ONE WORLD OPTIMIZATION SEMINAR

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Stochastic and Variance-Reduced Monotone Operator Splitting

Abstract. Monotone inclusions are a powerful and flexible paradigm for studying various problems arising in machine learning (ML), signal processing, and beyond. In this work, we are concerned with the projective splitting algorithm for monotone inclusions. This family of methods achieves full-splitting on monotone inclusions: set-valued operators are handled via resolvents, and single-valued and linear operators via evaluations and adjoints. However, these methods are unable to handle stochastic estimators of single-valued operators, making them impractical for most ML problems. In this work, we address this, providing the first stochastic projective splitting method. Almost-sure iterate convergence is proved under bounded noise variance with decaying stepsizes, and a convergence rate is derived. Most recently, we have extended the method to allow for a broad family of variance-reduced estimators. With these estimators, the method may use fixed, rather than decaying, stepsizes and obtains a significantly better iteration complexity than deterministic projective splitting.