Contribution ID: **39** Type: **Poster**

Single detector search for Core Collapse Supernova using Maching Learning

Tuesday 22 July 2025 16:38 (2 minutes)

The traditional CCSN search method relies on coherence information between multiple gravitational wave detectors to identify candidate events. This requirement reduces the effective lifetime of the search, as it excludes periods when only a single detector is operational. To address this limitation, we present a machine learning (ML)-based framework designed to enable single-detector detection of CCSN GWs by learning to discriminate between glitches and physically motivated CCSN signals. Our ML model is trained on 31 CCSN simulatioa waveforms obtained from three-dimensional hydrodynamic simulations spanning a broad range of progenitor masses, rotation rates, and explosion mechanisms. We evaluate classifier performance in both stationary and glitch-contaminated noise data from O3b using signal injections across the LIGO detector network. We compare our result with the two detector settings of our ML model, which retains 80.1% of dual detector sensitivity. At a fixed false positive rate of 5%, the model recovers CCSN signals with signal-to-noise ratios above 15.69, corresponding to a detection horizon of 3.06 kpc for standard explosions and up to 63.09 kpc for extreme progenitor models with one detector.

Primary author: CHEN, Andy (Natinal Yang Ming Chiao Tung University)

Co-authors: Dr KONG, Albert (National Tsing Hua University); Dr CHOU, Chia-Jui (Natinal Yang Ming Chiao Tung University); PAN, Kuo-Chuan (National Tsing Hua University, Taiwan); Prof. YANG, Yi (Natinal Yang Ming Chiao Tung University)

Presenter: CHEN, Andy (Natinal Yang Ming Chiao Tung University)

Session Classification: Poster Sparkler