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Markov Chain Variance Estimation: A Stochastic Approximation Approach

Wednesday, September 24th, 2025
12:10-1:30 PM
SEC 117

Zoom Meeting: Meeting ID: 983 2864 8232
Password: 665123

https://rutgers.zoom.us/j/98328648232?pwd=gcHifQ9OouKZnUY0EHLe8sjNXaV1oj.1

Light refreshments will be served in Hill 452, 11:40am

Abstract:

Inspired by risk sensitive Reinforcement Learning, we consider the problem of estimating the asymptotic variance of a Markov chain. We design the first recursive estimator that requires O(1) computation at each step, does not require storing any historical samples or any prior knowledge of run-length, and has optimal O(1/n) rate of convergence for the mean-squared error (MSE) with provable finite sample guarantees. Here, n refers to the total number of samples generated. Our estimator is based on linear stochastic approximation of an equivalent formulation of the asymptotic variance in terms of the solution of the Poisson equation. This estimator is also generalized in several directions, including approximate estimation, when the underlying state space is large. In the RL setting, our estimator immediately provides a temporal-difference type algorithm for policy evaluation in the risk sensitive setting, and paves the way for developing actor-critic style algorithms for variance-constrained RL

Bio: Siva Theja Maguluri is Fouts Family Early Career Professor and an Associate Professor in the School of Industrial and Systems Engineering at Georgia Tech. He obtained his Ph.D. and MS in ECE as well as MS in Applied Math from UIUC, and B.Tech in Electrical Engineering from IIT Madras. His research interests span the areas of Control, Optimization, Algorithms and Applied Probability. In particular, he works on Reinforcement Learning theory, scheduling, resource allocation and revenue optimization problems that arise in a variety of systems. His research and teaching are recognized through several awards including the "Best Publication in Applied Probability" award, NSF CAREER award, second place award at INFORMS JFIG best paper competition, Student best paper award at IFIP Performance, "CTL/BP Junior Faculty Teaching Excellence Award," and "Student Recognition of Excellence in Teaching: Class of 1934 CIOS Award."