

General Relativity and Quantum Cosmology

Particle Swarm Optimization and gravitational wave data analysis: Performance on a binary inspiral testbed

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The detection and estimation of gravitational wave (GW) signals belonging to a parameterized family of waveforms requires, in general, the numerical maximization of a data-dependent function of the signal parameters. Due to noise in the data, the function to be maximized is often highly multi-modal with numerous local maxima. Searching for the global maximum then becomes computationally expensive, which in turn can limit the scientific scope of the search. Stochastic optimization is one possible approach to reducing computational costs in such applications. We report results from a first investigation of the Particle Swarm Optimization (PSO) method in this context. The method is applied to a testbed motivated by the problem of detection and estimation of a binary inspiral signal. Our results show that PSO works well in the presence of high multi-modality, making it a viable candidate method for further applications in GW data analysis.

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