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Using Likelihood Ratio for Searching Gravitational Waves from Single Detector with SPIIR Pipeline

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We propose using likelihood ratio as a new ranking statistic for SPIIR to detect gravitational waves (GWs) from single detector data. We derived the forms of likelihood ratio for a candidate using its signal-to-noise ratio (SNR), chi-square, and auto-correlation length. For significance estimation, the background was constructed using one-week of data, and we used an exponential fit to extrapolate false alarm rate (FAR) estimates beyond the limit of one per observation time. Furthermore, we used a machine learning (ML) network SIGMa-Net to veto short-duration noise transients (glitches) to improve sensitivity. Here we show that, our method can recover all 6 single-detector events from O3 GWTC catalog, and no detector artefact has been assigned high significance.

Section

High Energy

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