

Utilizing Machine Learning to Search for LIGO Sources

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LIGO is one of the most sensitive instruments ever built, and with great sensitivity comes a significant amount of noise. Currently, the LIGO Scientific Collaboration is searching for ways to more efficiently differentiate between signal and noise, on both hardware and software. To date, the PyCBC pipeline has aided in the analysis of several gravitational wave detections. We utilized outputs of PyCBC software to compile larger amounts of data, including signal and noise, into SNR density plots, and we modified them so that they could be easily interpreted by an image classifier. We expected the signal density plots to be much more well-localized than for noise, based on observations of known instances of signal and noise. After selecting the parameters that demonstrated features in the density plots, we created a convolutional neural network to search for these patterns. We trained and tested the neural network over increasingly large and varied data sets.