

# Gravitational Geometry and Dynamics Group Seminar

Wed., Dec. 13<sup>th</sup>, 2023, at 11h00.

Room: 11.2.21 and Zoom ID: 989 6252 0928 (Password: [contact\\_graposo@ua.pt](mailto:contact_graposo@ua.pt))

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## Numerical Black Hole Perturbation Theory

Extreme-Mass-Ratio-Inspirals (EMRIs) modelling in time-domain has been anything but trivial due to the challenges associated with resolving the discontinuity emerging from the point-particle model of the smaller BH and the slow long-term evolution.

In this talk I will review two novel highly accurate hyperboloidal numerical algorithms in the time-domain designed to address the issues faced by previous attempts. In the first algorithm, arXiv:2306.13153, we use collocation methods with higher order jumps in combination with novel implicit-turned-explicit IMTEX time integrators; In the second algorithm, (arXiv: 1402.7343, 2202.01794) we will show how we can return high accuracies from a fully-spectral implementation with multidomain spectral decomposition and an implicit spectral time integrator. Both of our time-integrators show long-term stability, preserve symplectic structure and conserve energy.