Challenges in Training Physics-Informed Neural Networks (PINNs) for Long-Time Interval

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ABSTRACT

Despite its theoretical and practical significance, and the continuous advancements in scientific machine learning, accurately and stably solving time-dependent partial differential equations (PDEs) over long time intervals using physics-informed neural networks (PINNs) remains a challenge [1–5]. In this work, we analyze from multiple perspectives why it is difficult for PINNs or related models to approximate long-time dynamics. Based on this analysis, we propose a novel framework designed to extend the temporal interval of validity. This new approach maintains the high accuracy of existing methods for solving time-dependent PDEs while reducing computational cost.

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