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A particle consensus approach to solving nonconvex-nonconcave min-max problems

A zero-order optimization method is introduced for sequential min-max problems based interacting particles. The systems are coupled so that one population aims to solve the inner maximization problem, while the other aims to solve the outer minimization problem. The dynamics are characterized by a consensus-type interaction with additional stochasticity to promote exploration of the objective landscape. Without relying on convexity or concavity assumptions, theoretical convergence guarantees of the algorithm are established via a suitable mean-field approximation of the particle systems. Numerical experiments illustrate the validity of the proposed approach. In particular, the algorithm is able to identify a global min-max solution, in contrast to gradient-based methods, which typically converge to possibly suboptimal stationary points. This talk is based on joint work with Giacomo Borghi and Hui Huang.