Solving Weakly Monotone Variational Inequality and Its Application in GAN Training

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In this talk, I will present our recent work on solving non-convex non-concave min-max saddle-point problems, which has many important applications in machine learning, statistics, and operations research. One such example that attracts tremendous attention recently in machine learning is training Generative Adversarial Networks (GAN). We propose an algorithmic framework motivated by the inexact proximal point method, which solves the weakly monotone variational inequality corresponding to the original min-max problem by approximately solving a sequence of strongly monotone variational inequalities constructed by adding a strongly monotone mapping to the original gradient mapping. Our algorithm generates a sequence of solution that provably converges to a nearly stationary solution of the original min-max problem. The proposed framework is flexible because various subroutines can be employed for solving the strongly monotone variational inequalities. The overall computational complexities of our methods are established when the employed subroutines are subgradient method, stochastic subgradient method, gradient descent method and Nesterov's accelerated method and variance reduction methods for a Lipschitz continuous operator.