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Localization of gravitational waves using machine learning

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An observation of gravitational waves is a trigger of the multi-messenger search of an astronomical event. A combination of the data from two or three gravitational wave detectors indicates the location of a source and low-latency data analysis is key to transferring the information to other detectors sensitive at different wavelengths. In contrast to the current method, which relies on the matched-filtering technique, we proposed the use of machine learning that is much faster and possibly more accurate than matched filtering.
Our machine-learning method is a combination of the method proposed by Chatterjee *et al.* and a method using the temporal convolutional network.
We demonstrate the sky localization of a gravitational-wave source using four detectors: LIGO H1, LIGO L1, Virgo, and KAGRA, and compare the result in the case without KAGRA to examine the positive influence of having the fourth detector in the global gravitational-wave network.

Primary author: SASAOKA, Seiya (Tokyo Institute of Technology)

Co-authors: HOU, Yilun (Tokyo Institute of Technology); Dr SOMIYA, Kentaro (Tokyo Institute of Technology); Prof. TAKAHASHI, Hirotaka (Tokyo City University)

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