中俄可计算建模与数据智能研究中心

学术报告安排

地点：国定路 777 号 上海财经大学 红瓦楼 726 会议室

时间：2026 年 11 月 19 日 14:00 - 17:00

报告人	时间	报告题目
陈楚楚	14:00–14:40	Numerical preservation of probabilistic limit theorems for time-homogeneous Markov processes
董晓靖	14:40–15:20	Unconditionally Energy-Stable Decoupled Algorithms for Magnetohydrodynamic Systems
	15:20–15:40	休息（20 分钟）
王东	15:40–16:20	An efficient and stable diffusion generated method for quadrilateral mesh generation in general domains
许志钦	16:20–17:00	凝聚现象与大模型推理机制



报告人与报告摘要

陈楚楚

国家级青年人才，中国科学院数学与系统科学研究院，副研究员。2015 年在中国科学院数学与系统科学研究院获博士学位，2015-2017 年先后在普渡大学和密歇根州立大学从事博士后研究工作。主要研究方向为随机偏微分方程保结构算法及其理论分析，研究成果发表在 SINUM、JUQ、MMS、JCP、IMAJNA 等学术刊物上，在 Springer 出版社系列丛书 Lecture Notes in Mathematic 中合作出版专著《LNM 2341》和《LNM2399》。主持国家自然科学基金优秀青年科学基金项目、国家重点研发计划青年科学家项目等。

Numerical preservation of probabilistic limit theorems for time-homogeneous Markov processes

Probabilistic limit theorems provide fundamental characterizations of the long-time statistical behavior of stochastic systems. A natural question is whether these limit theorems can be faithfully preserved under numerical discretization. In this work, we establish a unified framework showing that, under suitable mixing and convergence conditions, numerical discretizations preserve both the strong law of large numbers and the central limit theorem of general time-homogeneous Markov processes. In particular, the numerical time averages converge almost surely to the same ergodic limit, and their normalized fluctuations converge in distribution to the same Gaussian limit as those of the underlying process. The framework applies to numerical discretizations of a broad class of stochastic systems, including stochastic ordinary differential equations, stochastic partial differential equations, stochastic functional differential equations.

董晓靖

湘潭大学教授、博士生导师，2015 年于西安交通大学获博士学位，2017 年至 2019 年在北京应用物理与计算数学研究所从事博士后研究，主要从事磁性流体力学高效数值算法研究。入选中国科学技术协会“第六届青年人才托举工程”及湖南省科技创新类湖湘青年人才计划。主持了国家自然科学基金面上项目及青年项目、中国博士后科学基金特别资助项目及面上项目等。研究成果发表在 Comput. Meth. Appl. Mech. Engrg.，J.Comp.Phys，Sci. China Math.，IMA J. Numer. Anal.,J. Sci. Comput. 等期刊上。在教学方面，主持建设的研究生课程《数值代数》入选湖南省研究生精品示范课程、主讲本科生《数值计算方法》先后入选省级和国家级线下一流本科课程，主持建设湘潭大学信息与计算科学系专业知识图谱建设。

Unconditionally Energy-Stable Decoupled Algorithms for Magnetohydrodynamic Systems

Magnetohydrodynamic (MHD) models arise in liquid metal transport, cooling systems for fusion devices, and other applications. Their numerical solution presents challenges involving strong nonlinear coupling, divergence-free constraints, and multiphase interface evolution. This talk presents energy-stable decoupled methods for incompressible MHD and two-phase CH–MHD systems, which use multiple scalar auxiliary variables to treat interfacial free energy and fluid–magnetic coupling separately. Convergence tests, energy dissipation results, and interface evolution simulations in complex two- and three-dimensional geometries illustrate the computational behavior of the methods.

王东

国家级青年人才、香港中文大学（深圳）理工学院长聘副教授、校长青年学者。2013 年获四川大学数学学士学位，2017 年获香港科技大学应用数学博士学位，2017—2020 年任美国犹他大学数学系助理教授，2020 年加入香港中文大学（深圳）。主要从事材料科学、图像处理、拓扑优化及多相流中的数学建模、高效算法与理论分析，在 SIAM 系列、Math. Comp.、J. Comput. Phys.等期刊发表 50 余篇论文。主持国家优青、深圳市优青等项目，曾入选 CSIAM 青年托举工程项目。2018 年获香港数学学会最佳博士论文奖及第 13 届 EASIAM 会议学生论文竞赛一等奖。2026 年获中国工业与应用数学学会（CSIAM）应用数学青年科技奖。

An efficient and stable diffusion generated method for quadrilateral mesh generation in general domains

This paper introduces a novel, robust, and computationally efficient framework for high-quality quadrilateral mesh generation on general two-dimensional domains. The core of the proposed approach is a novel method for computing cross fields by minimizing a modified and relaxed Ginzburg--Landau-type energy functional. A key innovation is the extension of the problem from the original, potentially complex domain to a larger regular computational domain. This extension transforms the central computational procedure into an iterative scheme that requires only two straightforward and efficient operations: linear diffusion solved globally via the Fast Fourier Transform (FFT) and point-wise normalization. Notably, our method eliminates the conventional need for generating an intermediate triangular mesh or solving complex nonlinear optimization problems on the irregular domain. We provide a rigorous theoretical analysis, proving that the proposed iterative algorithm guarantees unconditional monotonic decay of the objective functional. Comprehensive numerical experiments demonstrate the method's robustness across a wide range of complex geometries, its significant computational efficiency afforded by the FFT-based diffusion, and its consistent generation of high-quality quadrilateral meshes. This work presents a reliable and theoretically sound alternative to existing mesh generation techniques, with strong potential for practical applications in scientific computing.

许志钦

国家级青年人才、上海交通大学自然科学研究院、数学科学学院教授。主要研究深度学习的数学基础及其在科学计算中的应用，关注频率原则、参数凝聚及大语言模型的记忆与推理机制。在 IEEE TPAMI、JMLR、NeurIPS 、J. Comput. Phys.等期刊发表论文，现任 Journal of Machine Learning 创刊执行编辑。2026 年获中国工业与应用数学学会（CSIAM）应用数学青年科技奖。

凝聚现象与大模型推理机制

为了达到更好的性能，深度神经网络的参数量通常会被设为非常大。为什么一个如此多参数的模型会泛化好？这是一个重要且有趣的问题。这个报告从凝聚现象提供一种理解，对于泛化好的网络常常能观察到同层神经元会趋同。我们发现并深入挖掘这个现象及其背后的原理，理解初始化和权重衰减如何影响凝聚现象，并用它来理解大模型的推理。