# 数学与系统科学研究院

# 计算数学所学术报告

报告人：　**Dr. Jian Tao**

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报告题目：

**Computational Hierarchy for Engineering Model-Oriented Re-adjustable Applications (CHEMORA)**

邀请人：　崔涛 副研究员

报告时间：**2016** 年 **7** 月 **7** 日（周四）

下午 **14:00-15:00**

报告地点：　数学院南楼二层

**202** 会议室

# Abstract:

**Starting from a high-level problem description in terms of partial differential equations using abstract tensor notation, the CHEMORA framework discretizes, optimizes, and generates complete high performance codes for a wide range of compute architectures. CHEMORA extends the capabilities of the Cactus computational framework, facilitating the usage of large-scale CPU/GPU systems in an efficient manner for complex applications, without low-level code tuning. CHEMORA achieves parallelism through MPI and multi-threading, combining OpenMP, and CUDA. The discretization is based on higher-order finite differences on multi-block domains. Optimizations include high-level code transformations, efficient loop traversal strategies, dynamically selected data and instruction cache usage strategies, and JIT compilation of GPU code tailored to the problem characteristics. CHEMORA's capabilities are demonstrated by simulations of black hole collisions. This problem provides an acid test of the framework, as the Einstein equations contain hundreds of variables and thousands of terms.The development of CHEMORA is supported by the NSF Early-concept Grants for Exploratory Research (EAGER) program under the award number 1265449**

# Bio:

Jian Tao got his B.S degree from the University of Science and Technology of China in 2000, and later received his Ph.D in computational astrophysics from Washington University in St. Louis. Before joining CCT as a research scientist, he worked at CCT as a postdoc in the NSF XiRel project to build the next generation infrastructure for numerical relativity, and the NSF CyberTools project to develop the infrastructures needed for interdisciplinary research. He is a member of the Cactus framework group and the PI of an ongoing NSF BIGDATA (SMALL) project to improve both performance and usability of the HDF5 library that is widely used in the scientific computing community. He is also a Co-PI of the LSU CUDA reseach center and worked on CHEMORA, a programming framework to support automatic code generation and optimization for large scale scientific applications on heterogeneous systems.

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