

A deep learning pipeline for core-collapse supernova searches

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Core-collapse supernova (CCSN) explosions are among the most energetic events in the Universe, and their detection in gravitational waves is a challenging task, yet to be achieved. In this work, we present a convolutional neural network-based pipeline to detect these kinds of signals, employing time-frequency images. We train and validate our convolutional neural network using phenomenological waveforms, which mimic the waveforms obtained in 3D numerical simulations of CCSNe, embedded in O3 Gaussian detector noise. Furthermore, we tested its robustness by injecting signals from numerical relativity simulations in the real noise data taken by the Advanced LIGO-Virgo network during O3. With this algorithm we were able to identify signals from both our phenomenological template bank and from actual numerical 3D simulations of CCSNe.

Primary author: LOPEZ, Melissa

Presenter: LOPEZ, Melissa

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