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1st Year PhD candidate

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PhD Advisors:

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Research Interests/Skills:

Gravitational Wave data analysis (BayesWave)
Unmodelled Burst Searches (Supernova)
Opinion Dynamics (Complex Systems, Graph Theory)
Pulsar Timing

Recent Publication (February 2021):

PHYSICAL REVIEW D **103**, 062002 (2021)

Enhancing the gravitational-wave burst detection confidence in expanded detector networks with the BayesWave pipeline

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The global gravitational-wave detector network achieves higher detection rates, better parameter estimates, and more accurate sky localization as the number of detectors \mathcal{I} increases. This paper quantifies network performance as a function of \mathcal{I} for *BayesWave*, a source-agnostic, wavelet-based, Bayesian algorithm which distinguishes between true astrophysical signals and instrumental glitches. Detection confidence is quantified using the signal-to-glitch Bayes factor $\mathcal{B}_{S,G}$. An analytic scaling is derived for $\mathcal{B}_{S,G}$ versus \mathcal{I} , the number of wavelets, and the network signal-to-noise ratio SNR_{net} , which is confirmed empirically via injections into detector noise of the Hanford-Livingston (HL), Hanford-Livingston-Virgo (HLV), and Hanford-Livingston-KAGRA-Virgo (HLKV) networks at projected sensitivities for the fourth observing run (O4). The empirical and analytic scalings are consistent; $\mathcal{B}_{S,G}$ increases with \mathcal{I} . The accuracy of waveform reconstruction is quantified using the overlap between injected and recovered waveform, \mathcal{O}_{net} . The HLV and HLKV network recovers 87% and 86% of the injected waveforms with $\mathcal{O}_{\text{net}} > 0.8$, respectively, compared to 81% with the HL network. The accuracy of BayesWave sky localization is ≈ 10 times better for the HLV network than the HL network, as measured by the search area \mathcal{A} , and the sky areas contained within 50% and 90% confidence intervals. Marginal improvement in sky localization is also observed with the addition of the Kamioka Gravitational Wave Detector.

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