Contribution ID: **46** Type: **Oral Presentation**

Quasinormal modes calculated with physics-informed neural networks

Tuesday, 4 July 2023 14:20 (20 minutes)

The literature on the computation of black hole quasinormal modes (QNMs) is replete with the adoption of various approximation methods to solve the "quasi-Sturm Liouville" type problems governing the damped oscillations that dominate the ringdown phase of the time-evolving signal produced by perturbed black holes. Among the newest techniques is the physics-informed neural network (PINN) algorithm, a machine learning-based, general-purpose differential equation solver that has recently been implemented successfully to compute the QNMs of Kerr black holes perturbed by gravitational fields (of spin-weight, $s = -2$). Considering the recent work showing the significance of QNM overtones early in the gravitational wave signal (just following the peak strain amplitude), we utilise PINNs to compute QNM frequencies associated with overtone numbers $n > 0$ and the dominant $\ell = m = 2$ harmonic. The performance of PINNs is then compared with extant approximation methods for QNM computation.

Apply to be considered for a student ; award (Yes / No)?

Yes

Level for award;(Hons, MSc, PhD, N/A)?

PhD

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Session Classification: Theoretical and Computational Physics

Track Classification: Track G - Theoretical and Computational Physics