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Gravitational Wave Emulation Using Gaussian Process Regression ZOHEYR DOCTOR, BEN FARR, DANIEL HOLZ, Univ of Chicago — Parameter estimation (PE) for gravitational wave signals from compact binary coalescences (CBCs) requires reliable template waveforms which span the parameter space. Waveforms from numerical relativity are accurate but computationally expensive, so approximate templates are typically used for PE. These 'approximants', while quick to compute, can introduce systematic errors and bias PE results. We describe a machine learning method for generating CBC waveforms and uncertainties using existing accurate waveforms as a training set. Coefficients of a reduced order waveform model are computed and each treated as arising from a Gaussian process. These coefficients and their uncertainties are then interpolated using Gaussian process regression (GPR). As a proof of concept, we construct a training set of approximant waveforms (rather than NR waveforms) in the two-dimensional space of chirp mass and mass ratio and interpolate new waveforms with GPR. We demonstrate that the mismatch between interpolated waveforms and approximants is below the 1% level for an appropriate choice of training set and GPR kernel hyperparameters.

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