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Abstract

We use Bayesian analysis in order to quantitatively compare, under uncertainty, two peridynamics modeling hypotheses proposed for simulating the rapid expansion and fragmentation of metal rings. The comparison process requires the existence of experimental data, and involves two main computational tasks: the calibration of the random parameters in each modeling hypothesis, and the calculation of the hypotheses' plausibilities conditioned on the experimental data used. For expediency, we used computationally manufactured experimental data from a high-fidelity peridynamics model. Our study involves efforts on many fronts: quantification of uncertainty in the experimental data, use of advanced statistical algorithms, use of high-performance parallel computing, as well as software design and development. The methodology we discuss can be applied to any number of competing candidate hypotheses, which might even involve different underlying physical theories, as long as all hypotheses are compared using the same experimental data.