Abstract Submitted
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Fast Strength Model Parameter Optimization and Model Comparison Using Bayesian Statistics[1] AYAN BISWAS, DAVID WALTERS, DEVIN FRANCOM, EARL LAWRENCE, DARBY LUSCHER, SKY SJUE, JAMES AHRENS, Los Alamos National Laboratory — A variety of flow stress models exist with new models constantly being developed. These models aim to approximate the strength of materials in a variety of regimes from quasi-static loading through shock scenarios. All models contain an array of parameters which need to be tuned to the material under study. Some models perform well under limited conditions, requiring adjustment of the parameters when venturing outside of those predefined ranges. Other models perform well over a wide range of conditions with a set of parameters, but may be outperformed by other models optimized on a tighter range of conditions. Recent research by Los Alamos demonstrated the ability to optimize the Johnson Cook model using a set of 3 plate-impact experiments on Aluminum. They utilized Bayesian statistics and emulation to determine optimal parameters for the model with a quantification of parameter uncertainty. We have advanced this capability to incorporate multiple data types available to the modeler (e.g. velocimetry from plate-impact tests and stress-strain data from SHPB tests). Statistically robust comparisons of the performance and uncertainty of different flow stress models were carried out for different scenarios (e.g. small datasets vs. a suite of experiments of different types).

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