中華民國天文學會
The Astronomical Society of the Republic of China (Taiwan)

Contribution ID: **150** Type: **Poster**

Physics-Inspired Neural Network for Kilonova Modeling

Physics-inspired neural networks (PINNs) have gained considerable importance in recent years in the domain of Astronomy & Astrophysics, particularly, being a potential tool to solve differential equations within the given boundary conditions, not limiting to accurate predictions but also providing efficient approach for large computations. In this work, we have focused on solving the kilonova equations adopted from a specific kilonova model, through direct implementation of the PINN on the differential equations and respected boundary conditions provided in the model. The PINN architecture is trained on differential equations, conditioned on certain boundary conditions, hence learning the evolution of KNe light curves based on certain ranges of physical parameters. To test the performance, after successful training, predictions of light curve for a known set of physical parameters are given as an input and comparison is made between true and predicted light curves. Current results points to stable training with significant recovery of the light curves having a low mean squared error between them. It is important to note that training and prediction of the light curves in under 2 hours. The final target for this work is to accurately predict and hence develop a PINN based KNe model that can provide light curves and perform parameter estimation under low latency.

Section

High Energy

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Session Classification: Poster-HE