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Enhanced Gravitational Wave Detection with Normalizing-Sequential Flow

Gravitational waves coming from mergers of binary compact objects observed by detectors like LIGO and Virgo have profoundly transformed our understanding of the universe. However, as future detectors become more sensitive, it becomes increasingly difficult to effectively identify and characterize fainter and more complex signals hidden in noisy data. To address this problem, we use a machine learning approach, Normalizing-Sequential Flow (NSFlow), which leverages sequential normalizing flows to efficiently model complex posterior distributions and enhance inference speed. This approach provides faster sampling, more accurate uncertainty quantification, and better scalability for large-scale gravitational wave datasets. We will use this method to reconstruct each parameter posterior for binary black hole mergers and demonstrate its accuracy and robustness in direct comparison with established likelihood-based methods.

AI keywords

simulation-based inference, normalizing-sequential flow, probability density estimate

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