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Designing Scalable Distributed Learning Methods: Hybrid-Order Distributed Learning Framework

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Abstract

In this presentation, we first discuss on the major challenges in designing scalable distributed learning/optimization methods: communication overhead, computation load, and convergence speed, and elaborate on the deficiencies of the existing distributed learning methods to address these challenges. Then, we introduce the proposed approach of hybrid-order distributed stochastic gradient descent (HO-SGD) which strikes a better balance between these three than the previous methods, for a general class of non-convex stochastic optimization problems. In particular, we advocate that by properly interleaving zeroth-order and first-order stochastic gradient updates, it is possible to significantly reduce the communication and computation overheads while guaranteeing a fast convergence. The proposed method guarantees the same order of convergence rate as in the fastest distributed methods (i.e., fully synchronous SGD) while having significantly less computational complexity and communication overhead per iteration, and the same order of communication overhead as in the state-of-the-art communication-efficient methods, with order-wisely less computational complexity. Moreover, it order-wisely improves the convergence rate of zeroth-order SGD methods. Finally, through various empirical studies, we demonstrate that the proposed hybrid-order approach provides significantly superior generalization than all the baselines, owing to its novel exploration mechanism.

Biography

Naeimeh Omidvar is a Postdoctoral Researcher at the School of Computer Science, Institute for Research in Fundamental Sciences (IPM). She received the Ph.D. degree in Electronic and Computer Engineering from The Hong Kong University of Science and Technology, and the Ph.D., M.Sc. and B.Sc. degrees from Sharif University of Technology. Before joining IPM, she was with Sharif University of Technology as a Postdoctoral Research Fellow. Her research interests include theoretical computer science, distributed machine learning, stochastic optimization, next generation data networks, and IoT.

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