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• Lee, E.
• Luo, T.</td></tr>
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<tr><th>abstract</th><td>Boltzmann transport equation (BTE) is an ideal tool to describe the multiscale phonon transport phenomena, which are critical to applications like microelectronics cooling. Numerically solving phonon BTE is extremely computationally challenging due to the high dimensionality of such problems, especially when mode-resolved properties are considered. In this work, we demonstrate the use of physics-informed neural networks (PINNs) to efficiently solve phonon BTE for multiscale thermal transport problems with the consideration of phonon dispersion and polarization. In particular, a PINN framework is devised to predict the phonon energy distribution by minimizing the residuals of governing equations and boundary conditions, without the need for any labeled training data. Moreover, geometric parameters, such as the characteristic length scale, are included as a part of the input to PINN, which enables learning BTE solutions in a parametric setting. The effectiveness of the present scheme is demonstrated by solving a number of phonon transport problems in different spatial dimensions (from 1D to 3D). Compared to existing numerical BTE solvers, the proposed method exhibits superiority in efficiency and accuracy, showing great promises for practical applications, such as the thermal design of electronic devices.</td></tr>
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