



## ICTS Astrophysics & Relativity Seminar

- Title** : Optimizing the search for strongly lensed gravitational waves using bounding volume hierarchies
- Speaker** : Anandakrishnan H (Mahatma Gandhi University, Kerala)
- Date** : Fridayday, 10 July 2026
- Time** : 3:00 PM (IST)
- Abstract** : Gravitational-wave (GW) strong lensing arises when the propagation of GWs is affected by a massive intervening object, such as a galaxy or galaxy cluster, producing multiple magnified and time-delayed images of the same astrophysical event. Recent work has established fast and efficient Bayesian methods, such as Posterior Overlap 2.0, that can successfully search for these signals in current event catalogues. However, as the number of detections increases in upcoming observations, searching among these pairs leads to a quadratically increasing computational cost. Furthermore, establishing the statistical significance of the identified lensed candidates presents an even bigger computational challenge. Here, we address this problem by introducing a prefiltering step that vetoes obviously unlensed pairs at low cost. Our method uses Bounding Volume Hierarchies (BVHs) to spatially organize the posterior samples of events in bounding boxes and applies a fast pruning box-intersection algorithm to check bounding-box overlap, efficiently weeding out most of the unlensed pairs. This method transforms the all-pair search complexity from quadratic,  $O(N^2)$ , to a highly scalable  $O(N \log N)$  scaling in the number of GW events  $N$ . Our prefilter successfully discards over 68% of the unlensed background pairs with less than 0.1% false dismissal probability. This two-step pipeline reduces the computation time while maintaining the exact precision of the Bayesian framework, enabling GW strong lensing search in the next generation of massive catalogues.
- Venue** : Feynman Lecture Hall  
Zoom Meeting: <https://icts-res-in.zoom.us/j/93185554801?pwd=oBLn5BvAbJaIVVUoTUi5dTFgg3anNs.1>  
Meeting ID: 931 8555 4801  
Passcode: 101011