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CENTRO DE I&D EM MATEMÁTICA E APLICAÇÕES
CENTER FOR R&D IN MATHEMATICS AND
APPLICATIONS

Gravitational Geometry and Dynamics Group Seminar

Wed. 1st February '23 Online at 11h00 (PT)

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University of Valencia

Zoom meeting ID 962 2413 8340

passcode: ask to annulli@ua.pt - herdeiro@ua.pt

Solving the Teukolsky equation with physics- informed neural networks

We use physics-informed neural networks (PINNs) to compute the first quasi-normal modes of the Kerr geometry via the Teukolsky equation. This technique allows us to extract the complex frequencies and separation constants of the equation without the need for sophisticated numerical techniques, and with an almost immediate implementation under the `PyTorch` framework. We are able to compute the oscillation frequencies and damping times for arbitrary black hole spins and masses, with accuracy typically below the percentual level as compared to the accepted values in the literature. We find that PINN-computed quasi-normal modes are indistinguishable from those obtained through existing methods at signal-to-noise ratios (SNRs) larger than 100, making the former reliable for gravitational-wave data analysis in the mid term, before the arrival of third-generation detectors like LISA or the Einstein Telescope, where SNRs of $O(1000)$ might be achieved

<https://videoconfcolibri.zoom.us/j/96224138340?pwd=YkZUMGIUb0dqVjcxOVpXMTFVMTBxQT09>

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