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Key Laboratory of System Control and Information Processing, Ministry of Education

学术报告会

时间：2021年11月12日（周五）14:00-15:00
地点：电院群楼2-410会议室

A Novel Surrogate-Function-Based Paradigm for Large-Scale Convex Composite Optimization

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Abstract:

In this talk, I will introduce a novel paradigm called the Approximate Method of Multipliers (AMM) for solving a generic, large-scale convex composite optimization problem. AMM attempts to approximate the classic Method of Multipliers by virtue of a surrogate function with numerous options. It can be specialized to different types of new algorithms (e.g., proximal, second-order, gradient-tracking, etc.), and generalizes a broad span of existing first-order and second-order methods that were originally developed via different rationales. In contrast to the earlier unifying optimization frameworks, which can barely be reduced to second-order algorithms and require separable surrogate functions for distributed problem solving, AMM can effortlessly include second-order information through its surrogate function, and enables distributed implementation with both separable and non-separable surrogate function forms designed via ideas like Bregman divergence and convex conjugate functions. AMM is able to achieve an O(1/k) rate of convergence to optimality, and the convergence rate becomes linear when the problem is locally restricted strongly convex and smooth. Such convergence rates provide new or stronger convergence results to many prior methods that can be viewed as specializations of AMM.

Biography:

Jie Lu received the B.S. degree in Information Engineering from Shanghai Jiao Tong University, Shanghai, China, in 2007 and the Ph.D. degree in Electrical and Computer Engineering from the University of Oklahoma, Norman, OK, USA, in 2011. From 2012 to 2015, she was a Postdoctoral Researcher with the KTH Royal Institute of Technology, Stockholm, Sweden, and with the Chalmers University of Technology, Gothenburg, Sweden. Since 2015, she has been an Assistant Professor with the School of Information Science and Technology, ShanghaiTech University, Shanghai, China. Her research interests include distributed optimization, optimization theory and algorithms, and multi-agent decision making.