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EDITORIAL

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Recent advances and open problems in computational mechanics

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This Special Issue summarizes state-of-the-art contributions to computational solid and fluid mechanics. New computational approaches related to phase-field modeling, peridynamics and coupled problems are presented.

This includes the statistical analysis of effective crack properties within a phase-field approach, the wave propagation and their reflections at material interfaces in the context of peridynamic computations, the simulation of wind turbine towers with liquid column dampers, the modeling of offshore systems composed of slender structures, an extension of the natural force density method to 3D problems and the topology optimization for composite materials.

In addition, recent methods such as virtual elements, discrete elements, boundary elements, isogeometric analysis, and fictitious domain approaches are investigated. The following aspects are discussed: triangular virtual elements for Kirchhoff–Love shells, discrete elements for advanced manufacturing technologies, mathematical aspects of the collocation boundary element method for elasticity, and isogeometric analysis of flexible multibody systems. Moreover, the finite cell method for wire arc additive manufacturing and remeshing as well as eigenvalue stabilization for structures undergoing large elastoplastic deformations and the modeling of cracking in cortical bones based on a mesh fragmentation technique are discussed.

Furthermore, this volume includes machine learning techniques and uncertainty quantification in the context of enhanced deep learning for vascular wall fracture analysis, PINN-based level-set formulation for the reconstruction of bubble dynamics, data-driven computational mechanics for constitutive modeling, interior point algorithms in single crystal plasticity and uncertainty quantification using time-separated stochastic mechanics.

This special issue arises from the German-Brazilian Workshop on Computational Mechanics. All papers have undergone rigorous peer-reviewing before publication.

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