Variance-based stochastic extragradient methods for stochastic variational inequalities

Philip Thompson (CMM-Chile), A. Iusem (IMPA), A. Jofré (CMM-Chile), R.I. Oliveira (IMPA)

Resumo/Abstract:
We propose extragradient methods with stepsizes bounded away from zero for stochastic variational inequalities requiring only pseudo-monotonicity. We provide convergence and complexity analysis, allowing for an unbounded feasible set, unbounded operator, non-uniform variance of the oracle and, also, we do not require any regularization. Alongside the stochastic approximation procedure, we iteratively reduce the variance of the stochastic error. Our method attains the near-optimal optimal oracle complexity $\mathcal{O}(\epsilon^{-2})$ if the Lipschitz constant L is known or $\mathcal{O}(\log_{1/\theta} L) \cdot \epsilon^{-2}$ if L is unknown (up to log terms) and a faster rate $\mathcal{O}(1/K)$ in terms of the D-gap function, where K is the number of iterations required for a given tolerance $\epsilon > 0$. Such convergence rate represents an acceleration with respect to the stochastic error. The generated sequence also enjoys a new feature: the sequence is bounded in L^p if the stochastic error has finite p-moment. Explicit estimates for the convergence rate, the oracle complexity and the p-moments are given depending on problem parameters and distance of the initial iterate to the solution set.