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Using Evolutionary Neural Networks to Adapt the Jacobi Iterative Method for the Pressure Poisson Equation in a Multiphase Flow TIANRUI XIANG, Pennsylvania State University, YIPENG SHI, Peking University, XIANG YANG, Pennsylvania State University — We utilize evolutionary neural networks (ENNs) to determine a set of relaxation factors for the Jacobi iterative method, which is subsequently used to solve the pressure Poisson equation of a multiphase flow. The density of the fluid and the gas differ by a factor of 1000. An iterative method usually needs to be adapted to account for the large density different in the field, which usually involves a long process of trial and error. In this talk, we show that ENNs could shorten this process. The iterative method we adapt is the Jacobi method. This method is embarrassingly parallel, and converges at a reasonable rate if employing a set of appropriately picked relaxation factors. Our ENN uses the iterative solution at one instance as the input, and determines the relaxation factor for the next iteration. Despite the local nature of our input to the neural network, we show that the results of the ENN is very close to the global optimum.

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