

Abstract Submitted
for the APR20 Meeting of
The American Physical Society

Gaussian Process Accelerated Feldman-Cousins Approach for Physical Parameter Inference NITISH NAYAK, LINGGE LI, JIANMING BIAN, PIERRE BALDI, University of California, Irvine — The unified approach of Feldman and Cousins allows for exact statistical inference of small signals that commonly arise in high energy physics. It has gained widespread use, for instance, in measurements of neutrino oscillation parameters in long-baseline experiments. However, the approach relies on the Neyman construction of the classical confidence interval and is computationally intensive as it is typically done in a grid-based fashion over the entire parameter space. In this article, we propose an efficient algorithm for the Feldman-Cousins approach using Gaussian processes to construct confidence intervals iteratively. We show that in the neutrino oscillation context, one can obtain confidence intervals five times faster in one dimension and ten times faster in two dimensions, while maintaining an accuracy above 99.5%.

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Date submitted: 14 Jan 2020

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