

Dictionary Learning: A Novel Approach to Detecting Binary Black Holes in the Presence of Galactic Noise with LISA

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The noise produced by the inspiral of millions of white dwarf binaries in the Milky Way may pose a threat to one of the main goals of the space-based LISA mission: the detection of massive black hole binary mergers. We present a novel study for reconstruction of merger waveforms in the presence of Galactic confusion noise using dictionary learning. We discuss the limitations of untangling signals from binaries with total mass from $10^2 M$ to $10^4 M$. Our method proves extremely successful for binaries with total mass greater than $\sim 3 \times 10^3 M$ up to redshift 3 in conservative scenarios, and up to redshift 7.5 in optimistic scenarios. In addition, consistently good waveform reconstruction of merger events is found if the signal-to-noise ratio is approximately 5 or greater.

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