数学与系统科学研究院

计算数学所学术报告

报告人： **Dr. Ruoyu Sun**

（ *Facebook Artificial Intelligence Research* ）

报告题目：

Large Gaps between Gauss-Seidel Type Methods and Randomized Versions

邀请人： 戴彧虹 研究员

报告时间：2016 年 12 月 27 日（周二）

下午 16:30-17:30

报告地点： 科技综合楼三层

311 报告厅

Abstract：

A simple yet powerful idea for solving large-scale computational problems is to iteratively solve smaller subproblems. The applications of this idea include Gauss-Seidel (G-S), Kaczmarz, coordinate descent (CD), and ADMM. We prove rigorously that for all these methods, there are large gaps between the deterministic cyclic versions and the randomized versions.

First we show an $O(n^2)$ gap in the convergence rate for CD/G-S/Kaczmarz methods. In particular, we show that the cyclic versions can be $O(n^2)$ times slower than their randomized counterparts. Such a gap has been noticed in existing theoretical results, but was usually considered to be a theoretical artifact. We show that this gap indeed exists and establish the worst-case complexity of these methods.

Second we show a gap between divergence and convergence for ADMM. In particular, although cyclic multi-block ADMM was recently found to be possibly divergent, we show that RP-ADMM (randomly permuted ADMM) converges in expectation for solving linear systems. We believe RP-ADMM is potentially a very competitive algorithm for large-scale linearly constrained optimization problems.

Bio:

Ruoyu Sun will join UIUC IS&E department as an assistant professor in Spring 2017, and is currently a visiting scientist at Facebook Artificial Intelligence Research. Previously he was a postdoctoral scholar in Dept. of Management Science & Engineering at Stanford University, working with Yinyu Ye. He obtained his Ph.D. in Electrical Engineering at the University of Minnesota in 2015, under the supervision of Zhi-Quan (Tom) Luo. He received the B.Sc. degree in mathematics from Peking University, Beijing, China in 2009. His research interest mainly lies in large-scale optimization and its application in machine learning, data analysis and signal processing. He has also worked on signal processing and information theory for wireless networks. He has received the second place of INFORMS Nicholson student paper competition, and the honorable mention of INFORMS optimization society student paper prize.

欢迎大家参加！