数学与系统科学研究院

计算数学所学术报告

报告人：Assistant Prof. Mingyi Hong

（ Iowa State University,

Department of Industrial and Manufacturing Engineering (IMSE) ）

报告题目：

Iteration Complexity Analysis of Block Coordinate Descent Methods: Sublinear Convergence and Improved Rates

邀请人： 刘亚锋 博士

报告时间：2015 年 7 月 31 日（周五）

下午 15:30-16:30

报告地点： 科技综合楼三层

311 报告厅

Abstract:

In the first part the talk, we provide a unified iteration complexity analysis for a family of general block coordinate descent (BCD) methods, covering popular methods such as the block coordinate gradient descent (BCGD) and the block coordinate proximal gradient (BCPG), under various different coordinate update rules. We unify these algorithms under the so-called Block Successive Upper-bound Minimization (BSUM) framework, and show that for a broad class of multi-block nonsmooth convex problems, all algorithms covered by the BSUM framework achieve a global sublinear iteration complexity of O(1/r), where r is the iteration index. Moreover, for the case of block coordinate minimization (BCM) where each block is minimized exactly, we establish the sublinear convergence rate of O(1/r) without per block strong convexity assumption. Further, we show that when there are only two blocks of variables, a special BSUM algorithm with Gauss-Seidel rule can be accelerated to achieve an improved rate of O(1/r^2).

However, these bounds are all explicitly dependent on K (the number of variable blocks), and are at least K times worse than those of the gradient descent (GD) and proximal gradient (PG) methods. In the second part of the talk, we close such theoretical performance gap between BCD and GD/PG. First we show that for a family of quadratic nonsmooth problems, the complexity bounds for BCD and its popular variant Block Coordinate Proximal Gradient (BCPG) can match those of the GD/PG in terms of dependency on K. Our bounds are sharper than the known bounds for cyclic BCD by at least a factor of K. Second, we show an improved iteration complexity bound for general convex problems.

欢迎大家参加！