COLLOQUIUM SERIES

TITLE:
Network Data Streaming -- A Computer Scientist's Journey in Signal Processing

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ABSTRACT:
With the rapid growth of the Internet, network link speeds have become faster every year to accommodate more Internet users. Measuring and monitoring the traffic on such high-speed links has become an ever challenging problem. Our team is among the first to realize that data streaming algorithms have the potential to become very useful tools for measuring and monitoring high-speed networks. Data streaming is concerned with processing a long stream of data items in one pass using a small working memory in order to estimate certain statistics of the stream. The challenge is to use this small memory to "remember" as much information *pertinent to this estimation* as possible. However, existing data streaming algorithms are typically designed for processing a single stream of data for a single type of statistic, and most of these algorithms cannot operate at very high link speed. Targeting the deficiency of existing approaches, we have investigated new data streaming paradigms and mechanisms that allow us to perform large-scale distributed data streaming on tens of thousands of high-speed links and nodes, and aggregate, compress, and interpret these streaming results, for better measurement and monitoring of large networks. We also discovered that the applications of data streaming go far beyond network measurement and monitoring. Recently, we have successfully applied the data streaming techniques to a seemingly unrelated area: query routing in an unstructured P2P network. In this talk, I will talk about these new applications as well as our theory of formulating the data streaming problems in CS as the channel design problem in EE.

Bio:
Jun (Jim) Xu is an Associate Professor in the College of Computing at Georgia Institute of Technology. He received his Ph.D. in Computer and Information Science from The Ohio State University in 2000. His current research interests include data streaming algorithms for the measurement and monitoring of computer networks, algorithms and data structures for computer networks, network security, and performance modeling and simulation. He received the NSF CAREER award in 2003 for his ongoing efforts in establishing fundamental lower bound and tradeoff results in networking. He is a co-author of a paper that won the Best Student Paper Award from 2004 ACM Sigmetrics/IFIP Performance joint conference, and the faculty advisor of the student winners. He received 2006 IBM faculty award for making fundamental contributions to performance evaluation methodologies.

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