

Physics-Informed Neural Network for Kilonova Light Curves Modeling

Sunday, 5 July 2026 11:45 (15 minutes)

Physics-informed neural networks (PINNs) have gained considerable importance in recent years in the domain of Astronomy & Astrophysics, particularly as a potential tool to solve differential equations within the given boundary conditions, not only for making accurate predictions but also for providing an efficient approach for large computations. In this work, we have focused on solving the kilonova equations adopted from a specific kilonova model through the direct implementation of the PINN on the differential equations and the respective boundary conditions provided in the model. The PINN architecture is trained on differential equations conditioned on certain boundary conditions, thus learning the evolution of KNe light curves based on given ranges of physical parameters. To test the performance, after successful training, predictions of the light curve for a known set of physical parameters are given as input, and a comparison is made between the true and predicted light curves. Current results point to stable training with significant recovery of the light curves, showing a low mean squared error between them. Training and inference for the light curves are completed in under 2 hours. The ultimate goal is to develop an accurate PINN-based kilonova model for light-curve generation and low-latency parameter estimation.

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