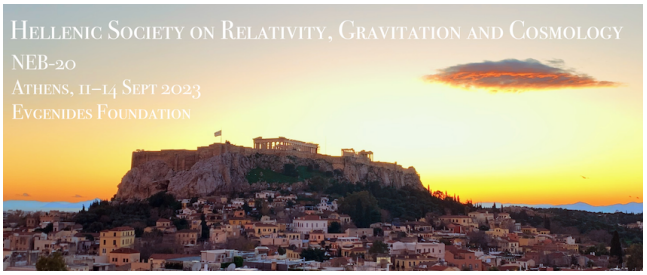

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A Multi-step Regression-based Approach to Predict Binary Neutron Star Post-merger Spectra Using a Feedforward Neural Network

Tuesday, 12 September 2023 12:20 (20 minutes)

Gravitational waves in the post-merger phase of binary neutron star mergers may become detectable with planned upgrades of existing gravitational-wave detectors or with the more sensitive next-generation detectors. A template bank of predicted waveforms can facilitate detection and parameter estimation. However, todate, only a relatively small number of waveforms have been constructed through numerical simulations. Here, we investigate the performance of an artificial neural network in constructing a simulation-based template bank in the frequency domain (restricted to the magnitude of the frequency spectrum and to equal-mass models) that depends on three parameters that can be inferred through observations, neutron star mass, tidal deformability and the gradient of radius versus mass. In comparison to multiple linear regression, we find that the artificial neural network can predict waveforms with higher fidelity and with more consistent performance in a cross-validation study.

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Session Classification: Parallel Session A