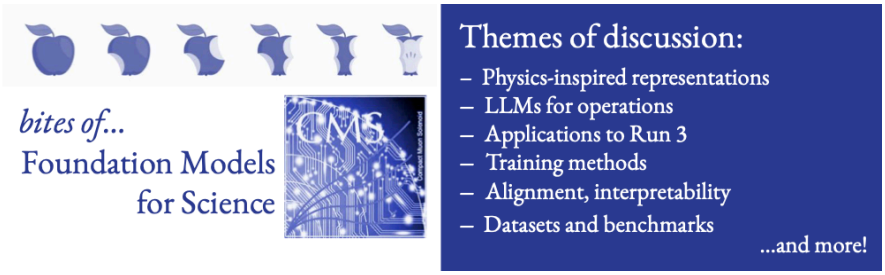

Contribution ID: **8** Type: **not specified**

Rapid Parameter Estimation for Kilonovae Using Likelihood-Free Inference

Wednesday 20 November 2024 15:20 (20 minutes)

Rapid parameter estimation is critical when dealing with short lived signals such as kilonovae. We present a parameter estimation algorithm that combines likelihood-free inference with a pre-trained embedding network, optimized to efficiently process kilonova light curves. Our method is capable of retrieving two intrinsic parameters of the kilonova light curves with a comparable accuracy and precision to nested sampling methods while taking significantly less computational time. Our inference uniquely utilizes a pre-trained embedding network that marginalizes the time of arrival and the luminosity distance of the signal, allowing inference of signals at distances up to 200 Mpc. We find that including a pre-trained embedding outperforms the use of likelihood-free inference alone, reducing training time, model size, and offering the capability to marginalize over certain nuisance parameters. This framework has been integrated into the publicly available Nuclear Multi-Messenger Astronomy codebase so users can deploy the model for their inference purposes. Our algorithm is broadly applicable to parameterized or simulated light curves of other transient objects, and can be adapted for quick sky localization.

Theme of discussion

Training methods

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