A Fully First-Order Method for Stochastic Bilevel Optimization

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The problem of stochastic bilevel optimization has been the focus of extensive study in recent years. Although many optimization methods have been proposed to address bilevel problems, existing approaches often require potentially expensive calculations involving the Hessians of lower-level objectives. The primary technical challenge lies in tracking the lower-level solutions as upper-level variables change. We introduce a Fully First-order Stochastic Approximation (F2SA) method, which only relies on first-order gradient oracles. Additionally, we analyze the complexity of first-order methods under minimal assumptions and provide matching lower bounds. This talk is based on joint work with Jeongyeol Kwon, Hanbaek Lyu, Stephen Wright, and Robert Nowak (UW-Madison).