Scale Simulations

ABSTRACT

In recent years, Scientific Machine Learning (SciML) has established itself as a powerful, diverse, and rapidly evolving field of research, driving transformative changes in computational mechanics and the sciences more broadly. By enabling fast surrogate models based on deep learning, SciML has opened new possibilities for replacing parts or, in some cases, the entirety of traditional, computationally expensive numerical solvers.

However, most real-world applications require large-scale analyses, whether due to the spatial extent of the domain, the multi-scale nature of the phenomena, the long time horizons, or the small time step and mesh sizes required to capture the phenomena. This mini-symposium will explore innovative approaches to extend and enhance established SciML methods to meet the demands of large-scale applications.

These challenges include the collection and curation of appropriate datasets, particularly in contexts where data acquisition is costly or limited. They also call for the development of efficient deep learning models capable of scaling to inputs involving millions of particles or grid points and perform long-time extrapolation. Additionally, the symposium will address the emerging debate around the use of large, specialized deep learning models versus general foundation models that can be applied across a variety of downstream tasks and potentially amortize training costs.

REFERENCES

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