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Reduced-order surrogate models for Green's functions in black hole spacetimes CHAD GALLEY, California Institute of Technology, BARRY WARDELL, Cornell University and University College Dublin — The fundamental nature of linear wave propagation in curved spacetime is encoded in the retarded Green's function (or propagator). Green's functions are useful tools because almost any field quantity of interest can be computed via convolution integrals with a source. In addition, perturbation theories involving nonlinear wave propagation can be expressed in terms of multiple convolutions of the Green's function. Recently, numerical solutions for propagators in black hole spacetimes have been found that are globally valid and accurate for computing physical quantities. However, the data generated is too large for practical use because the propagator depends on two spacetime points that must be sampled finely to yield accurate convolutions. I describe how to build a reduced-order model that can be evaluated as a substitute, or surrogate, for solutions of the curved spacetime Green's function equation. The resulting surrogate accurately and quickly models the original and out-of-sample data. I discuss applications of the surrogate, including self-consistent evolutions and waveforms of extreme mass ratio binaries. Green's function surrogate models provide a new and practical way to handle many old problems involving wave propagation and motion in curved spacetimes.

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