A Random Perturbation of the Gradient approach for Global Optimization of Stochastic Functions

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The minimization of the mean of a functional is a classical problem that can be solved by stochastic programming methods. Indeed, stochastic approximation techniques have been applied to a wide range of domains, such as machine learning, finances, engineering, to name just a few. In the case of convex functions, classical stochastic approximation algorithms, e.g. the ones derived from the Robbins-Monro method [1], are able to converge to the optimum solution. However, several domains of interest require the optimization of nonconvex and multimodal functions. That is, in this cases, a global optimization algorithm has to be introduced.

In this context, this paper investigates the use of the Random Perturbation of the Gradient (RPG) [2] and the Stochastic Average Gradient (SAG) [3] for the global optimization of multimodal stochastic functions. The aim of the RPG is to make the search escape local minima, i.e. search for the global solution of the problem. The purpose of the SGA is to reduce the computational burden required to estimate the descent direction of the algorithm. The performance and robustness of the resulting algorithm is tested in a set of global optimization stochastic functions. The results show that the proposed algorithm is able to successfully minimize the mean of stochastic functions requiring a competitive computational effort.

References

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