

ICTS Astrophysics & Relativity Seminar

Title : Fast and efficient Bayesian method to search for strongly lensed gravitational waves

Speaker : Ankur Barsode (ICTS-TIFR, Bengaluru)

Date : Thursday, 21 November 2024

Time : 3:30 PM (IST)

Abstract : A small fraction of the gravitational-wave (GW) signals from binary black holes observable by ground-based GW detectors will be strongly lensed by intervening objects such as galaxies and clusters. Strong lensing will produce nearly identical copies of the GW signals, separated by time delays of minutes to months. These lensed signals must be identified against a background of accidentally similar unlensed GW events. This is usually done using fast, but approximate methods that, for example, check for the overlap between the posterior distributions of a subset of binary parameters, or using slow, but accurate joint Bayesian parameter estimation. In this work, we present a modified version of the posterior overlap method dubbed "PO2.0" that is mathematically equivalent to joint parameter estimation while still remaining fast. We achieve a significant gain in efficiency by incorporating informative priors about the binary and lensing populations, selection effects, and all the inferred parameters of the binary. For binary black hole signals lensed by galaxies, our improved method can detect 65% lensed events at a pair-wise false alarm probability of $\sim 2 \times 10^{-6}$. Consequently, we have a 13% probability of detecting a strongly lensed event above 2.25σ significance during 18 months of observation by the LIGO-Virgo detectors at their current sensitivity.

Venue : Feynman Lecture Hall

Zoom Link: <https://icts-res-in.zoom.us/j/97019761370?pwd=MmTWIviKOsshF4LCgtMEHqNVabGnx1.1>

Meeting ID: 970 1976 1370

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