ID de Contribution: **126**   Type: **Invited talk**

A General-Purpose Theorem for High-Probability Bounds of Stochastic Approximation with Polyak Averaging

vendredi 1 août 2025 14:00 (30 minutes)

Polyak averaging is a well-known technique for achieving asymptotically optimal convergence in Stochastic Approximation. In this work, we establish the first high-probability bound for general Stochastic Approximation with Polyak Averaging. We take a black-box approach, assuming access to an anytime high-probability bound for a given Stochastic Approximation, and derive tight finite-time bounds for its Polyak-averaged version. Applying our black-box framework to general contractive Stochastic Approximation, we analyze the impact of averaging under various settings.

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Classification de Session: ML

Classification de thématique: Machine learning