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First search for a remnant of GW170817 using convolutional neural networks

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We present the results of the first-ever search for gravitational waves from a remnant of binary neutron star merger GW170817 using convolutional neural networks (CNNs). Analyzing one week of data after GW170817 for signals lasting about one hour did not return any viable candidates. We describe the search pipeline in detail, showing that the CNNs are used to trigger possible interesting times/frequencies to be followed up by another method to estimate parameters. Furthermore we explain some specific aspects of the CNNs used in this search, namely (1) how we trained them, (2) how we minimized their false alarm probability through an appropriate use of a threshold (our detection statistic) on their output, and (3) how we ensured their robustness towards signals that deviated from the model on which they were trained. Finally we show that our upper limits on a gravitational wave signal from a post-merger remnant are comparable to those obtained in previous LIGO/Virgo searches.

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