研讨会通知

各位老师,各位同学：

邓越凡教授团队邀请芝加哥大学学生Arjun Kapoor来我校进行学术交流，并于 2015 年 8 月 19 日举办一个超级计算技术与应用方面的研讨会，具体内容如下：

一：会议时间：2015 年 8 月 19 日下午 3 点整

二：会议地点：336 栋 210 室

三： 演讲人及报告题目：

Arjun Kapoor （15:00-16:00）

Parallel Computing Interconnection Network Optimization for Next-Generation Supercomputers and Applications of High Performance Computing in Big Data

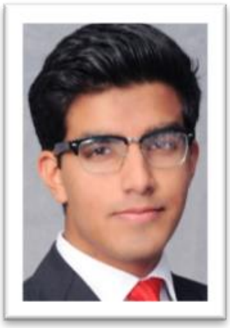
A Mini Seminar Series by a student of University of Chicago

August 19, 2015

15:00-16:00 Arjun Kapoor

Parallel Computing Interconnection Network Optimization for Next-Generation Supercomputers and Applications of High Performance

演讲人简介（A brief introdution to the speaker）



Arjun Kapoor is a student of Computational and Applied Mathematics and Economics at The University of Chicago where he is a Stamps Scholar, the most prestigious merit scholarship offered at the university, and a recipient of the Presidential Scholarship. Arjun has also received the US Congressional Award Gold Medal, the US Congress's highest honor for America's youth. As a research student at Stony Brook University, Arjun has had various experiences in applied mathematics and algorithm design. These designs are patented under his name and his work was recognized by the Siemens Foundation, naming Arjun is a Finalist in the Siemens National Science Competition, the Intel Science Talent Search, naming him a Semi-Finalist, and in the Intel International Science and Engineering Fair, where Arjun placed 2nd internationally and also received special awards recognition from Oracle, The Association for Advanced Computing Machinery, Wolfram Alpha, and The Mu Alpha Theta Mathematics Society. Continuing his work with supercomputing, Arjun is now in the process of designing and implementing a ~$20,000,000 supercomputer for the Government of Bhopal in India.

报告摘要（abstract）

Supercomputers have become critical to the advancement of many fields including medical research, big data analysis, and high-energy physics. Given the recent plateau in processor speeds, however, supercomputers are growing in processor count to meet demand. Essentially, because current industry standard interconnection networks are unable to address growing latency in these large networks, it is necessary that new networks be created. I applied simulated annealing, a commonly used heuristic to solving combinatorial optimization problems, with a novel distance recalculation algorithm, applicable in a variety of dynamic systems. The results of this process were optimal graphs that approached a 51% improvement in latency over the hypercube, an industry standard, and an algorithm whose time complexity was significantly lower than standard distance computation algorithms. These solutions, while significantly increasing efficiency, lost applicability as they became too complex to implement. A new algorithm was then created to embed the generated optimal topologies with small node counts to create larger, quasi-optimal topologies with an increased self-similarity within the systems. These embedded topologies, created after determining the mathematical advantage of self-similarity over symmetry, were, essentially, as efficient with regards to latency as the

previously generated optimal networks. In essence, this work provides critical insight into the fundamental nature of hyper latency-efficient parallel networks.

As supercomputers approach Exascale levels of performance, a variety of industries and fields of study will advance as they benefit from such a drastic increase in computational power. Notably, Big Data analysis has become a key field which is proving to be applicable to a large number of diverse problems. Amongst such fields which benefit from Big Data analytics, are Financial Forecasting, Weather Forecasting, and other forms of predictive analytics. With the understanding that the internet is a sort of ‘collective conscious,’ an algorithm will be discussed which is being created for the NYC DEP (New York City Department of Environmental Protection) to scrape information from Twitter regarding NYC water usage and, by pairing this information with weather records, water usage records, and information on a variety of other parameters, predict the water usage for the entire New York City of approximately 8,406,000 residents.