Luo, Mei Ju; Chen, Yi Zeng

Smooth and sample average approximation methods for solving stochastic generalized Nash equilibrium problems.

Summary: In this paper, we consider the class of stochastic generalized Nash equilibrium problems (SGNEP). Such problems have a wide range of applications and have attracted significant attention recently. First, using the first order optimality condition of SGNEP and the nonlinear complementary function, we present an expected residual minimization (ERM) model for the case when the involved functions are not continuously differentiable. Then, we introduce a smoothing function, depending on a smoothing parameter, to yield a smooth approximate ERM model. We further show that the solutions of this smooth ERM model converge to the solutions of the original ERM model as the smoothing parameter tends to zero. Since the ERM formulation contains an expectation, we further propose a sample average approximate problem for the ERM model. Moreover, we show that the global optimal solutions of these approximate problems converge to the global optimal solutions of the ERM problem with probability one. Here, convergence can be achieved in two ways. One is to fix the smoothing parameter, the other is to let the smoothing parameter tend to zero as the sample increases.

Keywords: stochastic generalized Nash equilibrium; expected residual minimization; sample average approximation; smooth approximation; exponential convergence
doi:10.3934/jimo.2016.12.1