THE UNIVERSITY OF GEORGIA
DEPARTMENT OF STATISTICS

Colloquium Series

Yuan Liao

Department of Economics

Rutgers University

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Fast and Robust Online Inference with Stochastic Gradient Descent via Random Scaling

We develop a new method of online inference for a vector of parameters estimated by the Polyak-Ruppert averaging procedure of stochastic gradient descent (SGD) algorithms. We leverage insights from time series regression in econometrics and construct asymptotically pivotal statistics via random scaling. Our approach is fully operational with online data and is rigorously underpinned by a functional central limit theorem. Our proposed inference method has a couple of key advantages over the existing methods. First, the test statistic is computed in an online fashion with only SGD iterates and the critical values can be obtained without any resampling methods, thereby allowing for efficient implementation suitable for massive online data. Second, there is no need to estimate the asymptotic variance and our inference method is shown to be robust to changes in the tuning parameters for SGD algorithms in simulation experiments with synthetic data.