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Noise or Astrophysical: Developing Machine Learning Classifiers for Characterizing Gravitational Wave Events

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The detection of gravitational waves with the Laser Interferometer Gravitational Wave Observatory (LIGO) has provided the tools to probe the furthest reaches of the universe. A rapid follow up to compact binary coalescence (CBC) events and their electromagnetic counterparts is crucial to find short lived transients. After a gravitational wave (GW) detection, another particular challenge is determining a fast and efficient way of characterizing events as astrophysical or terrestrial in origin. The mergers themselves provide many data products from low-latency CBC search pipelines which can aid in discerning whether or not a GW signal is astrophysical. We present an efficient low-latency method of alert classification by applying data products available in low-latency into three machine learning classification algorithms: Random Forest (RF), K-Nearest Neighbors (KNN), and Neural network (NN) using simulated event data from the Mock Data Challenge (MDC). We report the accuracy of the RF, KNN, and NN classifiers on the MDC events are 0.82, 0.84, and 0.89 respectively.

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