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Improving Compact Binary Coalescence Searches by Vetoing Local Noise Transients

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Compact binary coalescence (CBC) searches, which look for signals from binary black holes, binary neutron stars, and neutron star–black hole mergers, are a major part of contemporary gravitational wave (GW) astronomy. However, the sensitivity of these searches is often limited by local noise transients, or glitches, which can closely resemble real astrophysical signals in terms of time–frequency morphology. In this talk, I will present both analytical and machine learning (ML) methods we have developed to identify and veto such glitches, thereby improving the performance of CBC searches. On the analytical side, we introduce two chi-square tests: one using simulated sine–Gaussian waveforms and another using real glitches as basis vectors. Both tests help distinguish noise transients from astrophysical signals and lead to a significant improvement in search sensitivity. We also present an ML-based veto using sine–Gaussian projection (SGP) maps, which highlight clear differences between glitches and astrophysical signals. These maps serve as effective input features for classification, making them well-suited for real-time vetoing. This ML veto is currently being implemented in the SPIIR single-detector searches.

Section

Galaxy/Extragalactic

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