Robust and Accelerated Stochastic Approximation Approaches for Stochastic Optimization

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Abstract

ABSTRACT: Recognized as a powerful modeling technique in a diverse set of applications, stochastic optimization remains computationally challenging. In this talk, we discuss some recent exciting advancement in stochastic approximation (SA) methods applied to stochastic convex optimization. We first develop the robust stochastic approximation method and demonstrate that it can substantially outperform the widely used sampling average approximation method (SAA) for certain classes of problems. We then focus on the stochastic composite optimization, which covers an even wider range of problems. Although a valid lower bound on the rate of convergence for solving this class of problems was known from the classical complexity theory for convex programming, optimization algorithms that can achieve this lower bound had never been discovered. We succeeded in solving this problem by proposing an accelerated stochastic approximation method possessing this desired property. Some promising numerical results will also be presented for solving problems arising from financial risk management and network design under uncertainty.