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Learning the ‘Match’ Manifold to Accelerate Template Bank Generation

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In 2015, the first gravitational wave from a binary black hole merger was detected and since then, Ligo-Virgo-Kagra have observed many binary black hole mergers. However, identifying these cosmic events is computationally expensive. Therefore, fast data analysis will be essential in order to make future gravitational-wave observations a success. Template banks are used to identify potential gravitational-wave events but can take weeks to generate. In this research, machine learning is used to accelerate template bank generation by replacing direct computation of the ‘match’ with a multilayered-perceptron (LearningMatch). The model is able to predict the ‘match’ to 1% accuracy and is 3 orders of magnitude faster than current methods. Once the trained model is integrated into the template bank generation algorithm (TemplateGeNN), a template bank can be generated in hours rather than weeks!

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