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Machine-Learned Template Bank for Gravitational Waves¹ PRAVEER TIWARI, JEFFREY M. MCMAHON, Washington State University — Last year, the Laser Interferometer Gravitational-Wave Observatory (LIGO) detected, for the first time, a gravitational wave. Such are useful, because they can can give a lot of information about their source, which would otherwise be impossible to get from other astronomical detectors. One way of extracting this information is a method called matched filtering. This involves first creating a template bank of gravitational waveforms, for different source parameters. That detected is then compared with, and matched to those from this bank. One problem with this way of generating the templates is that the equations of general relativity must be numerically solved, which can take several weeks to get an accurate waveform (and only for a single set of parameters). In this presentation, we discuss an approach based on machine learning, whereby an artificial neural network is trained to learn numerical waveforms for a wide parameter range. The machine can then be used calculate waveforms that are arbitrarily close to the numerical ones, even for parameters not included in the training. With this approach, we are creating a numerically-exact template bank for gravitational waves.

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