![CityU Department of Data Science, 香港城市大學 City University of Hong Kong]

On Algorithms and Complexity to Solve Large-scale Optimization

Date: 4 November 2024 (Monday)

Time: 10:00am - 11:00am

Venue: Rm G7603, Yeung Kin Min Academic Building, City University of Hong Kong

ABSTRACT

In this talk, I will discuss two subclasses of nonconvex optimization problems motivated by applications in machine learning. The first one is bound-constrained problems. This problem class captures applications including nonnegative matrix factorization. Inspired by a two-metric projection method from Bertsekas, we propose a projected Newton-CG algorithm equipped with good worst-case complexity guarantees. The algorithm also has competitive fundamental operation complexity in terms of Hessian-vector product, thus suitable for large-scale computation. The second problem class is complicated by nonconvex expected-valued objective functions. Such a formulation can capture deep learning, policy optimization, autoencoder training, etc. It is known in literature that the sample complexity of stochastic first-order methods depend linearly on the problem dimension, which is undesirable for solving large-scale problems. To address this issue, we propose dimension insensitive stochastic first-order methods. Our algorithm allow for non-Euclidean and nonsmooth distance functions as the proximal terms when taking the stochastic gradient step. State-of-art sample complexity guarantees in terms of the dimension are shown.

Dr. Yue XIE
GUEST SPEAKER'S PROFILE

Dr. Yue XIE is a Research Assistant Professor in Musketeers Foundation Institute of Data Science (HKU-IDS) and Department of Mathematics at the University of Hong Kong. He was a postdoc at UW-Madison working in the nonconvex optimization group led by Professor Stephen J. Wright. He received his PhD degree in Pennsylvania State University and Bachelor degree from Tsinghua University. Dr. Yue XIE has been focusing on algorithm design and analysis to address optimization problems complicated by large-scale and stochasticity with all types of applications including machine learning and data science. He has published/served as the referee of top-tier journals including Mathematical Programming, SIAM Journal on Optimization, and IEEE Transactions on Automatic Control, etc. More details about him can be found at: https://yue-xie.github.io.

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All are welcome