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Deep Learning at Scale for Gravitational Wave Parameter Estimation from Surrogate Model Waveforms of Spinning Black Hole Mergers ASAD KHAN, ARNAV DAS, ELIU HUERTA, University of Illinois at Urbana-Champaign — We explore the applications of deep learning for parameter estimation from waveforms of non-precessing binary black hole mergers. The particular deep learning model used is a simplified version of WaveNet, an autoregressive model originally released by Google for generating raw audio waveforms. We modify the model to predict the mass ratio and individual spins of the two binary black holes by training it on quadrupole modes of 1.5 million waveforms simulated from NRHybSur3dq8, a surrogate model for hybridized non-precessing numerical relativity waveforms that is valid for the entire LIGO band. Since the surrogate model was trained on 108 numerical relativity waveforms with mass ratios $q \leq 8$ and spins $|\chi_{1_z}|, |\chi_{2_z}| \leq 0.8$, we restrict to the same parameter ranges for training and inference. Due to inherent degeneracies in the parameter space, waveform matching between simulated quadrupole modes of the ground truth parameters and the predicted parameters respectively is used to quantify the prediction errors. Our preliminary results show promising prediction errors, with waveform matches of greater than 0.98 for 72

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