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MODERN STRUCTURE-PRESERVING METHODS FOR PDES

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MINISYMPOSIUM

This minisymposium will bring together researchers working on developing, analyzing, and deploying novel discretizations of partial differential equations (PDEs) and data-driven models, which preserve the key structural properties of the continuous PDE solutions. Examples of such properties include local conservation of mass, satisfaction of divergence and curl conditions, preservation of symmetry and topology, satisfaction of maximum principles and entropy conditions, etc.

The minisymposium will feature novel approaches to structure preservation based on numerical optimization, residual redistribution, topological data analysis, entropy filtering, shock capturing, mesh correction, and other related techniques. Another important goal is to showcase recent advances in new and developing discretization techniques from physics-informed machine learning where data-driven models incorporate structure either by construction in the learning architecture or by novel choice of loss function; in this setting, we aim to identify models from data, which preserve analogs of classical structure-preserving PDE discretizations. Through this minisymposium, we hope to highlight the close relationships between various approaches under development, thus facilitating a deeper mathematical understanding and a broader use of modern structure-preserving methods for PDEs.