

数学与系统科学研究院

计算数学所学术报告

报告人: **Shi Jin**

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报告题目:

**Random Batch Methods for  
Interacting Particle Systems and  
Consensus-based Global Non-convex  
Optimization in High-dimensional  
Machine Learning**

邀请人: 洪佳林 研究员

报告时间: 2019 年 11 月 22 日 (周五)

上午 9:30-10:30

报告地点: 数学院南楼二层

202 教室

## **Abstract:**

We develop random batch methods for interacting particle systems with large number of particles. These methods use small but random batches for particle interactions, thus the computational cost is reduced from  $O(N^2)$  per time step to  $O(N)$ , for a system with  $N$  particles with binary interactions. For one of the methods, we give a particle number independent error estimate under some special interactions. Then, we apply these methods to some representative problems in mathematics, physics, social and data sciences, including the Dyson Brownian motion from random matrix theory, Thomson's problem, distribution of wealth, opinion dynamics and clustering. Numerical results show that the methods can capture both the transient solutions and the global equilibrium in these problems.

We also apply this method and improve the consensus-based global optimization algorithm for high dimensional machine learning problems. This method does not require taking gradient in finding global minima for non-convex functions in high dimensions.

**欢迎大家参加！**