2nd Order Physics Constrained Learning Accelerating Convergence and Improving Accuracy with Hessian Information **Update Model Parameters Optimizer** Calculate Gradients **PDE Loss Function Calibrated Model** < tol? **Predicted Observed Data** Data **Initial** and **Boundary Conditions Contribution 1 Contribution 2 Software Implementation** 1st Order Physics Constrained Learning ADCME: Gradient Calculation and Calculating Gradients for Implicit & Iterative Operators Inverse Modeling Pipelining

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