



THE UNIVERSITY OF
CHICAGO

Department of Statistics
STATISTICS COLLOQUIUM

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Uncertainty Quantification for Online Learning

MONDAY, November 5, 2018 at 4:30 PM

Eckhart 133, 5734 S. University Avenue

Refreshments before the seminar at 4:00 PM in Jones 111

ABSTRACT

Stochastic gradient descent (SGD) is an immensely popular approach for online learning in settings where data arrives in a stream or data sizes are very large. However, despite an ever-increasing volume of work on SGD, much less is known about the statistical inferential properties of SGD-based predictions. Taking a fully inferential viewpoint, this talk introduces a novel procedure termed HiGrad to conduct statistical inference for online learning, without incurring additional computational cost compared with SGD. The HiGrad procedure begins by performing SGD updates for a while and then splits the single thread into several threads, and this procedure hierarchically operates in this fashion along each thread. With predictions provided by multiple threads in place, a t -based confidence interval is constructed by decorrelating predictions using covariance structures given by a Donsker-style extension of the Ruppert--Polyak averaging scheme, which is a technical contribution of independent interest. Under certain regularity conditions, the HiGrad confidence interval is shown to attain asymptotically exact coverage probability. The performance of HiGrad is evaluated through extensive simulation studies and a real data example. We conclude the talk with an application of HiGrad to deep neural networks.

This is based on joint work with Yuancheng Zhu.

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