Hierarchical search strategies for compact binary coalescences using aligned-spin waveforms

Bhooshan Gadre, Sanjee Dhurandhar, and Sanjit Mitra
Inter-University Centre for Astronomy and Astrophysics, Post Bag 4, Ganeshkhind, Pune 411007, India
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The current template-based searches for gravitational waves from coalescing compact binaries in the data from LIGO-like detectors use waveform models in which total and orbital angular momenta are parallel to each other. Even with these aligned-spin models over the restricted parameter space, one has to use a bank containing few millions of waveforms to filter out the signal from the noisy data. The search is already computationally expensive. A similar search with larger parameter space, better statistic and with longer waveforms will be even costlier computationally and with more potential triggers to follow. Moreover, searches for precessing binaries are currently computationally prohibitive. To reduce the computational cost of the current searches, we have extended the two-stage hierarchical technique previously developed for non-spinning waveforms with aligned-spin banks incorporating coincidences and vetoes at each stage. On simulated data, we manage to reduce the computational cost by more than an order of magnitude while recovering all the signals detectable by the standard flat coincidence search. Even for real data, we expect the search to speed up by a factor of a few. We are also trying to introduce a simple cross-correlation step to prioritise analysis of those chunks of the data which are more likely to contain detectable gravitational signals, to further enhance the efficiency of the search.