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Optimizing SEOBNRv3 for LIGO Parameter Estimation TYLER KNOWLES, ZACHARIAH ETIENNE, SEAN MCWILLIAMS, West Virginia University — The Spinning Effective One Body–Numerical Relativity (SEOBNR) series of gravitational wave approximants are among the best available for Advanced LIGO data analysis. Unfortunately, SEOBNR codes as they currently exist within LALSuite are typically too slow to be directly used for standard Markov-Chain Monte Carlo-based parameter estimation (PE). Reduced-Order Models (ROMs) of SEOBNR have been developed for aligned-spin SEOBNR approximants, but there is no known way to make efficient ROMs of the full eight-dimensional parameter space, modeled by SEOBNR version 3 (SEOBNRv3). We therefore focus on direct optimization of the SEOBNRv3 code, building on our experience optimizing the aligned-spin SEOBNRv2 code. We report on a host of new optimizations to SEOBNRv3, including a form of guided automatic differentiation and optimized interpolation routines, which together speed up SEOBNRv3 by two orders of magnitude. This brings direct SEOBNRv3-based PE within reach for many important LIGO sources. We also report on future plans for optimization, which may improve SEOBNRv3 performance by at least another order of magnitude.

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