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Enhancing detection of gravitational waves with machine learning TANMAYA MISHRA, University of Florida — The Coherent WaveBurst (cWB) search algorithm identifies gravitational wave (GW) signals in the LIGO-Virgo data by looking for excess power events in the time-frequency domain. In order to efficiently and robustly separate signal events from noise events, we propose a machine learning algorithm to improve the cWB detection efficiency for binary black hole (BBH) mergers. A decision tree machine learning algorithm based on XGBoost is incorporated into the cWB framework. We test the enhanced cWB search on the O1-O2 data of LIGO-Virgo and successfully recover all the BBH events previously detected by cWB. We demonstrate an improvement of $\sim 25\%$ of the detection efficiency on a simulation set of stellar-mass BBHs, and an improvement of $\sim 15\%$ for the intermediate mass black hole mergers with total mass above 100 $M_{\odot}$. We demonstrate that the enhanced cWB search also has increased sensitivity to the eccentric binary mergers even when trained only on circular binary waveforms.

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