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MODEL ORDER REDUCTION IN VISCOPLASTIC FLOW MODELING USING PROPER ORTHOGONAL DECOMPOSITION AND NEURAL NETWORKS

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Yield stress fluid flows play an important role in the oil and gas industry (see recent review by Frigaard et. al [1]). There are many numerical methods for modeling such flows, and they often are computationally expensive. In this work we propose to reduce computational complexity of parametric studies of Bingham fluid flows by utilizing machine learning techniques. The idea is as follows: instead of solving the PDE for each parameter value, we first do several simulations for a few scenarios (build a training dataset), construct a surrogate model to predict the solution for any parameter value. In this case we have much faster model. We apply this approach to a well-known Mosolov problem [2] with Bingham number as a parameter. This problem has been solved numerically in many papers both for steady (for example, [3]) and unsteady ([4, 5]) cases.

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