Abstract Submitted
for the APR21 Meeting of
The American Physical Society

New, user-friendly codes to study critical collapse[1] LEONARDO WERNECK, West Virginia University — In this talk we present two well-documented, open-sourced, and user-friendly codes to study critical collapse in general relativity. Our goal was to produce a simple infrastructure that new users, particularly students, could quickly learn and use. The first of them is SFCOLLAPSE1D, a small code written in C++ to study collapse problems in 1+1 dimensions, using spherical-like coordinates. It uses the ADM formalism to numerically solve the Einstein-Klein-Gordon (EKG) equations and does not require adaptive mesh refinement algorithms, instead adopting a non-uniform radial sampling. The second code, NRPy+COLLAPSE, is a collection of JUPYTER notebooks which implement the EKG equations using the BSSN formalism in full 3+1 dimensions and in a variety of singular curvilinear coordinate systems. NRPy+ uses SYMPY to generate highly optimized C code from PYTHON expressions written in Einstein-like notation. The notebooks allow the user to learn by example while providing high quality LaTeX documentation, directly linking to the relevant papers on the arXiv. Both of these codes have been designed with efficiency in mind, allowing the study of many interesting problems in critical collapse using consumer-grade desktop computers.

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Date submitted: 08 Jan 2021   Electronic form version 1.4