Simulating Shock Solutions for Hyperbolic Conservation Laws with Physics-Informed Neural Networks

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Physics-informed neural networks represent a new paradigm for modeling complex systems, relying on both data and physical laws (e.g., partial differential equations) for the training. This duality is particularly interesting when little data is available. However, this formulation relies on smooth representations to describe the solutions, so it is not well suited to solving problems where discontinuities occur, as can be the case with nonlinear hyperbolic conservation laws. In this work, we explore how to solve this type of problems using multiple networks, describing on the one hand the behavior of the system in regular regions and on the other hand the jump conditions between these regions. The methods developed are applied to the Burgers equation with shocks.