Abstract
Network information theory is a promising and attractive research area in information science and engineering. During the past 40 years, there has been a lot of works on network information theory, which investigated the performance limits of several simple but typical multi-user communication systems. These results greatly impacted the design and optimization of modern communication systems, such as cellular networks and wireless relay networks. Recent advances on network information flow and network coding presented a unified framework for communication networks with general topologies. By studying network coding, information theorists came to know that the joint information processing among various information flows is feasible, and more importantly, can bring significant performance gains. The essential differences between the information networks and commodity networks are also demonstrated.

In this talk, we will describe recent achievements on wireless network information theory and network coding. A novel network model referred to as wireless switching network is proposed based on the observation and abstraction of several communication systems. In such networks, each user has its knowledge on the packets sent by itself, which is referred to as self-information. With self-information, not only network coding but also interference cancellation can be adopted. In our work, an interference cancellation method proposed by Shannon in 1961 is re-discovered and extended to the multi-hop scenario. We also study the impact of fading on wireless network coding. A novel cross-layer coding scheme, which we refer to as joint physical-network coding, is proposed to achieve the maximum capacity region. By demonstrating the essential relationship between the network layer status and the information processing scheme in the physical layer, our work starts a first step toward the cross-layer framework of network information theory. Some theoretical results on using network coding to enhance the security of wireless networks will also be presented.

Biography
Wei Chen received his B.S. degree (with distinction, ranked 1st in the department) from Tsinghua University in 2002, major in Operations Research. He is currently working toward his Ph.D. degree in Department of Electronic Engineering, Tsinghua University. Since 2005, he is also a visiting research staff in Department of Electronic and Computer Engineering, the Hong Kong University of Science and Technology.

His research interests are in network information theory and cross-layer design of wireless networks. He has also worked on the distributed queuing analysis and stochastic optimization of large scale logistics networks in his B.S. thesis. Mr. Chen received from Tsinghua University the creative funding for outstanding Ph.D. student in 2004. He received the IEEE ICC Best Paper Award in 2006.

** ALL ARE WELCOME **

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** A Note by Prof. S.C. Liew: Mr. Chen’s talk will include his IEEE ICC2006 best-paper award work and the latest results extending that work. **