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Efficient Neutrino Oscillation Parameter Extraction with Gaussian Processes

Neutrino oscillation is so far the only experimental observation beyond the standard model. Many experiments have been set-up to measure the parameters governing the oscillation probabilities. Feldman-Cousins method is a unified approach to create frequentist confidence intervals near physical limits or with low statistics. It is broadly used in neutrino oscillation parameter extraction. However, the Feldman-Cousins method is very computationally expensive, on the order of tens of millions of CPU hours. In this work, we propose an iterative method using Gaussian Process to efficiently estimate a frequentist confidence contour for the neutrino oscillation parameters and show that it produces the same results at a small fraction of the computation cost of the standard Feldman-Cousins method.

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