

# Gravitational Geometry and Dynamics Group Seminar

Wed., March. 13<sup>th</sup>, 2024, at 11h00.

Room: 11.2.21 and Zoom ID: 989 6252 0928

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## Numerical evolutions with the Kadath library: Application to the Schwarzschild black hole and Teukolsky gravitational waves

Numerical Relativity is a key tool for the study of strong-field gravity. I will present a new evolution code, based on the Kadath library. It relies on multidomain spectral methods for the space discretization, and explicit time integration schemes. I will first explain the motivation for this project, and use the scalar wave equation toy model as a pedagogical tool to introduce the relevant numerical methods.

I will then move to the core of this work: the application of the code to two gravitational systems, using a first-order reduction of the celebrated BSSN formulation of Einstein's equations. First, I will show that we can obtain long-lasting simulations of a stationary Schwarzschild black hole. Spectral convergence with respect to the radial resolution is achieved. Second, I will illustrate the propagation of gravitational waves, with an initial profile stemming from Teukolsky waves. I will emphasize the crucial ingredients leading to successful simulations, as well as the remaining limitations and mention prospect for future work.