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MESHFREE, PARTICLE, AND PERIDYNAMIC METHODS

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ABSTRACT

Meshfree, particle, and peridynamic methods have emerged as a new class of numerical methods that play an increasingly significant role in the study of challenging engineering and scientific problems. New and exciting developments of meshfree, particle, and peridynamic methods often go beyond the classical theories, incorporate more profound physical mechanisms, and become the preferred numerical tools in addressing the computational challenges that were once difficult or impossible to solve by conventional methods.

The goal of this session is to bring together experts working on these methods, share research results, and identify the emergent needs towards more rapid progress in advancing the important fields of meshfree, particle, and peridynamic methods. Topics of interest for this session include, but are not limited to the following:

• Recent advances in meshfree, particle, and peridynamic methods, and their coupling with finite element methods
• Methods for coupling multiple physics and/or multiple scales
• Methods of fictitious domains and non-intrusive coupling
• Strong form collocation methods
• Nodal integration and domain integration methods for the Galerkin formulation
• Characterization and stabilization of numerical instabilities
• Recent advances for challenging industrial applications: modeling extreme loading events, additive manufacturing, and mitigating disasters

- Integration of physics-based and data-enabled approaches
- Parallel computation, solvers, and large-scale simulations
- New applications such as optimizing additive manufacturing and mitigating disasters