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Rapid Identification and Classification of Eccentric BBH mergers using Machine Learning

The future of Gravitational Wave (GW) detectors [LVK] have made remarkable progress, with an expanding sensitivity band and the promise of exponential increase in detection rates for upcoming observing runs [O4 and beyond]. Among the diverse sources of GW signals, eccentric Binary mergers present an intriguing and computationally challenging aspect. We address the imperative need for efficient detection and classification of eccentric Binary mergers using Machine Learning (ML) techniques. Traditional Bayesian Parameter estimation methods, while accurate, can be prohibitively time-consuming and computationally expensive. To overcome this challenge, we leverage the capabilities of ML to expedite the identification and classification of eccentric GW events. I will present our approach that employs Separable Convolutional Neural Networks (SCNN) to discriminate between non-eccentric and eccentric Binary mergers and further classifying the latter into categories of low, moderate, and high eccentricity mergers.

Email

yuvraj.sharma@icts.res.in

Affiliation

ICTS-TIFR

Authors: RAVICHANDRAN, Adhrit; SHARMA, Yuvraj

Co-author: Dr KUMAR, Prayush (ICTS-TIFR)

Presenter: SHARMA, Yuvraj

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