Surrogate model of the waveform and remnant properties of precessing binary black holes

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February 8, 2019

Numerical relativity (NR) simulations are required to accurately model the merger of binary black holes. The most important outputs from these simulations are the gravitational waveforms, and the mass and spin of the final black hole formed after the merger. The waveforms are used in extracting astrophysical information from detections, while the final mass and spin are used in testing general relativity. Unfortunately, NR simulations are very expensive and cannot be used directly in these applications. Surrogate modeling is a data-driven approach to modeling, that has been shown to be both fast and accurate in reproducing NR simulations. We present a new 7-dimensional surrogate model for the waveforms and remnant properties of generically precessing binary black holes, with mass ratios up to 4. Trained directly against hundreds of NR simulations, these models are shown to reproduce the simulations as accurately as the simulations themselves